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# UNDERSTANDING THE DARK SIDE OF ANALYTICS: PRIMUM NON NOCERE!

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# **UNDERSTANDING THE DARK SIDE OF ANALYTICS: PRIMUM NON NOCERE!**

*Panel*

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## 1 Introduction

Artificial Intelligence (AI) and Machine Learning (ML) systems are heralded as the technologies of the future leading to transformative innovations.. We are undergoing an unprecedented growth in the number of analytics applications and algorithmic advancements in AI and ML (Gupta et al. 2018). Applications run across the gamut: of security, healthcare, transportation, and entertainment. Techniques such as deep learning, reinforcement learning are permeating into the scientific as well as business communities. . This is partly due to easy access to high performance computing capabilities offered through cloud environments, decreasing cost of graphical processing units, easy-to-use programming libraries for model development, and fast-paced training curriculums. Grant Agencies and more recent government initiatives, such as precision medicine and the American AI initiative, are further spurring the growth and innovation.

While many in the industry and the academic community have remained focused on developing better performing AI/ML models or algorithms, attention now needs to be geared towards understanding various problems and challenges that result from the improper use or unintended consequences of poor design or mishandling of such systems. We are starting to see some examples of unforeseen consequences of dark side of analytics. Examples include: 1) recent episodes of misinformation and psychographic profiling involving Cambridge Analytica, 2) AI systems defining health benefits, 3) Google’s withdrawal from project Maven (using AI for identifying drone targets using image recognition), 4) Amazon’s vision recognition based AI system misclassifying females and people of color, and 5) Amazon’s AI based system having recruiting biases against women (for details, see Griffith, 2019; Singer 2019; Thomas, 2019). A recent book titled *Weapon of Math Destruction* (O’Neil 2016) describes algorithmic bias and problems resulting from opaque AI/ML models. New stories appear virtually every week illustrating problems of misapplications of analytics and the ensuing concerns. We refer to these issues broadly as the *Dark Side of Analytics (DSA)*. Although work has been done on understanding unintended consequences in IS (D’Arcy, et al. 2014; Tarafdar et al., 2015a, 2015b), only isolated efforts and initiatives have begun to point out the existence of the dark side of analytics in other disciplines.

We posit that information systems discipline is uniquely positioned to focus on the “dark side” issues and deliver impactful research and practical contributions. As a discipline, IS focuses on a combination of technology infrastructure, data, models, strategy, and human factors with an awareness of specific application domains. Other disciplines tend to have their single focus within this broad area. For example, legal scholars have looked at the economic damage caused by poor analytical models resulting in denial of credit or biased hiring decisions and hold organizations responsible. Sociologists are studying similar issues. IS Researchers can study each of the dimensions in a collective fashion. For example, many of the models that have been deemed inappropriate are due to various data issues. The underlying data may be incomplete, of poor quality, may be missing one or more key attributes, which leads to an incorrect model. Marsden et al. (2019) have called for research to address such issues and propose innovative solutions on these lines. Similarly, algorithms and model development approaches can create bias. There is some preliminary recognition for the need to develop international standards model evaluation that could improve our trust on such models (e.g. see Rudzicz, et al. 2019).

From a design science perspective, some of the traditional design principles need to be mapped again and translated to different action items for AI/ML models. A recent study also explores various ways that could be used to fool neural nets (Alcron et al. 2018). A study being done at MIT Media labs is exploring the robustness of models towards changing input data to distort the output (Weng et al. 2018). Such approaches may help with fault tolerance from a technical perspective. It is unclear as to how to distinguish outputs of adversarial models such as ‘deepfakes’ from reality (e.g., see Villasenor, 2019). At the same time, the ethics surrounding the use of such models is questionable.

There are implications from ethics and privacy perspective as well. It remains unclear what are the guiding principles for using big data while utilizing ethical approaches and preserving privacy (Brey 2012; Hirsch, 2015). However, much remains to be done and understood on these lines. For example, that millions of pictures from websites may have been scrubbed without the knowledge of the individual to develop facial recognition technology, leading to privacy concerns (Solon, 2019). Finally, integration and implementation of AI in organizations also involves strategic considerations, economic analyses, and change management, just to identify a few issues. Again, these are within the purview of the IS discipline.

