

RESEARCH-BASED TEACHING ETHICS TO ENGINEERING STUDENTS

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Chalmers University of Technology

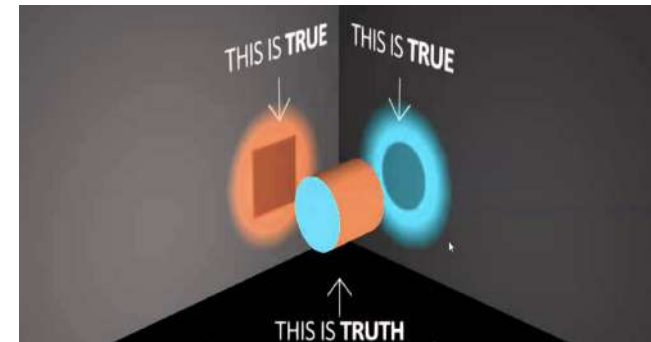
<https://www.chalmers.se/en/staff/Pages/gordana-dodig-crnkovic.aspx>

Mälardalen University

http://www.es.mdh.se/staff/37-Gordana_Dodig_Crnkovic



Motto: Technology
for people



<https://medium.com/the-ascent/it-can-all-be-true-e59bacf132b8>



<https://informatics.tuwien.ac.at/news/2410>
<https://informatics.tuwien.ac.at/news/2414>

Background

During more than twenty years, since 2001, I have been teaching students of Computer Science, Engineering, Interaction Design and occasionally Economics, in the following courses:

2001-2014 “Professional ethics” at Mälardalen University (Bachelor, MSc and PhD) and
2014-2017 “Research Ethics and Sustainable Development” at Chalmers University of Technology (PhD, Chalmers).

Even other courses that I have been teaching have important parts dedicated to ethics:

“Emerging trends and Critical Topics in Interaction Design” (Chalmers)

“Human-centered design” (BSc & MSc, Chalmers)

“Research Methods in Natural Sciences and Engineering” (PhD & MSc, MDH)

“Advanced Computational Thinking and Writing Research Toolbox” (2009-2012, MDH)

“Computational Thinking and Writing Research Toolbox” (2012-2013, MDH)

“Information - Knowledge - Science – Ethics” (in Swedish) (2013-2015, MDH)

I have regular guest lectures in Professional Ethics, Ethics of Computing, Ethics of AI, Design Ethics, Ethics for Cognitive Scientists, Robotic Ethics and Ethics of Autonomous Cars for different classes of computer science and engineering students.

In this talk I present lessons learned, illustrated by concrete examples from my courses, sketching briefly future possibilities.

In developing my courses, I have a similar approach to the one presented by Peter Bowden in the following:

“The course was based on the assumption that [identifying the major ethical issues in the discipline, and subsequently presenting and analysing them in the classroom, would provide the future professional with knowledge of the ethical problems that they were likely to face on graduation](#). The student has then to be given the skills and knowledge to combat these concerns, should he/she wish to. These findings feed into several components of the course, such as the code of ethics, the role of a professional society or industry association and the role of ethical theory. The sources employed to identify the issues were surveys of the literature and case studies.”

Peter Bowden (2010) Teaching ethics to engineers – [a research-based perspective](#).
European Journal of Engineering Education 35(5):563-572 DOI: 10.1080/03043797.2010.497549

Ethics publications in collaboration with my students

- Holstein, T., Dodig-Crnkovic, G., & Pelliccione, P. (2021). [Steps Towards Real-world Ethics for Self-driving Cars: Beyond the Trolley Problem](#). In Steven John Thompson (Ed.), Machine Law, Ethics, and Morality in the Age of Artificial Intelligence. IGI Global
- Dodig-Crnkovic, G., Holstein, T., & Pelliccione, P. (2021). [Future Intelligent Autonomous Robots, Ethical by Design. Learning from Autonomous Cars Ethics](#). <https://arxiv.org/abs/2107.08122>
- Holstein, T., Dodig-Crnkovic, G., & Pelliccione, P. (2020). Real-world Ethics for Self-Driving Cars. In Proceedings of the 42nd International Conference on Software Engineering (ICSE '20) Poster Track. <https://ethics.se>
- Holstein, T., Dodig-Crnkovic G. (2018) [Avoiding the Intrinsic Unfairness of the Trolley Problem](#). [Avoiding the Intrinsic Unfairness of the Trolley Problem](#), FairWare '18: Proceedings of the IEEE/ACM International Workshop on Software Fairness, Gothenburg, May 2018, pp. 32-37. doi: 10.23919/FAIRWARE.2018.8452918 <https://dblp.org/db/conf/icse/fairware2018.html> <https://dl.acm.org/doi/10.1145/3194770.3194772>
- Holstein, T., Dodig-Crnkovic G. and Pelliccione P. (2018) [Ethical and Social Aspects of Self-Driving Cars](#), <http://arxiv.org/abs/1802.04103>
- Johansen, A., Dodig-Crnkovic G., Lundqvist K., Hänninen K., Pettersson P. [Risk-based Decision-making Fallacies: Why Present Functional Safety Standards Are Not Enough](#). MARCH2017 International Workshop on decision Making in Software Architecture @ ICSA 2017 Gothenburg, Sweden. 04.04.2017. Published in: Software Architecture Workshops (ICSAW), 2017 IEEE International Conference. DOI: 10.1109/ICSAW.2017.50

Ethics publications in collaboration with my students

- Dodig-Crnkovic G. and Çürüklü B. [Robots - Ethical by Design](http://www.springerlink.com/content/f432g33181787u63/fulltext.html), Ethics and Information Technology 2011, Volume 14, Number 1, pp. 61-71.
<http://www.springerlink.com/content/f432g33181787u63/fulltext.html>
- Irfan Šljivo, Elena Lisova, Sara Afshar (2017) [Agent-Centred Approach for Assuring Ethics in Dependable Service Systems](#). 2017 IEEE World Congress on Services (SERVICES), Legal, Social and Ethical Aspects of Services Science. pp. 51-58
- Dodig-Crnkovic, G. and Sapienza, G., [Ethical Aspects of Technology in the Multi-Criteria Decision Analysis](#). IACAP conference, Ferrara, June 14-17, 2016.
- Sapienza, G., Dodig-Crnkovic, G. and Crnkovic, I. [Inclusion of Ethical Aspects in Multi-Criteria Decision Analysis](#). Proc. WICSA and CompArch conference. Decision Making in Software ARCHitecture (MARCH), 2016 1st International Workshop. Venice April 5-8 2016. DOI: 10.1109/MARCH.2016.5, ISBN: 978-1-5090-2573-2. [IEEE](#)
- Jägemar, M. and Dodig-Crnkovic, G. [Cognitively Sustainable ICT with Ubiquitous Mobile Services - Challenges and Opportunities](#). In Proceedings of the 37th International Conference on Software Engineering - [ICSE '15](#), Vol. 2. IEEE Press, NJ, USA, 531-540.
- Thekkilakattil, A. and Dodig-Crnkovic, G., [Ethics Aspects of Embedded and Cyber-Physical Systems](#) In [IEEE Proceedings of COMPSAC 2015: The 39th Annual International Computers, Software & Applications Conference, Symposium on Embedded & Cyber-Physical Environments \(ECPE\)](#). Taichung, Taiwan - July 1-5, pp. 39-44, 2015. DOI: 10.1109/COMPSAC.2015.41
- Backhaus P. and Dodig-Crnkovic G., [Wikileaks and Ethics of Whistle Blowing](#), Proceedings IACAP 2011. The computational Turn: Past, Presents, Futures?, p 332, Mv-Wissenschaft, Münster, Århus University, Danmark, Editor(s): Charles Ess and Ruth Hagengruber, July 2011

