Ethics

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Definition

ethics

Pronunciation: /ˈɛθɪks/

PLURAL NOUN

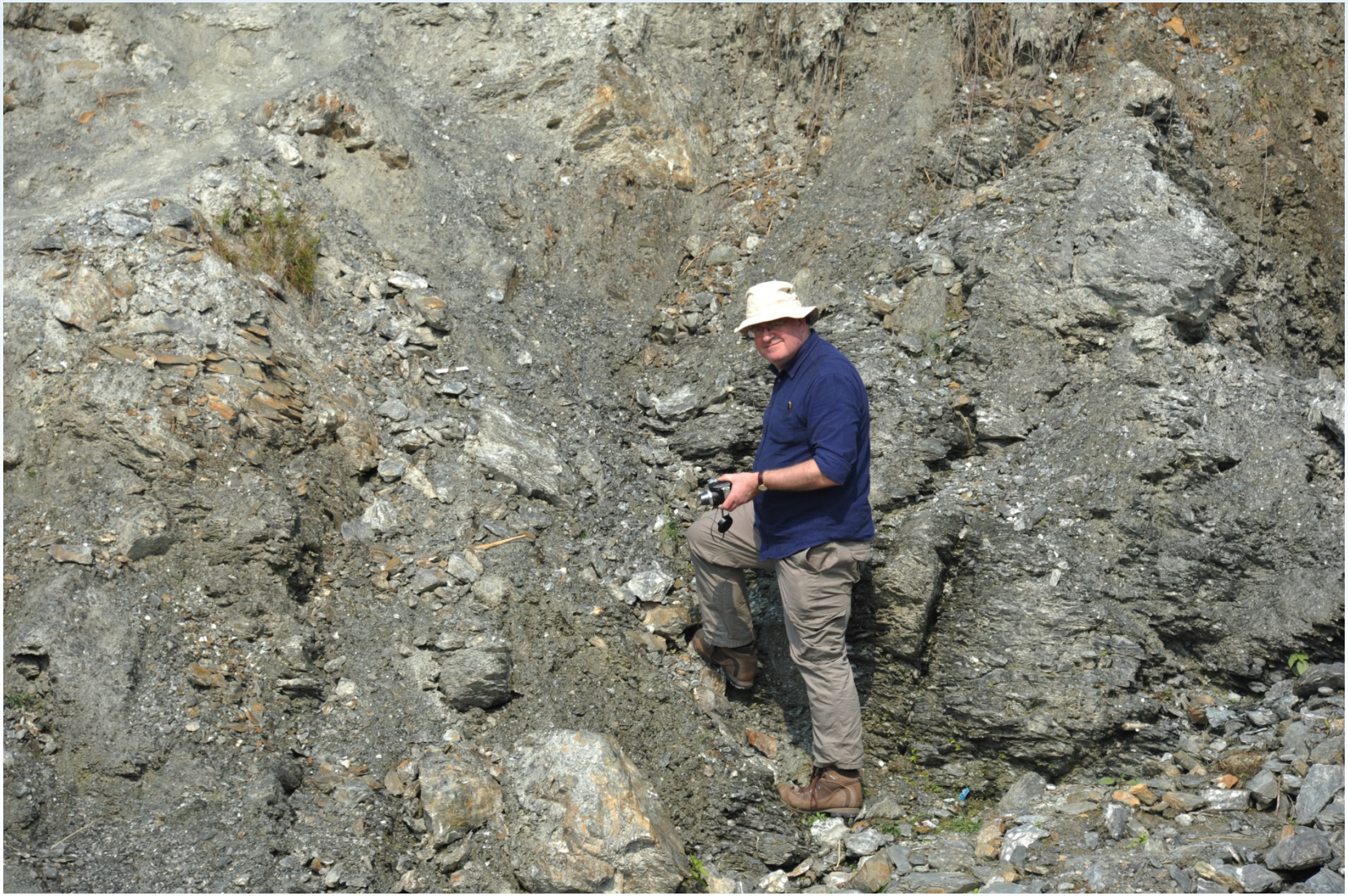
1. Moral principles that govern a person's behaviour or the conducting of an activity: *medical ethics also enter into the question*
2. The branch of knowledge that deals with moral principles: *neither metaphysics nor ethics is the home of religion*

