Dissertation Preparation
Mestrado em Engenharia Informática
Lecture 06
Ethics in Research

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Overview

- T1: Introduction
- T2: Notable events
- T3: Deepening ethics in research
- T4: Cases of ethical decision making

T1: Introduction

T1: Ethics

- "Standards of conduct (or behaviour) that distinguish between right/wrong, good/bad, etc." [1].
- The study of standards of conduct.

T1: Applied ethics

- The study of ethics in specific situations, professions, or institutions, e.g. medical ethics, research ethics, etc.

- In the PREPD course, we have two main topics:
  - research ethics (**this lecture**), and
  - engineering ethics (to be seen in week 13)

From [1].

T1: Research ethics

- "ethics underpins **all phases of research**, from when the idea for a project is conceived, all the way through its design and implementation, and on to how its findings are disseminated and put into practice in individual decisions or in policy" [7]

T2: Notable events

T2: Markable events

Many events marked the vision of ethics in research, namely in these areas:

- Data integrity and research misconduct
- Authorship, credit and peer review
- Ethics of new and dual-use technology
- Human subjects protection

T2: Data integrity and research misconduct

Fabrication, falsification or plagiarism [9]:

- **1830**: Mathematician Charles Babbage, often called the "father of the computer", wrote about dishonest data practices, including "fabricating, cooking, trimming, and fudging data".

- **1909**: Physicist Robert Millikan omitted 33 unfavourable observations from his Nobel Prize-winning oil drop experiments.

T2: Data integrity and research misconduct (2)

Cases of data fabrication that led to retracted papers [9]:

- **1974**: William Summerlin admitted to fabricating data by using a marker to make black spots on white mice.
- **2002**: Jan Hendrick Schön, a star in physics, was found to have fabricated and falsified data in dozens of papers. Many of his papers were retracted.
- **2014**: Haruko Obokata was found to have fabricated/falsified data in high-profile stem cell papers, which were retracted.

- 'Manipulated' stem-cell paper faces retraction
- Retraction note: Pluripotency of mesenchymal stem cells derived from adult marrow

T2: Data integrity and research misconduct (3)

- **Reproducibility [9]:**
  - **1989**: "Cold fusion" announcement by Pons and Fleischmann collapsed when dozens of labs could not reproduce their results.
  - **2013**: The NIH launched an initiative to promote rigour, transparency, and reproducibility in research.
- **Whistleblowing and (no) consequences [9]:**
  - **1986**: Engineer Roger Boisjoly warned NASA about O-ring data, predicting failure in the cold weather for the Space Shuttle Challenger launch. His warnings were ignored, and the shuttle exploded.

Authorship and Credit [9]:

- **1909**: Robert Millikan did not name his student, Harvey Fletcher, as an author, despite Fletcher's important contributions to the oil drop experiments.
- **1953**: James Watson and Francis Crick used Rosalind Franklin's "Photo 51" to verify their DNA model without her permission.
- **1997**: The ICMJE established guidelines that authorship must be based on substantial contributions to the research design, data collection/analysis, and writing/revising the paper.

T2: Authorship, credit and peer review (2)

Peer Review Failures [9]:

- Hoaxes **(1996)**: Physicist Alan Sokal submitted a paper filled with nonsense to a cultural studies journal to test its rigour. It was accepted and published.
- Predatory Journals **(2010)**: Jeffrey Beale published a list of "predatory journals," which charge high fees for publication but provide poor or nonexistent peer review.
- Rushing Publication **(2020)**: During the COVID-19 pandemic, a rush to publish led to the dissemination of invalid results and multiple retractions, such as those involving the company Surgisphere.

T2: Ethics of new and dual-use technology

- Scientist-Led Governance **(1973-1975)**: Scientists met to discuss the risks of new recombinant DNA technology and establish biosafety protocols.
- Dual-Use Research**(2014)**: Research that can be used for both good and harm. Concerns over bioterrorism and gain of function research highlight the dilemma of publishing information that could be misused.
- Generative AI **(2024)**: The use of generative AI in research has raised new ethical issues concerning accountability, rigour, reproducibility, honesty, and credit allocation.

Adapted rom [9]

T2: Human subjects protection

- Nuremberg Code **(1947)**: The first international code for research ethics. It requires that **voluntary consent** from human subjects is essential.
- Oversight **(1973)**: The National Research Act, passed after the Tuskegee Study, authorised federal agencies to develop human research regulations.
  - This requires institutions to form **Institutional Review Boards (IRBs)** to review and oversee all research with human subjects.
- The Common Rule **(1991)**: This is the basic federal regulatory framework that U.S. government agencies accept for protecting human subjects in research.

Adapted rom [9]

T3: Deepening ethics in research

T3: Ethics = law ?

Most societies also have legal rules that govern behaviour, but **ethical norms tend to be broader and more informal than laws**. Although most societies use laws to enforce widely accepted moral standards, and ethical and legal rules use similar concepts, ethics and law are not the same. An action may be legal but unethical or illegal but ethical.

From [8].

Ethics Versus the Law: The Case of the Belfast Project

- Project Belfast: keeping records of all sides of the conflict in Northern Ireland in the late 20th century with a **written guarantee**, subsequently not retained for legal reasons, **that the testimonies would be kept safe for the participant's lifetime**
- "there is even uncertainty about whether research institutions will keep their promises when facing external pressure"
- "it is not possible to fully inform someone about the risks they would be taking if they participate in research"

From [5].