Ethics publications in collaboration with my students

- Cürüklü B., Dodig-Crnkovic G., Akan B., [Towards Industrial Robots with Human Like Moral Responsibilities](#), 5th ACM/IEEE International Conference on Human-Robot Interaction, Osaka, Japan, March, 2010
- Georgieva M. and Dodig-Crnkovic G., [Who Will Have Irresponsible, Untrustworthy, Immoral Intelligent Robot?](#), Proceedings IACAP 2011. The Computational Turn: Past, Presents, Futures?, p 129, Mv-Wissenschaft, Münster, Århus University, Danmark, Eds.:Charles Ess and Ruth Hagenruber, July 2011
- Ahiska, C. (2010) [Computer-Mediated Human Manipulation and Uniqueness of Computer Ethics](http://www.idt.mdh.se/kurser/comphil/2009/CAP-FINAL/CerenAhiska-final.pdf) - <http://www.idt.mdh.se/kurser/comphil/2009/CAP-FINAL/CerenAhiska-final.pdf> - Presented at ECAP 2010
- Gawrylczyk, R. (2010) [Should Robots That Interact With Humans Look Like Humans?](http://www.idt.mdh.se/kurser/comphil/2009/CAP-FINAL/GawrylczykRobert_final.pdf) - http://www.idt.mdh.se/kurser/comphil/2009/CAP-FINAL/GawrylczykRobert_final.pdf Presented at ECAP 2010
- Dodig-Crnkovic G. and Anokhina M., [Workplace Gossip and Rumor: The Information Ethics Perspective](#), Proceedings of the Tenth International Conference ETHICOMP 2008, Living, Working And Learning Beyond Technology, T W Bynum, M C Calzarossa, I De Lotto and S Rogerson, (Editors)
- Dodig-Crnkovic G., Horniak V., [Ethics and Privacy of Communications in the e-Polis](#), Information Security and Ethics: Concepts, Methodologies, Tools, and Applications Edited By: Hamid Nemati, 2008
- Dodig-Crnkovic G., Horniak V., [Ethics and Privacy of Communications in the e-Polis](#), Encyclopedia of Digital Government, Idea Group Reference, July 25, 2006

Ethics publications in collaboration with my students

- Dodig-Crnkovic G., Horniak V., [Togetherness and Respect - Ethical Concerns of Privacy in Global Web Societies](#). Special Issue of AI & Society: The Journal of Human-Centred Systems and Machine Intelligence, on "Collaborative Distance Activities: From Social Cognition to Electronic Togetherness", CT. Schmidt Ed., Vol 20 No.3, 2006
- Dodig-Crnkovic G., and Larsson, T. [Game Ethics - Homo Ludens as a Computer Game Designer and Consumer](#). International Journal of Information Ethics, Special Issue on The Ethics of E-Games, Vol. 4 - December 2005
- Dodig-Crnkovic G. and Horniak V., [Good to Have Someone Watching Us from a Distance? Privacy vs. Security at the Workplace](#). Ethics of New Information Technology, Proceedings of the Sixth International Conference of Computer Ethics: Philosophical Enquiry, CEPE 2005, July 17- 19, 2005, University of Twente, Enschede, The Netherlands; Brey P, Grodzinsky F and Introna L, Eds. <http://cepe2005.utwente.nl/>
- Larsson, M. [Predicting Quality Attributes in Component-based Software Systems](#), PhD Thesis, Mälardalen University Press, Sweden, ISBN: 91-88834-33-6, 2004 (Chapter on ethics aspects)
- Larsson, S. [Improving Software Product Integration](#), Licentiate Thesis, Mälardalen University Press, Sweden, ISBN 91-88834-65-4, 2005 (Chapter on ethics aspects)

Doctoral symposium @IS4SI conference 2017

Papers written by my students based on their course essays

- Faragardi, H.R. (2017) [Ethical Considerations in Cloud Computing Systems](#). Proceedings. 1. 166. 10.3390/IS4SI-2017-04016.
- Holstein, T. (2017) [The Misconception of Ethical Dilemmas in Self-Driving Cars](#). Proceedings. 1. 166. 10.3390/IS4SI-2017-04016.
- Wallmyr, M. (2017) [Exploring interaction design with information intense heavy vehicles](#). Proceedings. 1. 166. 10.3390/IS4SI-2017-04016.
- Maro, S, (2017) [The automotive domain - From Multi-disciplinarity to Transdisciplinarity](#). Proceedings. 1. 166. 10.3390/IS4SI-2017-04016.
- Nyende, H. (2017) [Predicting pregnancy complications in low resource contexts - A case study of maternal healthcare in Uganda](#). Proceedings. 1. 166. 10.3390/IS4SI-2017-04016.
- Smith, G. (2017) [Ethical aspects of pursuing participatory research as an industrial doctoral student](#). Proceedings. 1. 166. 10.3390/IS4SI-2017-04016.
- Kade, D. (2015) [Ethics of Virtual Reality Applications in Computer Game Production](#). Philosophies 1 (1), 73-86

APA Computing and Philosophy journal

Papers written by my students based on their course essays

- [Linda Sebek \(2013\) *Assistive Environment: The Why and What*](#).
APA Computing and Philosophy journal



Articles from the course Computing and Philosophy

Computing and Philosophy course started in 2004 as Swedish National Course, developed as a result of collaboration in a research network PI (Torbjörn Lager, Joakim Nivre, Jan Odelstad, Björn Lisper, Peter Funk, Jan Gustafsson, Ulla Ahonen-Jonnarth, Gordana Dodig-Crnkovic). Participants from different universities (Blekinge, Dalarna, Mälardalen, Skövde, Uppsala) have taken part in the course. They have presented their research papers at the Mini-conference.

Several articles written for the course have been accepted for international conferences and published otherwise.

Afterward, for several years, the CAP course was held in collaboration with the University of Illinois Springfield (Peter Boltuc) with guest lecturers Luciano Floridi, Erik Sandewall, Lars-Göran Johansson, Vincent Müller, and others).

Thomas Larsson: [Ethics of the Hyperreal](#)

Magnus Johansson: [When Simulations Become Reality](#)

Kim Anttila: [Ethics in the Computer Profession](#)

Mikael Sandberg: [Gender Distribution Normalization in the Computer Game Development Arena](#)

Omar Bagdadi: [Is Big Brother a Human Necessity?](#)

Virginia Horniak: [Privacy of Computing – An Ethical Analysis](#)

Articles from the course Computing and Philosophy

Christina Björkman (2005) [Feminist Theory in Computer Science](#) - Chapter as a part of the PhD thesis, Crossing Boundaries, Focusing Foundations, Trying Translations: Feminist Technoscience Strategies in Computer Science

<https://www.diva-portal.org/smash/record.jsf?pid=diva2%3A837505&dswid=1692>

Two MSc students presenting at ECAP-2010 conference:

Ceren Ahiska (2010) [Computer-Mediated Human Manipulation and Uniqueness of Computer Ethics](#), <http://www.idt.mdh.se/kurser/comphil/2009/CAP-FINAL/CerenAhiska-final.pdf>. ECAP-2010 conference

Robert Gawrylczyk (2010) [Should Robots That Interact With Humans Look Like Humans?](#) http://www.idt.mdh.se/kurser/comphil/2009/CAP-FINAL/GawrylczykRobert_final.pdf
ECAP2010 conference

An example of an introductory lecture for Ph.D. students in Software Engineering with a focus on automation - August 2018

809

Automation

47. Automation and Ethics

Srinivasan Ramaswamy, Hemant Joshi

Should we trust automation? Can automation cause harm to individuals and to society? Can individuals apply automation to harm other individuals? The answers are yes; hence, ethical issues are deeply associated with automation. The purpose of this chapter is to provide some ethical background and guidance to automation professionals and students. Governmental action and economic factors are increasingly resulting in more global interactions and competition for jobs requiring lower-end skills as well as those that are higher-end endeavors such as research. Moreover, as the Internet continually eliminates geographic boundaries, the concept of doing business within a single country is giving way to companies and organizations focusing on serving and competing in international frameworks and a global marketplace. Coupled with the superfluous nature of an Internet-driven social culture, the globally-distributed digitalization of work, services and products, and the reorganization of work processes across many organizations have resulted in ethically challenging questions that are not just economically, or socially sensitive, but also highly culturally sensitive. Like the shifting of commodity manufacturing jobs in the late 1900s, standardization of information technology and engineering jobs have also accelerated the prospect of services and jobs more easily moved across the globe, thereby driving a need for innovation in design, and in the creation of higher-skill jobs. In this chapter, we review the fundamental concepts of ethics as it relates to automation, and then focus on the impacts of automation and their significance in both education and research.

