

SENTENCING BY COMPUTER: ENHANCING
SENTENCING TRANSPARENCY AND PREDICTABILITY,
AND (POSSIBLY) BRIDGING THE GAP BETWEEN
SENTENCING KNOWLEDGE AND PRACTICE

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INTRODUCTION

Computer technology has profoundly changed both the law and legal practice and continues to have a transformative impact on them. Initially, lawyers used computers to complete their relatively low-level professional activities more efficiently—for example, by providing databases for legal research and mechanizing legal forms and documents. More recently, computer technology has been used to facilitate far more complex activities like discerning the meaning of documents and predicting the outcome of court decisions.

One of the few remaining legal frontiers into which computer technology has not meaningfully extended is judicial decision-making.¹ Many decisions by judges involve a dynamic and multi-faceted calculus, which includes evaluating, weighing, and contrasting numerous considerations such as witness credibility, legal principles and rules, and competing legal objectives. It has been assumed that, due to its complexity, only a human who is well versed in the law and human behavior could undertake this process.² Nevertheless, the advent of sophisticated algorithms designed to facilitate decision-making involving a large number of variables challenges this assumption.

Sentencing law may be particularly amenable to computerized decision-making. The most obvious reason for this is that sentencing often has well-

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¹ This is despite predictions going back as far as forty years that computers one day might replace judges. See Anthony D'Amato, *Can/Should Computers Replace Judges?*, 11 GA. L. REV. 1277, 1278–80 (1977).

² Recently, however, even Chief Justice Roberts indicated that it may not be too far off “when smart machines . . . will assist with courtroom fact finding . . . [and] judicial decision making.” See Christopher Markou, *Why Using AI to Sentence Criminals is a Dangerous Idea*, THE CONVERSATION (May 16, 2017, 6:26 AM), <http://theconversation.com/why-using-ai-to-sentencing-criminals-is-a-dangerous-idea-77734>.

established objectives and considerations.³ Further, as a result of a move towards fixed or presumptive penalties,⁴ in many instances the appropriate penalty can already often be ascertained mathematically, at least within a reasonable range.⁵ In addition, at the sentencing stage of a case, the relevant facts are already established, and hence credibility and reliability issues—which require human judgement to resolve—are not relevant.

A number of problems could, however, result from the introduction of computerized sentencing. It may be difficult to embed judges' nuanced knowledge into computer programs, and, therefore, those programs could inappropriately apply sentencing rules and impose sentences that are either too harsh or too soft. In addition, it has been suggested that some algorithms that predict an offender's risk of recidivism (and could be used in computerized sentencing determinations) have the potential to entrench elements of the current sentencing system that unfairly discriminate against certain minority groups, including African American and socially disadvantaged offenders.⁶

This Article concludes that these problems can be overcome and that computers could determine sentences more effectively and fairly than human judges. The application of a properly designed algorithm that incorporates all relevant sentencing variables and confers appropriate weight on sentencing objectives and considerations could lead to sentences that are transparent and fair.⁷ Computers could make sentencing decisions more efficiently than judges because computers process relevant information instantaneously. Computerized sentencing may also be more transparent than judicial decision-making and can eliminate discriminatory aspects of the current sentencing system if programs are designed carefully to ensure that they do not apply sentencing considerations that directly or indirectly discriminate against certain groups.

There are several other potential benefits of computerized sentencing that may not be immediately obvious. Most significantly, computerized sentencing could provide the catalyst for urgently needed reform to sentencing

³ Mirko Bagaric & Sandeep Gopalan, *Saving the United States from Lurching to Another Sentencing Crisis: Taking Proportionality Seriously and Implementing Fair Fixed Penalties*, 60 ST. LOUIS U. L.J. 169, 183 (2016).

⁴ Michael Tonry, *The Questionable Relevance of Previous Convictions to Punishments for Later Crimes*, in PREVIOUS CONVICTIONS AT SENTENCING 91, 93 (Julian V. Roberts & Andrew von Hirsch eds., 2010).

⁵ See James S. Gwin, *Juror Sentiment on Just Punishment: Do the Federal Sentencing Guidelines Reflect Community Values?*, 4 HARV. L. & POL'Y REV. 173, 180–81 (2010).

⁶ See Mirko Bagaric, Nick Fischer & Gabrielle Wolf, *Bringing Sentencing into the 21st Century: Closing the Gap Between Practice and Knowledge by Introducing Expertise into Sentencing Law*, 45 HOFSTRA L. REV. 785, 824–29 (2017) [hereinafter Bagaric, *Bringing Sentencing*].

⁷ As is noted below, however, the accuracy and quality of computerized decision-making is obviously governed by the quality of the data and the accuracy of the algorithm that is designed to facilitate the decision. See *infra* Section IV.D.

law, which at present is fundamentally broken. It is the area of the law where there is the greatest gap between what the law seeks to achieve and what empirical data shows can be achieved through a system of state-imposed sanctions.⁸ This is largely because criminals have no political capital and engender no community empathy. Sentencing is a politicized institution and it has been heavily influenced by the “tough on crime” agenda, which has been the dominant political ethos for several decades.⁹ This sentiment has stifled rational and prudent development and reform of sentencing law. Further, it has culminated in the greatest socio-legal crisis of our time: the mass incarceration crisis.¹⁰ The United States imprisons nearly 7 hundred people per 100,000 of the population, which equates to more than 2 million Americans currently behind prison walls.¹¹ This is more than five times the average rate of incarceration in other developed countries.¹²

A key cause of the incarceration crisis was the move towards sentencing grids in many parts of America, which often mandated severe penalties for a large range of offenses and especially for offenders with prior convictions.¹³ This procedural shift away from a largely discretionary sentencing system (which existed until forty years ago)¹⁴ to a prescriptive process had a profound effect on sentencing outcomes. It is illuminating that the evolution from discretionary sentencing decision-making to the prescriptive application of the law was accompanied by a deep reevaluation of substantive

⁸ See Bagaric & Gopalan, *supra* note 3, at 184–85.

⁹ Bagaric, *Bringing Sentencing*, *supra* note 6, at 787.

¹⁰ See ANTHONY C. THOMPSON, *RELEASING PRISONERS, REDEEMING COMMUNITIES: REENTRY, RACE, AND POLITICS* 2 (2008); SASHA ABRAMSKY, *AMERICAN FURIES: CRIME, PUNISHMENT, AND VENGEANCE IN THE AGE OF MASS IMPRISONMENT* 171–72, 176 (2007); Lynn Adelman, *What the Sentencing Commission Ought to Be Doing: Reducing Mass Incarceration*, 18 MICH. J. RACE & L. 295, 295 (2013); Todd R. Clear & James Austin, *Reducing Mass Incarceration: Implications of the Iron Law of Prison Populations*, 3 HARV. L. & POL’Y REV. 307, 307 (2009); Bernard E. Harcourt, *Keynote: The Crisis and Criminal Justice*, 28 GA. ST. U. L. REV. 965, 965–66 (2012). The problem is so acute that even a “Reverse Mass Incarceration Act” has been proposed. See LAUREN-BROOKE EISEN & INIMAI CHETTIAR, BRENNAN CTR. FOR JUSTICE, *THE REVERSE MASS INCARCERATION ACT 1* (2015), https://www.brennan-center.org/sites/default/files/publications/The_Reverse_Mass_Incarceration_Act%20.pdf.

¹¹ *United States of America*, WORLD PRISON BRIEF, <https://www.prisonstudies.org/country/united-states-america> (last visited Jan. 4, 2019).

¹² See MELISSA S. KEARNEY ET AL., *THE HAMILTON PROJECT, TEN ECONOMIC FACTS ABOUT CRIME AND INCARCERATION IN THE UNITED STATES* 10 (2014), https://www.hamiltonproject.org/assets/legacy/files/downloads_and_links/v8_THP_10CrimeFacts.pdf (explaining that rates in countries in the Organisation for Economic Co-operation and Development range from 47 to 266 per 100,000 of the national population).

¹³ See Mirko Bagaric, *The Punishment Should Fit the Crime—Not the Prior Convictions of the Person That Committed the Crime: An Argument for Less Impact Being Accorded to Previous Convictions in Sentencing*, 51 SAN DIEGO L. REV. 343, 345–46 (2014) [hereinafter Bagaric, *The Punishment*].

¹⁴ See Nancy Gertner, *A Short History of American Sentencing: Too Little Law, Too Much Law, or Just Right*, 100 J. CRIM. L. & CRIMINOLOGY 691, 698–700 (2010).

sentencing law.¹⁵ This involved a reassessment of the objectives of sentencing, such as community protection, deterrence, retribution, and rehabilitation, and a recalibration of their respective priorities.¹⁶ It is possible that an even more monumental shift in the manner in which sentences are determined (from judicial to computerized sentencing) would also provide the impetus for a similar reevaluation of the appropriate aims of sentencing law.

Thus, while reforming the process by which sentencing decisions are made—from a court judgment to a computer algorithm—does not necessarily entail substantive reform, there is a reasonable prospect that procedural change will instigate a substantive reassessment of sentencing law and practice. This could drive a wholesale improvement of sentencing law if the sentencing algorithm is informed by empirical evidence of the outcomes that can be attained through state-imposed sanctions and by an imperative to impose proportionate penalties (as opposed to merely accommodating current sentencing principles and rules).

The reform proposed in this Article is thus evaluated from two different perspectives. Part I first examines whether sentencing in the context of the *current* law would be improved by using computers to make determinations regarding appropriate penalties. It concludes that computerized sentencing would make the present sentencing system more transparent, consistent, and predictable, and would eliminate some of the fundamental problems associated with current sentencing, such as the imposition of disproportionately harsh penalties, especially on offenders from minority groups. The second section in Part I evaluates the proposal for computerized sentencing in its potential role within a *reformed sentencing* model. Computerized sentencing is also desirable in a reformed sentencing system and, in fact, a move to computerized sentencing may make sentencing reform more likely. Part II provides an overview of the increasing use of computers in complex areas of the law. Part III sets out the manner in which a sentencing algorithm could be developed and how it could operate. Part IV discusses the advantages of using computers to make sentencing decisions. Potential disadvantages of this recommendation and ways to overcome them are discussed in Part V. The conclusion notes our key reform proposals and their likely benefits.

I. OVERVIEW OF CURRENT SENTENCING LAW AND ITS PROBLEMS

To contextualize the ensuing discussion of the potential of computers to make sentencing decisions, this Article first provides an overview of current sentencing law and practice, highlighting its limitations and failings.

¹⁵ See *infra* Section I.A.2.

¹⁶ See *id.*

A. *Prescriptive and Discretionary Sentencing*

1. Many Sentencing Regimes Involve Prescriptive Penalties

Although the United States' federal jurisdiction and each of its states have different sentencing systems,¹⁷ certain aspects of those systems, including their objectives, are similar throughout the country. The sentencing goals that they share are: community protection (also known as incapacitation); general deterrence; specific deterrence; rehabilitation; and retribution.¹⁸ While there is no consistency in the emphasis accorded to these objectives, the goal that has assumed cardinal status over the past few decades is community protection.¹⁹ This is reflected most prominently in the harsh prescriptive sentencing laws—manifested in fixed, minimum, or presumptive penalties²⁰—that now apply at least to some extent in all American jurisdictions.²¹ Nineteen of the United States' jurisdictions in fact have *extensive* guideline sentencing systems.²²

Generally, sentencing grids are used to outline prescribed penalties, and penalties are calculated principally by reference to two considerations: criminal history and offense seriousness.²³ Professor Michael Tonry is one of many who have denounced prescribed penalties for their severity and contribution to the mass incarceration crisis:

Anyone who works in or has observed the American criminal justice system over time can repeat the litany of tough-on-crime sentencing laws enacted in the 1980s and the first half of the 1990s: mandatory minimum sentence laws (all 50 states), three-strikes laws (26 states), [life-without-parole] laws (49 states), and truth-in-sentencing laws (28 states), in some places augmented by equally severe “carecr criminal,” “dangerous offender,” and “sexual predator”

¹⁷ Sentencing (and, more generally, criminal law) in the United States is mainly the province of the states. *See* *United States v. Morrison*, 529 U.S. 598, 613 (2000) (citing *United States v. Lopez*, 514 U.S. 549, 564 (1995)).

¹⁸ *See* U.S. SENTENCING GUIDELINES MANUAL § 1A1.2 (U.S. SENTENCING COMM’N 2018) [hereinafter SENTENCING GUIDELINES].

¹⁹ NAT’L RESEARCH COUNCIL, *THE GROWTH OF INCARCERATION IN THE UNITED STATES: EXPLORING CAUSES AND CONSEQUENCES* 9 (Jeremy Travis et al. eds., 2014) [hereinafter GROWTH OF INCARCERATION].

²⁰ For the purposes of clarity, these all come under the terminology of “fixed penalties” in this Article.

²¹ GROWTH OF INCARCERATION, *supra* note 19, at 325.

²² *See* Richard S. Frase & Kelly Lyn Mitchell, *What Are Sentencing Guidelines?*, U. MINN. (Mar. 21, 2018), <http://sentencing.umn.edu/content/what-are-sentencing-guidelines> (listing the following jurisdictions: Alabama, Arkansas, Delaware, the District of Columbia, Florida, Kansas, Maryland, Massachusetts, Michigan, Minnesota, North Carolina, Ohio, Oregon, Pennsylvania, Tennessee, Utah, Virginia, Washington, and the federal courts).

²³ *See* Alexis Lee Watts, *In Depth: Sentencing Guideline Grids*, U. MINN. (Jan. 11, 2018), <https://sentencing.umn.edu/content/depth-sentencing-guideline-grids>. Criminal history is based mainly on the number, seriousness, and age of the prior convictions. *See id.*

laws. These laws, because they required sentences of historically unprecedented lengths for broad categories of offenses and offenders, are the primary causes of contemporary levels of imprisonment.²⁴

There is abundant evidence that the move to more guidelines or pre-scriptive penalties has led to increases in the rates of incarceration and lengths of prison terms.²⁵ For instance, in 2012, the Pew Center reported that the average duration of a prison term has increased by thirty-six percent since 1990,²⁶ while the Sentencing Project found in 2013 that over ten percent of inmates in American prisons had life sentences,²⁷ which represents a four-fold increase since 1984, even though crime rates decreased over those years.²⁸ The Sentencing Project also reported that there were twenty-two percent more inmates serving life sentences without the possibility of parole in 2013 than in 2008.²⁹ A more recent study showed that the number of offenders serving life terms is now at a record high.³⁰ There are currently 161,957 prisoners serving a life term and an additional 44,311 offenders serving a “virtual life” sentence (that is, a term of fifty years or more).³¹ This amounts to 13.9% of the entire prison population.³² Nearly half of these prisoners (48.3%) are African American.³³ Incredibly, the United States’ incarceration rate for life terms is approximately fifty per 100,000 people, which is about

²⁴ Michael Tonry, *Remodeling American Sentencing: A Ten-Step Blueprint for Moving Past Mass Incarceration*, 13 *CRIMINOLOGY & PUB. POL’Y* 503, 514 (2014) (citation omitted). For further criticism of the United States’ sentencing guidelines, see Albert W. Alschuler, *Disparity: The Normative and Empirical Failure of the Federal Guidelines*, 58 *STAN. L. REV.* 85, 92–94 (2005); Gwin, *supra* note 5, at 175–76. Professor John Pfaff argues that the key reason for the increase in incarceration numbers is strict prosecution practices, wherein a higher rate of felonies is charged. JOHN F. PFAFF, *LOCKED IN: THE TRUE CAUSES OF MASS INCARCERATION AND HOW TO ACHIEVE REAL REFORM* 6 (2017); see also JAMES FORMAN JR., *LOCKING UP OUR OWN: CRIME AND PUNISHMENT IN BLACK AMERICA* 124 (2017).

²⁵ See MICHAEL MITCHELL & MICHAEL LEACHMAN, *CTR. ON BUDGET & POLICY PRIORITIES, CHANGING PRIORITIES: STATE CRIMINAL JUSTICE REFORMS AND INVESTMENTS IN EDUCATION* 4–6 (2014), <https://www.cbpp.org/sites/default/files/atoms/files/10-28-14sfp.pdf>; see also PEW CHARITABLE TRS., *MORE PRISON, LESS PROBATION FOR FEDERAL OFFENDERS* (2016), https://www.pewtrusts.org/-/media/assets/2016/01/pspp_fs_moreprisonlessprobation_v1.pdf.

²⁶ PEW CTR. ON THE STATES, *TIME SERVED: THE HIGH COST, LOW RETURN OF LONGER PRISON TERMS* 2, 13 (2012), http://www.pewtrusts.org/~/-/media/legacy/uploadedfiles/wwwpewtrustsorg/reports/sentencing_and_corrections/prisontimeservedpdf.pdf.

²⁷ See ASHLEY NELLIS, *THE SENTENCING PROJECT, LIFE GOES ON: THE HISTORIC RISE IN LIFE SENTENCES IN AMERICA* 13 (2013), <http://sentencingproject.org/wp-content/uploads/2015/12/Life-Goes-On.pdf>.

²⁸ *Id.* at 13–14.

²⁹ *Id.* at 1.

³⁰ See ASHLEY NELLIS, *THE SENTENCING PROJECT, STILL LIFE: AMERICA’S INCREASING USE OF LIFE AND LONG-TERM SENTENCES* 5 (2017), <http://www.sentencingproject.org/wp-content/uploads/2017/05/Still-Life.pdf>.

³¹ *Id.*

³² *Id.*

³³ *Id.*

the same as the *entire* incarceration rates of Finland, Sweden, and Denmark combined.³⁴ Further, in the United States federal jurisdiction, more than two-thirds of the offenders serving life in prison were imprisoned for nonviolent crimes.³⁵

To understand the operation of prescribed penalty laws and guideline sentencing systems in the United States, it is illuminating to consider the United States Sentencing Commission Guidelines Manual (“Federal Sentencing Guidelines” or “Guidelines”). These Guidelines have received significant attention and analysis,³⁶ greatly influenced state sentencing systems, and affected many offenders who have been sentenced under them.³⁷ As has been noted, “the federal government now operates the single largest criminal justice system by inmate count in the United States. Indeed, the federal prison system itself is among the top ten largest by country in the world.”³⁸ Further, as a report of the Brennan Center for Justice observes:

[H]istory proves that decisions made in Washington affect the whole criminal justice system, for better or worse. Federal funding drives state policy, and helped create our current crisis of mass incarceration. And the federal government sets the national tone, which is critical to increasing public support and national momentum for change. Without a strong national movement, the bold reforms needed at the state and local level cannot emerge.³⁹

Although the Federal Sentencing Guidelines are advisory rather than mandatory (since the United States Supreme Court’s decision in *United States v. Booker*⁴⁰), the Guidelines range has had a significant impact on

³⁴ *Id.*

³⁵ *Id.* at 13.

³⁶ SENTENCING GUIDELINES, *supra* note 18, § 1A1.2.

³⁷ See Douglas A. Berman & Stephanos Bibas, *Making Sentencing Sensible*, 4 OHIO ST. J. CRIM. L. 37, 47–48 (2006). There are more than 200,000 federal prisoners. E. ANN CARSON, U.S. DEP’T OF JUSTICE, NCJ 247282, PRISONERS IN 2013, at 2 (rev. 2014), <https://www.bjs.gov/content/pub/pdf/p13.pdf>. Also, as noted below, the broad structure of the Federal Sentencing Guidelines is similar to many other guideline systems in that the penalty range is not mandatory and permits departures in certain circumstances. See *infra* Section I.A.1.

³⁸ Melissa Hamilton, *Sentencing Disparities*, 6 BRIT. J. AM. LEGAL STUD. 177, 182 (2017) (footnote omitted).

³⁹ AMES C. GRAWERT, NATASHA CAMHI & INIMAI CHETTIAR, BRENNAN CTR. FOR JUSTICE, A FEDERAL AGENDA TO REDUCE MASS INCARCERATION 1 (2017), <https://www.brennancenter.org/sites/default/files/publications/a%20federal%20agenda%20to%20reduce%20mass%20incarceration.pdf>.

