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Ethics of Science and Technology

IDEA League

TU Delft
ETH Zurich
RWTH Aachen
Chalmers
Politecnico di Milano

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Ethics of Science and Technology

This doctoral school is focused on developing critical awareness about the values that are embedded in science and technology throughout the lifecycle from design to development, and management, control, production, adoption and use.

Summary

PhD students of the IDEA League partner universities need to develop critical awareness about the values that are embedded in science and technology throughout the lifecycle from design to development, and management, control, production, adoption and use.
This doctoral school aims to address this need thereby filling a gap in their education. The school is organized around 3 main themes: responsibility, values and governance. Each theme is the focus of one of the 3 weeks of which the school is composed. These themes are articulated under different disciplinary and methodological perspectives. To ensure that students acquire transferrable skills during the doctoral school, they are required to produce a team essay that could eventually lead to a scientific publication.

Motivation and learning objectives

PhD students of the IDEA League partner universities have an excellent technical preparation, but are generally unaware that scientific knowledge and technology not only shape the way its users live and act in the world, but also depend on specific visions about how they should live in it, about how the world should look like, and about how humans should relate to one another. Therefore, decisions to tackle a scientific problem or to develop, design, manage, control, produce and finally deploy a technology incorporate profound ethical assumptions and possess deep ethical implications. This course aims to raise participants' critical awareness of such ethical aspects of science and technology. After having completed this doctoral school students should:

- be acquainted with established ethical norms and concepts;
- be able to identify ethical issues in their domain of research;
- develop the ability to argue about ethical issues in science and technology drawing on specialized literature and ethical frameworks;
- learn about challenges, opportunities and criticalities of addressing ethical issues through design.

Background

This proposal is one of the outputs of an already established working group (Ethics Working Group) within the IDEA League framework. The group was formed in November 2017 as a bottom-up initiative around the theme of 'ethics in education and research in IDEA League universities'. The group had a number of Skype meetings, mostly revolved around ethics in education and, then, a first in-person

meeting in November 2018 at Politecnico di Milano. Amongst the decisions taken during this first meeting, the proposal of a Doctoral School on the Ethics of Science and Technology was considered a priority. The members of the Ethics Working Group agreed on the importance to raise the awareness of IDEA League doctoral and master students on the ethical and social issues of science and technology.

Scientific Board
Members of the Scientific Board are: Alessandro Blasimme (ETH Zurich), Karl de Fine Licht (Chalmers University of Technology), Saskia Nagel (RWTH Aachen) , Viola Schiaffonati (Politecnico di Milano), Behnam Taebi (TU Delft) , Leslie Zachariah (Secretary General of IDEA League).

Organization

The doctoral school is organized around 3 main themes: responsibility, values and governance. Each theme is the focus of one of the 3 long weekends of which the school is composed. These themes are articulated under different disciplinary and methodological perspectives.
All 5 IDEA League partners are actively involved as it is evident from both the composition of the Scientific Board and the variety of lecturers. The first two modules will definately be held online (the second module in hybrid form in Delft if possible). The third module will take place in Milan (if the Covid-situtation allows it) and online.

Each week is supervised by 2 coordinators (a local one + one from another IDEA League partner). Each week features lecturers from at least 3 partners (the local organizer + two other partners). Each week consists of 3 full days and 2 half days (when held on campus, 4 nights of accommodation needed for each participant).

Learning activities include lectures, case study discussions, exercises and group work. Reading material will be provided in advance to participants to facilitate learning and engagement during the doctoral school. Each day features no more than 2 lectures. Morning lectures are followed by case-study discussions and exercises connected to the lecture. Afternoon sessions start with group work (not necessarily connected to the daily lecture) and continue with a lecture followed by a general discussion.

Programme

In principle, the morning session lecturers also organize an interactive exercise session, while the afternoon session lecturers only bring a presentation and supervise the general discussion. There will be a remarkable attention for the group work, in which participants will be incentivized to critically think about their own field of research, while engaging with the relevant literature, partially recommended by the lecturers and coordinators, and partially looked up by the participants themselves. The aim of these exercises is that participants could get acquainted with the scholarship in the area of the course, which could benefit their future work. The week coordinators are in charge of the group work.