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[IDEA League School Engineering Complex Systems with Big data and Information Technology ECS-BIT'18, Gothenburg 2018 08 31](#)

[FORA Fog Computing for Robotics and Industrial Automation Summer School Seminar on ETHICS, Vienna 2018 06 08](#)

Ramaswamy S., Joshi H. (2009) Automation and Ethics. In: Nof S. (eds) Springer **Handbook of Automation**. Springer, Berlin, Heidelberg

Topics with ethical relevance that students identified in the questionnaire before the lecture

– technology aspects

Data-related

- *Data provenance (attribution, background)*
- Data confidentiality
- Data privacy
- Public understanding of technology and protection of private data
- Data quality, property and equality
- Data-driven approaches
- Reproducibility of real time datasets
- Data is never “neutral”
- Data collection influences behavior
- Data-streching used in political purpose
- security and reliability of the IoT devices
- “Surplus data” from screening of patients that can reveal much more
- Transparency vs. quality

Sustainability-related

- Fuel economy, lower emissions, reduced take-off and landing noise
- Environmental contributions of battery production, use and disposal
- Environmental impact of massive electronic production
- Increasing demand of rare elements
- **Lack of life cycle assessment**
- **Rebound effect**
- Digital sustainability?

Topics with ethical relevance identified

- methodology aspects

- Values involved in the method choices
- Epistemic problems related work – acknowledging its limitations
- Reducing reality into a model, with a loss of depth and variety of perspectives?
- Marginalizing the designer in the design process?
- Level of transparency is acceptable for an automated tool?
- Should we rely on automated tools if we consider the intrinsic limits of the learning process?
- Data-driven development methodology
- genetic discrimination
- genetic modification/engineering
- A tradeoff between safety and innovation
- OPEN SCIENCE
- Simulation compared to real experiments
- Making a connection between qualitative and quantitative information
- Application of the complex system in Landscape studies
- Reproducibility
- System's performance is almost always evaluated in isolation [QUESTION OF INTERPRETATION OF RESEARCH RESULTS]
- Authors do not verify their results thoroughly enough, or they hide complications
- THE REVIEW PROCESS IS NOT DOUBLE-BLIND
- Presentation of results (overemphasizing of their importance)

Topics with ethical relevance students identified - social aspects

- Cultural diversity
- Professional conduct
- Gender equality
- Quality of life
- Impact of technology on society at large
- Is the purpose of the analysis relevant enough to expose the users to privacy loss?
- Designing technology that could reduce the need for human employees?
- Entrusting the machine to define culturally relevant spaces for our cities?
- Legal issues related to copyright infringement
- Involving stakeholders/users
- Trust between stakeholders?
- Professional societies/organisations and Codes of Ethics
- Popular presentation of research and public opinion about research
- Informing the politics about possibilities and challenges of research

Ethics high on the agenda: Example CACM 2018 08

- INFORMATICS EUROPE AND ACM EUROPE COUNCIL [Regulating Automated Decision Making](#)
- CERF'S UP [Traceability](#) -workshop on cybersecurity was how to preserve the freedom and openness of the Internet while protecting against the harmful behaviors
- LETTERS TO THE EDITOR [Encourage ACM to Address U.S. Election Integrity](#)
- In the spirit of Moshe Y. Vardi's call for ACM to ". . . [be more active in addressing social responsibility issues raised by computing technology](#)," we urge the ACM U.S. Public Policy Council to undertake a study of the technological ... *CACM Staff*
- BLOG@CACM [Assessing Responsibility for Program Output](#)
- We lack an easy way to indicate that algorithms do not make decisions and are not biased; programmers do, and are. *Robin K. Hill*
- [Animals Teach Robots to Find Their Way](#)
- Navigation research demonstrates bio-machine symbiosis. *Chris Edwards*
- [Electronics Are Leaving the Plane](#) Stacking chips and connecting them vertically
- [Broadening the Path for Women in STEM](#) - Organizations work to address 'a notable absence of women in the field.' *Esther Shein*
- GLOBAL COMPUTING [Designing Sustainable Rural Infrastructure Through the Lens of OpenCellular](#)
- EDUCATION [Providing Equitable Access to Computing Education](#)
- Seeking the best measures to reach advantaged and less-advantaged students equally. *Mark Guzdial, Amy Bruckman*
- COLUMN: KODE VICIOUS [Every Silver Lining Has a Cloud](#)

Ethics high on the agenda: Example CACM 2023 05

- **ACM for the Public Good**

The ACM 4.0 Initiative aims to lay the foundations of ACM for the next 25 years on issues of service to society and to ACM members, ACM membership, ACM finances, and internal processes. *Moshe Y. Vardi*

- **A Career Built on Using Technology to Help Others**

Everyone deserves the access and opportunity to have a good and fulfilling life. Technologies can only contribute toward this goal when they are designed from an understanding of what makes a life good for the people concerned ... *Jules Maitland*

- **Women in Computer Science Are Making Strides**

Computer science is still not a level playing field for those women who majored in it and choose to pursue it as a career. *Esther Shein*

- **Do the Right Thing**

Exploring the intersection of legal compliance and ethical judgment. *Kendra Albert, James Grimmelmann*

- **Updates, Threats, and Risk Management**

Revisiting a recent column considering security updates. *Steve Lipner, John Pescatore*

- **Ethics as a Participatory and Iterative Process**

Facilitating ethical reflection, inquiry, and deliberation. *Marc Steen*

- **NSF on Chien's Grand Challenge for Sustainability**

This Viewpoint focuses on ways the computing community can contribute broadly to environmental sustainability and identifies NSF Directorate for Computer and Information Science and Engineering research programs supporting these ... *Nina Amla, Dilma Da Silva, Michael Littman, Manish Parashar*

- **ChatGPT, Can You Tell Me a Story?**

An exercise in challenging the true creativity of generative AI. *Ralph Raiola*

<https://cacm.acm.org/magazines/2023/5>

The topic is huge – Introduction to ethics

What this lecture can do is to open the window with a view



Facing grand challenges

“The global community is facing **Grand Challenges**. The European Knowledge Society must tackle these through the best analysis, powerful actions and increased resources. Challenges must turn into sustainable solutions (...) ” The Lund Declaration, 2009 [1]

Natural challenges: Global warming, Insufficient supplies of energy, water and food, Ageing societies, Public health, pandemics, Security, Environmental degradation

Unintended consequences of technology: AGI (artificial general intelligence), Nano-technology, Biotechnology/Bioinformatics, Autonomous machinery and control: Big data, Internet of things – internet of everything, Intelligent cities, Autonomous cars, Autonomous intelligent software as control physical systems, information systems etc.

...

The Centre for the Study of Existential Risk (University of Cambridge; <http://cser.org>)

Education of new generations of engineers often focus on training abstract skills without careful consideration of the role of embeddedness of technology into context.

Responsible research and innovation

Global challenges and opportunities prompted Responsible Research and Innovation (RRI), defined as:

"a transparent, interactive process by which societal actors and innovators become mutually responsive to each other with a view to the (ethical) acceptability, sustainability and societal desirability of the innovation process and its marketable products (in order to allow a proper embedding of scientific and technological advances in our society)."

Von Schomberg

Education of future engineers should follow!

Facing grand challenges: The university of the future

The transformation of “ivory tower” context-independent to socially-aware paradigm in increasingly information-rich knowledge-based societies.

The **triple helix model** connects:

- ACADEMIC
- INDUSTRY/BUSINESS
- GOVERNMENT

Inspired by biology: THE TRIPLE HELIX
Gene, Organism, and Environment by Richard Lewontin



<https://inquiryumn.files.wordpress.com/2014/09/triple-helix.png>

Science with and for society work program

[Societal challenges](#) for 2020 are formulated in [the Science with and for Society](#) work program, which meant to

“help build effective cooperation between science and society, to recruit new talent for science and to pair scientific excellence with social awareness and responsibility”

This new approach encourages all stakeholders (involved citizens, researchers, business, policymakers, etc.) to interact throughout the research and innovation process and to coordinate and align both the process and its outcomes with societal values and needs, in accordance with Responsible Research and Innovation (RRI).