http://www.oxforddictionaries.com/definition/english/ethics

Case studies

- IU-ATC (IITH + many others…)
  - Ultrasound
- CHDI (with Cambridge PDN)
  - Transgenic animals
- SHAMROCC (with Ulster, IITH, IITB)
  - Natural hazards

New Frontiers in IoT



Engineers are…

Engineers are…	Strengths	Weaknesses
Analytical	Problems can be understood through investigation and analysis.	Obvious responses may be overlooked in favour of more sophisticated analytical solutions.
Systematic		tical
Evidence Based		tion
Solution-Oriented	There is a solution (or solutions) for every problem.	The need to identify a solution may result in a hasty and inappropriate decision (or a delay when a decision needs to be made and a solution cannot be found)

Professionals

What is a Profession?

- Any type of work that needs special training or a particular skill, respected because it involves a high level of education

- A profession is a disciplined group of individuals who adhere to **ethical** standards. This group positions itself as possessing special knowledge and skills in a widely recognised body of learning derived from research, education and training at a high level, and is recognised by the public as such. *www.psc.gov.au*

ICE Rules of Professional Conduct

1. All members shall discharge their professional duties with integrity.

2. All members shall only undertake work that they are competent to do.

3. All members shall have full regard for the public interest, particularly in relation to matters of health and safety, and in relation to the well-being of future generations.

4. All members shall show due regard for the environment and for the sustainable management of natural resources.

5. All members shall develop their professional knowledge, skills and competence on a continuing basis and shall give all reasonable assistance to further the education, training and continuing professional development of others.

6. All members shall:
   - notify the Institution if convicted of a criminal offence;
   - notify the Institution upon becoming bankrupt or disqualified as a Company Director;
   - notify the Institution of any significant breach of the Rules of Professional Conduct by another member.

What are Engineering Ethics

- Public safety
- Whistleblowing
- Fair dealings
- Professionalism
- Limits to expertise
- Client's interests
- Sustainability

Engineering Council Statement of Ethical Principles

- The Royal Academy of Engineering and Engineering Council's Statement of Ethical Principles provide support to professional engineers in the development of their ethical skills, such as their ability to recognise the ethical aspects of engineering decisions, and to fulfil the ethical expectations of the general public.

- The primary elements in these skills are the abilities:
  - to identify the different, and sometimes competing ethical concerns they face
  - to analyse the issues that might underlie those concerns and
  - to respond effectively to those concerns.

Engineering Council Statement of Ethical Principles

1. **Accuracy and Rigour:** Professional engineers have a duty to ensure that they acquire and use wisely and faithfully the knowledge that is relevant to the engineering skills needed in their work in the service of others
   - ❑ always act with care and competence
   - ❑ perform services only in areas of current competence
   - ❑ keep their knowledge and skills up to date and assist the development of engineering knowledge and skills in others
   - ❑ not knowingly mislead or allow others to be misled about engineering matters
   - ❑ present and review engineering evidence, theory and interpretation honestly, accurately and without bias
   - ❑ identify and evaluate and, where possible, quantify risks

Engineering Council Statement of Ethical Principles

2. **Honesty and integrity** Professional engineers should adopt the highest standards of professional conduct, openness, fairness and honesty.
   - ❑ be alert to the ways in which their work might affect others and duly respect the rights and reputations of other parties
   - ❑ avoid deceptive acts, take steps to prevent corrupt practices or professional misconduct, and declare conflicts of interest
   - ❑ reject bribery or improper influence
   - ❑ act for each employer or client in a reliable and trustworthy manner.