More details in https://www.bbc.com/news/uk-northern-ireland-27238797.

T3: Ethics in Project/Thesis/Dissertation/Internship works

The Code of Good Practices and Conduct of P.Porto [3] addresses some aspects in specific articles, namely:

- Article 6th: Duties of Students (point *n*)
- Article 8th: Declaration of Commitment
- Article 10th: Best practices in research activities

T3: Ethics in Project/Thesis/Dissertation/Internship works (2)

"As pessoas que desenvolvam investigação devem ainda:

- Assegurar os mais elevados padrões éticos e legais em todas as atividades de investigação, nomeadamente quando inclua a **participação de seres humanos ou animais, a colheita e processamento de dados pessoais sensíveis, a utilização de células/tecidos de origem humana, os sistemas suscetíveis de operação autónoma, em particular quando envolva o uso de inteligência artificial, ou comunidades/pessoas desfavorecidas**;

- Submeter as atividades de investigação, referidas na alínea anterior, a apreciação por comissão de ética com competências na área específica, conforme imposição legal;"

From [3].

T3: Ethics in Project/Thesis/Dissertation/Internship works (3)

- From previous slide: "Submeter as atividades de investigação, referidas na alínea anterior, a **apreciação por comissão de ética com competências na área específica**, conforme imposição legal"

- Some works might require approval from an ethics review body. Example: Ethics Committee of the Superior School of Health of P.PORTO for clinical research

From [3].

T3: Ethics in Project/Thesis/Dissertation/Internship works (4)

Transparency, and reproducibility:

- Final undergraduate work
- Final master's degree work

T3: Research integrity

- Deal fairly with others
- Be honest about the methods and results
- Allow replicating the results wherever possible
- Protect the welfare of research subjects
- ...

From [2].

T3: The bias problem in scientific research

- Bias in scientific research refers to systematic errors or deviations that occur due to the influence of factors other than the phenomenon under investigation.
- To minimise bias, it is essential to use rigorous research methods and be transparent about all aspects of the research process.

From [4].

T3: Common types of bias

- **Sampling Bias**: Is the sample representative of the population being studied? Research might be based on a limited or unrepresentative set of software systems, developers, or environments, which can skew findings. For example, if studies focus mostly on open-source software projects, the results may not generalise well to closed-source enterprise environments.

- **Confirmation Bias**: Researchers may unconsciously favour results that confirm their hypotheses, potentially overlooking data that contradicts their assumptions.

- **Tooling and Data Bias**: Tools or datasets used in research might introduce bias.

From [4].

T3: Types of research misconduct

- **Fabrication**: Illegitimate creation of data
- **Falsification**: Inappropriate alteration of data
- **Plagiarism**: Use other works without attribution

From [2].

T3: Ethical concerns in research

Ethical concerns relate to principles and standards that ensure the research is conducted responsibly, with integrity, and in ways that respect the rights and well-being of all involved.

T3: Ethical concerns in research (2)

- **Informed Consent**: Ensuring that participants, if involved, are fully aware of the research purpose and voluntarily agree to take part.
- **Privacy and Data Security**: Ensuring sensitive information (e.g., user data, system logs) is handled securely, particularly when using real-world datasets.
- **Bias and Fairness**: Ensuring that algorithms or systems being researched do not discriminate against any group or individual.
- **Misuse of Technology**: Avoiding the development of technologies that could cause harm, be misused, or lead to unintended consequences.
- **Transparency**: Presenting all results (positive, negative, or neutral) to maintain academic integrity.

T3: Other unacceptable practices

- Hiding the use of AI or automated tools in the creation of content or drafting of publications.
- Citing selectively or inaccurately.

From [10].

T3: European code of conduct for research integrity

The European Code of Conduct describes **professional, legal, societal, ethical, and moral responsibilities** of the different actors in different settings, including those who define and implement the priorities and criteria for research funding, assessment, and publication.

From [10].

T3: Surveys

The results obtained through a survey can be compromised if there is a possibility of:

- Bias: coworkers commenting on the work of one of them
- Lack of confidentiality: possible influence over the individuals who are the respondents

From [2].

T3: Ethics evaluation guide

- Do the researchers discuss the ethics of their research and whether they were guided by any code of ethical conduct? If not, how does that affect your confidence in the research?
- Do the researchers explain any ethical dilemmas they faced and how they resolved them?
- Are there additional ethical issues that the researchers would have needed to address?
- Summarise the outcomes in a concluding section, but state the uncertainties and problems which might occur if the results are applied to products and services.

From [6].

T4: Cases of ethical decision making

T4: Case 1

The research protocol for a study of a hypertension drug requires the administration of the drug at different doses to 50 laboratory mice, with chemical and behavioural tests to determine toxic effects.

Tom has almost finished the experiment for Dr Q. He has only 5 mice left to test. However, he really wants to finish his work in time to go to Florida on spring break with his friends, who are leaving tonight. He has injected the drug in all 50 mice, but has not completed all of the tests. He therefore decides to extrapolate from the 45 completed results to **produce the 5 additional results**.

Fabrication?

From [8].

T4: Case 2

Dr T has just discovered a **mathematical error** in his paper that has been accepted for publication in a journal. The error does not affect the overall results of his research, but it is potentially misleading. The journal has just gone to press, so it is too late to catch the error before it appears in print. In order to avoid embarrassment, Dr T decides to **ignore the error**.

Misconduct?

From [8].

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