Societal values and needs: sustainability, safety, privacy, equity, diversity, etc.

<https://ec.europa.eu/programmes/horizon2020/en/h2020-section/science-and-society>

Organizational adaptation in the era of complexity and continuous change

A necessity of defining [social/organizational responsibility](#) in addition to customary [personal responsibility](#) [7].

We should take into account both [intended](#) and [unintended](#) consequences of research and technology in a preferably [anticipatory](#) and [learning](#) process that will in the first place prevent incidents and accidents and in the worst case *mitigate* their consequences, [8-13].

Contemporary global society is [organized in networks of networks](#) of interacting agents. Each individual belongs to a variety of networks, which define their different roles as [stakeholders](#) in various aspects of research and technology. In this context complexity and trans-disciplinarity /inter-disciplinarity comes as important aspect of research and development.

Values, priorities, and actions are [negotiated](#) by stakeholders, globally.

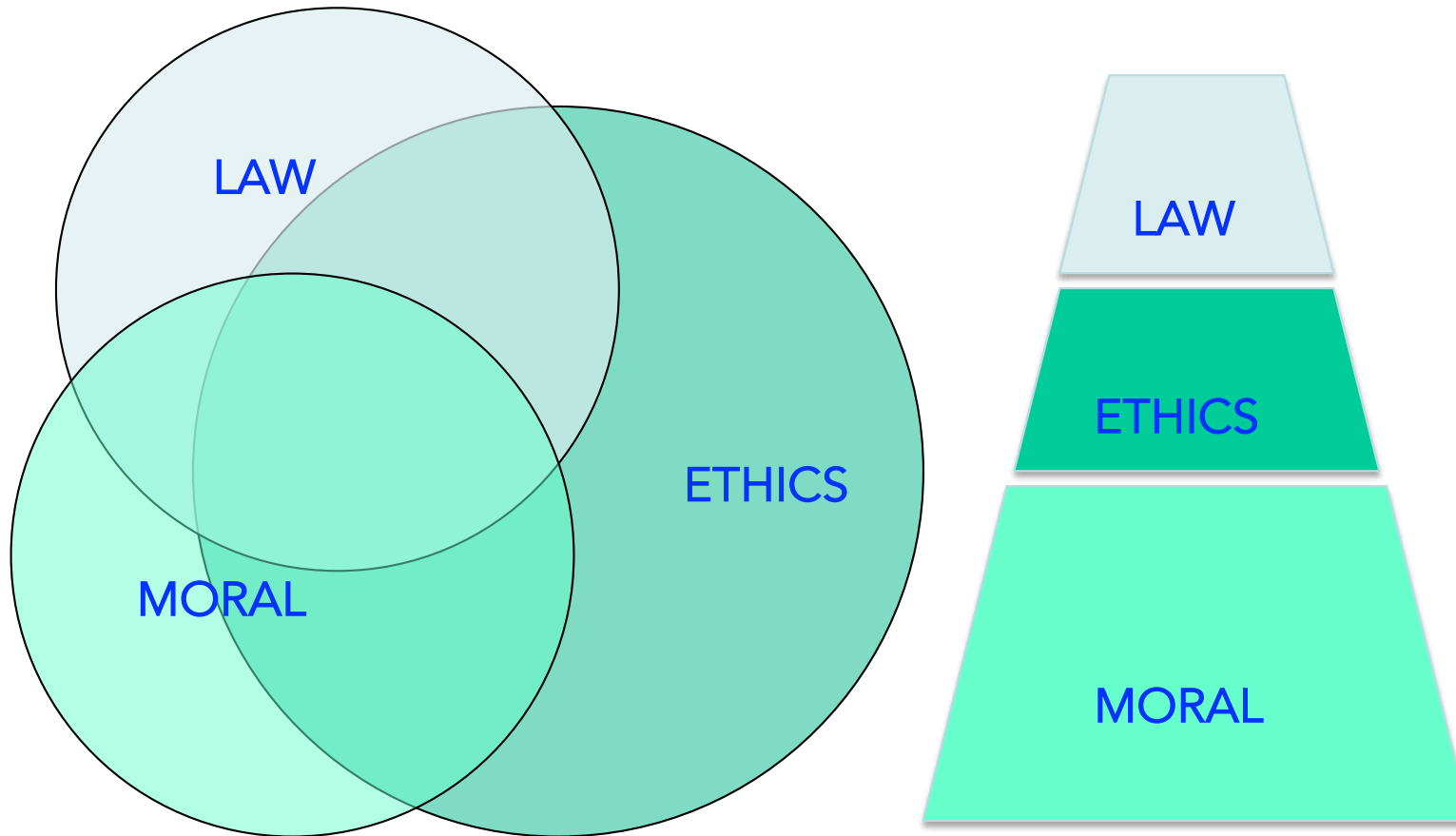
Educating engineers for the future

We are educating engineers that will solve [future problems](#).

Future is already at our doors: it comes in form of digitalization that is going to radically change our technology and society

Choices are made all the time in design and engineering and sensitivity to the consequences of choices is needed – involves moral judgment.

Societal normative systems



POLICY VACUUMS

Ethics of present-day technology and developing society – example of computer ethics

“A typical problem in computer ethics arises because there is a policy vacuum about how computer technology should be used. Computers provide us with new capabilities and these in turn give us new choices for action. Often, either no policies for conduct in these situations exist or existing policies seem inadequate. A central task of computer ethics is to determine what we should do in such cases, i.e., to formulate policies to guide our actions. Of course, some ethical situations confront us as individuals and some as a society. Computer ethics includes consideration of both personal and social policies for the ethical use of computer technology.”

Moor, J, 1985. “What is Computer Ethics”, *Metaphilosophy* 16(4): 266-75.
<http://www.cs.ucdavis.edu/~rogaway/classes/188/spring06/papers/moor.html>

The question of values

Too often, new technology develops with little attention to its impact upon human values



VALUES AND ETHICS IN KNOWLEDGE PRODUCTION



Nancy Tuana (2015)
Coupled Ethical-Epistemic Analysis in Teaching
Ethics. Critical reflection on value choices.
CACM VOL. 500 NO. 12. Pages 27-29

<http://cacm.acm.org/magazines/2015/12/194630-coupled-ethical-epistemic-analysis-in-teaching-ethics/abstract>

