INFT 3800
Professional Practice in IT

Sem 1, 2021
LECTURE NOTE – WEEK 4

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Professional Ethics III

- AI Technology landscape

- Application of AI

- Ethical Concerns with AI

- Impact of AI on employment

- Legal implication of AI

- Social implication of AI

- National framework for conduct of research

AI Technology landscape

- AI is not just about technology (acting), but about cognitive science (feeling) and computing (thinking) as well as about all social, ethical, and legal impacts on humanity.
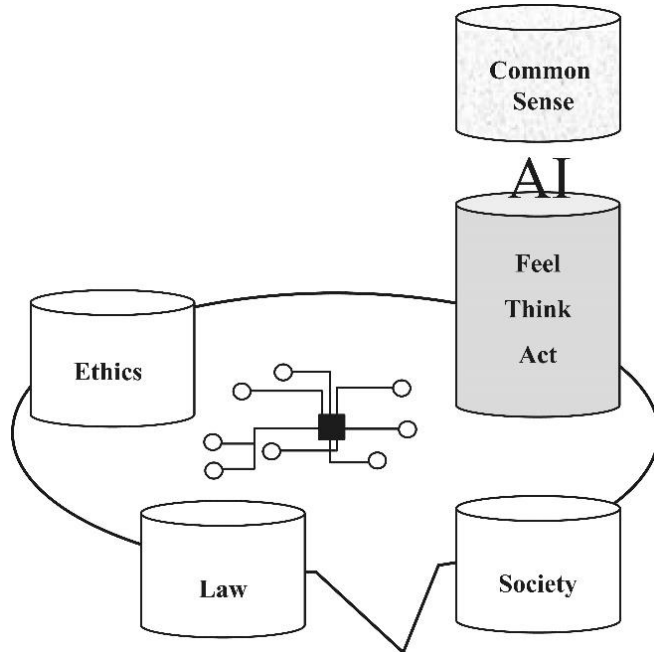

Figure 1. AI Impact environment

AI Technology landscape

- **AI** as science means cognitive science with focus on intelligence theories (El-Attar, 1997).
  - Thinking rationally, including prediction and judgement, information processing; computation.
- **AI** as technology means designing systems that act intelligently.
- Rapid advances in the field of AI have deep economic implications as well as at-large societal implication.
- AI technologies are not about human elimination but the substitution of manual and repetitive tasks with automation.

AI Technology landscape

- In general, the goal of AI is to develop functioning systems capable of handling complex problems in ways similar to human logic and reasoning.

"AI is the science and engineering of making the intelligent machines, especially intelligent computer programs"

(John McCarthy – Father of AI)

AI Technology landscape

- AI has grown into a transdisciplinary field with applications in nearly every aspect of human life.

- In general, the goal of AI is to develop functioning systems capable of handling complex problems in ways similar to human logic and reasoning.
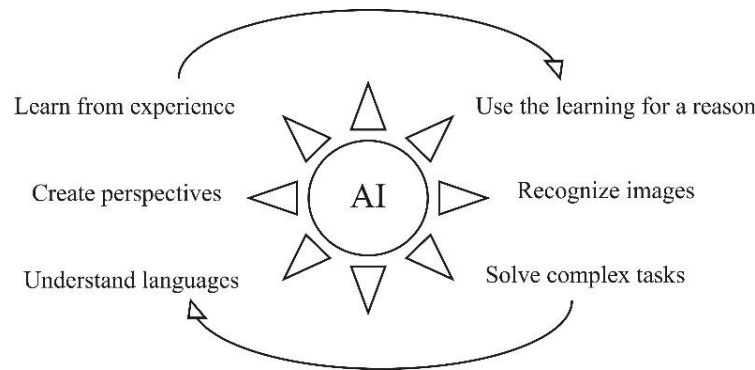
Figure 2. AI Functioning Approach

- "Artificial" is a concept that refers to something that is made or produced rather than occurring naturally (often replacing something natural).

AI Technology landscape

- AI technologies will be the most disruptive technologies over the next several year due to radical computational power, vast amount of data and other technologies.

- AI grew heavily in every aspect of society.

- AI Enablers are based on several principles:
    - Open-source algorithm
    - Support of local languages and industries
    - AI expertise and awareness
    - Positive social attitudes and trust
    - Data literacy and policies
    - Reliable infrastructure

AI Technology landscape

- Some companies control the entire value chain and some other companies are selling a piece of software that includes AI.

Enabler/Platform	AI products
Google	DeepMind, Cloud Machine Learning
Amazon	Amazon Machine Learning Services
IBM	Watson
Microsoft	Cortana Intelligence Suite, Microsoft Xiaoice
Facebook	Facebook Artificial Intelligence Lab
Intel	Xeon Phi
Qualcomm	Zeroth
Nvidia	High-end GPU

Table 1. Main enablers in AI technologies

AI Technology landscape
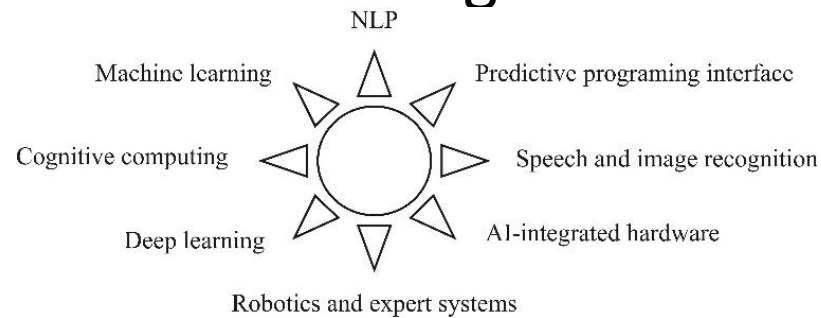
- ## Major AI domain technologies

Figure 3.
Major domains of AI

Domain	Description
NLP	An area of computer science and AI concerned with the interactions between computers and human (natural) languages to produce test from computer data. Eg. Alexa, Siri, Cortana etc.
Speech Recognition	The ability of a program to recognize and analyse spoken language words and phrases and convert them into data. Eg. Call routing, voice dialling, voice search, speech-to-text-processing.

