Beyond Compliance
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RESEARCH-BASED PERSPECTIVE IN TEACHING ETHICS TO ENGINEERING STUDENTS

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Mälardalen University
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ERCIM
European Research Consortium for Informatics and Mathematics

Inria

COMITÉ NATIONAL PILOTE D'ÉTHIQUE DU NUMÉRIQUE
sous l'égide du
COMITÉ CONSULTATIF NATIONAL D'ÉTHIQUE POUR LES SCIENCES DE LA VIE ET DE LA SANTÉ

Introduction

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" (20012-2013, 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 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
- Johnsen, 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, 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

- Çürüklü 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 Hagengruber, 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 - 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 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

Philosophy and Computers

FALL 2013 VOLUME 13 | NUMBER 1

Articles from the course Computing and Philosophy

Computing and Philosophy course started in 2004nas 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

EXPERIENCES FROM MY TEACHING OF ETHICS

An Example of an introductory lecture for Ph.D. students in software engineering with a focus on automation - August 2018

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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.

Part E | 47

[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?

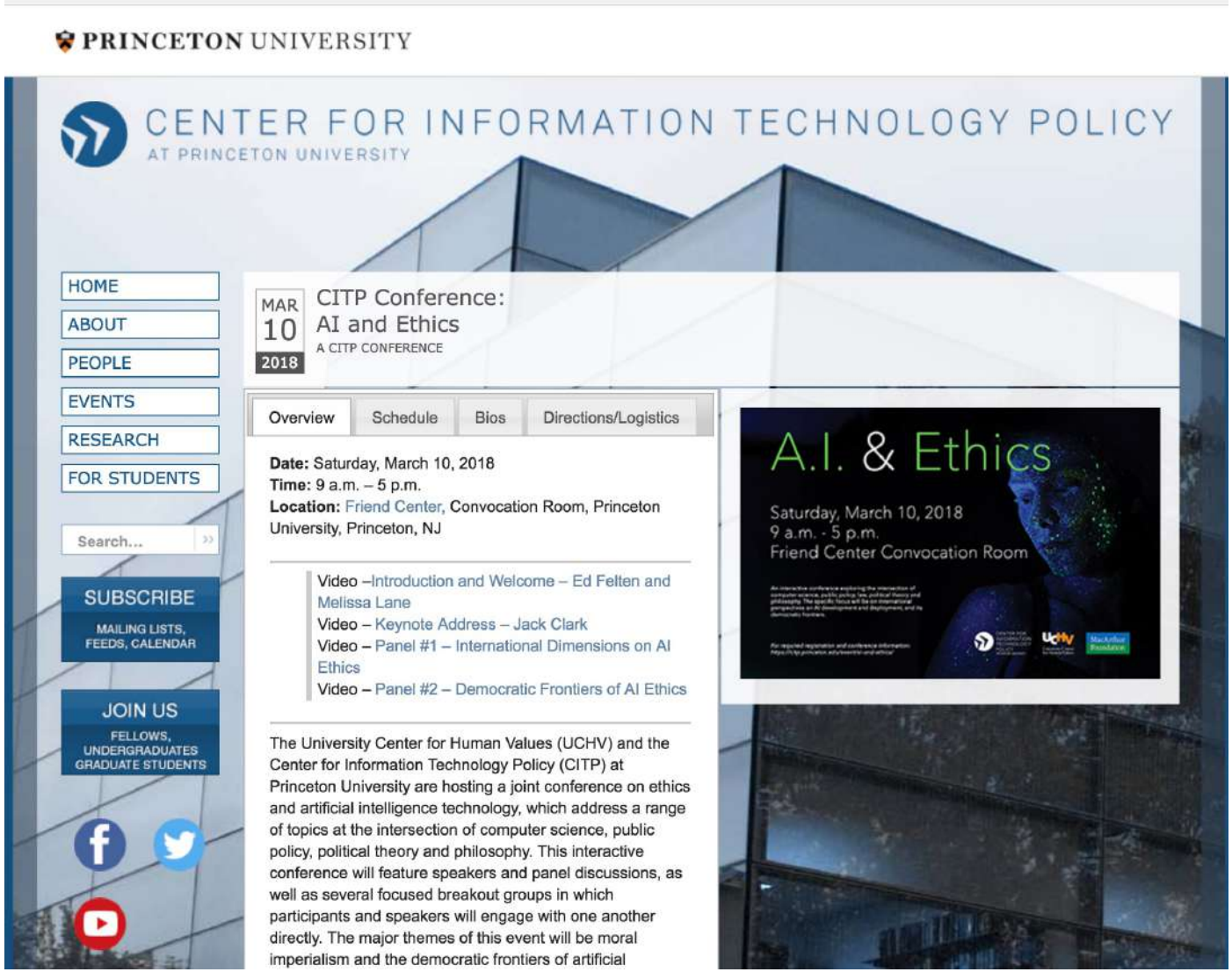
Topics with ethical relevance identified - methodology aspects

- Values
- The method
- Epistemic problems related work - acknowledging its limitations
- Reducing reality into a model, with 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
- Tradeoff between safety and innovation
- OPEN SCIENCE
- Simulation compared to real experiments
- Making connection between qualitative and quantitative information
- Application of the complex system in Landscape studies
- Reproduciblility
- System's performance 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)
- Value of an intervention compared to other applications

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

Topics that interest me: Ethics of AI



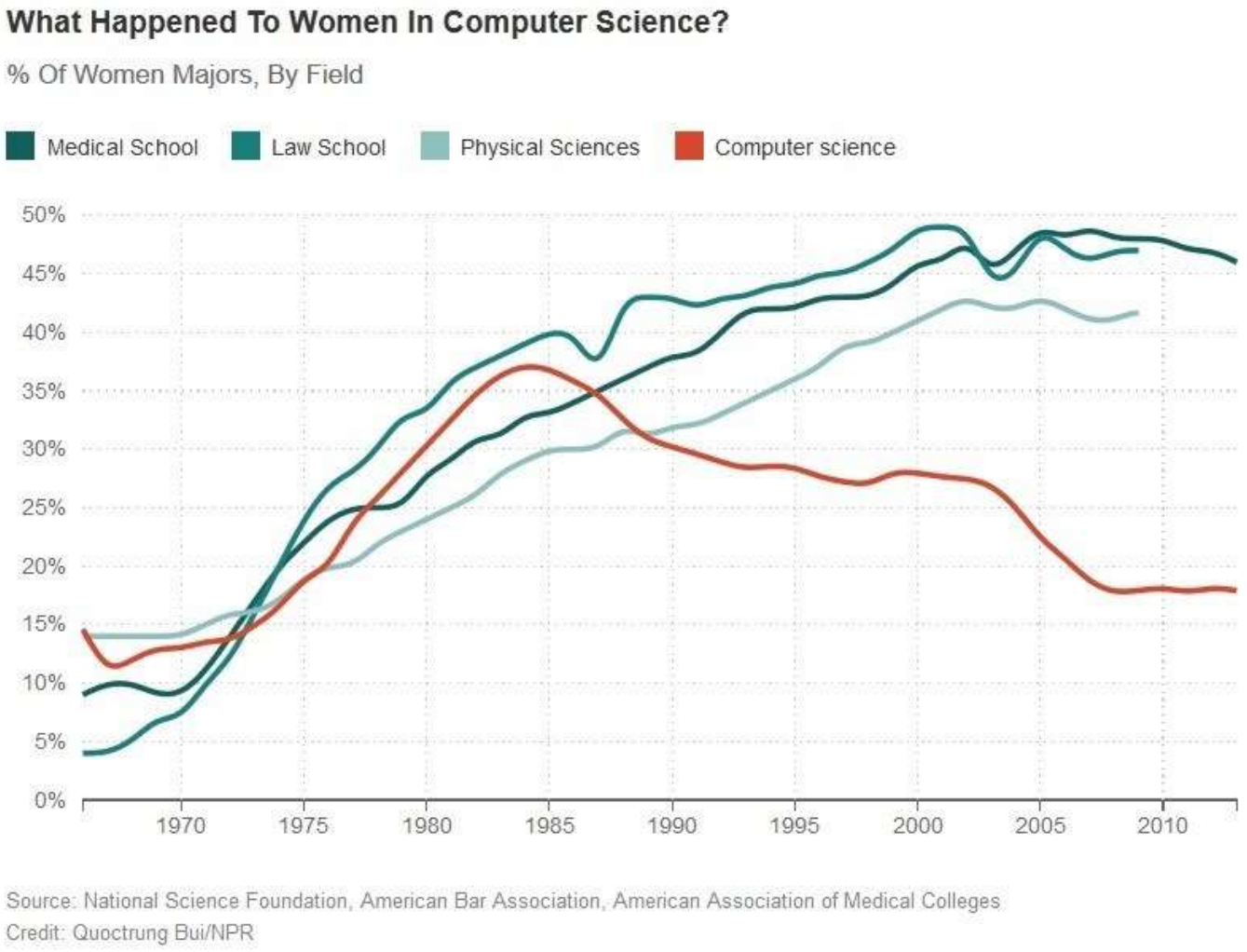
https://citp.princeton.edu/event/ai-and-ethics/