⁴⁰ 543 U.S. 220 (2005). In *Booker*, the Supreme Court held that aspects of the Guidelines that were mandatory were contrary to the Sixth Amendment right to a jury trial. *Id.* at 245–46; see also *Pepper v. United States*, 562 U.S. 476, 481 (2011) (“[W]hen a defendant’s sentence has been set aside on appeal, a district court at resentencing may consider evidence [that may] . . . support a downward variance from the now-advisory Federal Sentencing Guidelines range.”); *Irizarry v. United States*, 553 U.S. 708, 715 (2008) (“[T]here is no longer a limit comparable to the one at issue in *Burns* on the variances from Guidelines ranges that a district court may find justified under the sentencing factors set forth in 18 U.S.C. § 3553(a).”); *Gall v. United States*, 552 U.S. 38, 41 (2007) (“[W]hile the extent of the difference between a particular sentence and the recommended Guidelines range is surely relevant, courts of appeals must

many sentencing outcomes. It is only recently that judges have begun to depart from the Federal Sentencing Guidelines.⁴¹ In 2014, only forty-six percent of sentences imposed by federal courts fell inside the Guidelines, but prior to that, most sentences were within them.⁴² In more recent years, there has been a slight increase in the number of sentences imposed within the Guidelines range. In 2015, forty-seven percent of sentences were inside the Guidelines range; this increased to forty-nine percent in 2016.⁴³

The Federal Sentencing Guidelines resemble most other grid sentencing systems in that penalties are determined particularly by reference to an offender's prior convictions and the perceived severity of the crime.⁴⁴ An offender's criminal history can considerably increase the harshness of the penalty. For example, crimes at level 15 carry a presumptive penalty of imprisonment for 18–24 months for a first-time offender and 41–51 months for an offender with at least 13 criminal history points.⁴⁵ If a crime is at level 35, the Guidelines penalty range is 168–210 months for a first-time offender and

review all sentences—whether inside, just outside, or significantly outside the Guidelines range—under a deferential abuse-of-discretion standard.”); *Rita v. United States*, 551 U.S. 338, 354–56 (2007) (holding that federal appellate courts may apply presumption of reasonableness to district court sentences that are within properly calculated Guidelines ranges). Consequently, district courts are required to calculate and consider the Guidelines properly when sentencing, even in an advisory guideline system. 18 U.S.C. § 3553(a)(4)–(5) (2012); *see also Gall*, 552 U.S. at 49 (“As a matter of administration and to secure nationwide consistency, the Guidelines should be the starting point and the initial benchmark.”); *Booker*, 543 U.S. at 264 (“The district courts, while not bound to apply the Guidelines, must . . . take them into account when sentencing.”). The district court, in determining the appropriate sentence in a particular case, therefore, must consider the properly calculated Guidelines range, the grounds for departure provided in the policy statements, and then the factors under 18 U.S.C. § 3553(a). *Rita*, 551 U.S. at 347–48; *see also Gall*, 552 U.S. at 50–51 (“[A district judge] must consider the extent of the deviation and ensure that the justification is sufficiently compelling to support the degree of the variance[, and] . . . he must adequately explain the chosen sentence to allow for meaningful appellate review [An] appellate court should then consider the substantive reasonableness of the sentence imposed under an abuse-of-discretion standard. . . . It may consider the extent of the deviation, but must give due deference to the district court’s decision that the § 3553(a) factors, on a whole, justify the extent of the variance.”).

⁴¹ *See* U.S. SENTENCING COMM’N, U.S. SENTENCING COMMISSION FINAL QUARTERLY DATA REPORT: FISCAL YEAR 2014, at 10 fig.A (2015), http://www.ussc.gov/sites/default/files/pdf/research-and-publications/federal-sentencing-statistics/quarterly-sentencing-updates/USSC-2014_Quarterly_Report_Final.pdf.

⁴² *Id.* at 2 tbl.2, 12 tbl.4; *see also* Sarah French Russell, *Rethinking Recidivist Enhancements: The Role of Prior Drug Convictions in Federal Sentencing*, 43 U.C. DAVIS L. REV. 1135, 1160 (2010). For a discussion regarding the potential of mitigating factors to have a greater role in federal sentencing, *see* William W. Berry III, *Mitigation in Federal Sentencing in the United States*, in MITIGATION AND AGGRAVATION AT SENTENCING 247, 248 (Julian V. Roberts ed., 2011).

⁴³ U.S. SENTENCING COMM’N, ANNUAL REPORT: FISCAL YEAR 2016, at A-5 (2017), <https://www.ussc.gov/sites/default/files/pdf/research-and-publications/annual-reports-and-sourcebooks/2016/2016-Annual-Report.pdf>.

⁴⁴ *See* Carissa Byrne Hessick, *Why Are Only Bad Acts Good Sentencing Factors?*, 88 B.U. L. REV. 1109, 1109–10 (2008).

⁴⁵ SENTENCING GUIDELINES, *supra* note 18, § 5A. Offense levels range from 1 (least serious) to 43 (most serious). *Id.* The criminal history score ranges from 0 to 13 or more (worst offending record). *Id.*

292–365 months for an individual who has the highest criminal history score.⁴⁶

In addition to criminal history score and offense severity, the Federal Sentencing Guidelines outline dozens of other considerations that can influence the sanction that is imposed.⁴⁷ Further, judges are permitted to deviate from the Guidelines where there are applicable mitigating and aggravating considerations, which are taken into account mainly in the forms of “adjustments” and “departures.”⁴⁸ Adjustments are considerations that increase or decrease a penalty by a designated amount.⁴⁹ For example, a demonstration of remorse can result in a decrease of a penalty by up to two levels, and a penalty can be lowered by three levels if it is accompanied by an early guilty plea.⁵⁰ Departures more readily enable courts to impose a sentence that is outside the applicable Guidelines range.⁵¹ Pursuant to 18 U.S.C. § 3553, courts can also invoke considerations that are not set out in the Guidelines to justify departing from the applicable Guidelines range,⁵² but when this provision is invoked, judges must set out the reason for stepping outside the range.⁵³

2. The Move from Indeterminate Sentencing to Prescriptive Sentencing Involved a Re-Evaluation of Substantive Sentencing Law

The sentencing process is particularly amenable to computerization because sentences are often determined through prescribed penalty tables that clearly set out the variables and, in some instances (especially in relation to prior criminality), also establish the weight that should be attached to the variables. Before outlining in greater detail how an algorithm can be developed to dictate sentencing outcomes, it is important to explain the evolution

⁴⁶ *Id.*

⁴⁷ See AMY BARON-EVANS & JENNIFER NILES COFFIN, FD.ORG, NO MORE MATH WITHOUT SUBTRACTION: DECONSTRUCTING THE GUIDELINES’ PROHIBITIONS AND RESTRICTIONS ON MITIGATING FACTORS, at i–ii (rev. 2011), https://www.fd.org/sites/default/files/criminal_defense_topics/essential_topics/sentencing_resources/deconstructing_the_guidelines/no-more-math-without-subtraction.pdf.

⁴⁸ *Id.*

⁴⁹ *E.g.*, SENTENCING GUIDELINES, *supra* note 18, § 3A1.1 (providing for an upward adjustment of 2–4 levels in certain circumstances).

⁵⁰ *Id.* §§ 3E1.1, 5K2.16. However, section 5K2.0(d)(4) provides that the court cannot depart from a guideline range as a result of “[t]he defendant’s decision, in and of itself, to plead guilty to the offense or to enter a plea agreement with respect to the offense (i.e., a departure may not be based merely on the fact that the defendant decided to plead guilty or to enter into a plea agreement, but a departure may be based on justifiable, non-prohibited reasons as part of a sentence that is recommended, or agreed to, in the plea agreement and accepted by the court.)” *Id.* § 5K2.0(d)(4) (emphasis omitted).

⁵¹ *Id.* § 1A1.4(b).

⁵² *Id.* § 5K2.0(a)(2)(B); see also *Pepper v. United States*, 562 U.S. 476, 500–01 (2011); *Gall v. United States*, 552 U.S. 38, 50–52 (2007).

⁵³ SENTENCING GUIDELINES, *supra* note 18, § 5K2.0(c).

that has occurred in recent decades towards an increasingly prescriptive approach to sentencing because it highlights a significant potential, incidental advantage of computerized sentencing.

Judge Nancy Gertner describes the period until about forty years ago as one of indeterminate sentencing because judges made decisions about sentences in the context of a largely discretionary system.⁵⁴ Sentencing statutes did not exhaustively designate the matters to be taken into account in sentencing, and judges were mostly free to nominate the sentencing objectives that were relevant in individual cases, and the aggravating and mitigating factors to which they would attach weight. As Judge Gertner noted:

Consistent with this view of judges as the sentencing experts, Congress took a back seat, prescribing a broad range of punishments for each offense, and intervening only occasionally to increase the maximum penalty for specific crimes in response to public demand. Judges had substantial discretion to sentence, so long as it was within the statutory range. In effect, the breadth of the sentencing range left to the courts the task of “distinguishing between more or less serious crimes within the same category.”⁵⁵

The system was heavily criticized for lacking transparency, consistency, and predictability. Justice Marvel Frankel went so far as to describe it as lawless.⁵⁶ As Judge Gertner observes, these problems stemmed from the fact that

judges had no training in how to exercise their considerable discretion. Whatever the criminological literature, judges did not know about it. Sentencing was not taught in law schools; and to the extent there was any debate about deterrence and rehabilitation . . . it was not reflected in judicial training. “It was as if judges were functioning as diagnosticians without authoritative texts, surgeons without *Gray’s Anatomy*.”⁵⁷

In response to the criticisms of indeterminate sentencing and, in particular, its apparently unpredictable nature, guideline sentencing was

⁵⁴ Gertner, *supra* note 14, at 694. As noted by Professor William W. Berry III:

Prior to 1984, federal judges possessed discretion that was virtually “unfettered” in determining sentences, guided only by broad sentence ranges provided by federal criminal statutes. The Sentencing Reform Act of 1984 . . . moved the sentencing regime almost completely to the other extreme, implementing a system of mandatory guidelines that severely limited the discretion of the sentencing judge.

William W. Berry III, *Discretion Without Guidance: The Need to Give Meaning to § 3553 After Booker and Its Progeny*, 40 CONN. L. REV. 631, 631 (2008) (footnote omitted). They are also one of the key distinguishing aspects of the United States’ sentencing system compared to many other countries. See AMANDA SOLTER, SOO-RYUN KWON & DANA MARIE ISAAC, CRUEL AND UNUSUAL: U.S. SENTENCING PRACTICES IN A GLOBAL CONTEXT 46–47 (2012) (noting that 137 of 168 surveyed countries had some form of minimum penalties, but none of the others was as wide-ranging or severe as in the United States).

⁵⁵ Gertner, *supra* note 14, at 696.

⁵⁶ MARVIN E. FRANKEL, CRIMINAL SENTENCES: LAW WITHOUT ORDER 8 (1972). For a critique of his impact, see Lynn Adelman & Jon Deitrich, *Marvin Frankel’s Mistakes and the Need to Rethink Federal Sentencing*, 13 BERKELEY J. CRIM. L. 239, 256 (2008).

⁵⁷ Gertner, *supra* note 14, at 696–97 (footnote omitted).

introduced.⁵⁸ It is significant, especially for this Article, that the shift from a largely discretionary sentencing system to a prescriptive one prompted a reevaluation of substantive sentencing law. This reconsideration of sentencing law was often undertaken by a “new institutional player, an administrative agency—the sentencing commission—charged with generating sentencing standards.”⁵⁹

Developed in this context, the Federal Sentencing Guidelines were informed by a thoughtful consideration of the objectives of sentencing. The United States Federal Sentencing Commission expressly noted that the Guidelines aimed to “further the basic purposes of criminal punishment: deterrence, incapacitation, just punishment, and rehabilitation.”⁶⁰ Further, the Guidelines state that “[t]he [Sentencing Reform] Act’s basic objective was to enhance the ability of the criminal justice system to combat crime through an effective, fair sentencing system.”⁶¹ The Guidelines add that “[m]ost observers of the criminal law agree that the ultimate aim of the law itself, and of punishment in particular, is the control of crime.”⁶²

The depth of analysis that underpinned the Federal Sentencing Guidelines is highlighted by the fact that their content was informed by consideration not only of the extent to which offenders should be punished, but also of the philosophical foundations for imposing sanctions on offenders.⁶³ The United States Federal Sentencing Commission notes that “[a] philosophical problem arose when the Commission attempted to reconcile the differing perceptions of the purposes of criminal punishment.”⁶⁴ However, it was determined that it was unnecessary to delve into this quagmire because “[a]s a practical matter . . . in most sentencing decisions the application of either philosophy will produce the same or similar results.”⁶⁵

A key principle that guided the content of the Guidelines, at least at a theoretical level, was the principle of proportionality, which in broad terms is the view that the harshness of the penalty should match the seriousness of the offense.⁶⁶ Proportionality is pursued in the Guidelines “through a system that imposes appropriately different sentences for criminal conduct of differing severity.”⁶⁷

The comprehensiveness of the investigation that was undertaken to create the Guidelines is also evident in the fact that, rather than developing the

⁵⁸ See *id.* at 697–98; see also Joshua M. Divinc, *Booker Disparity and Data-Driven Sentencing*, 69 HASTINGS L.J. 771, 773 (2018).

⁵⁹ Gertner, *supra* note 14, at 698.

⁶⁰ SENTENCING GUIDELINES, *supra* note 18, § 1A1.2.

⁶¹ *Id.* § 1A1.3.

⁶² *Id.*

⁶³ See *id.*

⁶⁴ *Id.*

⁶⁵ *Id.*

⁶⁶ SENTENCING GUIDELINES, *supra* note 18, § 1A1.3.

⁶⁷ *Id.*

sentencing ranges in the abstract or against a purely theoretical model, they were based on analyses of over forty thousand sentences that had previously been imposed.⁶⁸

Although this major methodological and procedural change in sentencing was accompanied by a substantive reassessment of the objectives of sentencing law, the reevaluation of sentencing law ultimately failed in two key respects. First, its recommendations were not sufficiently informed by a consideration of the efficacy of sentencing to achieve the key orthodox objectives of sentencing, namely incapacitation, specific deterrence, general deterrence, and rehabilitation. Second, proportionality was pursued only in theory and not in practice. These observations are expanded upon later in this Article.⁶⁹ Despite these flaws, the shift from indeterminate to prescriptive sentencing does demonstrate that a fundamental change in the *manner* in which sentences are determined can provide the trigger for substantive reform of sentencing law.

Before setting out how computerized sentencing could operate, this Article highlights the substantive failings of the current sentencing system that could be ameliorated by a move to computerized sentencing.

B. *Sentencing Law Urgently Requires Reform—the Crime That is Mass Incarceration*

1. Prison is Too Expensive

An important subsidiary reason for changing the current sentencing decision-making methodology is that sentencing law at present has resulted in substantial government expenditure on imprisoning an extremely high number of offenders in American prisons and jails, which does not benefit the community. In 2014, more than 2.1 million Americans were incarcerated.⁷⁰ The imprisonment rate has steadily increased over the past forty years,⁷¹ and

⁶⁸ *Id.* § 1A1.5 (“The Commission emphasizes that it drafted the initial guidelines with considerable caution. It examined the many hundreds of criminal statutes in the United States Code. It began with those that were the basis for a significant number of prosecutions and sought to place them in a rational order. It developed additional distinctions relevant to the application of these provisions and it applied sentencing ranges to each resulting category. In doing so, it relied upon pre-guidelines sentencing practice as revealed by its own statistical analyses based on summary reports of some 40,000 convictions, a sample of 10,000 augmented presentence reports, the parole guidelines, and policy judgments.”).

⁶⁹ See *infra* Part III.

⁷⁰ DANIELLE KAEBLE, LAUREN GLAZE, ANASTASIOS TSOUTIS & TODD MINTON, U.S. DEP’T OF JUSTICE, NCJ 249513, CORRECTIONAL POPULATIONS IN THE UNITED STATES, 2014, at 2 (rev. 2016), <https://www.bjs.gov/content/pub/pdf/cpus14.pdf>.

⁷¹ In fact, during this period the imprisonment rate has quadrupled. See GROWTH OF INCARCERATION, *supra* note 19, at 1.

it has more than doubled over the past two decades.⁷² In 2011 and 2012, there was a slight decrease in prison numbers of approximately three percent.⁷³ Incarceration numbers increased again in 2013,⁷⁴ before slightly declining in 2014⁷⁵ and 2015.⁷⁶ The declines, though, are marginal, and a far-reaching, principled solution is necessary in order to drive down prison numbers meaningfully.⁷⁷ This point is highlighted by David Denvir, who calculates that at the current rate at which the number of people who are incarcerated is decreasing, it would take over thirty years for America's prison population to return to something resembling the imprisonment rate prior to the move towards mass incarceration:

Mass incarceration, in short, remains a durable monstrosity. As of 2015, an estimated 2,173,800 Americans were behind bars—1,526,800 in prison and 728,200 in jails—according to recently released data from the Bureau of Justice Statistics. That's 16,400 fewer people in jail and 35,500 fewer prisoners than in 2014 But even as the US becomes a much safer country, it still incarcerates its citizens at *much higher rates* than most any other on earth. . . . At the dawn of mass incarceration in 1980, the US's already-quite-large prison population was estimated at 329,821. To return to that number, the governments would have to replicate the recent 35,500-prisoner reduction for roughly thirty-four years in a row. That's a very long time to wait for the poor communities⁷⁸

In its recent analysis of mass incarceration in America, the New York Bar Association remarked on the breathtaking magnitude of the mass incarceration problem:

⁷² Albert R. Hunt, *A Country of Inmates*, N.Y. TIMES (Nov. 20, 2011), <http://www.nytimes.com/2011/11/21/us/21iht-letter21.html>.

⁷³ See CARSON, *supra* note 37, at 2 tbl.1.

⁷⁴ See *id.* (explaining that there was an increase of 4,344 prisoners in 2013 from 2012). While the federal prison population decreased for the first time since 1980, it was more than offset by an increase in the state prison population (the first increase since 2009). See *id.*

⁷⁵ In 2014, there was a slight decrease in federal and state prison numbers, but this was partially offset by an increase in local jail numbers. See Matthew Friedman, *Just Facts: The U.S. Prison Population Is Down (A Little)*, BRENNAN CTR. FOR JUST. (Oct. 29, 2015), <http://www.brennancenter.org/blog/us-prison-population-down-little>. State and federal prison numbers decreased by 15,400 people from December 31, 2013 to December 31, 2014. *Id.* However, county and city jail numbers increased by 13,384 inmates from midyear 2013 to midyear 2014. *Id.* While these time periods are not aligned, they are indicative of a larger trend. The increasing jail numbers are eclipsing the progress made by decreasing prison numbers.

⁷⁶ See DANIELLE KAEBLE & LAUREN GLAZE, U.S. DEP'T OF JUSTICE, NCJ 250374, CORRECTIONAL POPULATIONS IN THE UNITED STATES, 2015, at 1 (2016), <https://www.bjs.gov/content/pub/pdf/cpus15.pdf> (stating the number of prisoners fell from 2,173,800 to 2,136,600; i.e., a drop of 51,300, or about 1.7%).

⁷⁷ The peak incarceration rate was in 2009. This has declined only 4.9% since that time. See THE SENTENCING PROJECT, U.S. PRISON POPULATION TRENDS 1999–2015: MODEST REDUCTIONS WITH SIGNIFICANT VARIATION 1 (2017), <http://www.sentencingproject.org/wp-content/uploads/2017/05/US-Prison-Population-Trends-1999-2015.pdf>.

⁷⁸ See Daniel Denvir, *America's Durable Monstrosity*, JACOBIN (Jan. 9, 2017), <https://www.jacobinmag.com/2017/01/mass-incarceration-prison-bureau-justice-statistics>.

The American criminal justice system currently holds more than 2.2 million people in an estimated 1,719 state prisons No matter how many times the statistics are repeated, they remain shocking: The United States has 4% of the world's population and 21% of the world's prisoners, nearly 40% of whom are African-American. If the prison population were a state, it would be the country's 36th largest -- bigger than Delaware, Vermont and Wyoming combined.⁷⁹

Not surprisingly, America is now infamous both locally and internationally for its mass incarceration problem.⁸⁰ In addition to the number of people imprisoned, another noticeable manifestation of this crisis is its extreme drain on government funds that are required to support social services.⁸¹ While \$80 billion is spent directly on imprisonment each year,⁸² this figure does not incorporate the further social costs of incarceration,⁸³ which equate to a total annual financial cost of more than \$500 billion (representing almost six percent of the gross domestic product of the United States).⁸⁴ In the context of this expenditure, the National Research Council observed:

Budgetary allocations for corrections have outpaced budget increases for nearly all other key government services (often by wide margins), including education, transportation, and public assistance. Today, state spending on corrections is the third highest category of general fund expenditures in most states, ranked behind Medicaid and education. Corrections budgets have skyrocketed at a time when spending for other key social services and government programs has slowed or contracted.⁸⁵

The monetary investment in prisons has diminished the pool of funds available for other social services and, in the last twenty years, has

⁷⁹ N.Y.C. BAR ASS'N, MASS INCARCERATION: WHERE DO WE GO FROM HERE? 1–2 (2017) (footnote omitted).