Engineering Council Statement of Ethical Principles

3. **Respect for life, law and the public good:** Professional engineers should give due weight to all relevant law, facts and published guidance, and the wider public interest.
   - ensure that all work is lawful and justified
   - minimise and justify any adverse effect on society or on the natural environment for their own and succeeding generations
   - take due account of the limited availability of natural and human resources;
   - hold paramount the health and safety of others
   - act honourably, responsibly and lawfully and uphold the reputation, standing and dignity of the profession

Engineering Council Statement of Ethical Principles

4. **Responsible leadership: listening and informing:** Professional engineers should aspire to high standards of leadership in the exploitation and management of technology. They hold a privileged and trusted position in society, and are expected to demonstrate that they are seeking to serve wider society and to be sensitive to public concerns.
   - ❑ be aware of the issues that engineering and technology raise for society, and listen to the aspirations and concerns of others
   - ❑ actively promote public awareness and understanding of the impact and benefits of engineering achievements
   - ❑ be objective and truthful in any statement made in their professional capacity.

Engineering Practice as Experiments

- Any project is carried out in partial ignorance
  - Procurement lists
  - Nature of stresses of the finished product
  - Having all the 'facts' to proceed – we cannot wait until all facts are in before commencing work

- One talent crucial to an engineer's success lies precisely in the ability to accomplish tasks with only a partial knowledge of scientific laws about nature and society

Engineering Practice and Ethics

- There can be intended and unintended (or uncertain) outcomes of engineering projects.
  - E.g. a reservoir provides a region with water *but* might damage to another region's social fabric or ecosystem.
  - Stuff (people, the environment, …) changes when you deploy things.

- Effective Engineering relies upon knowledge gained about products both before and after they leave the factory
  - E.g. Ultimate test of success of a car is not when it leaves the factory, but its efficiency, safety, cost-effectiveness, impact and aesthetic value on the road

EPSRC experimental ethics

- The proposed experiments should be outlined, describing the following within the narrative text field*:

- The planned participant/sample numbers
- How the numbers were chosen
- How they are sufficient to produce a robust result
- The feasibility of recruiting sufficient participants / collecting sufficient samples
- How consent will be obtained and whether relevant information will be fed back to participants
- How data/samples will be anonymised or why anonymisation is not appropriate

Food for thought – Humanitarian/Development Engineering

- Humanitarian / Development engineering is the application of technology to control or modify the physical environment in ways that promote communication and interaction among stakeholders in order to avert or minimise injustice.
- It is not neutral towards the application of technology but morally and ethically committed to using technology to reduce conflict and inequity.
- The practice of humanitarian engineering, as defined above, requires a variety of skills:
  - knowledge of relevant technologies
  - sensitivity to the needs of people
  - understanding of social aspects of injustices and how they lead to violent conflict
  - appreciation of cultural, ethical and moral differences between people
  - willingness to learn and grow

Food for thought – Development Engineering

"One of the sector's greatest problems is an over dependence on a combination of overqualified engineers and architects and out of their depth generalists...combined with a high turnover of staff.

The 'professionals' tend to be overly unrealistic about the need to conform to codes that don't exist, are irrelevant or are not enforced, while the 'generalists' have little or no understanding of the structural issues. its a strange sector!"

Stakeholder quoted by Kate Crawford
http://www.katzn.org/post-disaster-repair/

Sustainable Development

The Engineering Council, in their inter-institutional guidance on sustainability state six principles.

Engineers should:

- *Contribute to building a sustainable society, present and future;*
- *Apply professional and responsible judgement and take a leadership role;*
- *Do more than just comply with legislation and codes;*
- *Use resources efficiently and effectively;*
- *Seek multiple views to solve sustainability challenges;*
- *Manage risk to minimize adverse impact to people or the environment*

AUTONOMOUS SYSTEMS (THE FUTURE)

Autonomy, n.