Topics that interest me:
Ethics in self-driving/autonomous cars

https://webcasts.weforum.org/widget/1/china2018?p=1&pi=1&th=1&id=a0W0X00000CIawBUAT&auto=1

Decisioon making by algorithms

Topics that interest me:
Gender issues in ICT



Ethical issues move technology forward.

They are NOT slowing down the development of technoloy.

Klimat och säkerhet driver på teknikfrågorna

VALET 2018. Teknikfrågorna står på en del områden mitt i den politiska debatten inför årets val. Ny Teknik har ställt 14 frågor till riksdagspartierna.

LÄS MER

Debatten om flyget tar ny fart

VALET 2018. Miljöpartiet vill inte bara behålla flygskatten, utan även höja den.

LÄS MER

Hållbart och underhållsfritt – därför väljer Linder betong för sina lokaler

ANNONS. "Betong har många fördelar, det är ett bestående material och det kräver inget underhåll."

The current debate in engineering

From the Swedish technical newspaper NyTeknik

Sustainability &. Climate

Sustainable air transport

Sustainable concrete

CACM August 2018 – Ethics high on the agenda

- 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

https://cacm.acm.org/magazines/2018/8

The topic is huge – Introduction to ethics

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

https://www.flickr.com/photos/mercolino/3424888900

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
- GOVERMENT

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

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

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.

Terminological clarification: Ethics and morality

The terms ethics and morality are often used interchangeably - indeed, they usually can mean the same thing, and in everyday conversation, there isn't a problem with switching between one and the other.

However, there is a distinction between them in philosophy!

Ethics and morality, etymology

Morality and ethics have the same roots, mores which means manner and customs in Latin, and etos which means custom and habits in Greek. (Robert Louden, Morality and Moral Theory)

Strictly speaking, morality is used to refer to what we would call *moral conduct* while ethics is used to refer to the *formal study of moral conduct*.

Ethics is also often called moral philosophy.

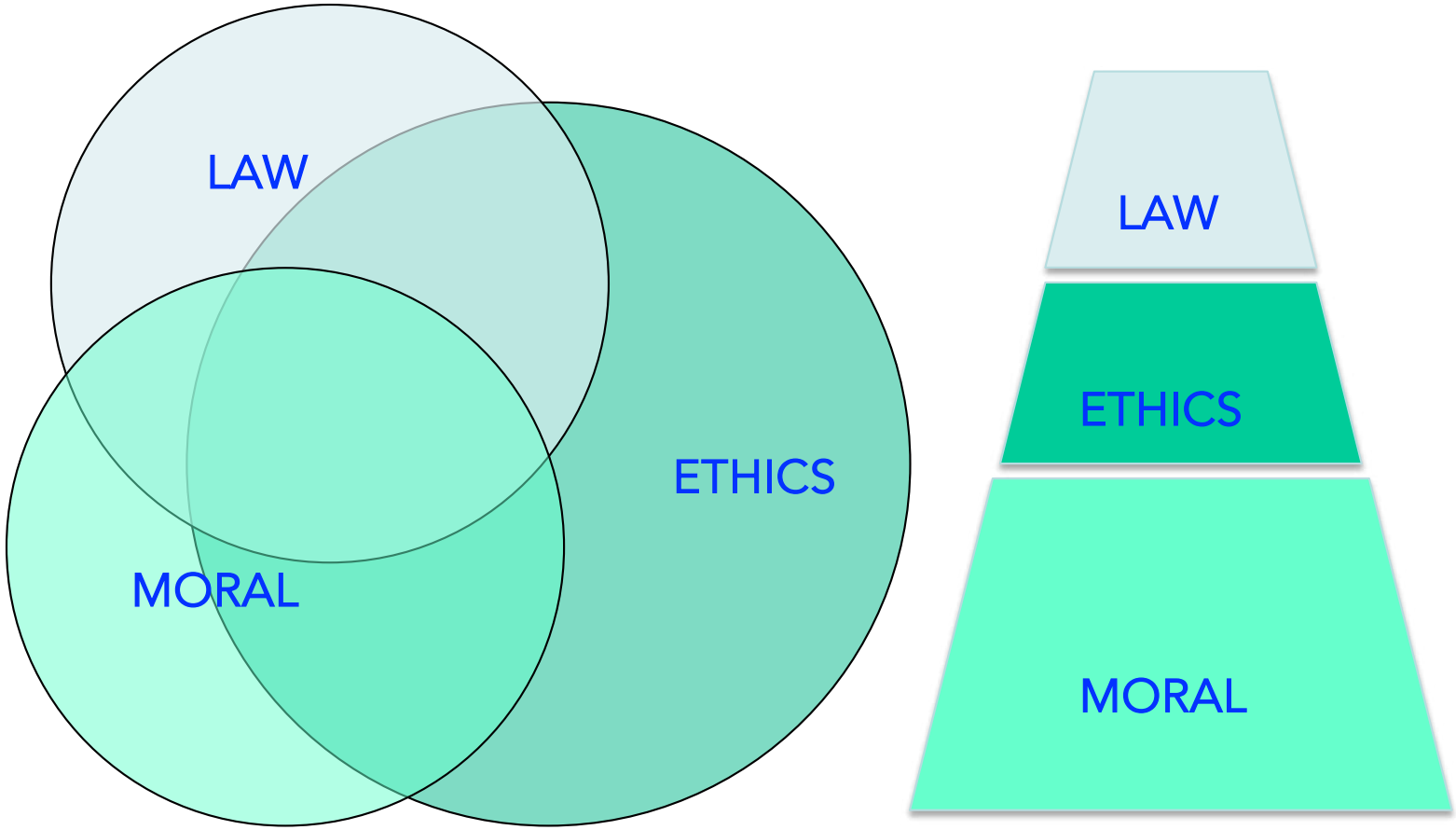
Ethics and morality, in short

- MORALITY - PRACTICE: the first-order set of beliefs and practices about how to live a good life.
- ETHICS - THEORY: a second-order, conscious reflection on the adequacy of our moral beliefs.

In a presentation at Chalmers in October 2015, ethicist Prof. Ibo van de Poel from TU Delft in the Netherlands suggested that the students need to develop the following "moral competencies":

- Moral sensibility
- Moral analysis skills
- Moral creativity
- Moral judgment skills
- Moral decision-making skills
- Moral argumentation skills

Societal normative systems



Ethics as continuum
- An ongoing conversation

- World changes constantly, and we have to interpret/construe it over and over again.
- We come back to ideas again and again, finding new meaning in them.
- Professional discussions of ethical issues in journals.

See http://www.utm.edu/research/iep/e/ethics.htm Ethics

What to expect from ethics

Functions of theory:

- Describe (What?)
- Explain (Why?)
- Prescribe (How?)
- Support (Yes, we can!)
  - Open new possibilities and insights
  - Wonder – move on exploring ethical aspects

On what ethical basis do people typically make moral decisions?

- Divine Command Theories
- Utilitarianism (Consequentialism)
  The action is best, which procures the greatest happiness for the greatest number…
- Virtue Ethics
  Maximize virtue, minimize vices

On what ethical basis do people make moral decisions?

