

## Review:

O'Neil, Cathy. 2016. *Weapons of Math Destruction: How Big Data Increases Inequality and Threatens Democracy*. Crown.

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#### *Abstract*

*The book Weapons of Math Destruction: How Big Data Increases Inequality and Threatens Democracy provides a very important point of view on the mathematical models and algorithms used for decision-making in our society. As the title suggests the author sees the possible dangerous influences of algorithms used for the specific groups in the society as huge and disastrous. The book describes the mechanism and functioning of mathematical models and algorithms in a comprehensible manner. It uses practical examples of various mechanisms commonly used in today's society. The main aim of the book is to break the myths about the mathematical models and their results, mainly the widespread beliefs about the algorithms as being fair, objective, and unbiased.*

#### *Keywords*

*mathematical models, algorithms, big data, social mechanisms, social divide*

The book *Weapons of Math Destruction: How Big Data Increases Inequality and Threatens Democracy* outlines the main problems of the use and abuse of mathematical models and big data in our society. The title refers to the main thesis of the book, that mathematical models and algorithms used for the fundamental decision-making and management of institutions and societies, can be dangerous mainly for their opacity, scale, and possible damage caused by their wide use. The author presents this premise with very practical examples. After the short introduction to the math science of big data (Chapter 1, *Bomb parts: What is a model?*; Chapter 2, *Shell shocked: My journey of disillusionment*), the main chapters invite us to the world of schools and colleges (Chapter 3, *Arms race: Going to college*), courts (Chapter 5, *Civilian casualties: Justice in the age of big data*), workplaces (Chapter 6, *Ineligible to serve: Getting a job*; Chapter 7, *Sweating bullets: On the job*), banks (Chapter 8, *Collateral damage: Landing credit*; Chapter 9, *No safe zone: Getting insurance*) and civic life (Chapter 3, *Propaganda machine: Online advertising*; Chapter 10, *The targeted citizen: Civic life*).

Not only does the book use practical examples and deeply respects the popular science style, it is easily readable and understandable despite the difficulty of the mathematical concepts outlined. For instance, the mathematical models are metaphorically described based on the everyday experience of the author as she decides what to cook for dinner within her large family based on “data” presenting the preferences of each family member as well the data about current food, changing tastes, and special events. This example uncovers the main disadvantage of the book as well. It sometimes simplifies the issue of big data and algorithms exceedingly. For this reason, it should not be recommended to readers with a background in mathematics and/or big data science.

Indeed, the main aim of the book is to break the myths about mathematical models and their results. O’Neil attacks the widespread beliefs about the algorithms as being fair, objective, and unbiased. Throughout the book, she presents them as black boxes with poor proxies to abstract human behaviour. She highlights that “models are opinions expressed in mathematics” (or computer code), but we tend to forget this as any mathematical model

seems to be more objective than any human involved in the process of evaluating teacher qualities, capabilities to pay a loan, be a good employee, et cetera.

Throughout the book, we encounter many individual cases of people trapped in dangerous feedback loops as the evaluation systems of algorithms in various institutions actually make it harder for them to advance and improve their lives. It is a single mother of a cancer child failing repeatedly trying to find a flexible job, a young man with mild psychological problems unable to break the barricade of “well standardised” psychological tests preceding the job interviews, and many other people of various ethnicity, zip codes, and income level that discriminate them from quality work, study, and financial opportunities. The problem with actual systems using the mathematical models to serve an institution in the age of big data is that their feedback loops feed them back. If the bank model labels poor people with bad credit, it becomes more difficult for them to get a loan and they become even more unable to pay their instalments. Reinforced police patrols in the poor neighbourhoods arresting people for small crimes again and again confirm the assumption of the great functionality of the model. Nevertheless, some more serious crimes in unexpected contexts can be overseen as the model does not count on them. The same can be said within other examples, for-profit schools, banks, employers’ strategies. The author states that being poor in such a world becomes more dangerous and expensive. At the same time, from the perspective of the rich, the world is a safer and more comfortable place.

The author claims that “the mathematical models need to be a tool, not a master.” The mathematical models are described as opinions expressed in mathematics (or computer code). That is not necessarily a problem. The problem rises while we start to blindly use them for decision-making in crucial situations (and) in an uncontrollable manner. Unfortunately, the author does not offer a solution. The final chapter tries to bring up some thoughts for the future, but they are rather general than constructive. Basically, the author claims that we need better values in the algorithms. The created models should meet our ethical standards, putting fairness

ahead of the profit. The author proposes that the need for ethical design can be translated into a variant of the Hippocratic oath for the designers of such models and mechanisms. The second point of the author is that we need positive feedback loops (insights from “the other side,” such as in students’ evaluations of teachers or the 360 evaluating process) so the models can be improved to serve better to the society as whole.