RWTH AACHEN UNIVERSITY   **(online)**

Module 1, Responsibility
22 April 2021 - 24 April 2021
Coordinators: Saskia Nagel (Aachen), Behnam Taebi (Delft)

TU Delft   **(online)**

Module 2, Values
26 May 2021 - 29 May 2021
Coordinators: Behnam Taebi and Rocky Clancy (Delft), Viola Schiaffonati (Milano)
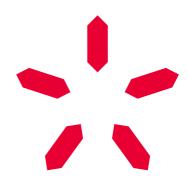
POLITECNICO MILANO 1863   **(hybrid)**

Module 3, Governance
23 June - 27 June 2021
Coordinators: Viola Schiaffonati (Milano), Alessandro Blasimme (Zurich)

Module 1

09.30-10.30: **How does Ethics matter? Introduction to Ethics and Technology. An Ethics Upfront Approach. Introduction to Normative Theories and Responsibility (Saskia Nagel, Behnam Taebi)**

11.00-12.30: PhD Students' self-introduction

12.30-13.30: Lunch

13.30-14.30: How to render your research societally relevant – learnings from transdisciplinary research (Michael Stauffacher)

15.00-16.00: Exercises (Michael Stauffacher)

09.30-10.30: **Animal Ethics, Scientific Integrity (Dominik Groß)**

11.00-12.30: **Group Work on Projects – Introduction and first steps (Behnam Taebi and support team)**

12.30-13.30: Lunch

13.30-14.30: **Social Construction of Science and Technology (Paolo Volontè, Stefano Crabu)**

15.00-16.00: **Exercises (Paolo Volontè, Stefano Crabu)**

09.30-10.30: **Moral argumentation under risk and uncertainty (Daniele Chiffi)**

11.00-12.00: **Exercises (Daniele Chiffi)**

12.00-13.00: Lunch

13.00-15.00: **Group Work on project and project update from students**

15.00-16.00: **Next steps to Delft. Farewell (Saskia Nagel, Behnam Taebi)**

Lecture: How does Ethics matter? Introduction to Ethics and Technology. An Ethics Upfront Approach. Introduction to Normative Theories and Responsibility
In this session, we will focus on three aspects: First, we discuss why ethics matter in engineering and what ethical questions could rise in engineering practices. Second, we will review several persistent biases about ethics, engineering and engineering ethics and discuss the consequences for practices. Finally, we will focus on how ethics matters in engineering, and how it is an essential part of engineering, distinguishing between the two approaches of 'ethics and the individual engineer', and 'ethics and the practice of engineering'.

Lecture: How to render your research societally relevant – learnings from transdisciplinary research

There is an increasing need for researchers to demonstrate the practical value of their research for society. I will walk through a 10-step approach to better link research to societal problem solving. The ten questions will guide reflections and discussions around research issues, the societal problems addressed, relevant actors and disciplines, and the purpose and form of the interaction with them.

Lecture: Animal Ethics, Scientific integrity

This lecture will point our different aspects of Research ethics – namely Animal Research Ethics (with a special focus on the 3Rprinciple), Clinical Ethics (with a focus on the difference between ethics commission and ethics committee) and Ethics in Science/ Scientific Integrity (including the topics good scientific practice, scientific fraud and plagiarism). It will provide insights into the fundamental issues of these sub-disciplines.

Lecture: Social construction of science and technology

Science and technology do not follow a linear and rational mode of operation, i.e. neutral with respect to values, interests and political positions. This lecture will discuss the social and cultural processes that enable the production of scientific knowledge and technologies. Building on recent work in science and technology studies, we will offer a comprehensive understanding of how scientific knowledge and technologies permeate culture and politics of contemporary societies, and are embedded in social practices, institutions, norms and discourses.

Lecture : Moral argumentation under risk and uncertainty

This lecture will focus on the analysis of different practices of moral argumentation under risk and uncertainty. Starting from specific examples of moral argumentation in science and technology, we will investigate how deductive, inductive and abductive forms of reasoning may cope with risk and uncertainty management. Then, we will explore how fallacies of risk and uncertainty may affect moral argumentation. Finally, we will provide some guidance in framing scientific and technological information for responsible risk and uncertainty communication. Some interactive activities will conclude the lecture.