- **The Ethics of Duty** (Deontological* Ethics)
  - Immanuel Kant's Moral Theory. The categorical imperative: -- "Act so that the maxim [determining motive of the will] may be capable of becoming a universal law for all rational beings."
- **Ethical Egoism**
  - "Ayn Rand, The Ethics of Selfishness
    Well known for her novels, especially, Atlas Shrugged
- "Machiavellism" – "The end justifies the means"
  - Nicolo Macchiavelli (The Prince) - rationalization of war

* 'deon' = duty

On what ethical basis do people make moral decisions?

- **The Ethics of Natural and Human Rights** – all people are created ...with certain basic rights
- **Social Contract Ethics** (We agree to be civil to one another under threat of punishment from a government established for this purpose. [Plato, Republic. Thomas Hobbes])
- **Evolutionary Ethics** – Being social increases our chances to survive

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

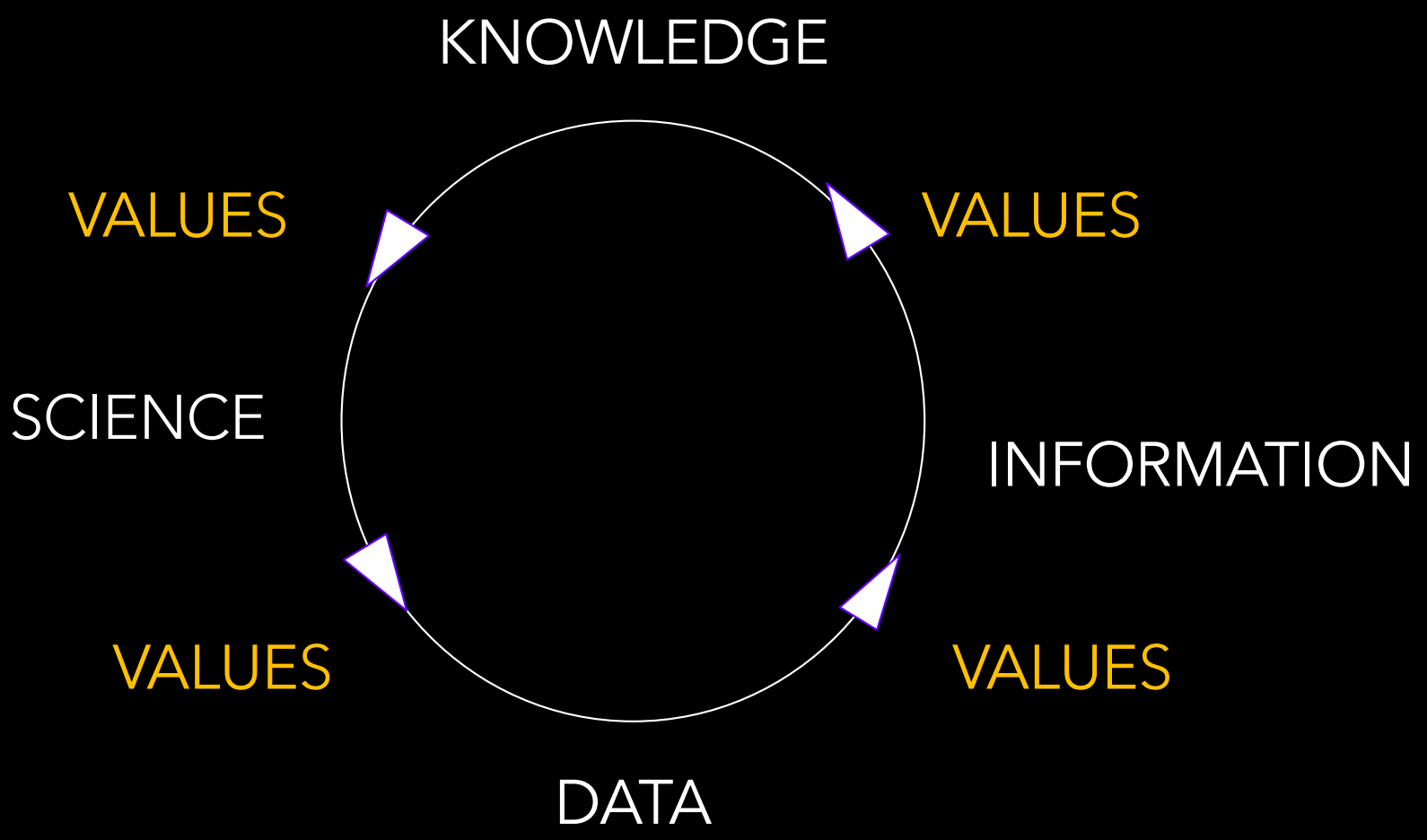
"Computer experts aren't just building and manipulating hardware, software, and code, they are building systems that help to achieve important social functions, systems that constitute social arrangements, relationships, institutions. computer experts can facilitate and constrain behavior, and materialize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

Peter Neumann (1994) **Computer-Related Risks.** Addison-Wesley ACM Press Series

VALUES IN RESEARCH – THE CHOICES WE MAKE

- The selection of research topics. What is a good basis for

(We get involved with existing research. Or we get funding for a specific research. Or we choose freely. Why is this research worth our time and effort?)

- Choice of approach, methodology, tools. What are the values of a model, hypothesis, or theoretical explanation in providing convincing explanation?

- Judgment of the support for a research result. What values of evidence constitute robust evidence?

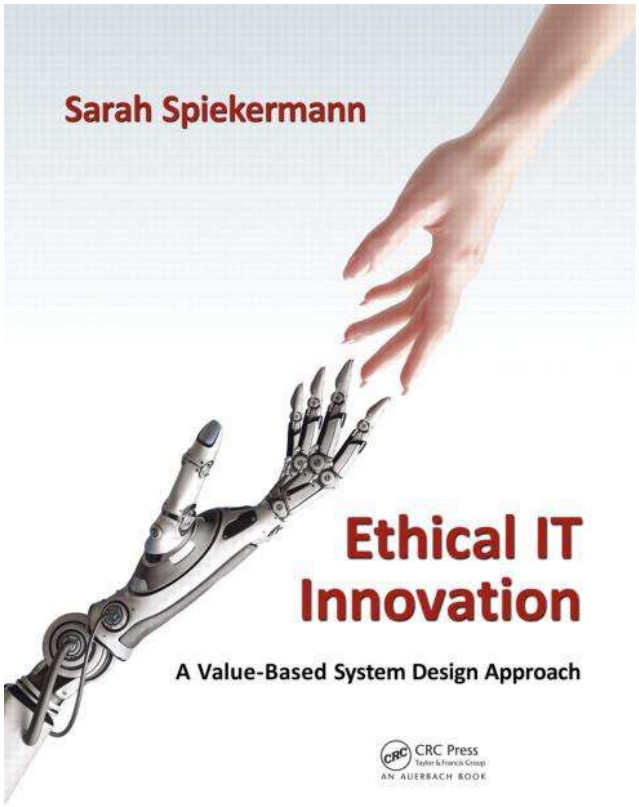
- How are ethical aspects of research taken care of?

REQUIREMENT FOR TRANSPARENCY OF VALUES

Transparency of values is essential for trustworthiness and credibility of research. It is central to transdisciplinary research such as e.g., the National Science Foundation's Sustainability Research Network on Sustainable Climate Risk Management (SCRiM, http://scrimhub.org).

Coupled ethical-epistemic analysis helps to identify new and refined research topics, and inform modeling for multi-objective, robust decision making.