⁸⁰ See ABRAMSKY, *supra* note 10, at 65; Adelman, *supra* note 10, at 295; Clear & Austin, *supra* note 10, at 307; Harcourt, *supra* note 10, at 969; see also U.S. JUSTICE ACTION NETWORK, REFORMING THE NATION'S CRIMINAL JUSTICE SYSTEM: THE IMPACT OF 2015 AND PROSPECTS FOR 2016, at 2 (2015), <http://www.justiceactionnetwork.org/wp-content/uploads/2015/12/Justice-Action-Network-Year-End-Report.pdf>; Vivien Stern, *The International Impact of U.S. Policies*, in INVISIBLE PUNISHMENT: THE COLLATERAL CONSEQUENCES OF MASS IMPRISONMENT 279, 280 (Marc Mauer & Meda Chesney-Lind eds., 2002) (“Among mainstream politicians and commentators in Western Europe, it is a truism that the criminal justice system of the United States is an inexplicable deformity.”).

⁸¹ For an analysis of why mass incarceration is flawed from the financial perspective, see Jason Furman & Douglas Holtz-Eakin, Opinion, *Why Mass Incarceration Doesn't Pay*, N.Y. TIMES (Apr. 21, 2016), <http://www.nytimes.com/2016/04/21/opinion/why-mass-incarceration-doesnt-pay.html>.

⁸² KEARNEY ET AL., *supra* note 12, at 13.

⁸³ Michael McLaughlin, Carrie Pettus-Davis, Derck Brown, Chris Vech & Tanya Renn, *The Economic Burden of Incarceration in the U.S.* 2 (Concordance Inst. for Advancing Soc. Justice, Working Paper No. CI072016, 2016), <https://joinnia.com/wp-content/uploads/2017/02/The-Economic-Burden-of-Incarceration-in-the-US-2016.pdf>.

⁸⁴ *Id.* at 32 tbl.3.

⁸⁵ See GROWTH OF INCARCERATION, *supra* note 19, at 314 (footnote and citation omitted).

significantly exceeded the increase in the rate of spending on higher education.⁸⁶ In eleven states, the amount spent on prisons in fact exceeds the amount that is spent on education.⁸⁷

This enormous financial outlay on incarceration has not resulted in any significant benefit to the community. Research projects have repeatedly found that increases to the number of people who are imprisoned do not correspond with enhanced community safety.⁸⁸ One such study by the Brennan Center for Justice reported in 2016 that “[r]igorous social science research based on decades of data shows that increased incarceration played an extremely limited role in the crime decline.”⁸⁹ This report in fact observed that a diminishing rate of imprisonment is associated with reduced crime:

Recent reforms enacted by states show that mass incarceration and crime are not inextricably linked. Over the last decade, 27 states have reduced both imprisonment and crime together. From 1999 to 2012, New Jersey and New York reduced their prison populations by about 30 percent, while crime fell faster than it did nationally. Texas decreased imprisonment and crime by more than 20 percent during the same period. California, in part because of a court order, cut its prison population by 27 percent, and violence in the state also fell more than the national average.⁹⁰

A clear demonstration of the fact that lower prison numbers can coincide with reduced crime rates is recent data from Texas: between 2007 and 2015, the incarceration rate in that state fell by seventeen percent while the

⁸⁶ See Adam Gopnik, *The Caging of America: Why Do We Lock Up So Many People?*, NEW YORKER (Jan. 22, 2012), <http://www.newyorker.com/magazine/2012/01/30/the-caging-of-america>.

⁸⁷ MITCHELL & LEACHMAN, *supra* note 25, at 1. Reduced investment in education is also occurring at the more junior education level. *Id.* at 10 (“In recent years . . . states have cut education funding, in some cases by large amounts. At least 30 states are providing less general funding per student this year for K–12 schools than in state fiscal year 2008, before the Great Recession hit, after adjusting for inflation. In 14 states, the reduction exceeds 10 percent. The three states with the deepest funding cuts since the recession hit—Alabama, Arizona, and Oklahoma—are among the ten states with the highest incarceration rates.” (footnote omitted)); see also Beatrice Gitau, *The Hidden Costs of Funding Prisons Instead of Schools*, CHRISTIAN SCI. MONITOR (Oct. 3, 2015), <http://www.csmonitor.com/USA/Justice/2015/1003/The-hidden-costs-of-funding-prisons-instead-of-schools> (noting that eleven states spend more on prisons than universities: Michigan, Oregon, Arizona, Vermont, Colorado, Pennsylvania, New Hampshire, Delaware, Rhode Island, Massachusetts, and Connecticut).

⁸⁸ JAMES AUSTIN & LAUREN-BROOKE EISEN WITH JAMES CULLEN & JONATHAN FRANK, BRENNAN CTR. FOR JUSTICE, HOW MANY AMERICANS ARE UNNECESSARILY INCARCERATED?, at 21 (2016), https://www.brennancenter.org/sites/default/files/publications/Unnecessarily_Incarcerated_0.pdf.

⁸⁹ *Id.* at 5.

⁹⁰ *Id.* (footnote omitted). The aim of lower incarceration numbers and less crime is readily achievable. See DANIELLE SERED, VERA INST. OF JUSTICE, ACCOUNTING FOR VIOLENCE: HOW TO INCREASE SAFETY AND BREAK OUR FAILED RELIANCE ON MASS INCARCERATION 8 (2017), https://storage.googleapis.com/vera-web-assets/downloads/Publications/accounting-for-violence/legacy_downloads/accounting-for-violence.pdf.

crime rate dropped by twenty-seven percent.⁹¹ More broadly, it has been noted:

Over the past several decades, America has seen a startling divergence between crime and punishment. While crime rates dropped steadily from the dramatic peaks of the 1990s, the nation's incarceration rates continued just as steadily to grow. And so, despite containing only 5 percent of the world's population, the United States came to hold a quarter of the world's prisoners.⁹²

Thus, the massive financial harm stemming from mass incarceration has not translated into any concrete benefits to the community.

2. Prison is Often Too Painful

The crisis that is mass incarceration also exacts an extreme toll on prisoners and their relatives and dependents. The extent to which prison violates the human rights of offenders—especially those who belong to racial minorities, including African American⁹³ and Latino communities,⁹⁴ and white Americans who come from socially and economically deprived backgrounds—has traditionally been underrated.⁹⁵ The pain stemming from imprisonment extends considerably beyond deprivation of liberty, and

⁹¹ Tina Rosenberg, Opinion, *Even in Texas, Mass Imprisonment Is Going Out of Style*, N.Y. TIMES (Feb. 14, 2017), <https://www.nytimes.com/2017/02/14/opinion/even-in-texas-mass-imprisonment-is-going-out-of-style.html>.

⁹² Matt Thompson, *Imagining the Presence of Justice*, THE ATLANTIC (May 3, 2017), <https://www.theatlantic.com/national/archive/2017/05/criminal-justice-across-america-reporting-project/524985/>.

⁹³ Mirko Bagaric, *Three Things That a Baseline Study Shows Don't Cause Indigenous Over-Imprisonment; Three Things That Might but Shouldn't and Three Reforms That Will Reduce Indigenous Over-Imprisonment*, 32 HARV. J. ON RACIAL & ETHNIC JUST. 103, 107 (2016) [hereinafter Bagaric, *Three Things*]; Mirko Bagaric, *Rich Offender, Poor Offender: Why It (Sometimes) Matters in Sentencing*, 33 L. & INEQ. 1, 7–8 (2015) [hereinafter Bagaric, *Rich Offender*]. However, it should be noted that, in recent years, there has been a slight reduction in the extent to which African Americans are imprisoned compared to the rest of the community, but, nevertheless, they are still imprisoned at a comparative rate to other offenders of 5:1. See Keith Humphreys, *Black Incarceration Hasn't Been This Low in a Generation*, WASH. POST (Aug. 16, 2016), <https://www.washingtonpost.com/news/wonk/wp/2016/08/16/black-incarceration-hasnt-been-this-low-in-a-generation/>. The reasons that African Americans are imprisoned at higher levels are discussed below. See *infra* Section V.A.

⁹⁴ See Bagaric, *Rich Offender*, *supra* note 93, at 48–49; Cassia C. Spohn, *Thirty Years of Sentencing Reform: The Quest for a Racially Neutral Sentencing Process*, in 3 POLICIES, PROCESSES, AND DECISIONS OF THE CRIMINAL JUSTICE SYSTEM 427, 429–31 (Julie Horney ed., 2000).

⁹⁵ See Judith R. Blau & Peter M. Blau, *The Cost of Inequality: Metropolitan Structure and Violent Crime*, 47 AM. SOC. REV. 114, 117 (1982); Richard Delgado, “Rotten Social Background”: Should the Criminal Law Recognize a Defense of Severe Environmental Deprivation?, 3 L. & INEQ. 9, 9–10 (1985); Craig Hancy, *Evolving Standards of Decency: Advancing the Nature and Logic of Capital Mitigation*, 36 HOFSTRA L. REV. 835, 865–66 (2008).

incarceration often inflicts gratuitous suffering on inmates. For example, the proportion of prisoners who are victims of sexual and physical offenses is substantially higher than that of the free population.⁹⁶ Furthermore, while in prison, offenders are restricted from accessing goods and services, and having sexual relationships and meaningful contact with their families.⁹⁷ The suffering stemming from prison extends well beyond the duration of the sentence. Prisoners suffer reduced life expectancy,⁹⁸ employment prospects, and income levels.⁹⁹ The full extent of the adverse consequences of imprisonment to inmates' health is only emerging now.¹⁰⁰ Recent research demonstrates that “[i]ndividuals who experience incarceration at any point in their life are disproportionately in poor health before, during, and after their incarceration.”¹⁰¹ Inmates have higher rates of HIV, hepatitis C, diabetes, asthma, and hypertension than the free population.¹⁰²

Imprisonment can also cause considerable (albeit incidental) harm to the innocent relatives and financial and emotional dependents of prisoners.¹⁰³ Those who often suffer most from incarceration are the children of inmates. Research has established that over five million American children have at least one parent who has been incarcerated, and children who have had a parent who has been imprisoned often experience other significant problems, including emotional difficulties, poor attendance at and participation in school, diminished parental oversight,¹⁰⁴ and, ultimately, a heightened risk of offending and being imprisoned themselves.¹⁰⁵ Children of incarcerated

⁹⁶ See GRESHAM M. SYKES, *THE SOCIETY OF CAPTIVES: A STUDY OF A MAXIMUM SECURITY PRISON* 71 (2007).

⁹⁷ *Id.* at 67–71; see also Robert Johnson & Hans Toch, *Introduction to THE PAINS OF IMPRISONMENT* 13, 17 (Robert Johnson & Hans Toch eds., 1982).

⁹⁸ See Anne C. Spaulding et al., *Prisoner Survival Inside and Outside of the Institution: Implications for Health-Care Planning*, 173 *AM. J. EPIDEMIOLOGY* 479, 481–82 (2011) (discussing a study that examined the 15.5-year survival rate of 23,510 ex-prisoners in Georgia and found much higher mortality rates for former prisoners than for the rest of the population).

⁹⁹ See GROWTH OF INCARCERATION, *supra* note 19, at 235–36. One study estimated the earnings reduction to be as high as forty percent. Bruce Western & Becky Pettit, *Incarceration and Social Inequality*, *DÆDALUS*, Summer 2010, at 8, 13.

¹⁰⁰ Christopher Wildeman & Emily A. Wang, *Mass Incarceration, Public Health, and Widening Inequality in the USA*, 389 *LANCET* 1464, 1464 (2017).

¹⁰¹ *Id.*

¹⁰² *Id.* at 1467.

¹⁰³ See Mirko Bagaric & Theo Alexandrcr, *First-Time Offender, Productive Offender, Offender with Dependents: Why the Profile of Offenders (Sometimes) Matters in Sentencing*, 78 *ALB. L. REV.* 397, 431–32 (2015). For a discussion about the meaning of flourishing, see Mirko Bagaric, *Injecting Content into the Mirage That Is Proportionality in Sentencing*, 25 *N.Z.U. L. REV.* 411, 424 (2013) [hereinafter Bagaric, *Injecting Content*].

¹⁰⁴ DAVID MURPHEY & P. MAE COOPER, *CHILD TRENDS, PARENTS BEHIND BARS: WHAT HAPPENS TO THEIR CHILDREN?* 2 (2015), <https://www.childtrends.org/wp-content/uploads/2015/10/2015-42ParentsBehindBars.pdf>.

¹⁰⁵ E. MOSELY, *TEX. DEP'T OF CRIMINAL JUSTICE, INCARCERATED – CHILDREN OF PARENTS IN PRISON IMPACTED* (2008), http://www.tdcj.statc.tx.us/gokids/gokids_articles_children_impacted.html

offenders can also have poor health: “The most wide-ranging assessment of the effect of parental—mostly paternal—incarceration used data from the National Survey of Children’s Health, showing links to a host of negative health outcomes among children, including self-rated health, depression, anxiety, asthma, and obesity.”¹⁰⁶

A shift to computerized sentencing not only promises to make sentencing more transparent and efficient, but it could also trigger an overarching review of sentencing law similar to that spurred by the move from indeterminate to prescriptive sentencing. The substantial damage that the current sentencing regime has caused makes such an assessment imperative. Importantly, in light of the current political and cultural climate in America, it is likely that there would be considerable support for a reevaluation of sentencing law.

C. *Current Widespread Support for Sentencing Reform*

That many Americans acknowledge the desperate need to reform their sentencing system is reflected in the fact that, while it was once essentially a discussion point among lawyers and academics, the subject now frequently elicits strong opinions from journalists, both Republican and Democrat politicians, public servants, and the broader community.

Many articles in mainstream newspapers and magazines have criticized various aspects of the current sentencing system. For instance, an article in *Rolling Stone* magazine condemned the imposition of mandatory sentences on nonviolent drug offenders because they cause suffering without reducing recidivism.¹⁰⁷ The *New York Times* has published numerous pieces that highlight the excessive government expenditure on incarceration¹⁰⁸ and endorse reduced sentences¹⁰⁹ (including those recommended in a proposal to soften federal sentencing laws).¹¹⁰ The *Huffington Post* reported on a 2016 White

(finding that children of parents who have been imprisoned are five times more likely than other children to commit offenses).

¹⁰⁶ See Wildeman & Wang, *supra* note 100, at 1469 (footnote omitted).

¹⁰⁷ See Andrea Jones, *The Nation’s Shame: The Injustice of Mandatory Minimums*, ROLLING STONE (Oct. 7, 2014), <http://www.rollingstone.com/politics/news/the-nations-shame-the-injustice-of-mandatory-minimums-20141007>.

¹⁰⁸ Eduardo Portor, *In the U.S., Punishment Comes Before the Crimes*, N.Y. TIMES (Apr. 29, 2014), <https://www.nytimes.com/2014/04/30/business/economy/in-the-us-punishment-comes-before-the-crimes.html>.

¹⁰⁹ Editorial, *Cut Sentences for Low-Level Drug Crimes*, N.Y. TIMES (Nov. 23, 2015), <http://www.nytimes.com/2015/11/23/opinion/cut-sentences-for-low-level-drug-crimes.html>; Editorial, *Cutting Prison Sentences, and Costs*, N.Y. TIMES (Dec. 24, 2016), <http://www.nytimes.com/2016/12/24/opinion/sunday/cutting-prison-sentences-and-costs.html>; Rosenberg, *supra* note 91.

¹¹⁰ Editorial, *Toward Saner, More Effective Prison Sentences*, N.Y. TIMES (Oct. 3, 2015), <https://www.nytimes.com/2015/10/04/opinion/sunday/toward-saner-more-effective-prison-sentences.html>.

House document that highlighted both that the prison population is disproportionately Hispanic and African American and that offenders who serve long prison terms often reoffend; it then considered options for lowering the crime rate.¹¹¹

Several well-researched and prominent reports have emphasized the urgent need to introduce sentencing measures that will lower the number of prisoners as well as violent crime. For example, a February 2017 report of the Vera Institute for Criminal Justice titled, *Accounting for Violence: How to Increase Safety and Break Our Failed Reliance on Mass Incarceration*, recommends taking a broader approach to the issue of violence, which involves “end[ing] mass incarceration and keep[ing] communities safe while upholding fairness and human dignity. [The report] suggests that any policy or practice targeting violence should be survivor-centered, accountability-based, safety-driven, and racially equitable.”¹¹²

Police officials, prosecutors, and attorneys general have similarly pleaded for reductions in the rates of incarceration. In 2017, Law Enforcement Leaders to Reduce Crime and Incarceration, which comprises 175 of these personnel from all of the states, issued a press release urging the Trump Administration to implement policies designed to reduce incarceration and violent crime.¹¹³ The group “urges the President and Attorney General to target federal resources toward preventing violent crime specifically, which poses the biggest threat, instead of over-resourcing efforts to fight lower-level drug crimes and non-violent crimes.”¹¹⁴ Support for lowering the rates of incarceration and expenditure on prisons as well as enhancing rehabilitation programs for offenders has even come from victims of crime.¹¹⁵

Many politicians from both parties have recognized that mass incarceration is a major problem, and it became a central topic of the primaries and presidential campaigns in 2016.¹¹⁶ Holly Harris and Andrew Howard reported on the public opinion that was driving this focus:

¹¹¹ Matt Ferner, *New Report Details Devastating Effects of Mass Incarceration on the U.S.*, HUFFINGTON POST (May 2, 2016, 7:34 PM), https://www.huffingtonpost.com/entry/effects-mass-incarceration_us_5727b6abe4b0b49df6ac0c00.

¹¹² SERED, *supra* note 90, at 8 (emphasis omitted).

¹¹³ See Press Release, Law Enforcement Leaders to Reduce Crime & Incarceration, Law Enforcement Leaders Urge President to Back Sentencing Reform, Spurn More Incarceration as Part of Anti-Crime Agenda (Feb. 13, 2017), <http://lawenforcementleaders.org/wp-content/uploads/2017/02/LEL-Report-Release.pdf>.

¹¹⁴ *Id.*; see also *Notable New Group Advocating for Sentencing Reforms: Law Enforcement Leaders to Reduce Crime and Incarceration*, SENTENCING L. & POL’Y (Oct. 21, 2015, 10:09 AM), https://sentencing.typepad.com/sentencing_law_and_policy/2015/10/notable-ncw-group-advocating-for-sentencing-reforms-law-enforcement-leaders-to-reduce-crime-and-inca.html.

¹¹⁵ Christopher Ingraham, *Even Violent Crime Victims Say Our Prisons Are Making Crime Worse*, WASH. POST (Aug 5, 2016), <https://www.washingtonpost.com/news/wonk/wp/2016/08/05/evn-violent-crime-victims-say-our-prisons-are-making-crime-worse/>.

¹¹⁶ See Clare Foran, *What Can the U.S. Do About Mass Incarceration?*, THE ATLANTIC (Apr. 28, 2016), <http://www.theatlantic.com/politics/archive/2016/04/ending-mass-incarceration/475563/>.

[P]olling data from dozens of states across the country shows overwhelming support across the political and ideological spectrum for criminal justice reform. Replacing one-size-fits-all mandatory minimum sentences with penalties that reflect individual cases polls out the roof in battleground states like Michigan (91%) and Ohio (87%). Surveys in states that will have hotly-contested Senate races such as Florida, Illinois, North Carolina, Nevada, and Speaker Ryan's home state of Wisconsin show support for reform issues ranging from the 60s to high 80s.¹¹⁷

There is now a considerable movement dedicated to reducing the incarceration rate, which is "gaining strength from the leadership and participation of formerly incarcerated people and their families."¹¹⁸

Although President Trump has indicated his support for "tough on crime" policies,¹¹⁹ some Republicans appreciate that such an agenda is unpopular and have recommended softening sentencing laws and reducing the number of prisoners.¹²⁰ Harris and Howard also observed:

First and foremost, it is conservatives in big red states like Texas, Georgia, and South Carolina who have led the way on justice reform issues for a decade. These efforts yielded great success in safely reducing the prison population, saving significant taxpayer resources, and most importantly lowering crime and recidivism rates. . . . The smart political play is to embrace these reforms. Doing otherwise could backfire. Just ask Alaska's then-incumbent Senator Mark Begich. In the state's 2014 U.S. Senate race, Begich attacked his Republican opponent, Dan Sullivan, alleging he was soft on crime. Sullivan emerged victorious over Begich and is currently serving as the junior senator from Alaska.¹²¹

In a poll of President Trump's supporters, sixty-three percent of respondents agreed that judges should have more flexibility to impose sanctions other than imprisonment.¹²² President Trump established a Task Force

¹¹⁷ See Holly Harris & Andrew Howard, *Ryan's Victory Trumps Justice Reform Opponents*, THE HILL (Aug. 15, 2016, 4:51 PM), <http://thchill.com/blogs/pundits-blog/crime/291500-ryans-victory-trumps-justice-reform-opponents>; see also Justin McCarthy, *Americans' Views Shift on Toughness of Justice System*, GALLUP (Oct. 20, 2016), <http://www.gallup.com/poll/196568/americans-views-shift-toughness-justice-system.aspx>.