1.

a) The condition or right of a state, institution, group, etc., to make its own laws or rules and administer its own affairs; self-government, independence.

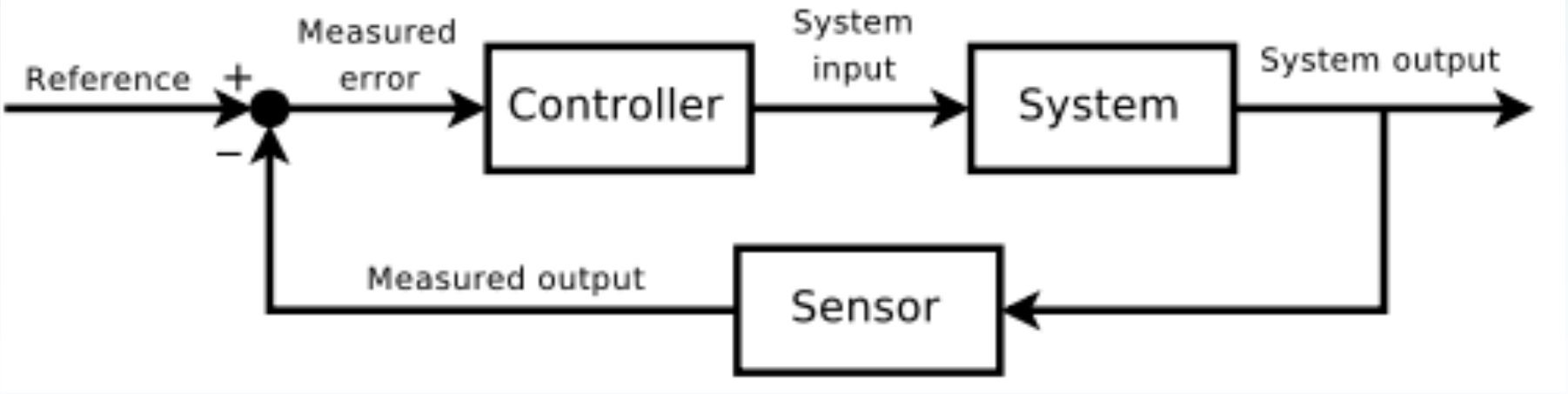
b) Philos. In Kantian philosophy: the freedom of will which enables a person to adopt the rational principles of moral law (rather than personal desire or feeling) as the prerequisite for his or her actions; the capacity of reason for moral self-determination.

c) More generally: liberty to follow one's will; control over one's own affairs; freedom from external influence, personal independence.

d) With reference to a thing: the fact or quality of being unrelated to anything else, self-containedness; independence from external influence or control, self-sufficiency.

2. …

Control systems



Degrees of autonomy

- Systems in which the controller is human and the control input they give is transmitted directly to the actuators.
  - e.g. human being driving a car
- Systems in which humans have a supervisory role – they might provide some of the control inputs, or make high-level decisions that have consequences in the human realm, but they are not responsible for the detailed actions.
  - The sensor data on which humans must make decisions is filtered by the system.
    - e.g. a CCTV system that switches view or generates alarms based on a potential identification of wanted individuals or suspicious behaviour.
  - The systems exercise control.
    - e.g. robotic surgery: the surgeon chooses the surgical target, tools and actions, but the robot makes detailed decisions about how to move its actuators in order to achieve the goal.
  - A combination of both:
    - e.g. an (armed) UAV may carry many sensors. It may have an in-built control system that determines its height and position. However, the height at which a UAV operates also determines the quality of the video images that it returns to an operator.