Ethical IT innovation: a value-based system design approach



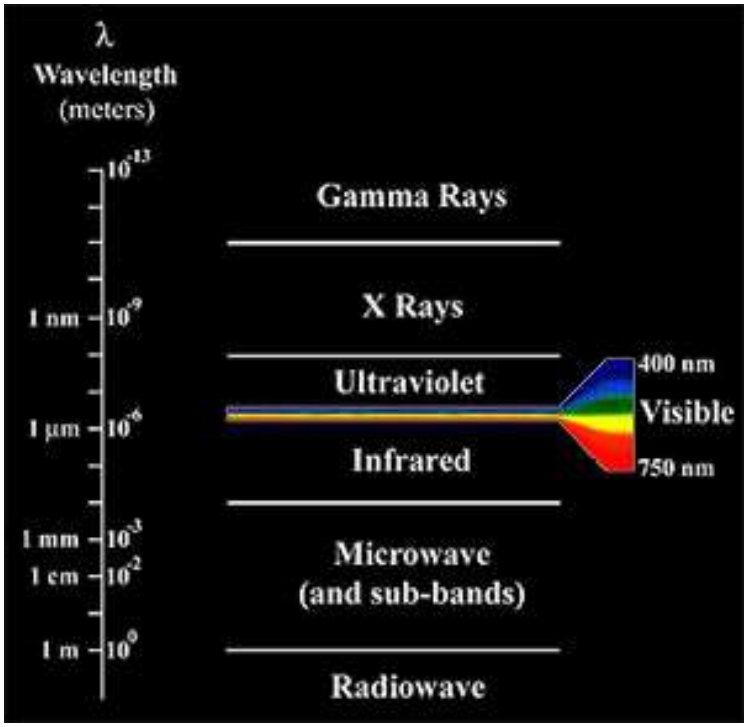
Sarah Spiekermann:

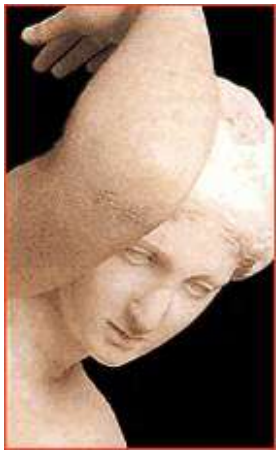
IEEE P7000
The first global standard process for addressing ethical concerns in system design