ETHICAL-EPISTEMIC* ANALYSIS

How values and priorities affect knowledge production

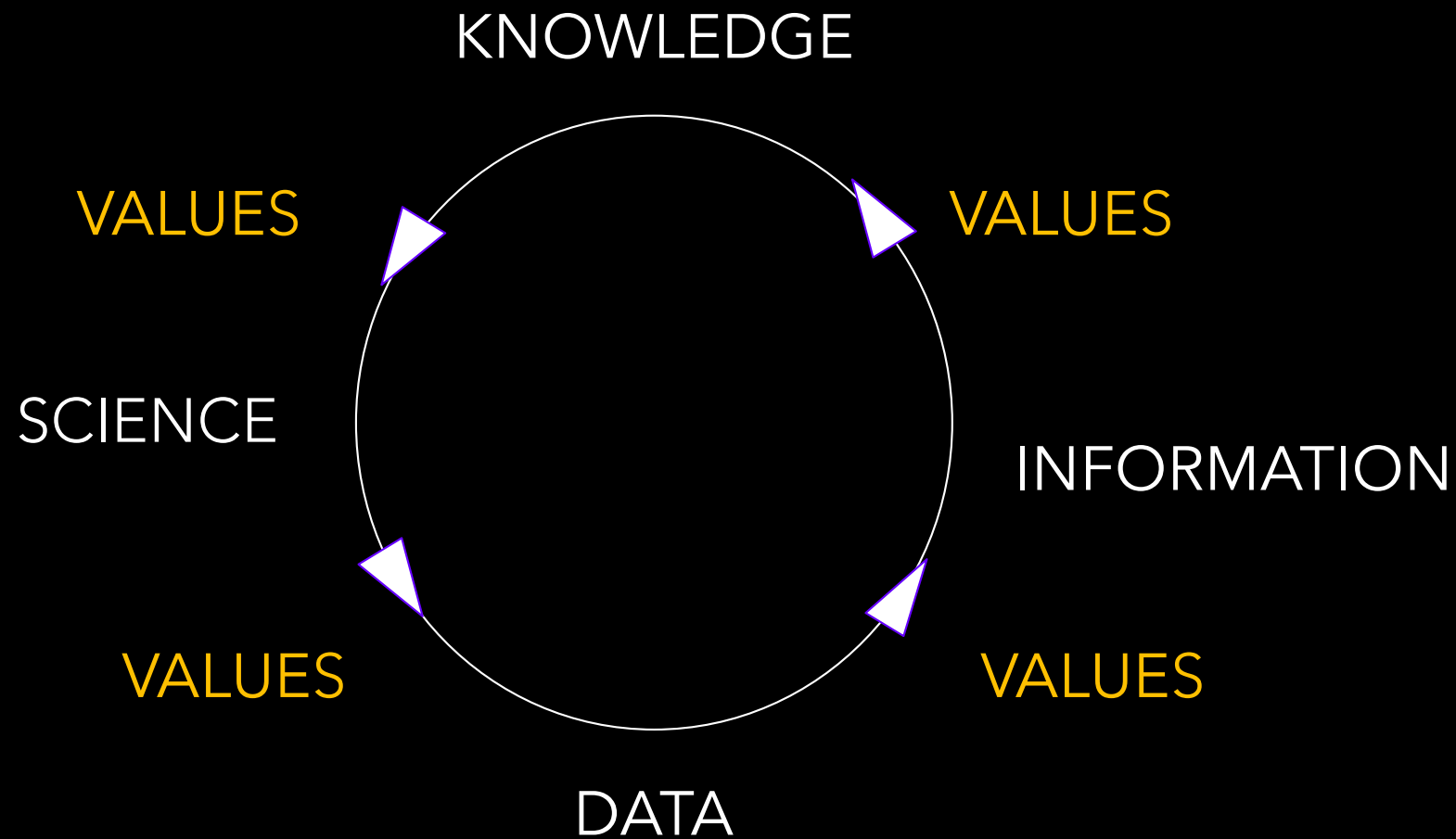
“Computer experts aren’t just building and manipulating hardware, software, and code, they are building systems that help to achieve important social functions, systems that constitute social arrangements, relationships, and institutions. computer experts can facilitate and constrain behavior and materialize social *values*.”

Deborah Johnson

Values serve as a guide to action and knowledge.

Epistemology-the branch of philosophy concerned with the nature and scope of knowledge.

Values in knowledge production



VALUES

Values serve as a guide to action and knowledge. They are relevant to all aspects of scientific and engineering practice, including discovery, analysis, and application.

Cognitive scientists have found values to be integral parts of STEM (Science, Technology, Engineering, and Mathematics) research.

TYPES OF VALUES

Various types of values can be involved in decision making and reasoning:

- ethical values (the good of society, equity, sustainability)
- *aesthetic* values (simplicity, elegance, complexity), or
- *epistemic* values (predictive power, reliability, coherence, scope).
- *economic* values, etc.

Code of conduct for research integrity basic principles - values

Reliability in ensuring the quality of research is reflected in the design, the methodology, the analysis, and the use of resources.

Honesty in developing, undertaking, reviewing, reporting, and communicating research in a transparent, fair, full, and unbiased way.

Respect for colleagues, research participants, society, ecosystems, cultural heritage and the environment.

Accountability for the research from idea to publication, for its management and organisation, for training, supervision and mentoring, and for its wider impacts

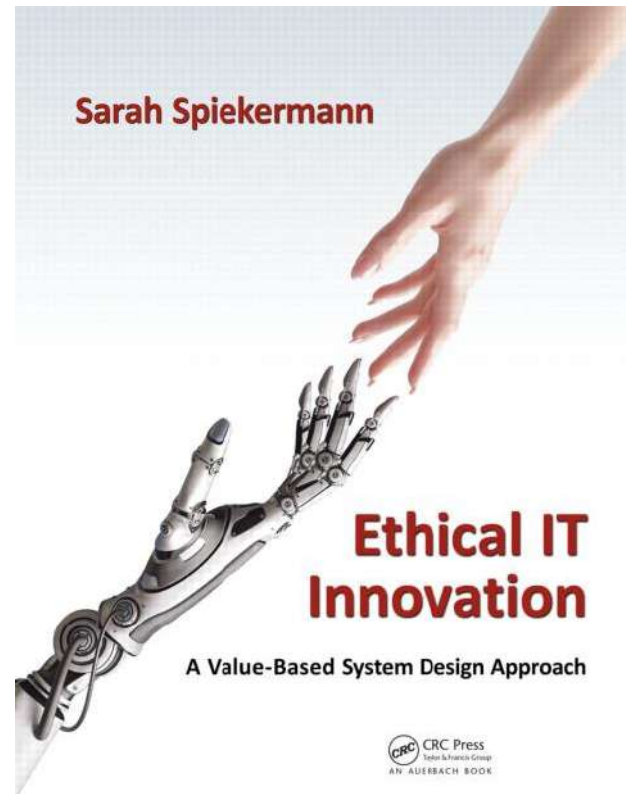
The European Science Foundations Code of Conduct for Research Integrity

https://ec.europa.eu/research/participants/data/ref/h2020/other/hi/h2020-ethics_code-of-conduct_en.pdf

Values related to risks

- Reliability
- Safety
- Security
- Privacy
- Human well-being

Ethical IT innovation: a value-based system design approach



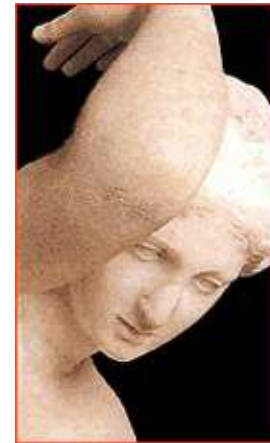
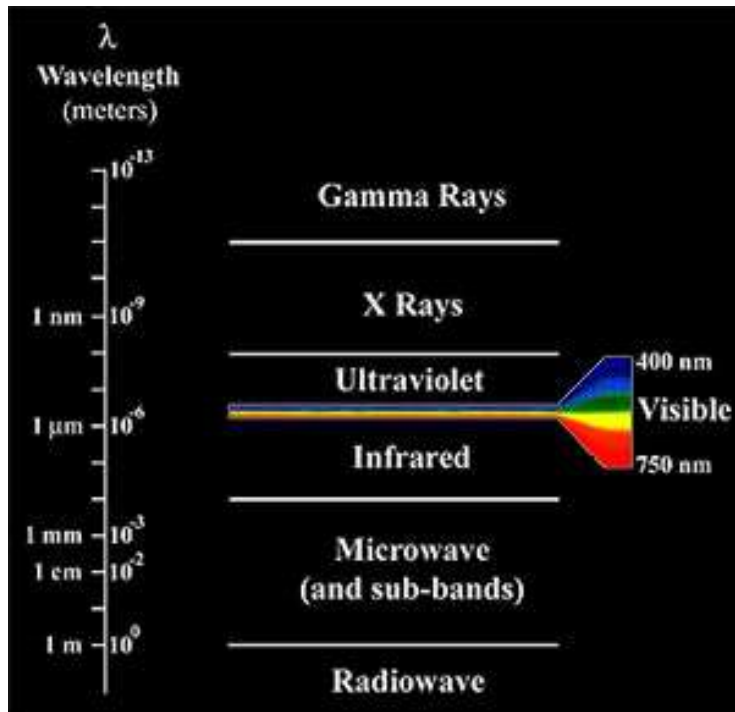
Sarah Spiekermann:

IEEE P7000
The first global
standard process for
addressing ethical
concerns in system
design