¹¹⁸ James Forman Jr., Opinion, *Justice Springs Eternal*, N.Y. TIMES (Mar. 25, 2017), https://www.nytimes.com/2017/03/25/opinion/sunday/justice-springs-eternal.html?_r=0.

¹¹⁹ See Jenna Goff & Joan Greve, *Trump vs. Clinton: Criminal Justice Reform*, PBS (Sept. 19, 2016), <http://www.pbs.org/weta/washingtonweek/blog-post/trump-vs-clinton-criminal-justice-reform>; Michelle Mark, *Here's What Hillary Clinton and Donald Trump Think About Criminal Justice*, BUS. INSIDER AUSTRAL. (Sept. 27, 2016, 6:08 AM), <http://www.businessinsider.com.au/trump-and-clinton-on-issues-mass-incarceration-and-criminal-justice-2016-9>.

¹²⁰ See Peter Bakcr, *2016 Candidates Are United in Call to Alter Justice System*, N.Y. TIMES (Apr. 27, 2015), <https://www.nytimes.com/2015/04/28/us/politics/bcing-less-tough-on-crime-is-2016-consensus.html>; Evan Halper, *Clinton's Call for Easing Harsh Sentencing Laws Is Echoed by Republican Rivals*, L.A. TIMES (Apr. 29, 2015, 6:48 PM), <http://www.latimes.com/nation/politics/la-pn-clinton-prison-reform-20150429-story.html>.

¹²¹ Harris & Howard, *supra* note 117.

¹²² Vikrant P. Reddy, *The Conservative Base Wants Criminal-Justice Reform*, NAT'L REV. (May 8, 2017, 8:00 AM), <http://www.nationalreview.com/article/447398/criminal-justice-reform-donald-trump-supporters-conservative-base-want-fresh>.

on Crime Reduction and Public Safety (“Task Force”)¹²³ to develop strategies to reduce crime. Although the Task Force appears to be focused on continuing to implement the “tough on crime” agenda, it may be receptive to recommendations for empirically sound alternative approaches.¹²⁴ Objectives of the Task Force include “identify[ing] deficiencies in existing laws that have made them less effective in reducing crime and propose new legislation that could be enacted to improve public safety and reduce crime.”¹²⁵ However, Attorney General Jeff Sessions issued a memorandum requiring federal prosecutors to “charge and pursue the most serious, readily provable offense,” which indicates a move towards more punitive sentences.¹²⁶

Even if President Trump does not adopt a reformist sentencing agenda, there are still considerable prospects that wide-ranging changes will be made, and the number of prisoners significantly reduced.¹²⁷ Federal prisons hold only approximately one in eight imprisoned Americans, so “mass incarceration is really a state issue,” and many American states have already implemented measures to lower the rate of incarceration.¹²⁸ For instance, statutes passed in forty-six states during 2014 and 2015 were directed towards “creating or expanding opportunities to divert people away from the criminal justice system; reducing prison populations by enacting sentencing reform, expanding opportunities for early release from prison, and reducing the number of people admitted to prison for violating the terms of their community supervision.”¹²⁹ Some states reduced the terms of prison sentences for property

¹²³ THE WHITE HOUSE, PRESIDENTIAL EXECUTIVE ORDER ON A TASK FORCE ON CRIME REDUCTION AND PUBLIC SAFETY, <https://www.whitehouse.gov/presidential-actions/presidential-executive-order-task-force-crime-reduction-public-safety/>.

¹²⁴ See *id.*

¹²⁵ *Id.*

¹²⁶ U.S. DEP’T OF JUSTICE, OFFICE OF THE ATTORNEY GEN., MEMORANDUM FOR ALL FEDERAL PROSECUTORS 1 (May 10, 2017), <https://www.justice.gov/opa/press-release/file/965896/download>; see also Aaron Cantú, *Two Steps Back: How Jeff Sessions’ Memo on Federal Prosecutions Could Take New Mexico Back to a Harsher Era*, SANTA FE REP. (May 16, 2017), <http://www.sfreporter.com/santafe/article-13419-two-steps-back.html#sthash.pcNDShdz.dpuf> (discussing the impact of the memorandum in terms of increasing incarceration numbers in one jurisdiction).

¹²⁷ For an overview of his administration’s activity in this area in the first one hundred days, see AMES C. GRAWERT & NATASHA CAMHI, BRENNAN CTR. FOR JUSTICE, CRIMINAL JUSTICE IN PRESIDENT TRUMP’S FIRST 100 DAYS (2017), https://www.brennancenter.org/sites/default/files/publications/Criminal_Justice_in_President_Trumps_First_100_Days.pdf.

¹²⁸ Rosenberg, *supra* note 91.

¹²⁹ REBECCA SILBER, RAM SUBRAMANIAN & MAIA SPOTTS, VERA INST. OF JUSTICE, JUSTICE IN REVIEW: NEW TRENDS IN STATE SENTENCING AND CORRECTIONS 2014–2015, at 3 (2016), https://storage.googleapis.com/vcra-web-assets/downloads/Publications/justice-in-review-new-trends-in-state-sentencing-and-corrections-2014-2015/legacy_downloads/state-sentencing-and-corrections-trends-2014-2015-updated.pdf. Wide-ranging reforms are occurring in Ohio and Michigan, see U.S. JUSTICE ACTION NETWORK, *supra* note 80, at 9, as well as in Texas. See Adam Brandon et al., *Congress Should Follow the Red States’ Lead on Criminal-Justice Reform*, NAT’L REV. (May 2, 2016, 8:00 AM), <http://www.nationalreview.com/article/434783/criminal-justice-reform-conservatives-have-led-way>. For a summary of recent changes in some states to lower penalties for property, drunk driving, and other low-level offenders,

and drug offenses.¹³⁰ California's Proposition 47 reduced certain nonviolent offenses from felonies to misdemeanors in California in 2014.¹³¹

While these reforms are commendable, they are piecemeal, lack an overarching methodology, and have resulted in only minor reductions in prison populations. A fundamental overhaul of sentencing is required to ensure that the system operates in a fair and efficient manner, enhances community safety, and punishes offenders in proportion to the gravity of their offenses, while avoiding the gratuitous infliction of punishment that places an intolerable fiscal burden on the community and needlessly ruins the lives of many offenders and their families.¹³²

see Sarah Breitenbach, *Prisons, Policing at Forefront of State Criminal Justice Action*, PEW (June 27, 2016), <http://www.pewtrusts.org/en/research-and-analysis/blogs/statelinc/2016/06/27/prisons-policing-at-forefront-of-state-criminal-justice-action>; see also Brandon L. Garrett, *Conservatives Are Leading the Way as States Enact Criminal Justice Reform*, SLATE (Mar. 31, 2017, 4:42 PM), http://www.slate.com/articles/news_and_politics/trials_and_crort/2017/03/conservatives_could_help_derail_trump_s_tough_on_crime_policies.html; Richard A. Oppel Jr., *States Trim Penalties and Prison Rolls, Even as Sessions Gets Tough*, N.Y. TIMES (May 18, 2017), <https://www.nytimes.com/2017/05/18/us/states-prisons-crime-sentences-jeff-sessions.html>; Forman Jr., *supra* note 118.

¹³⁰ SILBER, SUBRAMANIAN & SPOTTS, *supra* note 129, at 19–20, 23–25.

¹³¹ *Proposition 47: Criminal Sentences. Misdemeanor Penalties. Initiative Statute.*, CAL. GEN. ELECTION OFFICIAL VOTER INFO. GUIDE (2014), <http://vigarchivc.sos.ca.gov/2014/gcneral/cn/propositions/47/title-summary.htm>. This law brings about the following key changes: it “[r]equires [a] misdemeanor sentence instead of [a] felony [sentence] for certain drug possession offenses[,] . . . [and] for the following crimes when [the] amount involved is \$950 or less: petty theft, receiving stolen property, and forging/writing bad checks.” *Id.* Further, it “[a]llows [a] felony sentence for these offenses if [the] person has [a] previous conviction for crimes such as rape, murder, or child molestation or is [a] registered sex offender.” *Id.* And it “[r]equires resentencing for persons serving felony sentences for these offenses unless [a] court finds [that it would result in an] unreasonable public safety risk.” *Id.* The law was passed with a majority of fifty-nine percent of voters in favor. Kristina Davis, *Calif Cuts Penalties for Small Drug Crimes*, SAN DIEGO UNION-TRIBUNE (Nov. 4, 2014, 8:04 PM), <http://www.sandiegouniontribune.com/news/elections/sdut-prop-47-misdemeanor-law-vote-election-drug-2014nov04-story.html>; see also *San Francisco Called a Model for Ending Mass Incarceration*, CRIME REP. (Dec. 1, 2015), <http://www.thecrimereport.org/news/articles/2015-12-san-francisco-called-a-model-for-ending-mass-incarcce>. For an overview of the impact of the reform, see Rob Kuznia, *An Unprecedented Experiment in Mass Forgiveness*, WASH. POST (Feb. 8, 2016), https://www.washingtonpost.com/national/an-unpreccedented-experiment-in-mass-forgiveness/2016/02/08/45899f9c-a059-11e5-a3c5-c77f2cc5a43c_story.html. This was followed in November 2016 by Proposition 57, which allows prisoners to be released earlier, and which is likely to result in the release of 9,500 prisoners in four years (a seven percent reduction in the prison population in that state). See *California Plans to Free 9,500 Inmates Over Next 4 Years*, L.A. TIMES (Mar. 24, 2017, 11:40 AM), <http://www.latimes.com/local/california/la-me-california-inmates-20170324-story.html>.

¹³² As noted recently:

Despite dawning awareness of the deep social and economic costs of mass incarceration, no one-size-fits-all solution exists to change this picture. Rolling back mass incarceration while protecting public safety will require a legion of efforts in thousands of prosecutors' offices, police departments, parole boards, and legislative chambers. “What we have is not a system at all,” as Fordham University's John Pfaff told *The Atlantic's* Matt Ford, “but a patchwork of competing bureaucracies with different constituencies, different incentives, who oftentimes might have similar political ideologies, but very different goals and very different pressures on them.”

Thompson, *supra* note 92.

As noted above, there is considerable receptiveness to wide-ranging reform of the sentencing system.¹³³ A significant incidental advantage of a move to computerized sentencing is that the detailed and sophisticated analysis that is required to develop a sentencing algorithm would provide the opportunity for additional research and development in this area. This would extend beyond the descriptive process of collating data—which currently informs sentencing determinations—and include an evaluation of factors that should inform sentencing decisions. The likely outcome of such a process is discussed in Part III of this Article.

Against this backdrop, this Article now examines the role of computers in legal decision-making in greater detail.

II. OVERVIEW OF THE USE OF COMPUTERS IN LEGAL DECISION-MAKING AT PRESENT

Over the past forty years, computers have dramatically reformed legal practice. They are now used to draft and communicate legal advice, correspondence, and submissions, as well as to facilitate primary and secondary research, and thereby enhance the efficiency and accuracy of legal advice and judgments. Nevertheless, computers have had relatively little impact on judicial decision-making. This is unsurprising given that it demands high-level, complex reasoning and calibrations, and is at present greatly informed by human observation, impression, and intuition. For instance, to make findings regarding the facts of a matter, judges often seek to weigh contradictory testimonies and evaluate witnesses' reliability and credibility. They must then identify the correct law and apply it to the relevant factual scenario.

Computers are, however, gradually beginning to play a meaningful role in similarly complex areas of the law. This is principally due to the development of increasingly sophisticated algorithms.¹³⁴ As noted by the Pew Research Center, algorithms are not new. They are simply “instructions for solving a problem or completing a task. Recipes are algorithms, as are math equations. Computer code is algorithmic.”¹³⁵ The increasing use of algorithms stems from the fact that, at present, “massive amounts of data are being

¹³³ It should be noted that not all of the momentum is towards less incarceration. For instance, Senator Tom Cotton recently stated that the U.S. is suffering from “under-incarceration.” See Nick Gass, *Sen. Tom Cotton: U.S. has 'Under-Incarceration Problem'*, POLITICO (May 19, 2016, 2:16 PM), <https://www.politico.com/story/2016/05/tom-cotton-under-incarceration-223371>.

¹³⁴ See Rachel Hall, *Ready for Robot Lawyers? How Students Can Prepare for the Future of Law*, THE GUARDIAN (July 31, 2017, 7:25 AM), <https://www.theguardian.com/law/2017/jul/31/ready-for-robot-lawyers-how-students-can-prepare-for-the-future-of-law>.

¹³⁵ Lee Rainie & Janna Anderson, *Code-Dependent: Pros and Cons of the Algorithm Age*, PEW RES. CTR. (Feb. 8, 2017), <http://www.pewinternet.org/2017/02/08/code-dependent-pros-and-cons-of-the-algorithm-age/>.

created, captured and analyzed by businesses and governments.”¹³⁶ Algorithms play a key role in innumerable aspects of society from risk assessments for insurance premiums to detection of tax fraud,¹³⁷ and lights that control traffic flow.¹³⁸

The increasing complexity and capability of algorithms is now quickly redefining many aspects of the law, including the evaluation of the meaning of documents and the significance of information that is potentially important to the outcomes of cases. A number of existing software programs can interpret documents. Beyond merely identifying keywords, this software uses deductive reasoning to ascertain the literal and implied meanings of text.¹³⁹ For example, the software can:

recognize the sentiment in an e-mail message—whether a person is positive or negative, or what the company calls “loud talking”—unusual emphasis that might give hints that a document is about a stressful situation. The software can also detect subtle changes in the style of an e-mail communication. A shift in an author’s e-mail style, from breezy to unusually formal, can raise a red flag about illegal activity.¹⁴⁰

Artificial intelligence has been used to develop software that undertakes “e-discovery,” thus saving clients huge amounts of time and money.¹⁴¹ In one case, it was reported that the program analyzed 1.5 million documents for under \$100,000.¹⁴² It has been estimated that “the shift from manual document discovery to e-discovery would lead to a manpower reduction in which one lawyer would suffice for work that once required 500.”¹⁴³ The speed at which the program can search documents is so fast that it can be used to assist lawyers to bargain more persuasively when they are at the negotiating table.¹⁴⁴

Advances in machine learning have now progressed to the point where accurate predictive models can be developed using word sequences to

¹³⁶ *Id.*

¹³⁷ Ric Simmons, *Quantifying Criminal Procedure: How to Unlock the Potential of Big Data in Our Criminal Justice System*, 2016 MICH. ST. L. REV. 947, 957 (2016).

¹³⁸ See Keith Barry, *The Traffic Lights of Tomorrow Will Actively Manage Congestion*, CITYLAB (Sept. 11, 2014), <https://www.citylab.com/transportation/2014/09/the-traffic-lights-of-tomorrow-will-actively-manage-congestion/379950/>.

¹³⁹ See, e.g., Micha-Manuel Bucs & Emilio Matthaci, *LegalTech on the Rise: History of a New Era of the Legal Profession*, EVOLVE L. (July 6, 2016), <http://evolve.lawnow.com/blog/legaltech-rise-history-new-era-legal-profession/>.

¹⁴⁰ John Markoff, *Armies of Expensive Lawyers, Replaced by Cheaper Software*, N.Y. TIMES (Mar. 4, 2011), http://www.nytimes.com/2011/03/05/science/05legal.html?pagewanted=all&_r=0&module=ArrowsNav&contentCollection=Science&action=keypress®ion=FixedLeft&pgtype=article.

¹⁴¹ *Id.*

¹⁴² *Id.*

¹⁴³ *Id.*

¹⁴⁴ *Id.*

ascertain factors that influence the outcomes of judicial decisions.¹⁴⁵ This can assist lawyers and judges to identify efficiently relevant cases and patterns that drive legal decision-making. The first systematic study to attempt to predict the outcomes of cases decided by the European Court of Human Rights focusing solely on textual context was able to predict outcomes with seventy-nine percent accuracy.¹⁴⁶

Predictive algorithms are now also starting to play an important role in many aspects of the criminal justice system. Crime prediction programs examine reports of past crimes and other factors that have an impact on crime—such as weather conditions and proximity to bars or subway stations—to inform decisions regarding the deployment of police resources.¹⁴⁷ In some jurisdictions, predictive programs are used to determine which individuals are most likely to commit crimes.¹⁴⁸

Computers are not used directly to determine the sanctions that are imposed on offenders in the United States. Nevertheless, in several American jurisdictions, computer algorithms are applied to predict the likelihood of offenders' recidivism, and the outcomes of those analyses inform decisions about sanctions that are considered necessary in individual cases to achieve the sentencing objectives of community protection and rehabilitation.¹⁴⁹ Three methodologies are used to forecast offenders' likelihood of recidivism: (1) unstructured clinical assessments; (2) actuarial risk assessments; and (3) risk-and-needs assessments (which rely on structured professional judgment).¹⁵⁰

Clinical assessments are unstructured and involve an evaluator ascertaining an offender's risk of recidivism generally by referring to impressionistic criteria and experience, rather than empirically validated information.¹⁵¹ This is in effect the conventional approach employed by judges in sentencing offenders and is especially relevant in determining an offender's rehabilitative prospects and the extent to which they threaten community safety.

¹⁴⁵ See Nikolaos Alctras et al., *Predicting Judicial Decisions of the European Court of Human Rights: A Natural Language Processing Perspective*, PEERJ COMPUTER SCI., Oct. 2016, at 1, 1–2, <https://peerj.com/articles/cs-93.pdf>.

¹⁴⁶ *Id.* at 2.

¹⁴⁷ Simmons, *supra* note 137, at 955.

¹⁴⁸ *Id.* at 956.

¹⁴⁹ Alyssa M. Carlson, *The Need for Transparency in the Age of Predictive Sentencing Algorithms*, 103 IOWA L. REV. 303, 319–20 (2017).

¹⁵⁰ See Michael R. Davis & James R. P. Ogloff, *Key Considerations and Problems in Assessing Risk for Violence*, in PSYCHOLOGY AND LAW: BRIDGING THE GAP 191, 195 (David Canter & Rita Žukauskienė eds., 2008); Christopher Slobogin, *Risk Assessment*, in THE OXFORD HANDBOOK OF SENTENCING AND CORRECTIONS 196, 198–99 (Joan Petersilia & Kevin R. Reitz eds., 2012).

¹⁵¹ Slobogin, *supra* note 150, at 208.

The second methodology is actuarial assessments, which form the basis of “risk assessment tools.”¹⁵² Although relatively new, their intent—namely to evaluate “an individual’s chances of endangering public safety by reoffending”¹⁵³—is a well-established objective of sentencing decision-makers. Professors Richard Berk and Jordan Hyatt observe:

Forecasting has been an integral part of the criminal justice system in the United States since its inception. Judges, as well as law enforcement and correctional personnel, have long used projections of relative and absolute risk to help inform their decisions. Assessing the likelihood of future crime is not a new idea, although it has enjoyed a recent resurgence: an increasing number of jurisdictions mandate the explicit consideration of risk at sentencing.¹⁵⁴

Risk assessment tools use algorithms to analyze variables that precipitated past events and to develop “rules” about the probability of certain events occurring in the future.¹⁵⁵ Specifically, the creators of “actuarial instruments manipulate existing data in an empirical way to create rules. These rules combine the more significant factors, assign applicable weights, and create final mechanistic rankings.”¹⁵⁶ The major differences between the many risk assessment tools that have been developed are the inputs on which they rely and the weight that they apply to considerations that are linked to a risk of recidivism. In most of the tools, key variables include static factors such as an offender’s criminal history, criminal associates, pro-criminal attitudes, and antisocial personality.¹⁵⁷ In addition to employing these factors, recent and more sophisticated generation predictive tools—epitomized by the Post-Conviction Risk Assessment (“PCRA”) that is used in the federal jurisdiction to undertake probation assessments—also score dynamic variables such as employment status and history, education, and family background.¹⁵⁸

¹⁵² See Melissa Hamilton, *Back to the Future: The Influence of Criminal History on Risk Assessments*, 20 BERKELEY J. CRIM. L. 75, 91–92 (2015); Pari McGarraugh, Note, *Up or Out: Why “Sufficiently Reliable” Statistical Risk Assessment Is Appropriate at Sentencing and Inappropriate at Parole*, 97 MINN. L. REV. 1079, 1091 (2013). Such tools are in fact now used in the majority of states in the United States. See Shawn Bushway & Jeffrey Smith, *Sentencing Using Statistical Treatment Rules: What We Don’t Know Can Hurt Us*, 23 J. QUANTITATIVE CRIMINOLOGY 377, 378 (2007).

¹⁵³ See McGarraugh, *supra* note 152, at 1091. In addition, actuarial assessments and other risk assessment tools include unstructured clinical assessments and structured professional judgment assessments. See Davis & Ogloff, *supra* note 150, at 195; Slobogin, *supra* note 150, at 198.