## 2 Issues

Through this panel, we seek to raise important questions related to the DSA issues mentioned above from an IS perspective, identify different dimensions of the dark side of analytics and lay the foundation for developing a framework to understand such unintended or harmful consequences of analytics. This panel will also help take the initial step towards developing a unifying theory to understand DSA, a framework that explains the causal phenomenon underlying such events, and approaches to mitigate the impact of DSA. Panellists will offer deep insights from a contextual, design science, data, ethics and privacy perspective and also describe how some of the proposed approaches could be utilized for specific applications such as image recognition, fraud, crime (e.g. Brey 2017), etc. We hope that this will spark a strong interest among the IS community and will help initiate a new line of scientific inquiry in this area. Some of the questions that this panel will seek to explore and discuss are below:

- What are various vulnerabilities of AI/ML approaches that need to be evaluated?
- Can a prominent IS paradigm such as Design Science Research guide the development of AI/ML models that mitigate the dark side? What about the approach of Ethics by Design?
- What are the key data quality and design challenges for developing AI/ML models that can be trusted?
- How can ethics and privacy research play an important role in guiding the use of new AI/ML approaches?
- What can be done to address and recognize the problems caused by AI/ML approaches that are developed specifically to deceive and mislead (e.g. adversarial network)?
- What are different dimensions of the dark side of analytics?
- How can bias and subjectivity be addressed when designing trustworthy and reliable AI/ML models?

### 3 Panel Structure

We will begin an interactive dialog among the panel members soon to finalize our individual contributions and also discuss plans for developing a manuscript for a Research Commentary. At ECIS, each panellist will provide a brief overview of their perspective amounting to a total of approximately 45 minutes. The remaining half of the panel time will focus on an interactive format where at least two panellists will offer their perspective on each question described under the ‘issues’ section. Audience questions will also be addressed during the latter half portion of the panel.

### 4 Panellists

**Ramesh Sharda (Panel moderator), Oklahoma State University-** Ramesh will provide the overall problem context, give recent examples of the issues, and summarize the general opportunities for collaboration and leadership from within IS community to mitigate the dark side of analytics.

**Ashish Gupta (Panellist), Auburn University-** Ashish guest edited a special issue of *Information Systems Journal* that focused on dark side of technology and published several journal articles on the topic. Thus, he will present key issues, a framework from the broader dark side of technology research that could guide future DSA research and provide guidelines for designing approaches in the area.

**James Marsden (Panellist), University of Connecticut-** Jim is the Editor-in-Chief of *Decision Support Systems* which has already identified data issues as an important dimension of analytics implementations. He will tie these issues with the DSA framework.

**Philip Brey (Panellist), University of Twente-** Philip is president of the International Society for Ethics and Information Technology (INSEIT) and currently leads the European Commission-funded SIENNA project (budget 4M€), which studies ethical issues in AI and robotics. Philip will bring the ethics dimension, along with a European perspective to this issue.

**Irina Heimbach (Panellist), WHU – Otto Beisheim School of Management** – In her research, Irina utilizes “digital foot prints” left by users on the Internet to build prediction models and to understand users’ behavior. She will bring the users’ privacy aspect up, along with a European perspective.

#### 4.1 Prior Experience

**Ramesh Sharda** is the Vice Dean for Research and Graduate Programs, Watson/ConocoPhillips Chair and a Regents Professor of Management Science and Information Systems in the Spears School of Business at Oklahoma State University. He has co-authored two textbooks (*Analytics, Data Science, & Artificial Intelligence: Systems for Decision Support*, 11th Edition, Pearson and *Business Intelligence, Analytics, and Data Science: A Managerial Perspective*, 4th Edition, Pearson). His research focuses on analytics/data science and has been published in journals including *Management Science*, *Operations Research*, *Information Systems Research*, *Decision*

*Support Systems, Decision Science Journal, EJIS, JMIS, Interfaces, INFORMS Journal on Computing, ACM Data Base* and many others. He also serves as the Faculty Director of Teradata University Network He was inducted into Oklahoma Higher Education Hall of Fame in 2016. Ramesh is a Fellow of INFORMS.