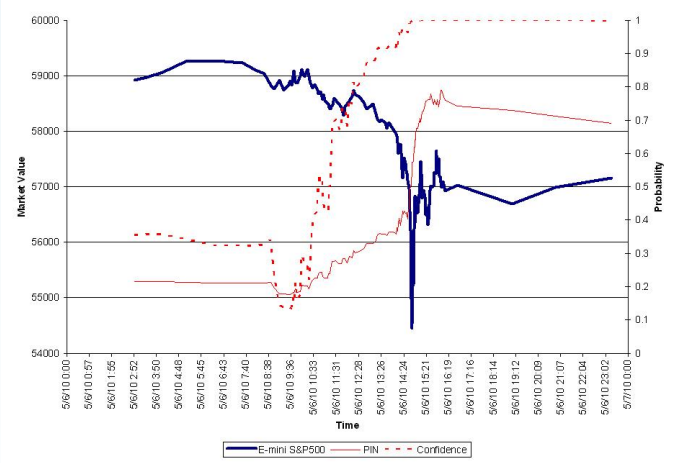
- Systems that learn from experience, over which humans have little control and, more often than not, little understanding of the basis on which control is being exercised.
  - Reinforcement learning systems make use of feedback in the form of a utility value to drive the optimisation of control action.
    - Humans must define a meaningful and robust utility value (this is hard)
    - The system must be exposed to the full range of possible inputs and their consequences.
    - e,g. automated trading systems may react well and be stable in normal trading conditions, but may drive a blip on a bear market into meltdown.
  - **In such cases, it is unclear with whom responsibility lies: the programmer who produced the system simply produced a reinforcement learning system that may be working exactly as expected.**

'A bot mediated reality'

- Automated trades comprise 70% of the Wall Street stock market and > 30% of equity trading in the UK.
- Bots create 24% of tweets.
- 50% of the Internet traffic going through websites and profiles is not human.
- 22 of the 30 most prolific Wikipedia editors are bots.
- Automated software performs the analysis of medical x-rays to find abnormalities, while risk-assessment algorithms decide a person's suitability for a credit card based on their financial history.
- Edgerank algorithms edit and remix our Facebook identities, determining which friends we interact with. Google's page-rank algorithm anticipates what we want to find, creating a '*filter bubble*'.