¹⁵⁴ Richard Berk & Jordan Hyatt, *Machine Learning Forecasts of Risk to Inform Sentencing Decisions*, 27 FED. SENT’G REP. 222, 222 (2015) (footnotes omitted).

¹⁵⁵ See McGarraugh, *supra* note 152, at 1091–92.

¹⁵⁶ Hamilton, *supra* note 152, at 92.

¹⁵⁷ *Id.* at 90.

¹⁵⁸ *Id.* at 94. Another common and similar tool is the Level of Service instrument, which incorporates fifty-four considerations. See Slobogin, *supra* note 150, at 199. In terms of predicting future violence, it has been noted that dynamic measures are slightly more accurate than static measures for short- to medium-term predictions of violence. See Chi Meng Chu et al., *The Short- to Medium-Term Predictive Accuracy of Static and Dynamic Risk Assessment Measures in a Secure Forensic Hospital*, 20 ASSESSMENT

Risk assessment tools are more accurate predictors of offenders' likelihood of recidivism than unstructured judgments. Indeed, research has established that "the best models are usually able to predict recidivism with about seventy percent accuracy—provided it is completed by trained staff,"¹⁵⁹ and they produce true positives between fifty to eighty-five percent, which is much higher than pure chance as well as the true positive rate of unstructured assessments.¹⁶⁰ Notwithstanding their efficacy, risk assessment tools are not widely used in the United States and, even when used, have not been applied systematically so as to have had a significant impact on the sentencing calculus.¹⁶¹ The Brennan Center for Justice made the following observations about the contribution of risk assessment tools to sentencing determinations in different jurisdictions:

Driven by advances in social science, states are increasingly turning toward risk assessment tools to help decide how much time people should spend behind bars. These tools use data to predict whether an individual has a sufficiently low likelihood of committing an additional crime to justify a shorter sentence or an alternative to incarceration. . . . Some courts have implemented risk assessments to determine whether defendants should be held in jail or released while waiting for trial; similarly, some parole boards use them to decide which prisoners to release. States such as Kentucky and Virginia have implemented the former, while Arkansas and Nevada have implemented the latter. More recently, states are applying risk assessments to guide sentencing decisions. The first state to incorporate such an instrument in sentencing was Virginia in 1994. By 2004, the state implemented risk assessments statewide, requesting judges to consider the results in individual sentencing decisions. Courts in at least 20 states have begun to experiment with using risk assessments in some way during sentencing decisions.¹⁶²

Whereas risk assessment tools evaluate individuals' likelihood of reoffending and endangering public safety,¹⁶³ risk-and-needs assessment

230, 230–31 (2011). Given that these tools go beyond the use of static factors and incorporate dynamic factors, they are sometimes referred to as "structured professional judgment tools." Davis & Ogloff, *supra* note 150, at 198.

¹⁵⁹ Edward J. Latessa & Brian Lovins, *The Role of Offender Risk Assessment: A Policy Maker Guide*, 5 VICTIMS & OFFENDERS 203, 212 (2010) (citation omitted). Moreover, risk assessment tools are generally more accurate than predictions based solely on clinical judgment. See D.A. Andrews et al., *The Recent Past and Near Future of Risk and/or Need Assessment*, 52 CRIME & DELINQ. 7, 12 (2006); William M. Grove et al., *Clinical Versus Mechanical Prediction: A Meta-Analysis*, 12 PSYCHOL. ASSESSMENT 19, 25 (2000).

¹⁶⁰ Slobogin, *supra* note 150, at 201.

¹⁶¹ They are most commonly used in Virginia, Missouri, and Oregon. *Id.* at 202–03.

¹⁶² AUSTIN & EISEN, *supra* note 88, at 18–19 (footnotes omitted). Judges often pay little regard to the results of risk assessment tools. See Slobogin, *supra* note 150, at 202, 207. In Virginia, fifty-nine percent of defendants who were found to be at low risk of reoffending by a risk assessment tool were still sentenced to prison. Simmons, *supra* note 137, at 966 n.76; see also Steven L. Chanenson & Jordan M. Hyatt, *The Use of Risk Assessment at Sentencing: Implications for Research and Policy 6* (Villanova Univ. Charles Widger Sch. of Law Working Paper Series, 2016), <https://digitalcommons.law.villanova.edu/cgi/viewcontent.cgi?article=1201&context=wps>.

¹⁶³ McGarraugh, *supra* note 152, at 1091.

tools (which constitute the third methodology for predicting the likelihood that an offender will recidivate) seek to identify interventions that will target offenders' specific needs and thereby lower their particular risk of recidivism.¹⁶⁴ In contrast to the actuarial approach of risk assessment tools that are designed to ascertain an individual's risk of engaging in antisocial behavior in the future, the intention behind the methodology of "structured professional judgment," on which risk-and-needs assessments rely, "is to provide information relevant to needs assessment and a risk management plan."¹⁶⁵ Risk-and-needs assessment tools take different forms, but one of the more popular ones—the Ohio Risk Assessment System—examines eight risk-and-needs factors: the history of antisocial behavior; antisocial personality patterns; antisocial cognition; antisocial associates; quality of family relationships; performance at school and work; extent of involvement in leisure and recreation; and history of substance abuse.¹⁶⁶ In addition to their broad use in decision-making about conditions for probation and parole, risk-and-needs assessment tools are now increasingly implemented in the sentencing process to reach determinations about whether to imprison offenders, place them on community supervision, or impose conditions or requirements on them.¹⁶⁷

It seems inevitable that transparent and validated risk assessment tools will progressively be used in sentencing. Arguments that it is inappropriate to attempt to quantify the likelihood that an offender will reoffend are patently misconceived given that this exercise is already integral to sentencing decisions. As noted by Professors Steven Chanenson and Jordan Hyatt:

Every jurisdiction, whether explicitly acknowledged or not, relies on the use of an at-sentencing risk assessment in almost every single criminal sentencing. The generally unexplained exercise of discretionary judicial sentencing authority is a prime example of a first-generation, clinical risk assessment. Judges rely on their own subjective experience—and a largely unknown mix of factors specific to that defendant and the nature of the crime—to set a sentence within the parameters allowed by law. The use of criminal history also serves as a commonly relied upon indicator of future dangerousness.¹⁶⁸

¹⁶⁴ NATHAN JAMES, CONG. RESEARCH SERV., R44087, RISK AND NEEDS ASSESSMENT IN THE FEDERAL PRISON SYSTEM 4–5 (2018), available at <https://fas.org/sgp/crs/misc/R44087.pdf>.

¹⁶⁵ Slobogin, *supra* note 150, at 199.

¹⁶⁶ JAMES, *supra* note 164, at 7–8. For an explanation of the manner in which it is used, see SUPERIOR COURT WORKING GRP. ON SENTENCING BEST PRACTICES, CRIMINAL SENTENCING IN THE SUPERIOR COURT: BEST PRACTICES FOR INDIVIDUALIZED EVIDENCE-BASED SENTENCING, at viii (2016), <https://massdocs-digital-mass-gov.s3.amazonaws.com/s3fs-public/2019/jud-appx-c-criminal-sentencing-best-practices.pdf?7nO2Ay.caD4iB23qrCivXHQH5VXUZ5Bh>.

¹⁶⁷ PAMELA M. CASEY, ROGER K. WARREN & JENNIFER K. ELEK, NAT'L CTR. FOR STATE COURTS, USING OFFENDER RISK AND NEEDS ASSESSMENT INFORMATION AT SENTENCING: GUIDANCE FOR COURTS FROM A NATIONAL WORKING GROUP 1, 7, 9–10, 16–17 (2011), <http://www.ncsc.org/~media/microsites/files/csi/rna%20guide%20final.ashx>.

¹⁶⁸ Chanenson & Hyatt, *supra* note 162, at 3.

Thus, while most sentencing decisions do not involve computer technology at present, algorithms are already used to some extent to help determine core sentencing variables. The climate is therefore right for an expansion of the role of algorithms in the sentencing domain. This is especially the case given that sentencing is an area of law that on its face is extremely amenable to computerized decision-making.¹⁶⁹ In most sentencing matters, the relevant facts are not contested and sentencing decisions are generally made after the prosecution and defense have agreed on the relevant facts. To the extent that the facts are in dispute, the judge can make a clear-cut factual determination before proceeding to apply the relevant law. In addition, the relevant legal considerations that inform the ultimate decision are often clearly designated, and even the weight that should be accorded to them is sometimes prescribed.¹⁷⁰ Moreover, sentencing generally does not involve the resolution of matters of credibility or reliability, which require human judgement.

There are, however, two circumstances in which a fact-finding process is necessary at the sentencing stage. The first situation occurs when an offender pleads not guilty to a crime, but is nonetheless convicted of it. In this instance, the judge makes relevant factual determinations based on the evidence presented at trial. The second circumstance where fact finding is required occurs when the offender pleads guilty, but agreement on the appropriate sanction cannot be reached, so a sentencing hearing is conducted. In such cases, the judge is still required to make relevant factual determinations and, only after these have been determined, would the computer then set the penalty.

III. THE MANNER IN WHICH THE SENTENCING ALGORITHM WOULD OPERATE

A. *Designing an Algorithm for Current Sentencing Systems*

Later, Part IV outlines the advantages of computerized sentencing. To achieve those benefits, it is important to define clearly the considerations that contribute to the sentencing algorithm and comprehensively set out the weight attributable to each of them. This Part defines those considerations. As noted above, it would be a straightforward matter to develop an algorithm for the current sentencing law systems of many jurisdictions that extensively use sentencing guidelines. Those systems expressly demarcate the considerations that inform penalties and often set out the weight to attach to them within a reasonably narrow range. The main considerations that inform

¹⁶⁹ Nigel Stobbs et al., *Can Sentencing Be Enhanced by the Use of Artificial Intelligence?*, 41 CRIM. L.J. 261, 261, 276 (2017).

¹⁷⁰ *Id.* at 262, 276.

penalties include the maximum penalty for an offense, an offender's prior criminal history, and the seriousness of the offense, as well as a number of aggravating and mitigating factors. Such considerations could readily be mapped into an algorithm, which would be used to compute an appropriate sentence. It would be necessary, however, to pick a precise figure for aggravating and mitigating factors where the impact on penalty is set out within a band, rather than identified as a precise figure.¹⁷¹ Logically, the midpoint should be chosen.

It is more complex to develop an algorithm for sentencing systems where there is a considerable degree of discretion because the variables and the weight to be accorded to them are not clearly articulated. Nevertheless, it is possible to inject greater clarity into the considerations that inform the sentencing calculus and then develop an algorithm incorporating those considerations to make sentencing determinations. This would involve extensively researching and carefully analyzing sentences that have been handed down in each relevant jurisdiction. Researchers would need to explain in detail existing sentencing law and practice after ascertaining the mean and median penalties for each offense, analyzing the reasons that have been provided for the sentences and identifying the variables that informed the relevant sentencing determinations. They may also need to make some approximations regarding the weight that courts have placed on sentencing variables in past cases. This process is more complex, but it is certainly achievable and in principle is no different from the process underpinning the algorithms that have been designed to predict the outcomes of decisions by the European Court of Human Rights.¹⁷²

Having established that it is possible to introduce computerized decision-making into current sentencing systems, this Article now considers how computerized sentencing would operate in an empirically validated and normatively sound sentencing system.

B. *Designing an Algorithm for a Reformed Sentencing System*

One of this Article's Authors has recently set out the components of an ideal sentencing system after analyzing empirical data regarding the efficacy of state-imposed punishment to achieve the key goals of sentencing, and normative considerations regarding the proper role and limits of punishment.¹⁷³ The basis for these conclusions is discussed further below, but in summary

¹⁷¹ As noted previously, this is the case with the Federal Sentencing Guidelines. *See supra* Section I.A.1.

¹⁷² *See Alctras et al., supra* note 145, at 2.

¹⁷³ *See Bagaric & Gopalan, supra* note 3, at 173.

the study concluded that the sentencing objectives of general deterrence¹⁷⁴ and specific deterrence¹⁷⁵ should be discarded.¹⁷⁶ Additionally, the sentencing goal of rehabilitation¹⁷⁷ should be pursued to the extent that it can be empirically validated through risk-and-needs assessment tools, while the aim of incapacitation¹⁷⁸ should be retained only in relation to serious sexual and violent offenders in order to protect the community and punish offenders to an extent that is commensurate with the seriousness of their offense.¹⁷⁹

This research also proposed that the principle of proportionality should be the key determinant of which penalty is imposed.¹⁸⁰ Studies have shown that serious sex and violent offenses considerably set back the interests of victims, but other types of offenses cause far less harm. Moreover, because the rate of commission of crimes does not appear to increase when sanctions other than imprisonment are imposed on low-level offenders, it is recommended that offenders who do not commit serious sexual or violent offenses generally not be sentenced to prison.¹⁸¹ This approach would not diminish community safety. In *Brown v. Plata*,¹⁸² the Supreme Court held that California's overcrowded prisons breached the cruel and unusual punishment clause of the Eighth Amendment and ordered the state to reduce its prison population by over 30 thousand within two years.¹⁸³ A recent study found that the unprecedented release of a large number of nonviolent and nonsexual offenders that followed this decision did not result in an appreciable increase in violent crime and led to only a small increase in minor property offenses.¹⁸⁴

To illustrate the way in which a strategically developed sentencing system would operate, the current penalty levels and the presumptive penalty levels that should apply to a number of common offenses are set out below

¹⁷⁴ This is the theory that harsh penalties reduce crime by discouraging would-be offenders because they fear being subjected to a harsh sanction. *Id.* at 188.

¹⁷⁵ This is the theory that harsh sanctions deter individual offenders by demonstrating to them that criminal acts will attract severe consequences. *Id.* at 187.

¹⁷⁶ *Id.* at 189.

¹⁷⁷ This is the view that offenders' attitudes regarding the appropriateness of crime can be changed by measures undertaken by the criminal justice system. *Id.* at 187–88.

¹⁷⁸ This is the practice of confining offenders, usually in prison, so that they cannot reoffend in the community. *Id.* at 185.

¹⁷⁹ Bagaric & Gopalan, *supra* note 3, at 186–87, 189.

¹⁸⁰ *Id.* at 171.

¹⁸¹ *Id.* at 186–87.

¹⁸² 563 U.S. 493 (2011).

¹⁸³ *Id.* at 501–02.

¹⁸⁴ Charis E. Kubrin et al., Opinion, *Releasing Low-Level Offenders Did Not Unleash a Crime Wave in California*, WASH. POST (Mar. 17, 2016), https://www.washingtonpost.com/opinions/releasing-low-level-offenders-did-not-unleash-a-crime-wave-in-california/2016/03/17/7d376adc-c4b5-11e5-a6f3-21ccd5f74c_story.html?noredirect=on&utm_term=.b3cc759ad028; see also MIKE MALES, CTR. ON JUVENILE & CRIMINAL JUSTICE, URBAN CRIME TRENDS REMAIN STABLE THROUGH CALIFORNIA'S POLICY REFORM ERA (2010–2016), at 1 (2017), http://www.cjcrj.org/uploads/cjcrj/documents/urban_crime_trends_remain_stable_through_californias_policy_reform_era_2010-2016.pdf.

with stipulations for the considerations that would lead to a penalty increase or decrease. The proposed penalty ranges are contextualized by comparing them to the current penalties for each offense as prescribed by the Federal Sentencing Guidelines. By way of overview, all of the proposed penalties are significantly less severe than the current Guidelines penalty ranges.

Offense	Current Penalty Level	Proposed Penalty Level ¹⁸⁵
Theft	6 (0–18 months) ¹⁸⁶	0
Theft of more than \$15,000	10 (6–30 months) ¹⁸⁷	1 (0–6 months)
Insider trading	8–14 (0–46 months) ¹⁸⁸	1 (0–6 months)
Trafficking small quantities of drugs (e.g. less than 50 grams cocaine)	12 (10–37 months) ¹⁸⁹	1 (0–6 months)
Burglary of a residence	17 (24–63 months) ¹⁹⁰	1 (0–6 months)
Robbery (without the use of a weapon)	20 (33–87 months) ¹⁹¹	2 (1 year')
Robbery with a weapon	23–27 (46–162 months) ¹⁹²	3 (2 years)
Aggravated assault	14–24 (15–125 months) ¹⁹³	6 (5 years)
Trafficking large quantities of drugs (e.g., more than 450kg of cocaine)	38 (235 months to life) ¹⁹⁴	6 (5 years)
Kidnapping with ransom demand	38 (121 months to life) ¹⁹⁵	8 (7 years)
Criminal sexual abuse (e.g., rape)	30–38 (97 months to life) ¹⁹⁶	11 (10 years)
First degree murder	43 (life) ¹⁹⁷	21 (20 years)

The above suggestions for penalties are only presumptive, rather than mandatory, because there are several considerations that should be able to increase or decrease a penalty that are respectively referred to as aggravating and mitigating considerations. They are valid sentencing considerations because they logically, normatively, or empirically relate to justifiable sentencing objectives—typically community protection (incapacitation)—or to the principle of proportionality, or they derive from an established criminal defense. The tables below set out recommendations for the aggravating and mitigating considerations that should be recognized, the maximum weight that should be accorded to them, and the justifications for taking them into account in the sentencing calculus.¹⁹⁸

¹⁸⁵ Column 3 is from Bagaric & Gopalan, *supra* note 3, at 238–39.

¹⁸⁶ SENTENCING GUIDELINES, *supra* note 18, §§ 2B1.1(a)(2), 5A.

¹⁸⁷ *Id.* §§ 2B1.1(b)(1)(C), 5A.

¹⁸⁸ *Id.* §§ 2B1.4(a), 4(b)(2), 5A.

¹⁸⁹ *Id.* §§ 2D1.1(c)(14), 5A.

¹⁹⁰ *Id.* §§ 2B2.1(a)(1), 5A.

¹⁹¹ *Id.* §§ 2B3.1(a), 5A.

¹⁹² SENTENCING GUIDELINES, *supra* note 18, §§ 2B3.1(a), .1(b)(2)(A)–(E), 5A.

¹⁹³ *Id.* §§ 2A2.2(a)–(b)(3), 5A.

¹⁹⁴ *Id.* §§ 2D1.1(c)(1), 5A.

¹⁹⁵ *Id.* §§ 2A4.1(a)–(b)(1), 5A.

¹⁹⁶ *Id.* §§ 2A3.1(a)(1)–(2), 5A.

¹⁹⁷ *Id.* §§ 2A1.1(a), 5A.

¹⁹⁸ These are derived from Mirko Bagaric, *A Rational Theory of Mitigation and Aggravation in Sentencing: Why Less Is More When It Comes to Punishing Criminals*, 62 BUFF. L. REV. 1159, 1236 tbls.1 & 2 (2014).

Aggravating factors:

Consideration	Maximum Weight	Rationale
Prior criminal record for serious sexual and violent offenses	50%	Incapacitation
High degree of involvement in crime	10%	Proportionality (culpability)
High degree of planning	10%	Proportionality (culpability)
High level of harm	10%	Proportionality (harm to victim)

Mitigating considerations:

Consideration	Maximum Weight	Rationale
Severe impact from punishment (e.g., harsh prison conditions)	50%	Proportionality (harm to offender)
Plea of guilty	25%	Reduce delay and cost of criminal justice system
Assisting authorities	25%	Reduce crime
Socio-economic deprivation—only for nonsexual and nonviolent offenses	25%	Proportionality (culpability)
Restitution of property	25%	Proportionality (harm to victim)
No prior convictions	25%	Incapacitation
Harm to dependents of the offender	20%	Innocent should not suffer
Incidental punishment	20%	Proportionality (harm to offender)
Spontaneous offending	10%	Proportionality (culpability)
Self-defense	10%	Failed criminal defense (coherency of the criminal law)
Necessity	10%	Failed criminal defense (coherency of the criminal law)
Duress or coercion	10%	Failed criminal defense (coherency of the criminal law)
Mental illness	10%	Failed criminal defense (coherency of the criminal law)

The above penalty adjustments set out the maximum discount or increase that should be permitted when the relevant consideration is applicable. In order to make mapping apposite to computerization, it is necessary to select a binary figure and it is a logical solution to pick the midpoint, which is half of each of the figures set out above.

In light of the clear-cut nature of the above considerations and the fact that the weight attributable to them is predetermined, an algorithm could readily be designed to determine appropriate sentences in relation to all offense types. It is important to note that the same process for developing an algorithm can apply irrespective of how many variables are taken into account. Thus, an algorithm could be developed for the reformed sentencing system proposed in this Article, as well as for existing sentencing systems.

IV. ADVANTAGES OF SENTENCING BY COMPUTER

There are a number of important benefits that would most probably result from computerized sentencing. Some of those advantages are more immediately apparent than others.