Module 2

Wednesday - 26 May

15.00-16.00: Introduction and self-presentation (Ibo van de Poel)

Thursday - 27 May

09.30-10.30: AI and responsibility (de Fine Licht)

11.00-12.00: Exercises on AI and responsibility (de Fine Licht)

12.00-13.30: Lunch

13.30-14.30: **Group work**

15.00-16.00: AI and Human Meaningful Control (Filippo Santoni de Sio)

Friday - 28 May

09.30-10.30: Technology, Well-Being, and Disability (Janna Van Grunsven)

11.00-12.00: Exercises on Technology, Well-Being, and Disability (Janna Van Grunsven)

12.00-13.30: Lunch

13.30-14.30: Brain Engineering? Human Enhancement – promises and perils (Saskia Nagel)

15.00-16.00: **Group work supervision**

Saturday - 29 May

09.30-10.30: RRI: co-responsibility – or no responsibility? (Stefan Böschen)

11.00-12.00: Exercise RRI: co-responsibility – or no responsibility? (Stefan Böschen)

12.00-13.00: Lunch

13.30-15.00: **Group work supervision**

15.00-16.00: **Projects development reports**

16.00-16.30: **Next steps to Milano. Farewell (Rocky Clancy, Viola Schiaffonati, Behnam Taebi)**

Lecture: Introduction and self-presentation: Design for Values
A key insight from philosophy of technology is that technological artifacts and sociotechnical systems are not value neutral, but support or inhibit certain values. Several philosophical accounts for understanding the embedding of values in technological artifacts have been proposed and approaches like Value Sensitive Design, Design for Values and Responsible Innovation have been established for integrating values into technical design. This session will discuss some of these accounts and will focus on some of the theoretical and methodological challenges of designing new technology for values.

Lecture: AI and Responsibility
In the discussion about artificial intelligence (AI) and its applications "responsibility" is one of the key notions where there are questions about who is responsible for what, on what grounds, what should follow from irresponsible behavior, and what it constitutes to be a responsible programmer, just to mention a few examples. These question ties into what it constitutes to have meaningful control over AI (see Lecture 3) as well as that of responsible innovation (see Lecture 6) but also the goals of developing AI in the first place (see for instance Lecture 4 and 5). In this lecture some of the most well-known- and controversial cases when it comes to the development and applications of AI will be discussed, and from these discussions we will arrive at a framework for thinking about responsibility and AI in a more systematic and nuanced way. This framework will then in part be developed later on in the course.

Lecture: AI and Human Meaningful Control
The past few years have seen a dramatic increase in the academic and public debate on the ethics of AI. The EU and many other agencies have sponsored several initiatives to draft general principles and guidelines for an ethical design and use of AI systems. One specific concern with the development of new generation AI systems based on machine learning and the like is that about human control and responsibility. How to design AI systems in such a way that their designers/users/controllers may be reasonably confident that the systems will not display unwanted, unpredictable behaviour; and how to consistently maintain human responsibility for AI behaviour?
In this lecture the concept of "meaningful human control" over AI system will be presented and discussed, with reference to case studies, including automated driving systems.

Lecture: Technology, Well-being and disability
The World Health Organization (WHO) defines health technology as "the application of organized knowledge and skills in the form of devices, medicines, vaccines, procedures and systems developed to solve a health problem and improve quality of lives." Improving quality of life with health technology is, however, not only a technical but also an ethical endeavor, but how can those working in the field of clinical technology and biomedical engineering know that the technologies they develop do in fact meet the aim of improving quality of lives? By looking at a number of concrete cases and different ethical theories, this lecture aims to offer a perspective on the ethical issues associated with health technologies, while addressing challenging questions that could arise from this perspective.

Lecture: Brain engineering? Human Enhancement – promises and perils
This lecture will introduce the concept of Human Enhancement, with a focus on the potential of a variety of neurotechnologies, and analyse its ethical implications. The course will provide insights on the ongoing ethical debate and in interaction with participants will discuss key moral values,

thereby exemplifying moral deliberation on emerging technologies that have a strong impact on human self-understanding.

Lecture: RRI: co-responsibility – or no-responsibility?
RRI (Responsible Research and Innovation) is one key guiding principle in the European innovation arena. The lecture and its related interactive formats is focusing on the question of how forms of responsibility are formatted with and through using this principle in different innovation activities.