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

STAKEHOLDERS AND DIFFERENT PERSPECTIVES

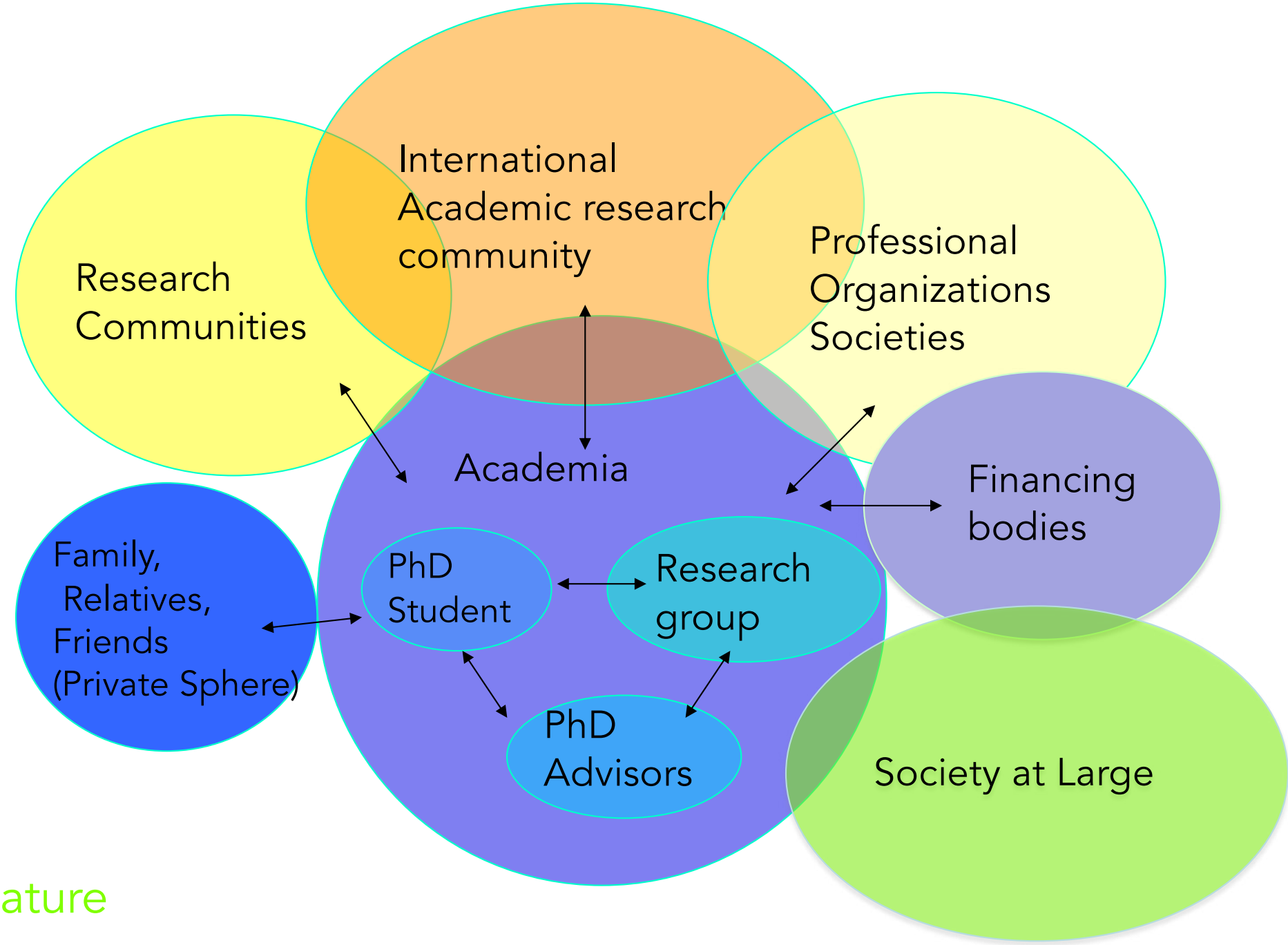
World seen in different light



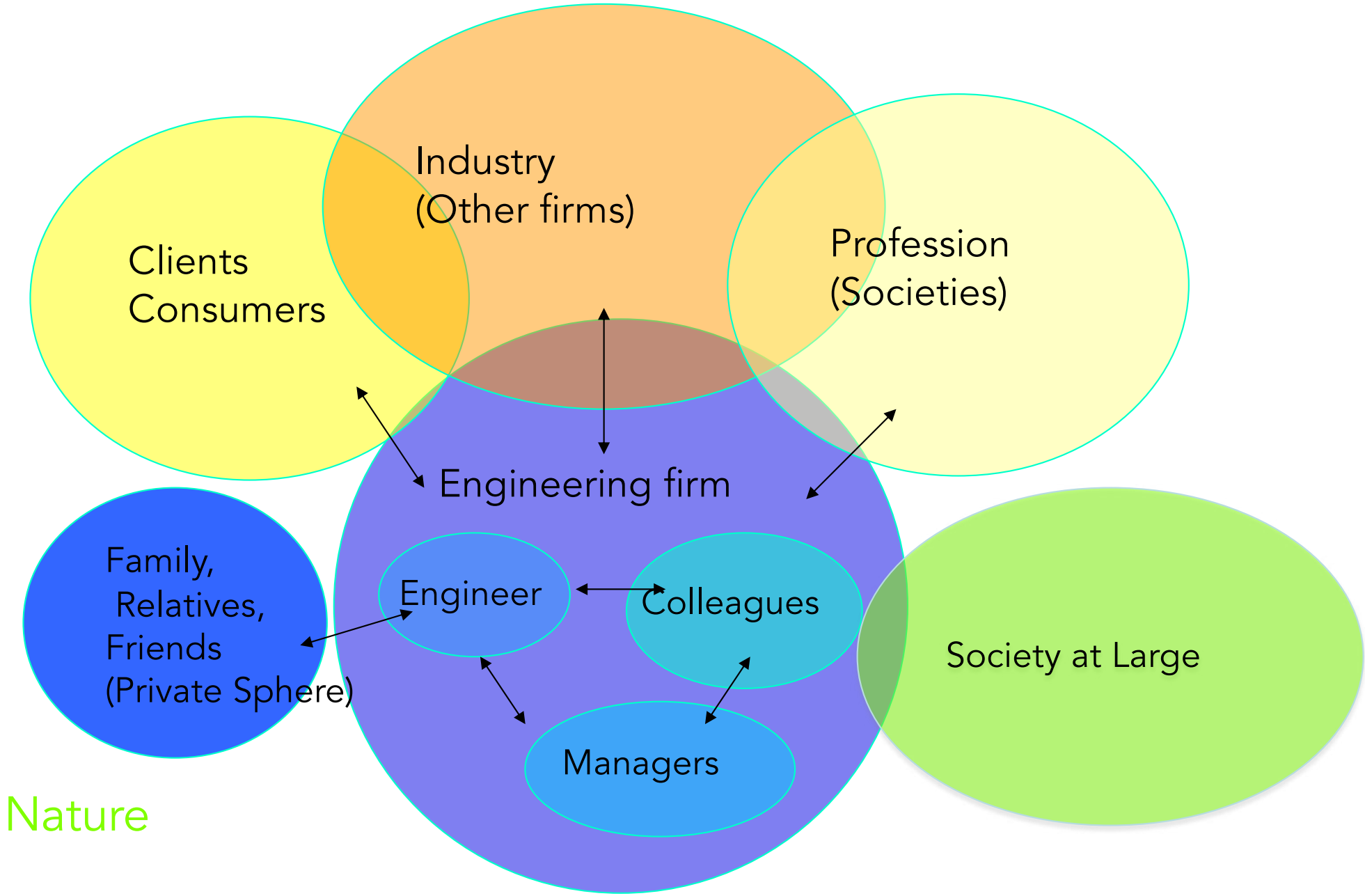


What if we could see in any wavelength of the electromagnetic spectrum, from gamma-rays to radio waves? How would the world appear to us?

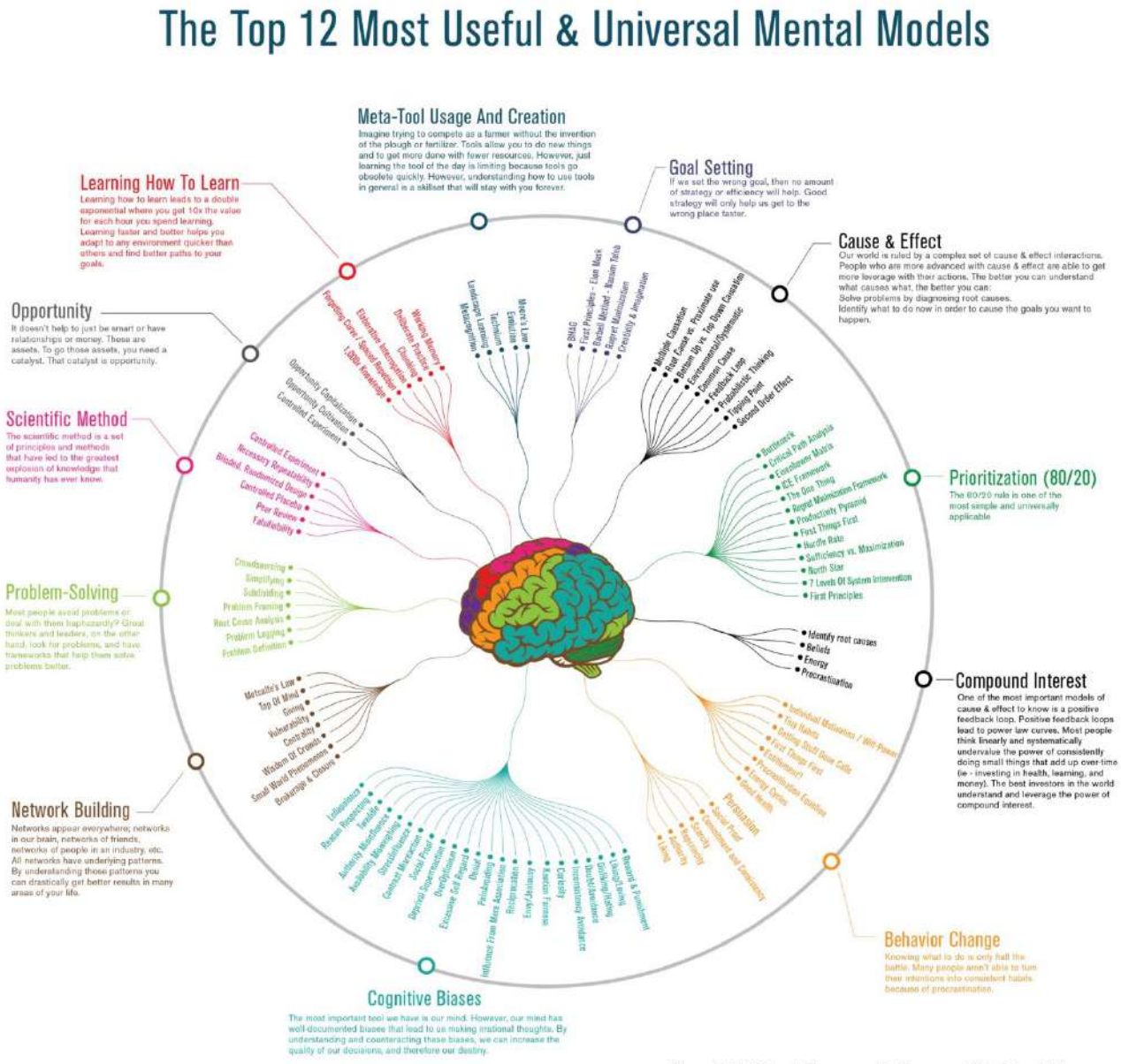
STAKEHOLDERS IN AN ACADEMIC RESEARCH PROJECT



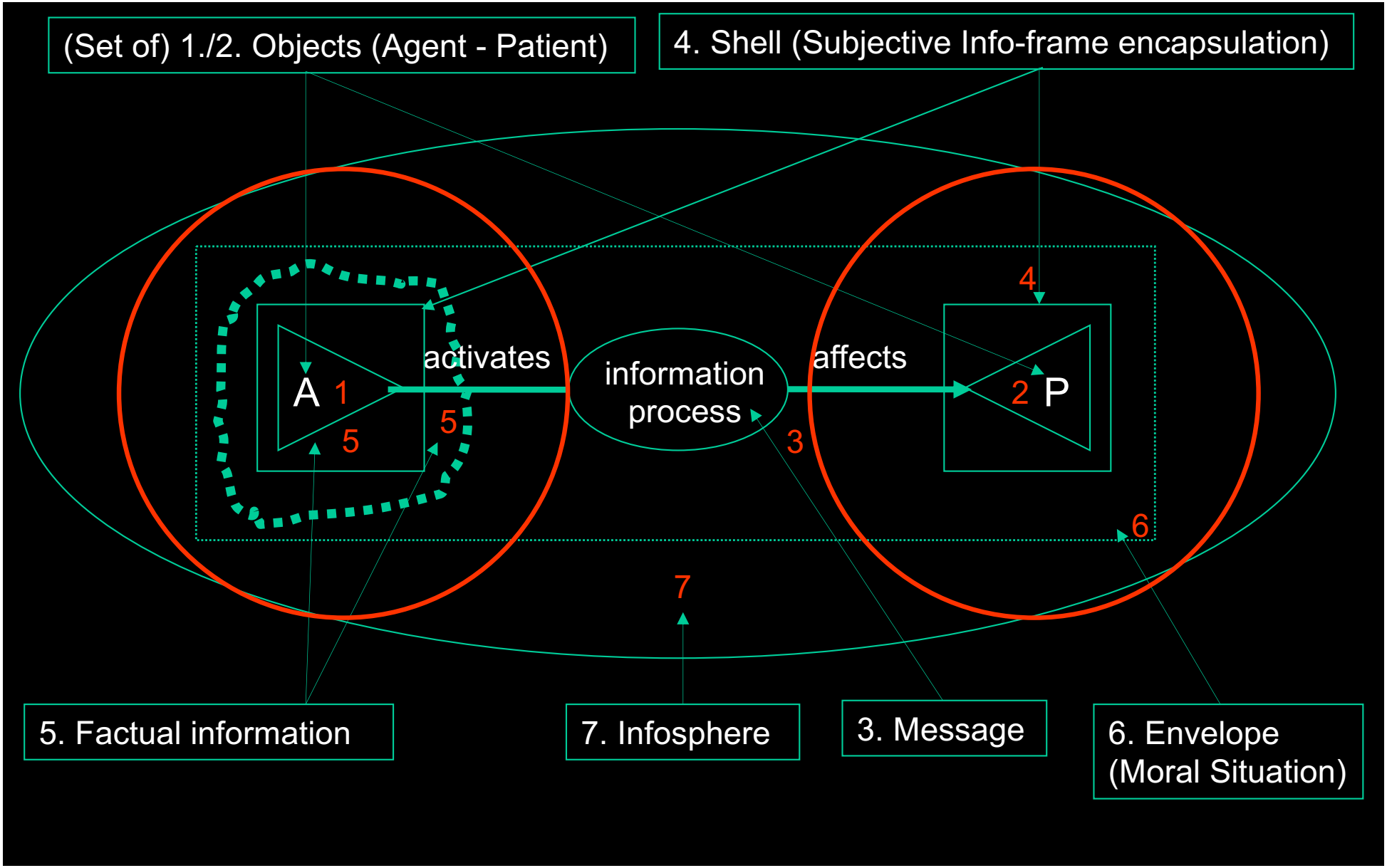
STAKEHOLDERS IN AN INDUSTRIAL RESEARCH PROJECT