A. *Rule of Law Benefits: Consistent, Predictable, and Transparent Sentencing Law and Outcomes*

It is unjustifiable for courts to make decisions that are inconsistent, arbitrary, or opaque, especially where those determinations can potentially result in restrictions to an individual's liberty. Such decisions fundamentally violate the rule of law.¹⁹⁹ One of the more obvious potential advantages of computerized sentencing is that it could make sentencing law and sentencing outcomes more consistent, predictable, and transparent (provided, of course, that the formula underpinning the algorithm is disclosed and applied consistently). Those benefits are especially important in the realm of sentencing law because it is the domain in which the community acts in its most coercive manner against citizens.

Geoffrey de Q. Walker explains that the rule of law is both a legal doctrine and “normative concept” of “modern liberal democratic countries,” which constitutes “an ideal towards which a legal order should move if it is . . . to secure certainty in human relations.”²⁰⁰ The rule of law operates in a society where everyone—including judicial decision-makers—acknowledges “an obligation to comply with law, and act accordingly,” and where there is “an absence of arbitrary coercion.”²⁰¹ While, as Walker appreciates, it is important that the law remains flexible and changes in response to shifting public opinion, there is a crucial “need for certainty and stability in the law so that people will be able to plan and organize their arrangements in accordance with it.”²⁰² In helping to preclude arbitrary and uncertain justice, consistent, predictable, and transparent sentencing decisions could thus constitute a crucial safeguard of the rule of law.

John Rawls observes that “[t]he rule of law also implies the precept that similar cases be treated similarly,”²⁰³ and Walker considers that, when

¹⁹⁹ See JOHN FINNIS, *NATURAL LAW AND NATURAL RIGHTS* 272 (2d ed. 2011); Jeffrey Jowell, *The Rule of Law Today*, in *THE CHANGING CONSTITUTION* 57, 74–75 (Jeffrey Jowell & Dawn Oliver eds., 3d ed. 1994); JOSEPH RAZ, *The Rule of Law and Its Virtue*, in *THE AUTHORITY OF LAW: ESSAYS ON LAW AND MORALITY* 210, 214–16 (1979).

²⁰⁰ GEOFFREY DE Q. WALKER, *THE RULE OF LAW: FOUNDATION OF CONSTITUTIONAL DEMOCRACY* 1 (1988).

²⁰¹ *Id.* at 3.

²⁰² *Id.* at 42.

²⁰³ JOHN RAWLS, *A THEORY OF JUSTICE* 237 (1971).

implemented in practice, “this principle [of consistent decision-making] . . . significantly limits the discretion of judges and . . . forces them to justify the distinctions that they make between persons by reference to the relevant legal rules and principles.”²⁰⁴ For cogent reasons, as Maria Jean J. Hall et al. put it, “it is desirable that like cases be treated alike,” and “there is universal acceptance that consistency of approach should be an essential feature of sentencing decision-making.”²⁰⁵ Hall and her coauthors built “a decision-support prototype” using artificial intelligence techniques for “sentencing decisions made by magistrates” in the criminal jurisdiction in the State of Victoria, Australia, in 2002 and 2003.²⁰⁶ In striving to produce “technology-based solutions [that would] . . . help to maximize consistency of process in bounded discretion-sentencing regimes,” this team recognized:

From a retributivist perspective, a certain measure of consistency is necessary to ensure that offenders are punished in at least rough proportion to their culpability and thereby maintain public confidence in the integrity of the criminal-justice process. From an economic/utilitarian perspective, consistency enhances certainty of punishment, which, in turn, increases lawmakers’ ability to pursue optimal levels of deterrence.²⁰⁷

While, as discussed above, the sentencing objective of deterrence should be discarded as it is largely unachievable, “certainty of punishment” is a vital aim that any sentencing system must strive to produce, as it inevitably boosts offenders’, victims’, and the broader community’s trust in the legal system. The connection between consistency in sentencing and public confidence was noted by the Supreme Court of New South Wales in the Australian case, *R v. Jurisic*.²⁰⁸ “There is a need to ensure consistency in sentencing decisions. Inconsistency offends the principle of equality before the law and is a manifestation of injustice. Public criticism of particular sentences for inconsistency . . . is sometimes justified.”²⁰⁹

One of the main reasons for the move from indeterminate to prescriptive sentencing was the inconsistencies that plagued sentencing law and practice. It seems, however, that even largely prescriptive sentencing models have failed to achieve a reasonable level of consistency. A number of recent studies have demonstrated wide-ranging disparity between the sentences imposed by judges who applied the Federal Sentencing Guidelines.²¹⁰ A study of judges at the Boston division of the District of Massachusetts showed that the three most lenient judges imposed sentences that were on average 25.5

²⁰⁴ WALKER, *supra* note 200, at 19.

²⁰⁵ Maria Jean J. Hall et al., *Supporting Discretionary Decision-Making with Information Technology: A Case Study in the Criminal Sentencing Jurisdiction*, 2 U. OTTAWA L. & TECH. J. 1, 3, 31 (2005).

²⁰⁶ *Id.* at 3.

²⁰⁷ *Id.*

²⁰⁸ (1998) 45 NSWLR 209.

²⁰⁹ *Id.* at 216.

²¹⁰ Divine, *supra* note 58, at 831.

months or less, while the other two judges, who sentenced at least fifty defendants, imposed sentences that were more than double this length.²¹¹ Syracuse University's Transactional Records Access Clearinghouse program studied approximately 370,000 federal sentences that had been imposed nationwide and similarly observed wide inter-judge sentencing disparity in numerous jurisdictions.²¹² For example, the median sentences imposed by judges in Dallas ranged from sixty months to 121.5 months, and among judges in the District of Columbia, the median sentences ranged from twenty-seven to seventy-seven months.²¹³

Professor Neil Hutton notes that, although courts in the United Kingdom may "recognize that consistency between judges contributes significantly to the achievement of justice in sentencing[,] . . . sentencing appears to be neither formal nor rational" and is therefore susceptible to producing inconsistencies between decisions.²¹⁴ The same observation is to a significant extent applicable to the United States' current sentencing systems in which disparities between sentences "may be produced by inequalities in the consideration given to the facts of the case."²¹⁵ A major reason for these inconsistencies is that implicit biases and deeply rooted values and beliefs of individual judges often affect their decision-making. Even though American judges make decisions within prescriptive and guideline sentencing systems that have presumptive penalties, there is considerable scope for their personal views of offenders (including those perceptions of which even they are unaware) to affect their decisions.

The clarity and transparency of computer sentencing would certainly make sentencing more consistent and predictable. Hutton notes that "[o]ne of the main aims of using computer technology to support sentencing has been to make the sentencing process more formal and more rational," and thereby to "reduce disparities" and ensure that sentencing decisions are consistent with one another.²¹⁶ Computerized sentencing does have the potential to achieve broad consistency between sentences that are imposed on offenders for similar crimes. Computers cannot make decisions pursuant to sentiments and agendas that are not explicitly incorporated into their programs. As Richard Susskind observes, "computer systems will not suffer from 'off-

²¹¹ *Id.* at 791.

²¹² *Id.* at 792.

²¹³ *Id.* It was also noted that there were fewer differences between the sentences imposed in some districts. *Id.* In relation to the Federal Sentencing Guidelines, see ALAN ELLIS & MARK H. ALLENBAUGH, BLOOMBERG LAW WHITE COLLAR CRIME REPORT, UNWARRANTED DISPARITY: EFFECTIVELY USING STATISTICS IN FEDERAL SENTENCING 7 (2017).

²¹⁴ Neil Hutton, *Sentencing, Rationality, and Computer Technology*, 22 J.L. & SOC'Y 549, 550–51 (1995).

²¹⁵ *Id.* at 558.

²¹⁶ *Id.*

days' that so often inhibit the performance of human beings."²¹⁷ Indeed, lacking human irrationality, there is no reason for computers to deviate from a consistent approach to sentencing. Thus, the features of an ideal computerized sentencing system that are outlined above could ensure that similar sentences are produced where the facts of crimes are alike.

According to this proposal, incorporated into the computers' programs would be, in Hutton's words,

a set of rules describing the criteria which should be taken into account and the method through which account is to be taken[,] . . . an unambiguous, formally specified aim or set of aims for punishment, and a rational set of rules determining how appropriate punishments are to be allocated to particular cases.²¹⁸

A constant, unvarying suite of factors that inform penalties—including aggravating and mitigating considerations that increase or decrease penalties respectively—and specifications of the weight to attach to each of those factors in certain circumstances should be built into the computer algorithm. Underpinning those factors and their impact on penalties would be clearly articulated objectives that the sentences are designed to achieve, namely, rehabilitation, community protection (and incapacitation where serious sexual and violent offenses have been committed), and punishment that is commensurate with the seriousness of an offense. Hutton emphasizes that incorporating “the principle of proportionality” into computerized sentencing programs in particular can “increase the formal, generalizable, rule-governed aspects of sentencing and thus provide a more rational basis for sentencing” and result in more consistent sentencing decisions.²¹⁹ To ensure that computerized sentencing leads to proportionate sentencing, also incorporated into the algorithm could be calculations of the extent to which certain offenses set back the interests of their victims (this factor is discussed in greater detail below).²²⁰

Hutton envisages an ideal sentencing system in which “any sentencer presented with the same case would reach the same decision as to the appropriate sentence. Thus the sentence for any case would be predictable providing the correct rules and procedures had been followed.”²²¹ A clear set of variables would be applied, and judicial bias that can at present lead to inconsistencies in sentences would be eliminated from the decision-making

²¹⁷ RICHARD SUSSKIND, *An Introduction to Expert Systems in Law*, in TRANSFORMING THE LAW: ESSAYS ON TECHNOLOGY, JUSTICE AND THE LEGAL MARKETPLACE 161, 173 (2000).

²¹⁸ Hutton, *supra* note 214, at 558.

²¹⁹ *Id.* at 565.

²²⁰ See *infra* notes 268–274 and accompanying text.

²²¹ Hutton, *supra* note 214, at 552.

process.²²² This ambition of consistent, predictable sentencing could be realized through computerized sentencing.

In producing a publicly accessible algorithm that clarifies the variables and integers that are considered in sentencing and the weight that is attached to them, as well as the objectives of sentencing, computerized sentencing will also ensure that the decision-making process is more transparent. Maria Jean J. Hall et al. found that their “decision-support prototype” resulted in “[t]ransparency . . . by demonstrating how legal decisions are made,” and thereby led “to a better community understanding of legal domains and [reduced] . . . public criticism of judicial decision-making.”²²³ Whereas, at present, sentencing determinations can be influenced by judges’ particular prejudices and, as Professor Eric Engle observed, “[c]ourts generally ‘duck’ the question of exactly how they weight the [varying] interests,” “modeling law by computer” can eliminate judicial discretion and discrimination, and articulate precisely how various interests are balanced in the decision-making process.²²⁴ Indeed, Susskind observes that “[e]xpert systems” are, by their nature, “usually . . . transparent” because they “can generate explanations of the lines of reasoning that lead them to their conclusions.”²²⁵

It is important to emphasize that the variables that influence sentencing outcomes must be transparent and set out clearly in a manner that is comprehensible to all people involved in the criminal justice system and the general public. Promulgation of the algorithm that is used in computerized sentencing will reassure all interest groups, including offenders, victims and the community generally. Controversy recently erupted concerning a judge’s sentencing of a Wisconsin offender to six years in prison on the basis of a computer program’s assessment of his risk of recidivism for the reason that the algorithm for this software had been kept hidden from the public.²²⁶ The company that produced the software claimed that the algorithm was a trade secret, but as Adam Liptak observed in the *New York Times*, this unfairly prevented the offender from challenging the risk assessment.²²⁷ Liptak aptly commented, “[t]here are good reasons to use data to ensure uniformity in

²²² This advantage of computerized sentencing is also examined further below. *See infra* notes 277–291, 300–305 and accompanying text.

²²³ Hall et al., *supra* note 205, at 3, 31.

²²⁴ Eric Engle, *Legal Interpretation by Computer: A Survey of Interpretive Rules*, 5 AKRON INTELL. PROP. J. 71, 92–93 (2011).

²²⁵ RICHARD SUSSKIND, *A Jurisprudential Approach to Expert Systems in Law*, in TRANSFORMING THE LAW: ESSAYS ON TECHNOLOGY, JUSTICE AND THE LEGAL MARKETPLACE 177, 183 (2000) (emphasis omitted).

²²⁶ Adam Liptak, *Sent to Prison by a Software Program’s Secret Algorithms*, N.Y. TIMES (May 1, 2017), https://www.nytimes.com/2017/05/01/us/politics/sent-to-prison-by-a-software-program-secret-algorithms.html?_r=0; *see also* Jason Tashca, *Courts Are Using AI to Sentence Criminals. That Must Stop Now*, WIRED (Apr. 17, 2017, 7:00 AM), <https://www.wired.com/2017/04/courts-using-ai-sentence-criminals-must-stop-now/>.

²²⁷ Liptak, *supra* note 226.

sentencing. It is less clear that uniformity must come at the price of secrecy.”²²⁸ This criticism can be readily surmounted by ensuring that all of the elements of the sentencing decision-making program are publicly disclosed.

B. *More Efficient Sentencing Practice*

Another significant advantage of computerized sentencing is that sentencing decisions would be made much more quickly and efficiently.²²⁹ An algorithm can resolve a problem significantly faster than a human because computers process information nearly instantaneously. Therefore, computerized sentencing could greatly reduce the time between a finding of guilt and the imposition of a sentence. In producing sentencing determinations in a timely fashion, computerized sentencing could ameliorate the numerous adverse ramifications that stem from delays in sentencing decision-making.

The consequences of long delays in making sentencing decisions include clogging of the court system and increased financial costs to the public. Perhaps even more importantly, the longer it takes for sentencing decisions to be made, the longer offenders must wait to learn of their fate, and the longer victims must postpone their sense of resolution; often neither the offenders nor the victims can proceed with their lives while the sentencing decisions remain unresolved. This infringes the universal maxim that “[j]ustice delayed is justice denied.”²³⁰ As Professor Stefan Voigt observes, “detaining a suspect while he is waiting for his trial is a serious intrusion into his personal freedom,” and “[o]verly long court delay is not only likely to threaten the legitimacy of a country’s judicial system, but can also lead to a loss in legitimacy of the political system at large,” and it can “have important economic consequences.”²³¹ Indeed, swift completion of sentencing is crucial to promoting the rule of law. Walker maintains that the right to a speedy trial is “implicit in the rule of law,” as is the “[a]ccessibility of courts,” by which he means that “a person’s ability to vindicate legal rights is not made illusory by long delays or excessive costs.”²³²

C. *Cheaper Resolution of Sentencing Decisions*

A major potential community benefit of introducing computerized sentencing would be considerable fiscal savings flowing from reductions in the

²²⁸ *Id.*

²²⁹ See Sarah Krasnostein & Aric Freiberg, *Pursuing Consistency in an Individualistic Sentencing Framework: If You Know Where You’re Going, How Do You Know When You’ve Got There?*, 76 L. & CONTEMP. PROBS. 265, 278 (2013).

²³⁰ Stefan Voigt, *Determinants of Judicial Efficiency: A Survey*, 42 EUR. J.L. & ECON. 183, 183 (2016).

²³¹ *Id.* at 183–84.

²³² WALKER, *supra* note 200, at 5, 40.

amount of time currently spent by judges in determining appropriate sentences. The costs of judges taking long periods of time to make decisions are not all immediately apparent. They include not only the salary of individual judges, but also expenses involved in hiring administrative staff to run the courts and assist judges, the overheads of courthouses, such as power and water bills, and payment by the state or offenders of counsel to appear on their behalf. Indeed, advocates' fees could be substantially reduced if computerized sentencing is introduced because counsel will be aware of the factors that will be taken into account in the decision-making process and can prepare their cases accordingly.²³³ Counsel also will not need to spend significant time seeking to persuade judges to make particular sentencing decisions. In addition, if judges spend less time on sentencing determinations, they will be free to devote more time to attending to other court matters, thereby reducing court delays and backlog.

Diminished spending on courts and counsel could lead to a reduction in the legal financial obligations borne by offenders, which represent a "criminal justice debt" that Alexandra Shookhoff, Robert Constantino, and Evan Elkin observe can ultimately "harm the individual, the community, and the criminal justice system itself."²³⁴ At present, many offenders are required to pay a "growing number of court fees, fines, and surcharges[,] . . . [which] include public defender fees, mandatory surcharges for a conviction, . . . [and] parole and probation supervision fees."²³⁵ Shookhoff, Constantino, and Elkin note that, although those financial "penalties" are used "to hold individuals accountable for their crimes," they are also relied upon to "generate revenue in the face of increasingly tighter budgets" and "help fund many aspects of the criminal justice system."²³⁶ Carrying this financial burden can inhibit offenders' rehabilitation and thus diminish community safety.²³⁷ In reducing the costs associated with making sentencing decisions, computerized sentencing could lessen the need to pass these costs onto offenders and save taxpayers considerable money in court operation costs.

D. *Elimination of Racial Bias from Sentencing Decisions*

Empirical studies have uncovered that offenders from minority groups—especially African Americans—often receive more severe sentences than white offenders who have committed comparable crimes.²³⁸

²³³ See Hall et al., *supra* note 205, at 35.

²³⁴ Alexandra Shookhoff, Robert Constantino & Evan Elkin, *The Unintended Sentence of Criminal Justice Debt*, 24 FED. SENT'G REP. 62, 63 (2011).

²³⁵ *Id.*

²³⁶ *Id.*

²³⁷ See *id.*

²³⁸ Rosc Matsui Ochi, *Racial Discrimination in Criminal Sentencing*, 24 JUDGES J. 6, 8 (1985).

Researchers have found that racial bias has contributed to this disparity, thereby undermining the rule of law. As Walker notes, a critical component of the rule of law is “the rules of natural justice,” which include “the requirement of an unbiased tribunal.”²³⁹ A key potential advantage of computerized sentencing is that it could eliminate the influence of racial bias on sentencing decisions.

An analysis of the sentences of more than 77 thousand offenders found that the same courts will sentence black offenders to prison terms that are twelve percent longer than the sentences they impose on white offenders, even where the offenders have committed identical crimes and have identical criminal histories.²⁴⁰ Similar statistics were uncovered by research undertaken for the United States Bureau of Justice Statistics and the United States Department of Justice Working Group on Racial Disparity into sentences imposed in the federal jurisdiction pursuant to the Federal Sentencing Guidelines.²⁴¹ Factoring in variables recognized by the Guidelines, this study found that, between 2005 and 2012, black offenders received sentences that imposed prison terms that were around five to ten percent longer than the prison terms imposed on white offenders who had committed similar crimes.²⁴² The same study speculated that *Booker*, in holding that the Guidelines were advisory only, had increased judges’ discretion in applying the Guidelines and led to inconsistent sentencing decisions being made for black and white offenders.²⁴³ The report states:

We are concerned that racial disparity has increased over time since *Booker*. Perhaps judges, who feel increasingly emancipated from their guidelines restrictions, are improving justice administration by incorporating relevant but previously ignored factors into their sentencing calculus, even if this improvement disadvantages black males as a class. But in a society that sees intentional and unintentional racial bias in many areas of social and economic activity, these trends are a warning sign. It is further distressing that judges disagree about the relative sentences for white and black males because those disagreements cannot be so easily explained by sentencing-relevant factors that vary systematically between black and white males. . . . We take the random effect as strong evidence of disparity in the imposition of sentences for white and black males.²⁴⁴

²³⁹ WALKER, *supra* note 200, at 37.

²⁴⁰ David S. Abrams et al., *Do Judges Vary in Their Treatment of Race?*, 41 J. LEGAL STUD. 347, 350 (2012); Ronald S. Everett & Roger A. Wojtkiewicz, *Difference, Disparity, and Race/Ethnic Bias in Federal Sentencing*, 18 J. QUANTITATIVE CRIMINOLOGY 189, 198 tbl.1 (2002).

²⁴¹ See William Rhodes et al., *Federal Sentencing Disparity: 2005–2012*, at 1–2 (Bureau of Justice Statistics Working Paper Series, Paper No. WP-2015:01, 2015) (documenting previous studies in the United States that support the conclusion that subconscious bias causes racial disparity in sentencing).

²⁴² See *id.* at 23, 41.

²⁴³ *Id.* at 66.

