Responsible Innovation and Quality Assurance in Data Science & AI

DEDS Winter School

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Description

Governments, industry organizations and individuals are increasingly adopting computerized systems and services that are becoming an integral part of local economies and are shaping the social fabric. Within regulated industry sector, computing applications are subject to safety regulations and strict quality control. In other sectors, the quality is controlled by public policies and market competition. With rapid changes and a lag between practices, policies and regulations, it is of utmost importance for computing professionals to be aware of the impactful and long-lasting implications of their work and to adhere to the principles of professional ethics.

The aim of this Seminar is to enable computing professionals to apply critical thinking and logical reasoning to specific ethical issues that they may encounter in their work and to develop practices that adhere to ethical frameworks, professional guidelines, and computing design principles to delivery quality systems. We will use ACM Code of Ethics to discuss accountability and responsibility in computing profession and review the emerging regulations aimed at quality assurance in data science and AI.

The Seminar includes short lectures and group assignments taken during the sessions. Lectures cover four topics, reflecting on the techniques and methods commonly used in Data Science:

- Ethics Theories
- Professionalism & Professional Code of Conduct
- Ethical Design & Privacy Protecting Principles
- Ethics for Safety & Reliability, Accountability & Responsibility

Preparation: Students are advised to select a simple machine-learning (ML) project that they are familiar with and can run on one of the online platforms with ML toolkits (e.g., a Google Colab). The selected example will be used to discuss reproducibility of the ML set up and validation of the outcomes.

Schedule

7 April 2022		Lectures	Group Exercises		
9:00	9:30	**1. Ethics Theories**	9:30	9:50	Exercise: Rule & Act utilitarianism and Act deontology
9:50	10:10	**2. Professionalism & Professional Code of Conduct**	10:10	10:30	Exercise: Application of the code of conduct; protection of digital assets
10:30 - 11:00		Break			
11:00	11:20	**3. Ethical Design & Privacy Protecting Principles**	11:20	11:40	Exercise: Solove's principles of privacy protecting design
11:40	12:10	**4. Ethics for Safety & Reliability, Accountability & Responsibility**	12:10	12:20	Exercise: Requirements and specifications for reproducibility
12:20	12:30	**Wrap up discussion**			
12:30 - 14:00		Lunch			

Topics

1. Ethics Theories

- Why Ethics Theories? – Discussion of ethics and ethics theories; common approaches to practical ethics
- Specific Ethics Theories: Main concepts related to ethics theories; main types of ethics theories and building arguments for ethical issues.

Reading

- Chapter 1, Ethics in a Computing Culture (Brinkman and Sanders, 2013)
  Brinkman, William John, and Alton F. Sanders. *Ethics in a computing culture*. Cengage Learning, 2012
- Chapter 1, Ethics for the Information Age (Quinn, 2013)
  Quinn, Michael J., 2013. *Ethics for the information age* (pp. 137-138). Sixth Edition, Boston: Pearson Education.
- Who Must You Trust? Thomas Wadlow, ACM Queue, Vol. 12, No. 5, pp. 1-14, March 2014.

2. Professionalism & ACM Code of conduct

- Meaning of professionalism: definitions and common requirements
- Computing profession and requirements for professionalism in computing
- Professional Codes in Computing: different professional codes; aspects and issues covered in professional codes; use of professional odes to build arguments in respect to given ethical scenarios.

Reading

- Professional Software Engineering: Fact or Fiction? Steve McConnell, Leonard Tripp. IEEE Software, Vol. 16, No. 6, pp. 13-18, 1999.

- Association of Computing Machinery (ACM) Code of Ethics and Professional Conduct https://www.acm.org/code-of-ethics
- Licensing Software Engineers is in the Works. Kathy Kowalenko, IEEE The Institute, February 2012. http://theinstitute.ieee.org/career-and-education/career-guidance/licensing-software-engineers-is-in-the-works
- NCEES Principles and Practice of Engineering Examination - Software Engineering Exam Specifications. https://cdn.ncees.org/wp-content/uploads/2012/11/SWE-Apr-2013.pdf

3. Ethical Design and Privacy Protecting Principles

- Perspectives on Privacy: multi-dimensional nature of privacy and trade-offs
- Theory of privacy; Solove's taxonomy of privacy problems.

Reading

- Chapter 4 of the book Ethics for the Information Age (Quinn, 2013)
- Respecting People and Respecting Privacy. L. Jean Camp, Communications of the ACM, Vol. 58, No. 7 , pp. 27-28, July 2015.
- I've Got Nothing to Hide and Other Misunderstandings of Privacy. Daniel J. Solove, San Diego Law Review, Vol. 44, pp. 745-772, 2007.
- Privacy Implications of Health Information Seeking in the Web. Timothy Libert. Communications of the ACM, Vol. 58, No. 3, pp. 68-77, March 2015.

4. Ethics for Safety and Reliability, Accountability and Responsibility

- Failure of Computer Systems: effects of computer systems failure; causes of software failure
- Importance of Accountability: define accountability and explain its importance for morality, ethics and professionalism; barriers for accountability
- Moral Responsibility in Computing: Criteria and rules for moral responsibility in computing
- Processes and regulations in data quality and AI quality assurance.

Reading

- Chapter 8 of the book Ethics for the Information Age (Quinn, 2013)
- Moral Responsibility for Harm Caused by Computer System Failures. D. Birsch. Ethics and Information Technology, Vol. 6, No.4, pp. 233-245, 2004
- Accountability in a Computerized Society. H. Nissenbaum. In: B. Friedman (ed.), Human Values and the Design of Computer Technology. Cambridge University Press, pp. 41–64. Available online at: http://www.nyu.edu/projects/nissenbaum/papers/accountability.pdf
- Moral Responsibility for Computer Artifacts: The Rules. Keith W. Miller, IT Professional, Vol. 13, No. 3, pp. 57-59, IEE Press, 2011. Available online at: https://edocs.uis.edu/kmill2/www/TheRules/.
- Francine Berman, Rob Rutenbar, Brent Hailpern, Henrik Christensen, Susan Davidson, Deborah Estrin, Michael Franklin, Margaret Martonosi, Padma Raghavan, Victoria Stodden, Alexander S. Szalay, Realizing the Potential of Data Science, Communications of the ACM, April 2018, Vol. 61 No. 4, Pages 67-72 https://cacm.acm.org/magazines/2018/4/226372-realizing-the-potential-of-data-science/fulltext
- Longbing Cao, Data Science: Challenges and Directions, Communications of the ACM, Vol. 60 No. 8, Pages 59-68, 2017 https://cacm.acm.org/magazines/2017/8/219605-data-science/fulltext
- Xu, Zongben, and Jian Sun. "Model-driven deep-learning." *National Science Review* 5, no. 1 (2017): 22-24