**Ashish Gupta** is an Associate Professor of Analytics in Raymond J. Harbert College of Business and Harbert Advisory Council Faculty Fellow at the Auburn University. He has had visiting appointments at Mayo Clinic Rochester, Biomedical Informatics at the Arizona State University and University of Tennessee Health Science Center in Memphis. His research interests are in the areas of big data, analytics, healthcare informatics, self-driving car, social media, sports analytics, organizational and individual performance. His recent articles have appeared in journals such as *EJIS, Decision Sciences EJOR, Journal, Risk Analysis, Journal of American Medical Informatics Association, MIT Sloan Management Review, Journal of Biomedical Informatics, IEEE Transactions, Information Systems Journal, Decision Support Systems, Information Systems Frontiers, Communications of the Association for Information Systems, etc.* He has published 5 edited research books. His research has been supported by agencies such as THEC, DHS, NSF, DOD and several private organizations.

**James Marsden** is a Board of Trustees Distinguished Professor at the University of Connecticut since 1993. He formerly was the founding Chair and Philip Morris Professor of Information Systems at the Department of Decision Science and Information Systems, University of Kentucky. Dr. Marsden has had visiting appointments at Purdue University, University of Arizona, Katholieke Universiteit Leuven, and the University of York. His areas of specialization include econometrics, quantitative methods, information economics, decision support system valuation, expert systems, and the management of computing systems. Professor Marsden is the Editor-in-Chief for *Decision Support Systems* His research has appeared in *Decision Support Systems, Journal of Political Economy, Journal of Economic Theory, MIS Quarterly, Journal of Law and Economics, American Economic Review, Statistical Science, Journal of Economic Dynamics and Control*, and numerous other leading journals. Jim was the 2016 winner of the AIS LEO Award “for lifetime exceptional achievement in Information Systems.”

**Philip Brey** is full professor of philosophy and ethics of technology at the department of philosophy, University of Twente, the Netherlands. He is also president of the International Society for Ethics and Information Technology (INSEIT), former president of the Society for Philosophy and Technology (SPT), and former scientific director of the 4TU.Centre for Ethics and Technology of the Universities of Twente, Delft, Eindhoven and Wageningen, a research center comprising over 70 researchers. Brey is on the editorial board of eleven leading journals and book series in his field, including *Ethics and Information Technology, Nanoethics, Philosophy and Technology, Techné, Studies in Ethics, Law and Technology and Theoria*. His work focuses on the ethics of technology, particularly information technology, robotics, biomedical technology and sustainable technology. He focuses on topics such as the ethical assessment of emerging technologies, how to identify and design for values in technology, the relationship between technology, power, and politics, and the relation between agency and structure in ethics of technology. He currently leads a European Union Horizon 2020 project, SIENNA (2017-2021, budget €4.0 million), involving 13 international partners, on the ethical

and human rights aspects of emerging technologies, including human genomics, human enhancement, robotics and artificial intelligence.

**Irina Heimbach** is an assistant professor of Digitalization at WHU - Otto Beisheim School of Management, Germany. She received her PhD in Information Systems from TU Darmstadt, Germany in 2016. In 2017, she was a visiting researcher at Marshall School of Business, USC in Los Angeles, USA. Irina teaches elective courses in Information and Decision Support Systems as well as Data Analytics. Irina has been always fascinated how digitalization pervades all aspects of modern everyday life, business, and society. Her research centers particularly on digital markets, privacy, content sharing on social media, algorithmic decision making and data analytics. She applies econometric methods, web and text mining as well as field and laboratory experiments. Her research has been published in *Information Systems Research*, *International Journal of Research in Marketing*, *BISE*, *Electronic Markets* and *Journal of Business Economics* as well as in international conferences in Information Systems, Marketing and Computer Science. Her research won the Claudio Ciborra-Award of the European Conference on Information Systems (ECIS) 2013 and experienced wide media coverage.

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