HUMAN COGNITIVE BIASES

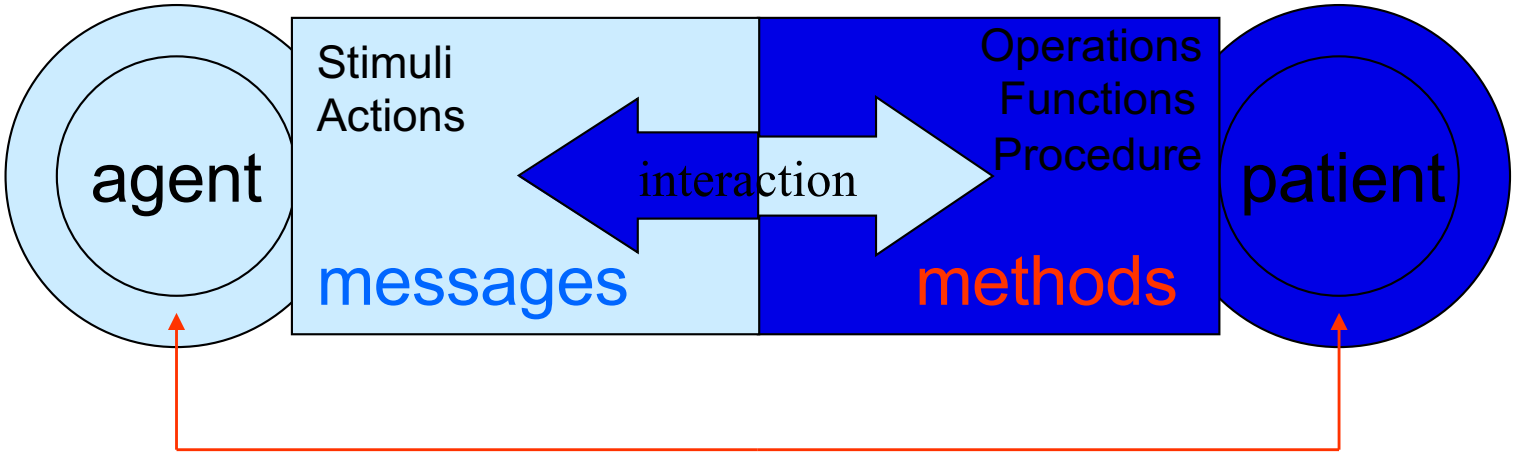


The informational model of moral action - Floridi



The informational model of moral action - Floridi

Moral action = information process



data structures constituting the nature of the entity in question (state of the object, its unique identity, and attributes)

Floridi, L. A defence of informational structural realism. Synthese 161, 219–253 (2008). https://doi.org/10.1007/s11229-007-9163-z

Floridi's informational structural realist basis for info-computational modelling of cognizing agents. Gordana Dodig-Crnkovic Journal of Experimental & Theoretical Artificial Intelligence Volume 27, 2015 - Issue 1: Inforgs and the Infosphere: Themes from Luciano Floridi's Philosophy of Artificial Intelligence

Ethical sensitivity

Why must scientists become more ethically sensitive than they used to be? **John Ziman** 1998

"Academic science" vs. "Industrial science"

Academic science basically individualistic, following Merton norms (1942) Science as free "speech community."

"The only constraint—an immensely powerful one in practice—was that the results of their research would be closely scrutinized by other members of one of the innumerable specialized research communities that partition the scientific world." [PEER REVIEW]

“Mode 1” and “Mode 2” research

Mode 1, classical academic

Mode 2, collaboration with industry and society, usually undertaken as a succession of projects, each justified in advance to a funding body whose members are usually not scientists.

Important feature of “mode-2” science is that it is largely the work of teams of scientists, often networked over several different institutions. Where, then, do the ethical responsibilities lie?

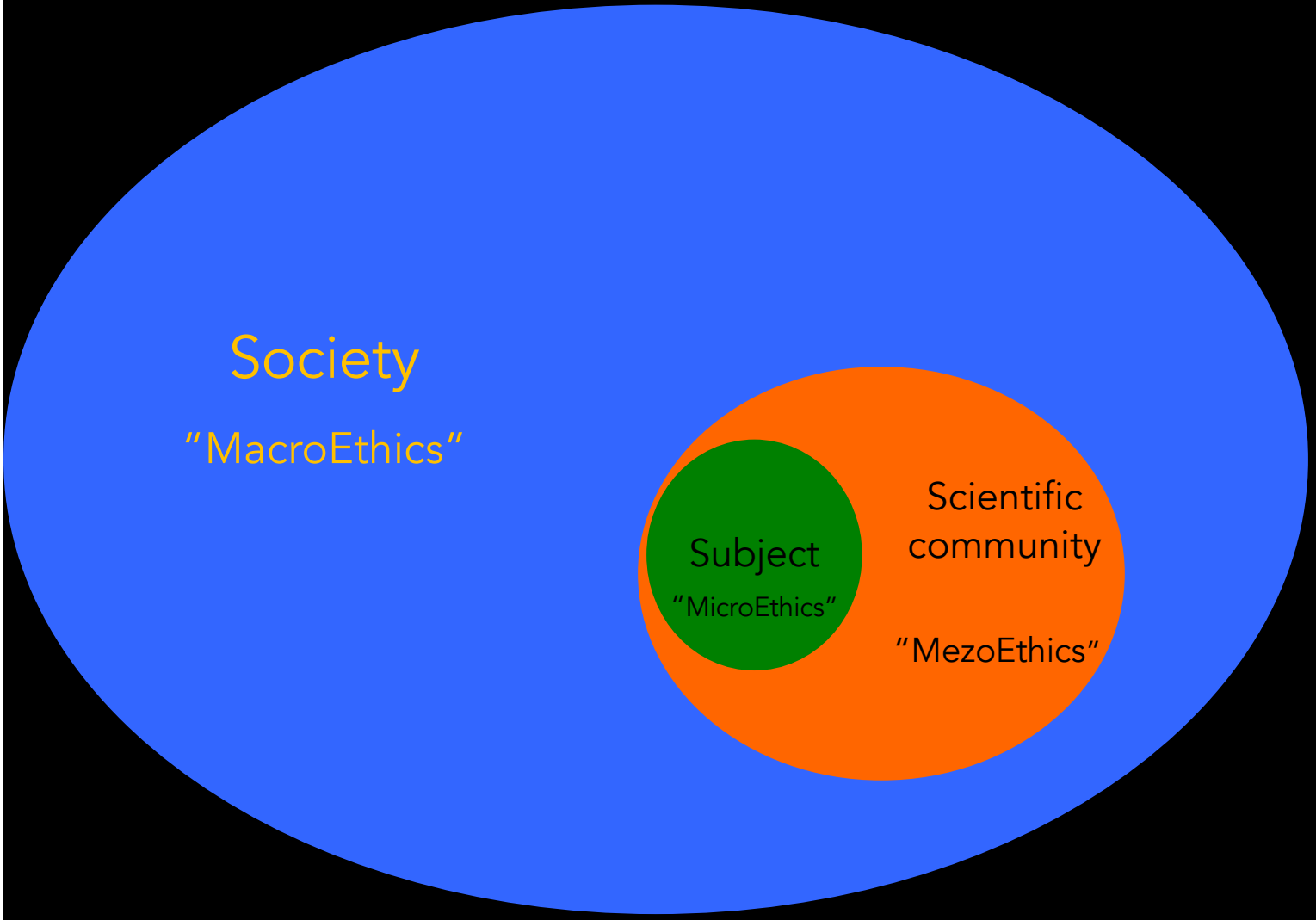
OPEN QUESTION: HOW DO WE INVOLVE ALL IMPORTANT STAKEHOLDERS AND HOW TO NEGOTIATE COMMON SOLUTIONS? (THINKING IN TERMS OF COMPLEX SOCIO-TECHNOLOGICAL NETWORKS)