²⁴⁴ *Id.* at 68. A more recent study focusing on sentencing patterns in Florida noted that African Americans often received markedly longer prison terms than white offenders for the same offense. See Elizabeth Johnson et al., *Black Defendants Get Longer Sentences in Treasure Coast System*, DAYTONA BEACH

Offenders' immutable characteristics—especially race—can in fact influence sentencing decisions in the current sentencing system in various ways. Some suggest that algorithms that have been developed to predict offenders' likelihood of recidivism may discriminate against offenders with particular immutable traits and entrench racism in decision-making about sentences.²⁴⁵ An offender's race is not an explicit consideration in risk assessment tools or sentencing law generally.²⁴⁶ Nevertheless, due to the fact that more African Americans have prior convictions than white Americans, the inclusion of prior criminality as a consideration in risk assessment tools and as an aggravating factor in sentencing determinations can have the effect of discriminating against African American offenders.²⁴⁷

As noted by Professor Christopher Slobogin, “[e]nhancing the punishment of an offender because of gender, age, or any other immutable characteristic strikes some as grossly unfair.”²⁴⁸ If immutable traits are to be factored into the sentencing calculus, there must be an acknowledgment of the manner in which they operate and a sound justification for how the trait in question should properly affect sentencing outcomes. This, too, has been noted by Slobogin:

The Supreme Court, however, does not believe that risk assessment is antithetical to criminal justice. It has even approved death sentences based on dangerousness determinations (*Jurek v. Texas*[, 428 U.S. 262, 275–76 (1976)]). If sentences can be enhanced in response to risk, then neither society's nor the offender's interests are advanced by prohibiting consideration of factors that might aggravate or mitigate that risk simply because they consist of immutable characteristics. In any event, risk-based sentences are ultimately based on a prediction of what a person will do, not what he is; immutable risk factors are merely *evidence* of future conduct, in the same way that various pieces of circumstantial evidence . . . are not blameworthy in themselves²⁴⁹

Likewise, the Court in *Malenchik v. Indiana*²⁵⁰ (the first state appellate decision to consider the appropriateness of risk-and-needs assessments in sentencing) held that it was not discriminatory for judges to use risk

NEWS-JOURNAL (Dec. 19, 2016, 1:09 PM), <http://www.news-journalonline.com/news/20161218/black-defendants-get-longer-sentences-in-treasure-coast-system>.

²⁴⁵ See Laurel Eckhouse, Opinion, *Big Data May Be Reinforcing Racial Bias in the Criminal Justice System*, WASH. POST (Feb. 10, 2017), https://www.washingtonpost.com/opinions/big-data-may-be-reinforcing-racial-bias-in-the-criminal-justice-system/2017/02/10/d63dc518-cc3a-11e6-9973-c5cfb7ccfb0d_story.html?utm_term=.6a19034da71a; Julia Angwin et al., *Machine Bias: There's Software Used Across the Country to Predict Future Criminals. And It's Biased Against Blacks*, PROPUBLICA (May 23, 2016), <https://www.propublica.org/article/machine-bias-risk-assessments-in-criminal-sentencing>. See generally *supra* Part III (discussing the use of risk assessment tools).

²⁴⁶ *United States v. Taveras*, 585 F. Supp. 2d 327, 336 (E.D.N.Y. 2008).

²⁴⁷ Bagaric, *Three Things*, *supra* note 93, at 105–06.

²⁴⁸ Slobogin, *supra* note 150, at 205.

²⁴⁹ *Id.*

²⁵⁰ 928 N.E.2d 564 (Ind. 2010).

assessment tools that took into account offenders' immutable traits on the basis that sentencing law

mandates that pre-sentence investigation reports include "the convicted person's history of delinquency or criminality, social history, employment history, family situation, economic status, education, and personal habits." Furthermore, supporting research convincingly shows that offender risk assessment instruments, which are substantially based on such personal and sociological data, are effective in predicting the risk of recidivism and the amenability to rehabilitative treatment.²⁵¹

Nevertheless, risk assessment tools and other tools that are used to predict the likelihood of offenders' recidivism must expressly articulate the relevant considerations that they take into account, so that immutable characteristics will only be incorporated into them if it is definitively established that they can have an impact on this risk (as opposed to being a proxy for other considerations, such as an offender's deprived social and economic background). Further, if the tools are developed carefully and with a focus on preventing the operation of factors that lead to indirect discrimination, they can minimize the potential for considerations such as race to influence sentencing outcomes inappropriately. The results of significant research into the effects of race on one risk assessment tool in particular—the PCRA, which were published in 2016—illustrate this point.²⁵²

A study undertaken by Professor Jennifer Skeem and Christopher Lowenkamp analyzed risk assessments that had been conducted using the PCRA in relation to 34,794 federal offenders in order to recommend conditions for their probation.²⁵³ (Risk assessments have no impact on sentencing decisions in the federal system, so Skeem and Lowenkamp did not examine the results of the application of the PCRA in relation to sentencing).²⁵⁴ In addition to finding that the PCRA was accurate in more than seventy percent of cases,²⁵⁵ the authors discovered the following:

First, there is little evidence of test bias for the PCRA. The instrument strongly predicts re-arrest for both Black and White offenders. Regardless of group membership, a PCRA score has essentially the same meaning, i.e., same probability of recidivism. So the PCRA is informative, with respect to utilitarian and crime control goals of sentencing. Second, Black offenders tend to obtain higher scores on the PCRA than White offenders ($d = .34$; 13.5% nonoverlap). So some applications of the PCRA might create disparate impact—which is defined by moral rather than empirical criteria. Third, most (66%) of the racial difference in PCRA scores is attributable to criminal history—which strongly predicts recidivism for both groups, is embedded in current sentencing guidelines, and has been shown to contribute to

²⁵¹ *Id.* at 568, 574.

²⁵² See JENNIFER SKEEM & CHRISTOPHER T. LOWENKAMP, RISK, RACE, & RECIDIVISM: PREDICTIVE BIAS AND DISPARATE IMPACT 29 (2016).

²⁵³ *Id.* at 2.

²⁵⁴ *Id.* at 13.

²⁵⁵ *Id.* at 20.

disparities in incarceration. Finally, criminal history is *not* a proxy for race. Instead, criminal history partially mediates the weak relationship between race and a future violent arrest.²⁵⁶

Thus, offenders' immutable traits should not influence sentencing decisions unless there is clear and persuasive evidence that they are relevant to an important objective of sentencing. It is possible to ensure that computerized sentencing follows these protocols and that it does not lead to the imposition of harsher sanctions on offenders from certain racial and social groups than on others. Indeed, computers can achieve this outcome far more effectively than judges.

In contrast to humans, computers have no instinctive, unconscious bias, are incapable of inadvertent discrimination, and are uninfluenced by extraneous considerations, assumptions, and generalizations that are not embedded in their programs. They operate simply by applying variables that have been preprogrammed. Bias can infiltrate computerized sentencing only if an algorithm incorporates existing variables that result in disproportionately harsh sentences being imposed on offenders from minority groups. Consequently, for computerized sentencing to eliminate bias from sentencing decisions—and, indeed, ensure that racially-based sentencing is not entrenched as a consequence of it—the algorithm itself must be free of the discrimination that permeates the present sentencing regime. Programs and algorithms need to be designed so that they do not include any variables that could have this effect by virtue of their implicit bias. Once the programs and algorithms have been developed, there would be no scope for extraneous, racial considerations to have an impact on computerized sentencing decisions.

E. *Potential to Provide the Catalyst for Reform That Can Make the Sentencing System Fairer*

A particularly significant, if less obvious, potential benefit of moving to computerized sentencing is that it could provide a catalyst to reform the current sentencing system. A change to computerized sentencing might be similar in magnitude to, if not even greater than, the shift from indeterminate to prescriptive sentencing, which in turn precipitated a reevaluation of the United States' sentencing systems. Introducing computerized sentencing would provide an opportunity to redress problems that have thus far frustrated the implementation of progressive sentencing reforms.

As alluded to above, at present there remains a considerable gap between sentencing practice on the one hand, and sentencing expertise and empirical research on the other.²⁵⁷ Despite past efforts to improve sentencing law and practice, insufficient consideration was paid to clear evidence that

²⁵⁶ *Id.* at 29 (citation omitted).

²⁵⁷ See Bagaric, *Bringing Sentencing*, *supra* note 6, at 805.

the central, traditional sentencing objectives that have been used to justify inflicting harsh sentences—namely, specific deterrence, marginal general deterrence, and general incapacitation—are in fact flawed.²⁵⁸

The aim of specific deterrence is founded on the assumption that individual offenders will be deterred from reoffending if they receive severe sentences because they will seek to avoid future further punishment.²⁵⁹ Although this premise seems reasonable, empirical evidence indicates that offenders who receive harsh punishments, and particularly those who are incarcerated, do not always reoffend less often than those who have received lighter sentences.²⁶⁰ Indeed, in some cases, severe penalties lead to higher rates of recidivism.²⁶¹

Likewise, research has demonstrated that severe sentences do not have a general deterrent effect that is attributable to their harshness and thus do not achieve the aim of marginal general deterrence.²⁶² It does nonetheless seem that the existence of sanctions alone, irrespective of their severity, may deter people generally from committing crimes (this research supports the notion of “absolute general deterrence”).²⁶³ This is not, however, a reason for imposing *particularly harsh* sentences on offenders, though it does justify imposing sanctions that are sufficiently harsh that people would seek to avoid them, such as fines or very short prison terms.

The sentencing objective of general incapacitation as a method of protecting the community is similarly flawed. It is based on the unsubstantiated assumption that any offender who has committed a crime in the past is likely to reoffend and therefore should be imprisoned to ensure that he or she does not endanger the public. Evidence suggests that offenders who have the highest rates of recidivism are those who commit minor crimes.²⁶⁴ However, incarceration of minor offenders is unjustified because their immediate offenses do not warrant a harsh sanction and the cost of their imprisonment is

²⁵⁸ *Id.* at 789.

²⁵⁹ Mirko Bagaric & Theo Alexander, *The Capacity of Criminal Sanctions to Shape the Behaviour of Offenders: Specific Deterrence Doesn't Work, Rehabilitation Might and the Implications for Sentencing*, 36 CRIM. L.J. 159, 159 (2012).

²⁶⁰ Daniel S. Nagin, Francis T. Cullen & Cheryl Lero Jonson, *Imprisonment and Reoffending*, 38 CRIME & JUST. 115, 155 (2009); *see also* DONALD RITCHIE, SENTENCING ADVISORY COUNCIL, DOES IMPRISONMENT DETER? A REVIEW OF THE EVIDENCE 10 (2011), <https://www.sentencingcouncil.vic.gov.au/sites/default/files/publication-documents/Does%20Imprisonment%20Deter%20A%20Review%20of%20the%20Evidence.pdf>; DON WEATHERBURN ET AL., AUSTRALIAN INST. OF CRIMINOLOGY, THE SPECIFIC DETERRENT EFFECT OF CUSTODIAL PENALTIES ON JUVENILE REOFFENDING 4 (2009).

²⁶¹ Bagaric, *Bringing Sentencing*, *supra* note 6, at 805.

²⁶² *See id.* at 807; *see also* RITCHIE, *supra* note 260, at 10.

²⁶³ *See* FRANKLIN E. ZIMRING & GORDON J. HAWKINS, DETERRENCE: THE LEGAL THREAT IN CRIME CONTROL 14 (1973); RITCHIE, *supra* note 260, at 12; Bagaric, *Bringing Sentencing*, *supra* note 6, at 807.

²⁶⁴ *See* JESSICA ZHANG & ANDREW WEBSTER, AUSTRALIAN BUREAU OF STATISTICS, AN ANALYSIS OF REPEAT IMPRISONMENT TRENDS IN AUSTRALIA USING PRISONER CENSUS DATA FROM 1994 TO 2007, at 30 (2010); Ben Vollaard, *Preventing Crime Through Selective Incapacitation* 11 (Tilburg Law & Econ. Ctr., Discussion Paper No. 2011-001, 2011).

not proportionate to the harm caused by their offending.²⁶⁵ Offenders who commit serious offenses (that is, violent and sexual offenses) and have prior convictions for similar serious crimes also have relatively high reoffending rates.²⁶⁶ While it may be legitimate to incarcerate this cohort of offenders, it represents a very small percentage of offenders and therefore there is no justification for applying the sentencing objective of general incapacitation to the majority of offenders who fall outside this group.²⁶⁷ General incapacitation is contrasted with the theory of “selective incapacitation,” which is relied upon to justify incarcerating offenders if risk assessments forecast that those individuals have a high likelihood of recidivism. Selective incapacitation is nonetheless a flawed objective at present because there are no tools yet that enable us to determine with certainty which serious offenders are likely to commit further serious offenses. However, if risk assessment tools are developed that can make such predictions accurately and be incorporated appropriately into a sentencing algorithm, selective incapacitation will be an attainable objective.

These unachievable aims continue to be pursued in current sentencing systems. Another key deficiency of the present sentencing system relates to the inability to apply properly the principle of proportionality. Although the principle of proportionality—the notion that the “punishment should fit the crime”—is a component of the sentencing systems of ten American states,²⁶⁸ there has not yet been developed a coherent means of ensuring that the penalty that is applied matches the seriousness of the offense.²⁶⁹ Both Authors have argued elsewhere that these problems can be attributed to longstanding punitive attitudes towards offenders—driven particularly by racial prejudice and, in recent years, also by a “tough-on-crime” political agenda—which have led to the imposition of more sentences as well as harsher sentences on offenders (including for nonviolent offenses), without in fact reducing crime rates.²⁷⁰ As noted above, there is evidence, however, of changes to such

²⁶⁵ See Kevin Bennardo, *Incarceration's Incapacitative Shortcomings*, 54 SANTA CLARA L. REV. 1, 8–9 (2014) (noting that some incapacitative models assume that prison is not part of society, so crimes committed in prison are not taken into account in assessing the incapacitating effect of imprisonment); see also Colin Murray, “To Punish, Deter and Incapacitate”: *Incarceration and Radicalisation in UK Prisons After 9/11*, in PRISONS, TERRORISM AND EXTREMISM: CRITICAL ISSUES IN MANAGEMENT, RADICALISATION AND REFORM 16, 17–18 (Andrew Silke ed., 2014) (noting that, for incapacitation to reduce the crime rate, it is vital that inmates do not corrupt other prisoners).

²⁶⁶ Bagaric, *The Punishment*, *supra* note 13, at 410.

²⁶⁷ *Id.* at 406.

²⁶⁸ Gregory S. Schneider, Note, *Sentencing Proportionality in the States*, 54 ARIZ. L. REV. 241, 250 (2012).

²⁶⁹ Andrew von Hirsch & Nils Jareborg, *Gauging Criminal Harm: A Living-Standard Analysis*, 11 OXFORD J. LEGAL STUD. 1, 3 (1991). For discussion regarding the obscure proportionality jurisprudence by the Supreme Court, see Perry L. Moricarty, *Implementing Proportionality*, 50 U.C. DAVIS L. REV. 961, 977–78 (2017).

²⁷⁰ Bagaric, *Bringing Sentencing*, *supra* note 6, at 790.

attitudes and of an increasing receptiveness in American society to the notion of reforming sentencing practice.²⁷¹

Moreover, there is a clear way of implementing the proportionality principle in decision-making related to sentences: this involves measuring the extent to which a crime adversely affected a victim's interests and imposing a sentence that is sufficiently harsh to set back the offender's interests to the same degree.²⁷² Research has been conducted into the effects of various offenses on their victims as well as into factors that have an impact on individuals' wellbeing (such as the Organisation for Economic Co-operation and Development's "Better Life Index," which refers to matters such as people's satisfaction with life and to elements that contribute to that, including a sense that their rights to physical integrity, liberty, and property are being maintained).²⁷³ It would be possible to draw on this work to develop an objective means of assessing the ways in which, and the extent to which, an offense has harmed a victim. The resulting data from such evaluations could be incorporated into the sentencing algorithm in order to produce a penalty that inflicts inconvenience or suffering on the offender that is of a similar magnitude to the harm experienced by the victim.²⁷⁴

A move to a fundamentally different form of sentencing decision-making could clear the way for a more wide-ranging reassessment of the sentencing system. Thus, computerized sentencing could ensure that only justifiable sentencing aims are pursued in decision-making about sentences, and that sentences are imposed that are proportionate to the offenses that have been

²⁷¹ *Id.* at 813.

²⁷² ANDREW ASHWORTH, *SENTENCING AND CRIMINAL JUSTICE* 97 (5th ed. 2010) (recommending that proportionality at the outer limits "exclude[] punishments which impose far greater hardships on the offender than does the crime on victims and society in general."); Bagaric, *Bringing Sentencing*, *supra* note 6, at 790; Bagaric, *Injecting Content*, *supra* note 103, at 413. This proposed method bears some similarity to approaches of other theorists, in particular the notion of an "empirical desert" advanced in Paul H. Robinson, *The Ongoing Revolution in Punishment Theory: Doing Justice as Controlling Crime*, 42 ARIZ. ST. L.J. 1089, 1093, 1104–07 (2011) (suggesting different criteria for informing the content of the principle); *see also* von Hirsch & Jareborg, *supra* note 269, at 11 (discussing the concept of using an interests analysis to estimate the severity of crimes, which is similar to a living standard analysis for gauging crime seriousness).

²⁷³ *How's Life?*, OECD BETTER LIFE INDEX, <http://www.oecdbetterlifeindex.org/#/1111111111> (last visited Feb. 4, 2019). These measures are designed to be more informative than economic statistics and are consistent with various studies of human wellbeing. *See* Michael Argyle et al., *Happiness as a Function of Personality and Social Encounters*, in *RECENT ADVANCES IN SOCIAL PSYCHOLOGY: AN INTERNATIONAL PERSPECTIVE* 183 (Joseph P. Forgas & J. Michael Innes eds., 1989); TIM KASSER, *THE HIGH PRICE OF MATERIALISM* 4 (2002); Martin E. P. Seligman & Mihaly Csikszentmihalyi, *Positive Psychology: An Introduction*, 55 AM. PSYCHOLOGIST 5, 13 (2000). For a summary of the results of those studies, *see* Mirko Bagaric & James McConville, *Goodbye Justice, Hello Happiness: Welcoming Positive Psychology to the Law*, 10 DEAKIN L. REV. 1, 10–17 (2005) (in a thematic edition concerning the link between law and happiness research).

²⁷⁴ JESPER RYBERG, *THE ETHICS OF PROPORTIONATE PUNISHMENT: A CRITICAL INVESTIGATION* 102 (2004); ANDREW VON HIRSCH & ANDREW ASHWORTH, *PROPORTIONATE SENTENCING: EXPLORING THE PRINCIPLES* 144 (2005).

committed. To this end, a computer algorithm could be developed by reference to empirical evidence of the efficacy of state-imposed sanctions to achieve objectives of sentencing. In so doing, it should disregard the goals of deterrence and general incapacitation, and instead prioritize the aims of community protection (though only to the extent that it involves incapacitation of the most serious offenders, and particularly those who have committed similar serious crimes in the past), rehabilitation, and proportionality.

In reaching decisions that pursue the objectives of proportionality, as well as community protection and rehabilitation—and uninfluenced by the prejudices and agendas that can infiltrate decision-making about sentences at present—computerized sentencing could produce significantly fairer sentences overall than sentences that are currently being imposed. In particular, computerized sentencing could eliminate the problem that disproportionately harsh sentencing decisions are often made, and especially in relation to offenders from minority groups. As noted above, if the algorithms and programs for the computers are prepared in an informed manner to ensure that they are free of bias against any members of society and of inherently punitive attitudes towards offenders, and that they operate by reference to the principle of proportionality, less severe sentences will be imposed. By reducing the frequency of harsh sentences, and particularly those sentences that involve incarceration, computerized sentencing could result in a significant reduction in the prison population. In addition, community safety would not be diminished because the algorithm would evaluate both the risk that offenders will reoffend in the future and offenders' needs that can be addressed to ameliorate that risk.

Thus, a move towards computerized sentencing could facilitate reforms that would overcome the drawbacks of the current sentencing regime and finally bridge the chasm between sentencing knowledge and practice and, crucially, make the community safer.

F. *Implementing the Move to Computerized Sentencing*

The proposed reform should obviously be tested prior to being used in actual sentencing matters. Testing the process is necessary in order to evaluate properly the efficacy of the proposed algorithm and make appropriate changes to it if required. It will also enable relevant stakeholders, including judges, academics, lawyers, victims, offenders and the wider community, to provide feedback about it.

It is desirable to trial the proposal in the context of an existing sentencing system. To this end, the Federal Sentencing Guidelines system is the most suitable reference point. As noted above, it is the most influential and analyzed sentencing system in the United States and accounts for nearly ten percent of all imprisoned offenders. In addition, this system is relatively prescriptive, sets out clear sentencing ranges, and precisely identifies most

mitigating and aggravating factors. It is in effect already an algorithm, albeit one that is not coded to be processed by a computer.