Emergent behaviours

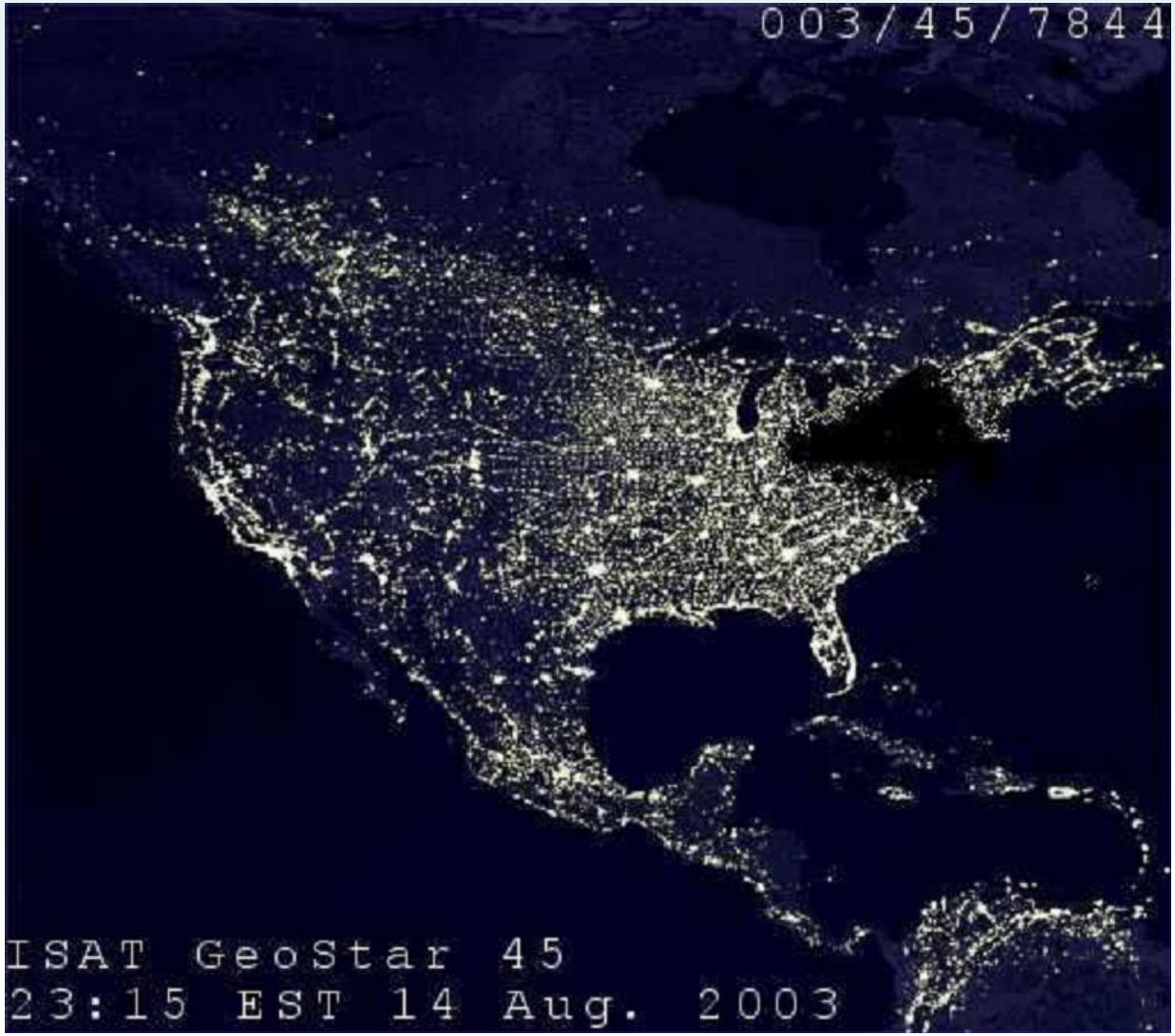
- *…in recent years, the global financial markets have become a complex adaptive **ultra-large-scale socio-technical system-of-systems**.*
- *Major failures in the financial markets SoS can now occur at super-human speeds, as was witnessed in the "Flash Crash" of May 6th 2010.*



- *As engineered systems become more complex, **it becomes more reasonable to argue that no one person or group of users is responsible for failures, but rather that the failures are inherent, latent, in the system**; this seems especially so in the case of socio-technical systems*

- *The Global Financial Markets: an Ultra-Large-Scale Systems perspective*
  D. Cliff & L. Northrup The Future of Computer Trading in Financial Markets - Foresight Driver Review – DR 4

Northeast blackout 2003



Asimov's laws

1. A robot may not injure a human being or, through inaction, allow a human being to come to harm.
2. A robot must obey the orders given it by human beings, except where such orders would conflict with the First Law.
3. A robot must protect its own existence as long as such protection does not conflict with the First or Second Laws.

- A robot may not injure humanity, or, by inaction, allow humanity to come to harm.

EPSRC / AHRC principles of robotics

- Robots should not be designed solely or primarily to kill or harm humans.
- Humans, not robots, are responsible agents. Robots are tools designed to achieve human goals.
- Robots should be designed in ways that assure their safety and security.
- Robots are artifacts; they should not be designed to exploit vulnerable users by evoking an emotional response or dependency. It should always be possible to tell a robot from a human.
- It should always be possible to find out who is legally responsible for a robot.

Ethical?

- Drones that decide when to kill people
- Sex robots
- Companion robots for patients with dementia
- Companion robots that argue with patients with dementia

- And… with emerging AI
- What rights to robots have?
- Can you own a robot? Sell it? Decide when to update it, or when to switch it off?

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