ETHICS IN RESEARCH

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

Peer Review, by AJC1, Flickr.com

Domains of research ethics



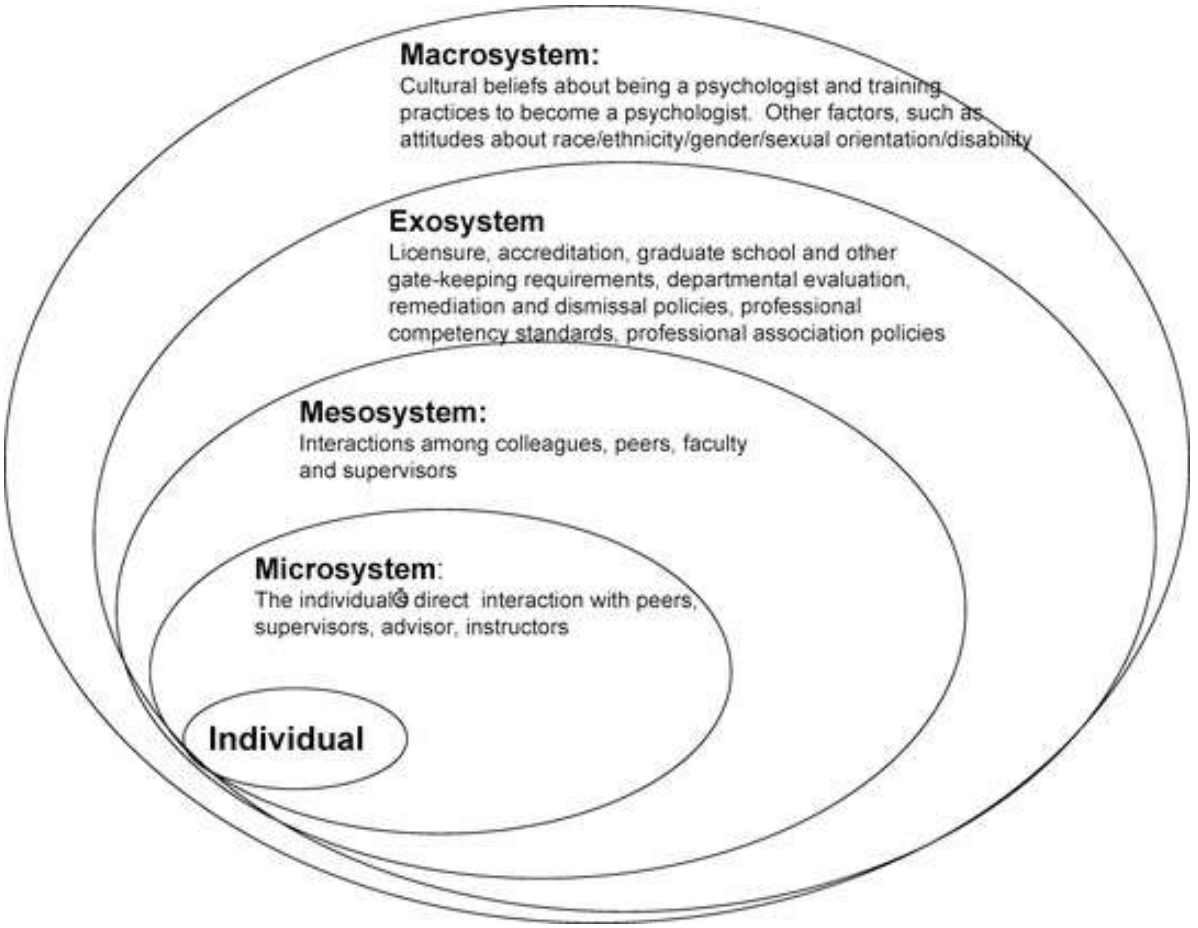
Is it true?
1. Scientific integrity

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

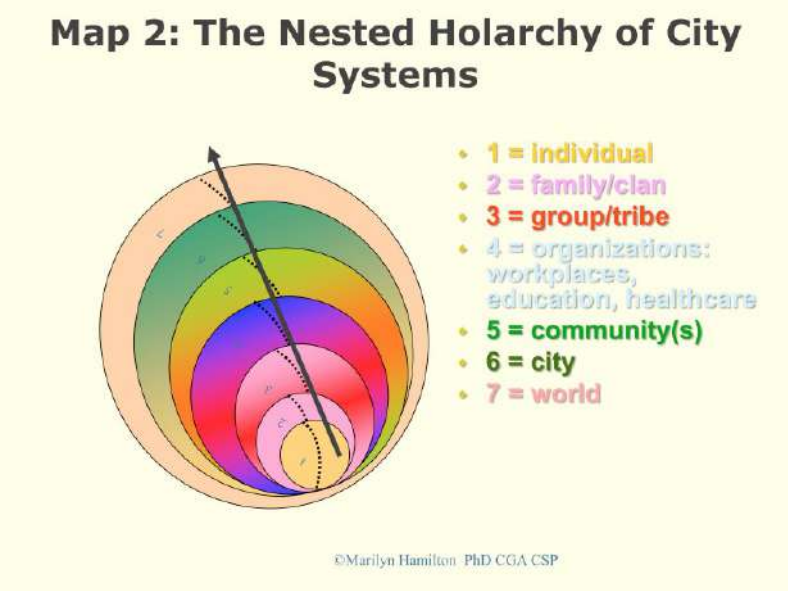
Micro – Meso – Exo – Macro Domains



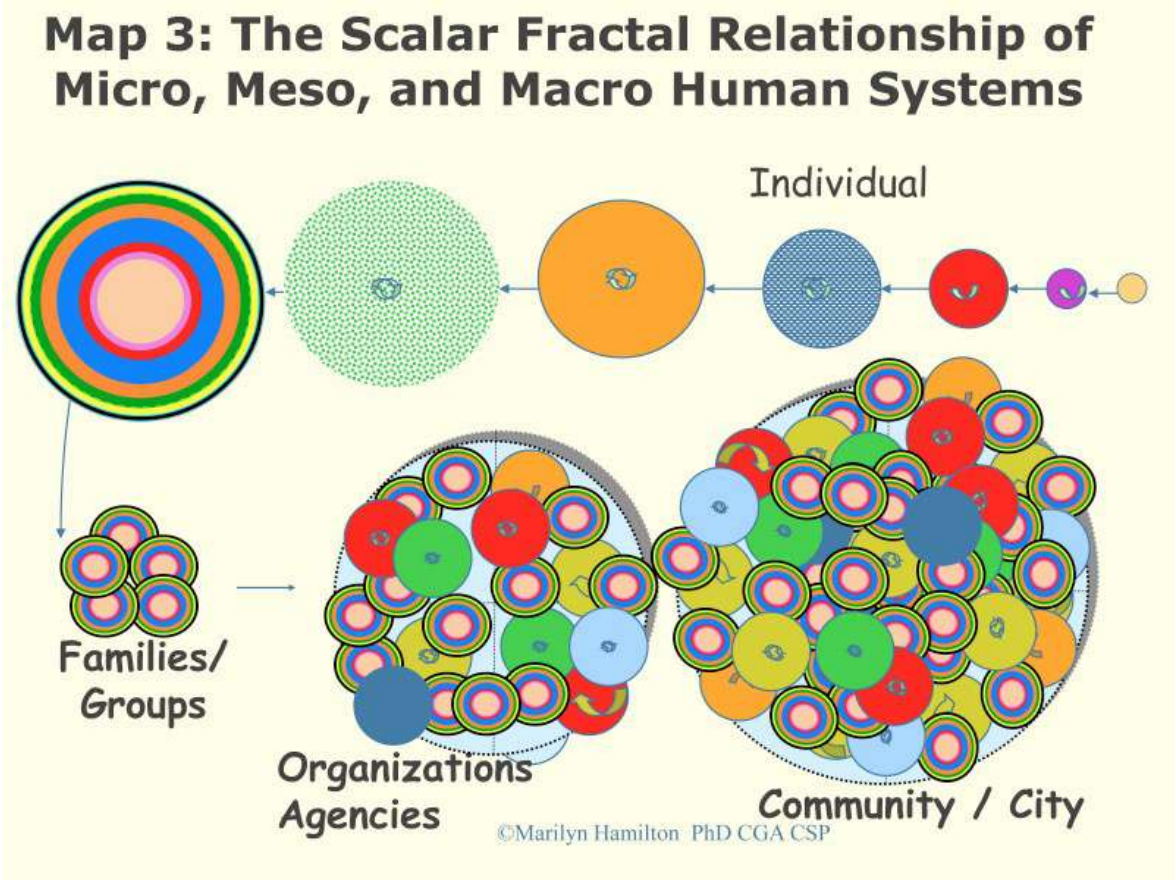
You will recognize this domain-based view in the analysis of many different types of problems – organization of society, sustainability of cities, ecology, economics, ethical aspects etc.