<https://www.crcpress.com/Ethical-IT-Innovation-A-Value-Based-System-Design-Approach/Spiekermann/p/book/9781482226355#googlePreviewContainer>

STAKEHOLDERS AND DIFFERENT PERSPECTIVES

World seen in different light



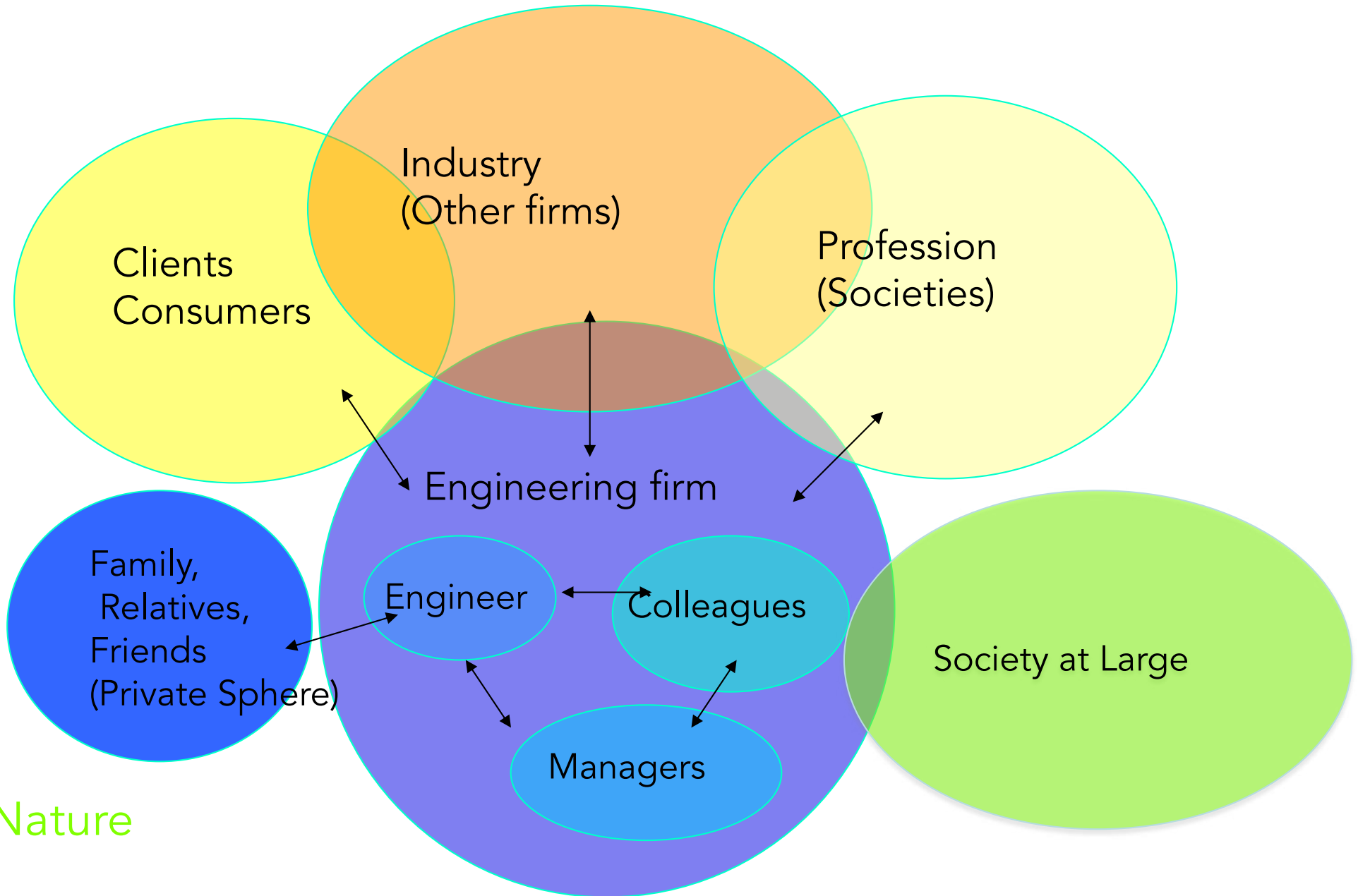
What if we could see in any wavelength of the electromagnetic spectrum, from gamma-rays to radio waves? How would the world appear to us?

STAKEHOLDERS IN AN ACADEMIC RESEARCH PROJECT



Nature

STAKEHOLDERS IN AN INDUSTRIAL RESEARCH PROJECT

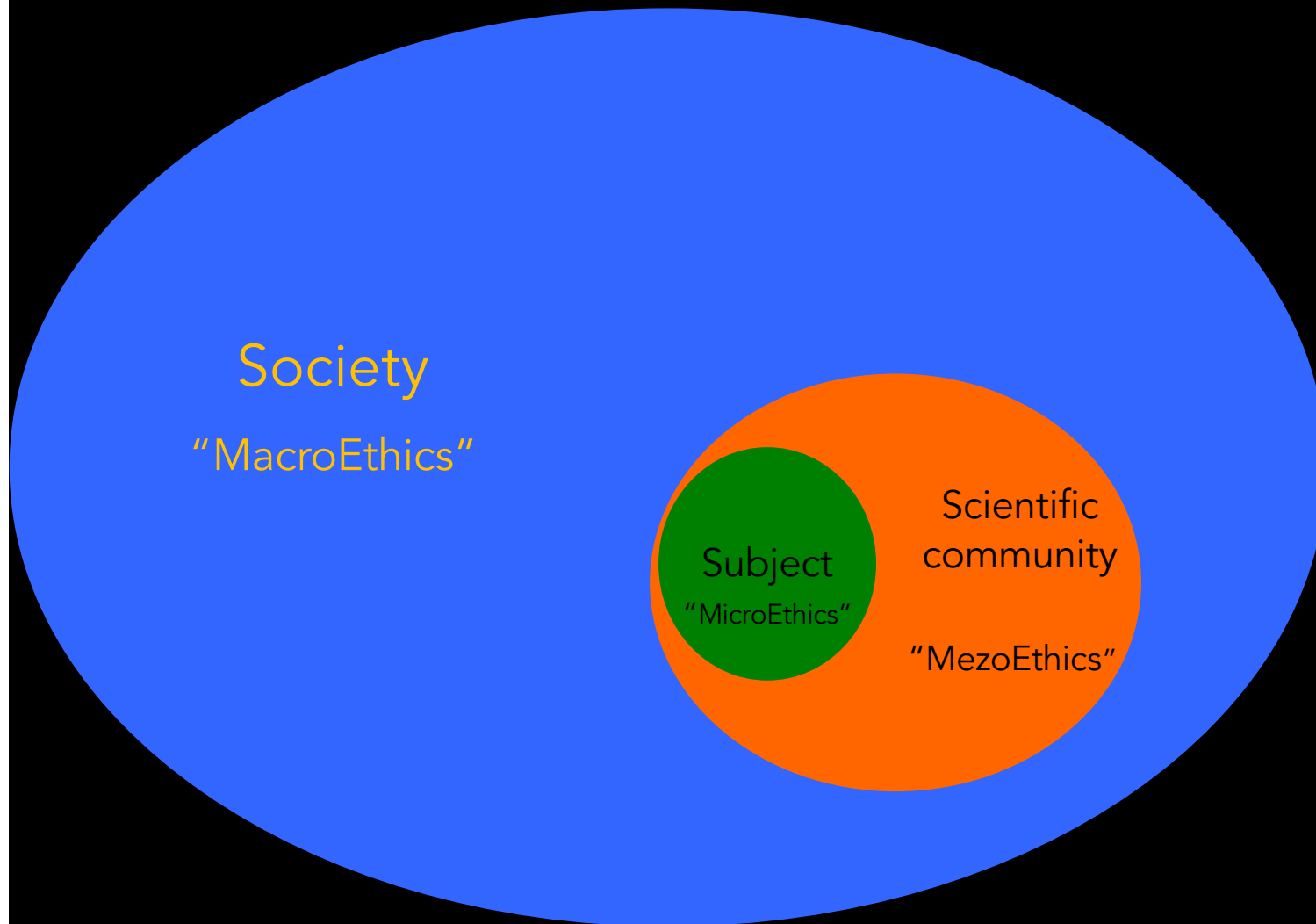


ETHICS IN RESEARCH

The state of the art in today's research and society



Domains of research ethics



Is it true?