In order to test the proposal, research needs to be undertaken into a large number of sentencing decisions to identify the considerations that judges most commonly apply in sentencing for particular offense types and the weight that is typically accorded to these considerations. This will provide the data necessary to code the sentencing algorithm. The research should focus on sentencing outcomes in the past two years, which would yield an extensive database of approximately 150,000 cases.²⁷⁵ The results of this analysis should be coded into an algorithm, which should in turn be applied prospectively to all federal sentencing cases for a year. The sentencing outcomes should then be contrasted with the actual sentences that are imposed by courts in those cases. This will provide an opportunity to appraise the computer-generated sentencing outcomes fully from the perspective of their objective appropriateness and their similarities with, and differences from, court-imposed sanctions. This dual perspective will enable a comprehensive evaluation of the algorithm and, in particular, will ensure that computer-generated sentences that appear to be too harsh or too soft are detected, thereby facilitating refinement of the algorithm.

At the same time, an alternative algorithm should be developed based on the model of sentencing that is proposed in this Article. The sentences that emerge from the application of this algorithm should then be contrasted with those that have been produced based on the current system. This investigation will facilitate concrete comparisons between the present system of sentencing and an empirically validated and normatively sound sentencing system and is likely to lead to the expedited implementation of the recommended reforms.

V. POSSIBLE DISADVANTAGES OF SENTENCING BY COMPUTER

This Part of the Article foreshadows objections to the proposal for computerized sentencing and demonstrates that, while some of those concerns have a veneer of plausibility, all them can be overcome by carefully designing the system with the right variables. This discussion is relatively brief, given that a number of possible objections to computerized sentencing have been discussed in the preceding Part of the Article, but it is necessary to examine them here to make the most persuasive case for computerized sentencing.

²⁷⁵ See U.S. SENTENCING COMM'N, OVERVIEW OF FEDERAL CRIMINAL CASES: FISCAL YEAR 2015, at 1 (2016) (finding that about seventy-seven thousand sentencing cases are finalized annually).

A. *Elimination of Discretion from the Sentencing Process*

The shift from indeterminate to prescriptive sentencing systems in the United States was inspired by the aim of reducing judicial discretion in order to inject consistency, transparency, and predictability into the sentencing regime. Nevertheless, as discussed above, those systems still permit judges to exercise some discretion in relation to the sentences they impose, and it is likely that many would perceive this latitude as reasonable and appropriate, provided that it is circumscribed.²⁷⁶ Constructing and using an algorithm to make sentencing decisions according to the proposal in this Article would, however, transform the current sentencing system into a wholly prescriptive sentencing system. Some may argue that the introduction of prescriptive penalties without any accompanying judicial discretion through computerized sentencing would be unduly severe and inflexible. These criticisms can be rebutted.

Prescriptive or presumptive penalties were, in the past, introduced as part of a “tough-on-crime” agenda,²⁷⁷ and it is thus unsurprising that they are criticized for being too harsh.²⁷⁸ Indeed, as noted above, the apparent extreme severity of fixed penalties is the main reason why they attract criticism. Nevertheless, the key opposition to current fixed penalties is in reality a resistance to unduly harsh criminal sanctions generally, rather than to fixed penalties per se. Therefore, if a computerized sentencing system operates by reference to prescribed penalties that are both less draconian than current fixed penalties and proportionate with offenses that have been committed, it is likely that this key objection to presumptive penalties will be negated.

Other criticisms have nonetheless also been advanced against fixed penalties. In particular, it has been shown that severe fixed penalties result in more offenders pleading not guilty.²⁷⁹ Offenders tend to contest findings of guilt for offenses that carry mandatory sanctions particularly strenuously and thereby often waste the court’s time and resources.²⁸⁰ If fixed penalties were set at more moderate levels, however, this problem would dissipate.²⁸¹ Another objection to harsh fixed penalties is that they can encourage criminal

²⁷⁶ See *supra* Section I.A.2.

²⁷⁷ See Neil Morgan, *Capturing Crims or Capturing Votes? The Aims and Effects of Mandatories*, 22 U.N.S.W. L.J. 267, 269 (1999) (stating that fixed penalties are introduced because judges are seen as not being sufficiently tough on crime).

²⁷⁸ See *supra* Section IV.D (discussing that some fixed penalty systems have been introduced to achieve more principled aims).

²⁷⁹ MICHAEL TONRY, SENTENCING MATTERS 148–50 (1996).

²⁸⁰ See *id.*

²⁸¹ The evidence certainly favors such a view. Where fixed penalties are not unduly severe, there is no research or empirical evidence to support such matters. For example, there is nothing to suggest that the mandatory minimum penalties for drunk driving, which are present in most Australian jurisdictions, have resulted in longer hearings or more not-guilty pleas.

justice officials—including police, prosecutors, and judges—to adopt surreptitious tactics in an attempt to ensure that those laws are not applied.²⁸² For instance, there is evidence that prosecutors threaten to call for the imposition of mandatory penalty provisions in order to pressure an accused to plead guilty to offenses that are similar to those charged, but that do not carry a mandatory sentence.²⁸³ Consequently, it is prosecutors, rather than judges, who in reality often exercise discretion in determining the sentence that is ultimately imposed on an offender.²⁸⁴ If, however, the fixed penalties were not so severe and disproportionate to the seriousness of the offenses for which they are prescribed, criminal justice officials would not be able to coerce guilty pleas, and, further, would have no reason to seek to circumvent the operation of such laws.

Of course, the severity of fixed penalties should not be reduced merely to overcome peripheral problems associated with such a sentencing methodology. The potential harm to the community from imposing light penalties that are not commensurate with the seriousness of crimes could outweigh any benefits flowing from improvements to the efficiency and consistency of the sentencing system. However, the key reason for reducing the severity of penalties—to give effect to the principle of proportionality—has sound empirical and normative foundation.²⁸⁵ Consequently, lowering the penalty for most offenses will not have incidental adverse consequences.

In addition to their severity, the other aspect of fixed penalties that is particularly condemned is their apparent inflexibility. Some maintain that, because fixed penalties are so rigid, they cannot accommodate the full ambit of relevant sentencing variables.²⁸⁶ As a consequence, according to Professor Tonry, in a prescriptive sentencing regime, while similar cases may be treated in the same way, different cases are not treated differently from each other. For this reason, Tonry argues, fixed sentences do not achieve a paramount objective of sentencing, namely, fairness.²⁸⁷ By contrast, in a system where judicial discretion is permitted to influence decision-making regarding sentences, judges can take into account variations between cases. Undoubtedly, some judges have developed considerable expertise in attaching suitable weight to different factors to reach decisions regarding sentences. Hutton observes that “[v]ery often, experienced sentencers will ‘know’, almost without

²⁸² TONRY, *supra* note 279, at 147, 150; *see also* Michael Tonry, *The Mostly Unintended Effects of Mandatory Penalties: Two Centuries of Consistent Findings*, 38 CRIME & JUST. 65, 67 (2009).

²⁸³ TONRY, *supra* note 279, at 150.

²⁸⁴ *Id.* at 151; *see also* Russell Hogg, *Mandatory Sentencing Laws and the Symbolic Politics of Law and Order*, 22 U.N.S.W. L.J. 262, 263–64 (1999).

²⁸⁵ *See supra* Section IV.E.

²⁸⁶ EVAN BERNICK & PAUL J. LARKIN, JR., THE HERITAGE FOUND., RECONSIDERING MANDATORY MINIMUM SENTENCES: THE ARGUMENTS FOR AND AGAINST POTENTIAL REFORMS 7 (2014).

²⁸⁷ Michael Tonry, *Sentencing Reform Across Boundaries*, in THE POLITICS OF SENTENCING REFORM 267, 278 (Chris Clarkson & Rod Morgan eds., 1995).

thinking, what kind of sentence is appropriate.”²⁸⁸ Hall et al. feared that using artificial technology in decision-making about sentences would remove the possibility for “a human decision-maker to introduce an element of humanity in special circumstances.”²⁸⁹ In a similar vein, Professor Christopher Markou argues that sentencing algorithms move us towards crude methodologies, which are lacking in rigor and sophistication, and

the “black boxing” of the legal system. This must be resisted forcefully. Legal systems depend on continuity of information, transparency and ability to review. What we do not want as a society is a justice system that encourages a race to the bottom for AI [artificial intelligence] startups to deliver products as quickly, cheaply and exclusively as possible. While some AI observers have seen this coming for years, it’s now here—and it’s a terrible idea.²⁹⁰

These criticisms are, however, misplaced and devoid of evidence, and a properly developed algorithm could certainly overcome them. The suggestion that more judicial discretion leads to greater fairness needs to be established, not merely asserted, but there is in fact no evidence to substantiate it. Discretion leaves open the prospect of a *wider range* of decisions, but not necessarily *more improved* decisions. The argument that greater discretion leads to enhanced judicial fairness involves the assumptions that: (1) there are some considerations that are not readily foreseeable in the relevant discipline; and (2) the advantage to be gained by allowing judges the opportunity to accommodate these variables outweighs the potential disadvantage of discretion being exercised improperly. Yet neither of these assumptions has been demonstrated to be accurate, nor do they seem tenable.

As seen above, sentencing is a purposeful, outcome-oriented activity with clear objectives, and there is a large amount of empirical data establishing which objectives are achievable. Moreover, as noted above, it is feasible to identify the complete list of considerations that should have an impact on the choice of penalty and the weight that they should be afforded. Application of these considerations leads to fair outcomes. Fairness can thus be built into the decision-making process through careful and meticulous identification of the considerations that empirical data and normative limitations identify as being relevant to the choice of sanction, and then through accurate application of these considerations. There is no demonstrated need for judges to have an overarching power to substitute their sentiments in preference to the outcomes that follow from the application of clearly established sentencing principles and rules. It is verging on judicial worship to claim that judges “‘know’, almost without thinking, what kind of sentence is appropriate.”²⁹¹ Judges have no special training in sentencing and there is no basis to assume that their intuition is superior to decisions resulting from the application of

²⁸⁸ Hutton, *supra* note 214, at 553.

²⁸⁹ Hall et al., *supra* note 205, at 33.

²⁹⁰ Markou, *supra* note 2.

²⁹¹ Hutton, *supra* note 214, at 553.

normatively and empirically grounded sentencing considerations. The claim that computerized sentencing would lead to a black box in decision-making in fact inverts the correct comparison between judicial and computerized sentencing. Computer programs are totally transparent and binary, while judicial discretion, by its very nature, is opaque.

Further, even if it could be established that a discretionary system of sentencing was, on occasion, preferable to a properly developed presumptive system, the disadvantages of discretion are likely to outweigh any benefits that may flow from more nuanced decision-making in some cases. A key problem with unfettered sentencing discretion is that it invariably leads to sentences being based on the personal predispositions of judges, which in turn results in opaque and inconsistent decisions. Like most people, many judges probably view themselves as being fair and objective. Yet they inevitably have preferences and biases that inform their decision-making. Judges can have difficulty recognizing biases in the thought patterns involved in their decision-making,²⁹² and the most difficult biases to overcome are those of which one is unaware. In *How Judges Think*, Judge Richard Posner states, “[w]e use introspection to acquit ourselves of accusations of bias, while using realistic notions of human behavior to identify bias in others.”²⁹³ People assume that “their judgments are uncontaminated”²⁹⁴ with implicit bias, but the truth is otherwise. All people, including judges, are influenced by their life journey and “are more favorably disposed to the familiar, and fear or become frustrated with the unfamiliar.”²⁹⁵

Many studies show that the impact of implicit judicial bias is significant. Thus, it has been shown, for example, that:

* Attractive offenders receive more lenient penalties than other accused, except when they use their attractive appearance to facilitate the crime.²⁹⁶

²⁹² Jennifer K. Robbennolt & Matthew Taksin, *Can Judges Determine Their Own Impartiality?*, MONITOR ON PSYCHOL., Feb. 2010, at 24, 24–25.

²⁹³ RICHARD A. POSNER, *HOW JUDGES THINK* 121 (2008).

²⁹⁴ Timothy D. Wilson et al., *Mental Contamination and the Debiasing Problem*, in HEURISTICS AND BIASES: THE PSYCHOLOGY OF INTUITIVE JUDGMENT 185, 190 (Thomas Gilovich et al. eds., 2002).

²⁹⁵ Ochi, *supra* note 238, at 53.

²⁹⁶ Birtc English, *Heuristic Strategies and Persistent Biases in Sentencing Decisions*, in SOCIAL PSYCHOLOGY OF PUNISHMENT OF CRIME 295, 304 (Margit E. Oswald et al. eds., 2009). In one study, seventy-seven percent of defendants who were deemed unattractive received a prison term, while only forty-six percent of defendants who were considered attractive were subjected to the same penalty. See John E. Stewart, II, *Defendant's Attractiveness as a Factor in the Outcome of Criminal Trials: An Observational Study*, 10 J. APPLIED SOC. PSYCHOL. 348, 354 (1980).

* As noted above, race often influences sentencing outcomes. In particular, it has been noted that white judges are more lenient towards white than black offenders in their decisions, while black judges display no overall preference towards either white or black offenders.²⁹⁷

* The socioeconomic background of parties also influences legal outcomes. An analysis of child custody cases showed that judges favor wealthy litigants over those who are impoverished.²⁹⁸

* The racial background of victims can also influence sentencing decisions. Black offenders who harmed white victims were found in one study to be sentenced more harshly than black offenders who harmed black victims.²⁹⁹

There is also a range of other, more subtle factors that have been found to influence the mindsets of judges and the decisions they make. Thus, it has been noted that judges who think about negative matters, such as their own death, set bail at higher levels than other judges.³⁰⁰ Another study observed that judges were far more likely to grant parole if they made the decision shortly after they had taken a meal break.³⁰¹ The researchers speculated on the reason for this:

[A]ll repetitive decision-making tasks drain our mental resources. We start suffering from 'choice overload' and we start opting for the easiest choice. . . . And when it comes to parole hearings, the default choice is to deny the prisoner's request. The more decisions a judge has made, the more drained they are, and the more likely they are to make the default choice. Taking a break replenishes them.³⁰²

²⁹⁷ Jeffrey J. Rachlinski et al., *Does Unconscious Racial Bias Affect Trial Judges?*, 84 NOTRE DAME L. REV. 1195, 1210 (2009).

²⁹⁸ Mirko Bagaric, *Sentencing: From Vagueness To Arbitrariness: The Need to Abolish the Stain That Is the Instinctive Synthesis*, 38 U.N.S.W. L.J. 76, 106–07 (2015) [hereinafter Bagaric, *From Vagueness*]; Michele Benedetto Neitz, *Socioeconomic Bias in the Judiciary*, 61 CLEV. ST. L. REV. 137, 158–59 (2013).

²⁹⁹ Bagaric, *From Vagueness*, *supra* note 298, at 107; *see also* Siegfried L. Sporer & Jane Goodman-Delahunty, *Disparities in Sentencing Decisions*, in SOCIAL PSYCHOLOGY OF PUNISHMENT OF CRIME 379, 390 (Margit E. Oswald et al. eds., 2009).

³⁰⁰ Bagaric, *From Vagueness*, *supra* note 298, at 107; *see also* Abram Rosenblatt et al., *Evidence for Terror Management Theory: I. The Effects of Mortality Salience on Reactions to Those Who Violate or Uphold Cultural Values*, 57 J. PERSONALITY & SOC. PSYCHOL. 681, 682 (1989).

³⁰¹ Shai Danziger et al., *Extraneous Factors in Judicial Decisions*, 108 PROC. NAT'L ACAD. SCI. 6889, 6890 (2011).

³⁰² Bagaric, *From Vagueness*, *supra* note 298, at 108 (quoting Ed Yong, *Justice Is Served, but More So After Lunch: How Food-Breaks Sway the Decisions of Judges*, DISCOVER MAG. (Apr. 11, 2011, 3:00

Judges are unlikely of their own volition to reduce the extent to which their preferences can guide their decisions. Judge Posner correctly noted that judges, like all people, are utility-maximizers and hence gain satisfaction from the prestige of their role and the influence they can have in the discharge of their functions.³⁰³ Judges, in making their decisions, give effect to their preferences, which are in turn influenced by their “background, temperament, training, experience, and ideology, which shape [their] preconceptions and thus [their] response[s] to arguments and evidence.”³⁰⁴

It is understandable that judges have a desire to infuse their decisions with their subjective experiences, preferences, and values, but this inclination should not be accommodated in a system that has a profound effect on the interests of offenders, victims, and the broader community.³⁰⁵ Thus, there is no persuasive basis for maintaining that a properly developed sentencing computer program is less fair than a sentencing system that permits considerable judicial discretion.

B. *Supposed Lack of Experts to Develop the Systems*

A computerized sentencing system will need to be superior to the current sentencing regime and constitute an “expert system” in the sense that it is, in Richard Susskind’s words, “capable of functioning at the standard of (and sometimes even at a higher standard than) experts.”³⁰⁶ Such a system—which must embody and represent legal rules, norms, reasoning, and “jurisprudential theory,” and also be sufficiently flexible so that it can easily be modified in response to changes to sentencing law or policy—could only be developed through the application of highly sophisticated technical skills and deep knowledge of information technology and the law.³⁰⁷ Susskind believes that it is difficult to locate people who have the requisite proficiency in and understanding of both computer technology and the law.³⁰⁸ Susskind also observes that “[t]he costs associated with developing expert systems in law are considerable” and include remuneration of “skilled computer professionals,”³⁰⁹ lawyers, legal academics, and researchers.

These criticisms are, however, unfounded. Clearly, the computer program for sentencing offenders will be complex and will need to be flexible enough to adapt to legal change, but these requirements can be readily accommodated. Familiarity with the relevant legal principles and rules, as well

PM), <http://blogs.discovermagazine.com/notrocketscience/2011/04/11/justice-is-served-but-more-so-after-lunch-how-food-breaks-sway-the-decisions-of-judges>).

³⁰³ POSNER, *supra* note 293, at 35–36.

³⁰⁴ *Id.* at 249.

³⁰⁵ Bagaric, *From Vagueness*, *supra* note 298, at 110–11.

³⁰⁶ SUSSKIND, *A Jurisprudential Approach to Expert Systems in Law*, *supra* note 225, at 182–83.

³⁰⁷ *Id.* at 192–94.

³⁰⁸ *Id.* at 174.

³⁰⁹ *Id.* at 171.

as technological proficiency to input all of the data into a workable program (each complex in their own right), will be required to develop the computer program. There is, however, no need for the same individuals to possess both of these. It is in fact the norm for experts from different disciplines to come together and work harmoniously to solve a common problem. Indeed, at present, judges do not build the computer programs that are used to record their determinations, while software scientists work with mechanical engineers to build driverless cars. There is no reason in principle and practice that lawyers and software engineers cannot work collaboratively in a productive partnership to develop a sentencing algorithm. Moreover, there is no basis for assuming that the cost of creating the computer program for sentencing will be prohibitive, especially given the cost savings that will ensue from reductions in the duration of courts' sentencing hearings.

CONCLUSION

Computer algorithms are quickly changing human behavior and the nature of social, work, and other professional interactions. They influence the direction and focus of police investigations, how much we pay for insurance premiums, the way our health needs are assessed and treated, and the way in which we commute from one location to another. Yet judicial decision-making has largely remained impervious to the age of computerization. This is in part due to the belief that the variables that must be taken into account in legal decision-making are too numerous and complex to be automated. For two key reasons, however, this assumption is breaking down.

The first reason is that the sophistication of computer processes is increasing to the point where the number of variables that can be calibrated is now virtually limitless. The second reason is that there is a growing recognition of the limits and deficiencies of human decision-making in the legal context. While judges can adjust their decisions to factor in a large number of considerations and hence strive to achieve individualized justice, at the same time, their thinking is necessarily influenced by their values, beliefs, and upbringing. Consequently, subconscious bias and irrelevant considerations can easily influence judicial decision-making, resulting in injustice.

Accordingly, the option of computerized sentencing is now feasible. This Article argues that, on balance, computerized sentencing is preferable to judicial sentencing because it has greater capacity than human decision-makers to produce decisions that uphold the rule of law virtues of consistency, transparency, and predictability. In addition, computerized sentencing has the potential to eliminate more subtle problems with sentencing law, such as the influence of judges' subconscious biases on sentencing decisions, which sometimes results in unduly harsh sentences being imposed on offenders from certain racial groups.

Importantly, computerized sentencing could foreseeably incite a fundamental reshaping of substantive sentencing law objectives and principles,

which would result in profound community benefits, including far lower incarceration levels and, consequently, a safer community. A shift from judicial to computerized sentencing and the development of an algorithm to determine sentencing outcomes would necessarily involve an examination of the factors and considerations that currently influence sentencing decisions, as well as an assessment of the factors that *should* inform sentencing decisions. Indeed, the move from discretionary to prescriptive sentencing over the past few decades in many instances involved a reassessment of the goals and aims of sentencing law. If a move to computerized sentencing does spur a more wide-ranging evaluation of the sentencing system, it could result in the development of an algorithm that will lead to a considerable reduction both in prison numbers and the needless suffering of many offenders and their families, without a commensurate increase in the crime rate. Rarely would technology have done more to advance individual and community flourishing.