Module 3

Wednesday - 23 June

15.00-16.00: Introduction and self-presentation (Paolo Volonté, Stefano Crabu)

Thursday - 24 June

09.30-10.30: Ethics of risk: How the Fukushima accidents fell through the cracks of risk assessments (Behnam Taebi)

11.00-12.00: Exercises on ethics of risk (BehnamTaebi)

12.00-13.30: Lunch

13.30-14.30: **Group work**

15.00-16.00: **Group work**

Friday - 25 June

09.30-10.30: Science, technology, and public policy (Alessandro Blasimme)

11.00-12.00: Exercises on science, technology, and public policy (Alessandro Blasimme)

12.00-13.30: Lunch

13.30-14.30: Technology assessment (Stefan Böschen)

15.00-16.00: Group work supervision

Saturday - 26 June

09.30-10.30: Gender perspectives/RRI (Carmen Leicht)

11.00-12.00: The intricacies of uncertainty (Giovanni Valente)

12.00-13.30: Lunch

13.30-14.30: **Group work**

15.00-16.00: **Group work supervision**

Sunday - 27 June

09.30-12.00: **Final projects development reports (students)**

Lecture: Introduction and self-presentation: Governance of scientific and technological innovations
This lecture will offer a comprehensive overview to the different models and practices of governance and assessment of scientific and technological innovations, with a special attention on those that imply complex and widespread collaboration among policymakers, lay people, scientists and private actors. We will focus on the multiple expertise, heterogeneous subjects and multifaceted practices involved in the management and assessment of science and technology.

Lecture: Ethics of risk: How the Fukushima accidents fell through the cracks of risk assessments

Assessments are an essential part of the engineering practice. More specifically, the ability to assess technological risks is crucial for our understanding of risk and reducing the likelihood of future risks. In this session, we will systematically review the nuclear accident of the Fukushima Daiichi, focusing on how the accident fell through the cracks of risk assessments. We will further discuss several limitations of assessments, specifically reviewing important societal and ethical aspects of risks.

Lecture: Science, technology, and public policy

This lecture and its associated interactive activities will revolve around the complex relationship between science and policy-making. Through a series of selected case studies, and drawing on established scholarship in science policy, we will discuss the role of knowledge in policy formation, we will illustrate the role of public policy in regulating scientific research and technological innovation, and we will discuss the prospects for democratic deliberation around the governance of science and technology.

Lecture: Technology Assessment

This lecture and its associated interactive activities is focusing on the history of Technology Assessment (TA), its key characteristic as problem-oriented research and the problems relating to its form of expertise for public problem-solving and decision-making. Finally, perspectives of the future development of TA, e.g. the relevance of future knowledge or perspectives of a "Global TA" are presented.

Lecture: Gender perspective/RRI

The lecture will focus on politics and gender formulated as key dimensions in RRI. Based on actual European data the lecture will discuss why and how gender equality is relevant in RRI on structural and organizational level and will discuss different strategies and concepts.

Lecture: The intricacies of uncertainty

Uncertainty is an essential component of scientific reasoning. Indeed, even the models that we successfully employ in technological applications do not provide an exact representation of the world. Rather, due to the great complexity of the phenomena under investigation, they tend to distort reality and as such they are intrinsically uncertain. This lecture aims to discuss different strategies for dealing with uncertainty, both in terms of how it arises in scientific practice and in terms of how it is treated in decision-making processes at the public policy level.

Assessment

To ensure that students acquire transferrable skills during the doctoral school, they are required to produce a preparatory work in view of a scientific publication. At the beginning of the doctoral school students are assigned to groups according to thematic relevance. These groups select a case study to be critically discussed, preferably related to the work of one or a few participants. The week coordinators are in charge of the groups work, particularly helping the groups in narrowing down the focus of their academic endeavor by engaging with the literature. At the end of the 3 weeks each group is supposed to deliver the preparatory work for an envisioned publication according to a template provided by the instructors and including: a tentative title, short description of the selected case study; the research question; state of the art/key literature; methodology; ethical relevance; target journals; a short outline with the envisaged results.

After the conclusion of the doctoral school, the instructors of the doctoral school will guarantee their support to the groups that will decide to fully develop the proposal into a publication to be submitted. This model has proven to be successful in earlier courses organized for PhD students of universities of technology.

Continuatiton

The possibility of having support from instructors for the development of a full publication after the conclusion of the doctoral school is a way to promote the continuation of the network established during the doctoral school, throughout different IDEA partners. In particular, this is a way to strengthen the network between instructors and students, given that the network between the academic partners is already quite strong for the presence of a well-established Ethics Working Group within the IDEA League activities.

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