1. Scientific integrity

Is it fair?

2. Collegiality

3. Protection of human subjects

4. Animal welfare

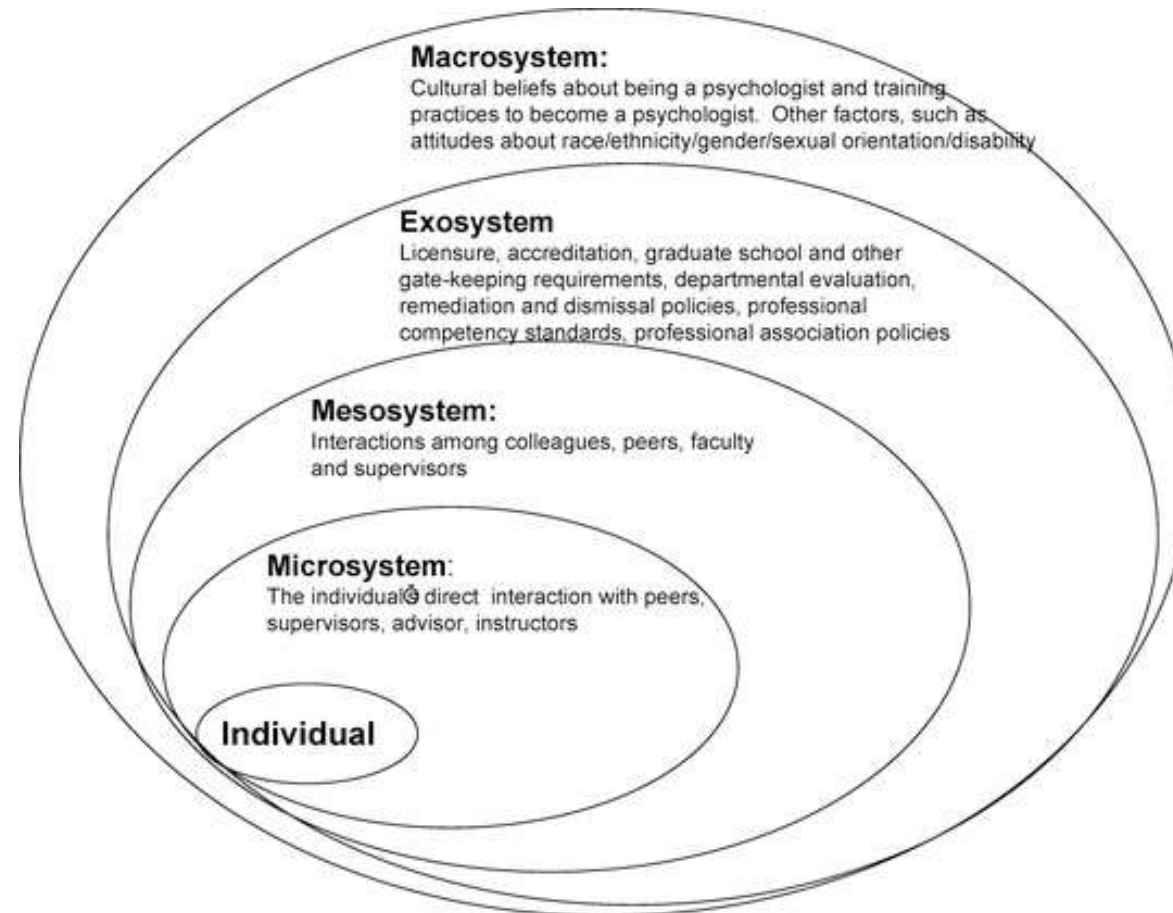
5. Institutional integrity

Is it wise?

6. Social responsibility

Kenneth D. Pimple (2002) "Six Domains of Research Ethics. A Heuristic Framework for the Responsible Conduct of Research". Science and Engineering Ethics 8 , 191-205

Micro – Meso – Exo – Macro Domains



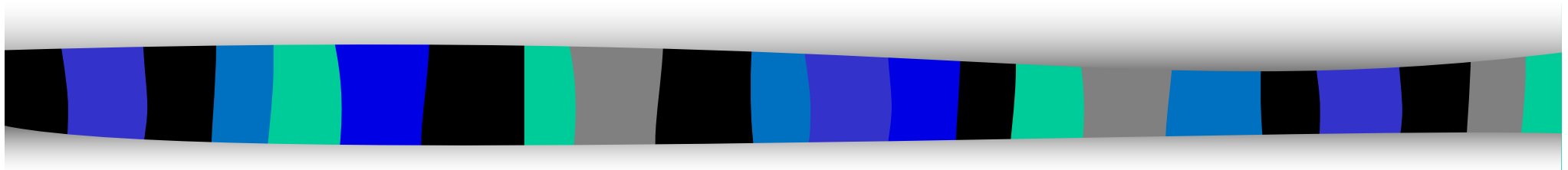
You will recognize this **domain-based** view in the analysis of many different types of problems – organization of society, sustainability of cities, ecology, economics, ethical aspects etc.

Source: American Psychological Association website

PROFESSIONAL ETHICS COURSE

7.5 ECTS

Mälardalen University, Sweden



Gordana Dodig Crnkovic

Mälardalen University, Sweden

http://www.es.mdh.se/staff/37-Gordana_Dodig_Crnkovic




<https://www.mdh.se/staff?id=gdc01>







■ LECTURES

Professional Ethics in Science and Engineering, CD5590

Teacher and examiner: [Gordana Dodig-Crnkovic](mailto:gordana.dodig-crnkovic@mdh.se), gordana.dodig-crnkovic@mdh.se

Time & Place: Monday & Thursday, 13:15 - 15:00, Classroom V220 (V222 on 11-27 and 12-05)

DATE		TOPIC
3 Nov L1		GETTING STARTED. Course Preliminaries. Introduction. Administrivia. Identifying Moral Issues Basic Moral Orientations
6 Nov L2		METHODS AND TOOLS OF ANALYSIS OF ETHICAL ARGUMENT Philosophical Foundations of Ethics Ethical Relativism, Absolutism and Pluralism
10 Nov L3		The Ethics of Conscience The Ethical Egoism The Ethics of Duty The Ethics of Respect

<p>13 Nov L4</p>		<p>The Ethics of Consequences: Utilitarianism The Ethics of Rights The Ethics of Justice</p>
<p>17 Nov L5</p>		<p>The Ethics of Character The Ethics and Gender</p>
<p>20 Nov L6/E1</p>	 Beehives	<p>PROFESSIONAL AND ETHICAL RESPONSIBILITIES Codes of Ethics. Whistle Blowing <u>In-class activity: CASE STUDIES</u> (Jessica, Karin, Henrik)</p>
<p>24 Nov L7/E2</p>	 Beehives	<p>ENVIRONMENTAL ETHICS <u>In-class activity: CASE STUDIES</u> (Teresa, Said)</p>
<p>27 Nov L8</p>		<p>GUEST LECTURE BY PETER FUNK AI and Ethics</p>
<p>01 Dec L9</p>		<p>GUEST LECTURE BY KERSTI MALMSTEN Nursing and Medical Ethics</p>

<p>4 Dec L10/E3</p>	 <p>Beehives</p>	<p>PRIVACY AND CIVIL LIBERTIES <u>In-class activity: CASE STUDIES</u> (Virginia, Jörgen)</p>
<p>05 Dec L11</p>		<p>GUEST LECTURE BY MONIKA EIBORN Nuclear Non-proliferation and Ethics Nucleus 02 2003 side 39</p>
<p>08 Dec L12/E4</p>	 <p>Beehives</p>	<p>RISKS IN TECHNOLOGY AND SCIENCE PRECAUTIONARY PRINCIPLE <u>In-class activity: CASE STUDIES</u> (Jonas, Balaji, Artur)</p>
<p>11 Dec L13/E5</p>	 <p>Beehives</p>	<p>INTELLECTUAL PROPERTY <u>In-class activity: CASE STUDIES</u> (Magnus, Jens)</p>
<p>12 Dec L14/ E6</p>	 <p>Beehives</p>	<p>COMPUTER GAMES AND ENTERTAINMENT <u>In-class activity: CASE STUDIES</u> (Thomas, Kim)</p>
<p>15 Dec L15</p>		<p>COURSE WRAP-UP</p>
<p>TAKE-HOME EXAM</p>		<p>RESEARCH PAPER + CLASS NOTES</p>



RESEARCH ETHICS & SUSTAINABLE DEVELOPMENT

CHALMERS UNIVERSITY OF TECHNOLOGY
SWEDEN

Learning Outcomes

- The aims of this course are to:
- 1) understand the **nature and range of ethical issues** in research and **sustainable** development;
- 2) understand what is meant by **sustainable development** and potential implications for research, in particular in the own research project;
- 3) familiarize with a **framework for decision making** when faced with ethical issues and
- 4) appreciate the **complex relation between science and society**.