Source: American Psychological Association website

Complexity aspects relating Micro – Meso – Exo – Macro levels of analysis – example of city



A holarchy, in the terminology of Arthur Koestler, is a connection between holons, where a holon is both a part and a whole. The term was coined in Koestler's 1967 book The Ghost in the Machine.



http://www.newsociety.com/Books/I/Integral-City

EXAMPLE OF DOCUMENTS ADDRESSING ETHICAL CONSIDERATIONS

Future Intelligent Autonomous Systems

The IEEE Global Initiative for Ethical Considerations in Artificial Intelligence and Autonomous Systems

http://standards.ieee.org/develop/indconn/ec/autonomous_systems.html

Prioritizing human well being in the age of artificial intelligence: https://youtu.be/z5yZU8tp9W8 (5:56)

EXAMPLE OF DOCUMENTS ADDRESSING ETHICAL CONSIDERATIONS

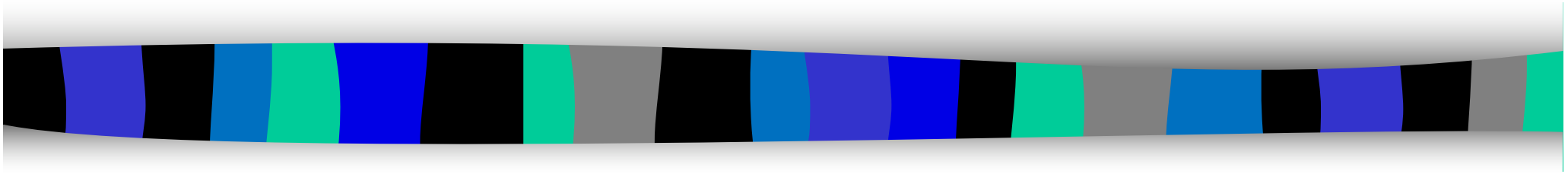
The European Science Foundations Code of Conduct for Research Integrity
https://ec.europa.eu/research/participants/data/ref/h2020/other/hi/h2020-ethics_code-of-conduct_en.pdf

PROFESSIONAL ETHICS COURSE AT MÄLARDALEN UNIVERSITY SWEDEN

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 , 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

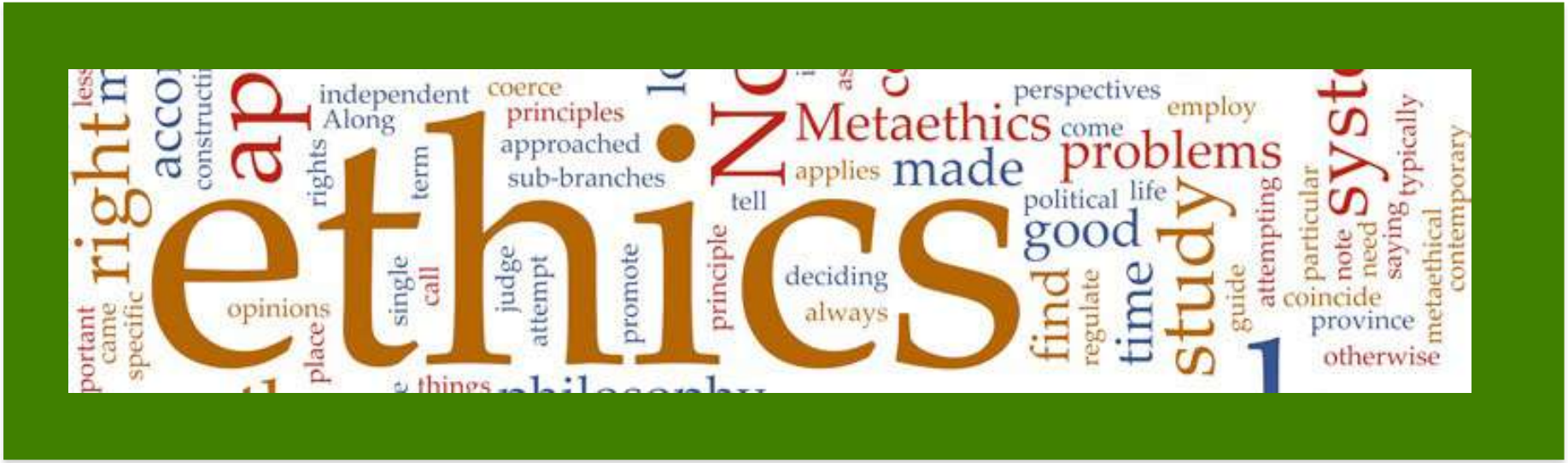
13 Nov L4		The Ethics of Consequences: Utilitarianism The Ethics of Rights The Ethics of Justice
17 Nov L5		The Ethics of Character The Ethics and Gender
20 Nov L6/E1	 Beehives	PROFESSIONAL AND ETHICAL RESPONSIBILITIES Codes of Ethics. Whistle Blowing In-class activity: CASE STUDIES (Jessica, Karin,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

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

RESEARCH ETHICS & SUSTAINABLE DEVELOPMENT

CHALMERS UNIVERSITY OF TECHNOLOGY
SWEDEN

Chalmers University of Technology & University of Gothenburg



Research Ethics & Sustainable Development

3.0 ECTS

GFOK025

Day 1 Part 1 – Course Introduction

Gordana Dodig-Crnkovic

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:

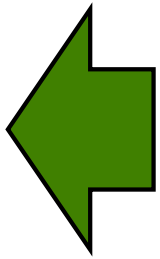
1. Attendance and preparation for the in-class discussions.
2. Writing an essay describing ethical and sustainability aspects of the PhD research project (or equivalent) of the participant. It is based on the interviews with at least two stakeholders.
3. Participation in a peer review seminar in which 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)

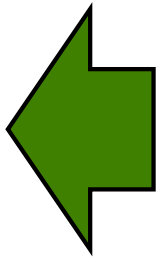


Assignment and readings

Day 2

Science and Society

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

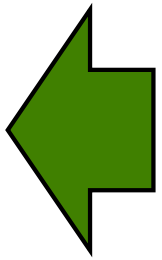


Assignment and readings

Course Overview

Day 3

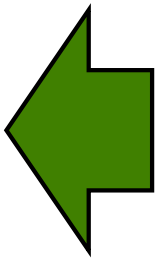
Peer Review Meeting
for SD-RE Essays
(Class in Review Groups)



Essay
SD-RE

Day 4

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



Preparation for
the Mini-
conference

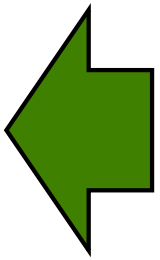
Course Overview

Day 5

Mini-conference

(Class, Gordana)

1 2 3 4 I 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


Previous editions course responsible:
Elisabeth Saalman
Tom Adawi

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

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/