Assessment of the Outcomes

A successful completion of this course will be judged on the following:

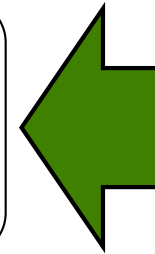
1. **Attendance** and **preparation** for the **in-class discussions**.
2. **Writing an essay** describing **ethical** and **sustainability** aspects of the PhD research project (or equivalent) of the participant. It is based on the interviews with at least two stakeholders.
3. **Participation in a peer review seminar** in which you give feedback on other graduate students essays and receive feedback on your own essay.
4. **Group work** preparing presentations for the Mini-conference.
5. **A Mini-conference** with **"lightning talk"** presentations of individual essays, common **group conclusions** and the subsequent **class discussion**.

Course Overview

Day 1

Problems & Principles

Course intro & Ethics (Gordana)
Sustainable Development (Magdalena)

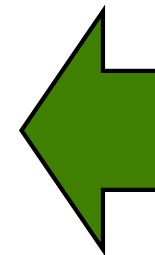


Assignment
and
readings

Day 2

Science and Society

Research Policy (Sven)
Publishing Ethics & Societal Aspects
of Technology (Guest lectures)

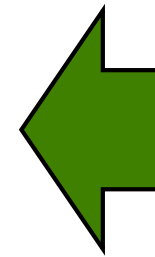


Assignment
and
readings

Course Overview

Day 3

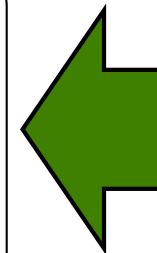
Peer Review Meeting
for SD-RE Essays
(Class in Review Groups)



Essay
SD-RE

Day 4

Group Meetings
(Class, preparation for Mini-conf.)



Preparation for
the Mini-
conference


Course Overview

Day 5

Mini-conference

(Class, Gordana)

1 2 3 4 | 5 6 7 8



“Lightning talk”
individual
presentations;
group conclusions
followed by the
class discussion

EXAMINATION FORMS IN MY ETHICS COURSES

- INDIVIDUAL CLASS-NOTES – What did I find interesting in this lecture – students' own reflections
- IN-CLASS PRESENTATION OF A CHOSEN TOPIC – Students choose a topic from their research. For undergrads, topics that interest them.
- RESEARCH PAPER, WITH THE AIM TO PRESENT AT A CONFERENCE OR PUBLISH IN A JOURNAL
- PRESENTATION ON THE MINI-CONFERENCE (IN CLASS)

CHALLENGES AND THE FUTURE PROSPECTS

- At the beginning (2000), it was not easy to develop a course on ethics for students of computing and engineering. There was “no place” for yet another course in the curriculum. There was no feeling of urgency, which gradually formed with the recent huge advances of AI.
- The hope is the introduction of ethics education to change the situation and encourage and support colleagues researchers, young and established, by exchange of experiences and resources
- In the future, given the impressive development of intelligent, nano-, bio-, neuro-, medical-, and other emerging technologies that can radically change our personal lives and the whole civilization, in which computing professionals are heavily involved, it is of central importance that professionals contribute to our common knowledge about possible features, promises, and challenges of emerging technologies.

SOME CONCLUSIONS

What I find important is

- Relevance of ethics topics for students' own context
- Applicability and generalizability of approaches from what is learned
- Humble teaching attitude – no preaching and no besserwisser (know-all) style
- Using authority/power with utmost care
- Ethics is not about being perfect but being as good as reasonably possible, given human cognitive constraints
- Introducing students to the world of research and real-world problems
- Cultivating analytic-synthetic thinking, and logical reasoning/argument
- Respect for different positions/traditions/cultures, stakeholders
- Arguing for the necessity of understanding the subject matter (technology) in order to make informed judgments
- Interdisciplinarity/Transdisciplinarity center-stage
- Keeping in mind – we are educating for the FUTURE – identifying seeds of future developments and addressing their promises and challenges
- Educating T-SHAPED ENGINEERS – deep in technology, broad in humanities (Barry Bohm)

SOME CONCLUSIONS

- Bringing in guest lecturers with relevant experiences team-work, networking
- Sharing experiences in peer-review meetings & group work

Course Teaching Team



Gordana Dodig-Crnkovic, course responsible

Magdalena Svanström

Sven Andersson

Guest lectures: Erik Bohlin, Claes Strannegård

Experiences from the course
"Research Ethics and Sustainable
Development" at Chalmers



Previous editions course responsible:

Elisabeth Saalman

Tom Adawi

In the Context of Digital Humanism



Technology profoundly shapes the world we live in, and the stakes are high. Digital Humanism deals with digital technology development and policies based on human rights, democracy, inclusion, and diversity.

Current activities

- [Inauguration of the UNESCO Chair on Digital Humanism](#)
- May 15, 2023 Digital Humanism, Event TU Wien InformatICS launches the first UNESCO Chair on Digital Humanism to address the ethical, societal, and political challenges of digital technology.
- [Ann Light: Planet-Centric Design](#)
- May 11, 2023 Digital Humanism, Public Lecture, Guest Professor, Doctoral School What kind of societal transformation is needed to address climate breakdown and how can technology support it?
- [Jürgen Pfeffer: “Studying Human Behavior with Data from Social Media Platforms”](#)
- May 8, 2023 Digital Humanism, Public Lecture, CDL RecSys Issues and challenges when working with API data and the future of social media research in a possible post API world.
- [Gordana Dodig-Crnković: Research-Based Teaching Ethics](#)
- May 4, 2023 Digital Humanism, Public Lecture, Guest Professor, Doctoral School The expert on education in engineering and research ethics will talk about her teaching experience and how Digital Humanism shapes the field.
- [ChatGPT – A Catalyst for What Kind of Future?](#)
- Mar 21, 2023 Digital Humanism, Read the statement of the Digital Humanism Initiative on ChatGPT and how the online world will change.
- [Our Experts on the Latest Developments in AI](#)
- Feb 21, 2023 Digital Humanism, Research, AI ChatGPT is all over the news, and the advancement and challenges of AI are

P.S.

The idealized picture of the roles of the teacher and students in a research-based ethics course can be compared to the work of a renaissance art studio. It is definitely **beyond compliance** (the action of complying with a wish or command.)



Young Leonardo da Vinci was taken by his father to Florence to begin his apprenticeship in the studio of Andrea Verrocchio. It was the most important workshop in the city and many of the young apprentices working there, such as Botticelli and Perugino, would later become famous. Around the time Leonardo arrived, Verrocchio was busy making the gilt bronze ball for the Cathedral dome. It was in this workshop that Leonardo received the training that best suited his spirit of enthusiastic experimenter. Verrocchio coordinated the many activities of his workshop. Ever since the thirteenth century, it was usual for the master to allow his best pupils to complete works that had been thought of and sketched out by him.

<https://izi.travel/en/fed2-andrea-del-verrocchio-leonardo-da-vinci-and-others-battesimo-di-cristo/en>

REFERENCES

References in full text can be found on my web page:

<http://gordana.se/>