AI Technology landscape

- Major AI domain technologies

Domain (Cont)	Description (Cont)
Machine Learning	A core component within AI that provides computers with the ability to learn without being explicitly programmed. It involves programming computers that can teach themselves and learn from example data or past experience. Eg. Image recognition
Deep Learning	A class of learning procedures to facilitate object recognition in images, video labelling and active recognition. Often coupled with automatic speech recognition.
Robotics	About how to train a machine to interact with the world around it in anticipated ways. How to manipulate of objects in interactive environment, and how to interact with people.
Expert System (ES)	Computer programs aiming to model human expertise in one of more specific knowledge areas.

AI Technology landscape

- Three basic components in ES

  1. A knowledge and experience
  2. An inference engine processing consultation and determining how inferences are being made
  3. An input/output interface for interactions with the user

Application of AI

In the past, AI was mainly used for robotics and solving complex problems.

Several applications of AI:

- Intelligent automation
- Autonomous driving
- Health
- Education
- Intelligent product design and smart manufacturing
- Retail

Application of AI

- Intelligent automation

"The performance of tasks by machines (often computers) rather than human operators often to increase efficiency and reduce variability".

(Balfe et al, 2015)

Many believe AI and automation leads to mass automation of jobs, raising inequality and economic strife.

- AI is poised to replace people in certain kinds of jobs.
- AI will likely replace tasks rather than jobs
- AI will also create new kinds of jobs

Application of AI

- Autonomous Driving
  - Offers the possibility of profoundly changing transportation.
  - Equipping cars and light vehicles with this technology will likely reduce collisions, energy consumption, and pollution.
  - Eliminate human errors
  - Substantially affect safety and congestion
  - Increase mobility for those who are presently unable or unwillingly to drive.

Application of AI

- Moral & ethical questions around AI and autonomous driving:
  - About safety, security, prevention of harm, and mitigation of risks.
  - About human moral responsibility and ethical considerations and fundamental rights of privacy and data protection.
  - About governance, regulation, design, development, inspection, monitoring, testing, and certification.
- With autonomous driving, the moral responsibility is shifting from a human driver to some programmed algorithm.

Application of AI

- Healthcare
  - AI has the potential to improve quality of life and health consequences.
  - Treatment and care will still rely on human judgment.AI
  - Collection of useful data from personal monitoring devices and mobile applications.
  - AI speeds up telemedicine
  - Improve online consultations by recognizing patient history and symptoms more quickly.
  - Suggest the finest course of action
  - Potential risk; accuracy, reliability, security and privacy.

Application of AI

- Education
  - AI to provide personalized learning.
  - Offers many benefits for students with different learning styles.
  - Smart content creation from digitized guides of textbooks to customizable learning digital interfaces
  - Five key areas in using AI for the delivery of educational services:
    1. Mentors for every learner
    2. Learning 21st century skills
    3. Interaction data for learning
    4. Universal access to global classrooms
    5. Lifelong and life wide learning

Application of AI

- Intelligent product design and smart manufacturing
  - Two modules of an intelligent product:
    - The intelligent functions: to retrieve and collect the real world data to be used in the intelligence software.
    - The intelligent software components: makes all decision making tasks.
  - Smart manufacturing reflects the impact of smart technologies such as IoT, cloud computing, cyber-physical systems and data science.
  - Integrate manufacturing platforms with sensors, computing resources, control, simulation and predictive engineering.

Application of AI

- Intelligent product design and smart manufacturing
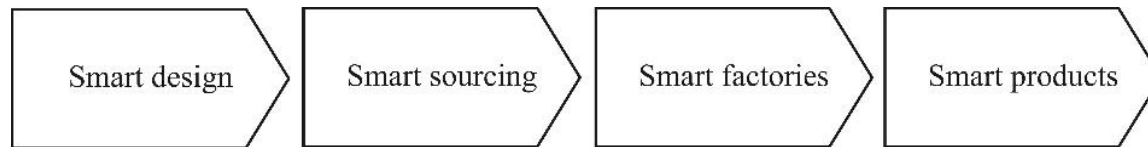 - Smart manufacturing chain of activities

Figure 4. Smart manufacturing chain of activities

  - Smart design involves raid prototyping and modelling
  - Smart sourcing provides automated ordering services, just-in-sequence deliveries, route optimization and condition monitoring
  - Smart factories involves flexible production, preventive maintenance and quality, remote maintenance and Lean manufacturing.
  - Smart products provides new revenue models, forward-looking services, automatic parts ordering and preventive maintenance.

Application of AI

- Retail
  - E-commerce is widely considered to be a space with a lot of potential to make a big impact on the industry by using AI.
  - AI enable retailers to:
    - Drive sales and predict demand
    - Understand consumer behaviour
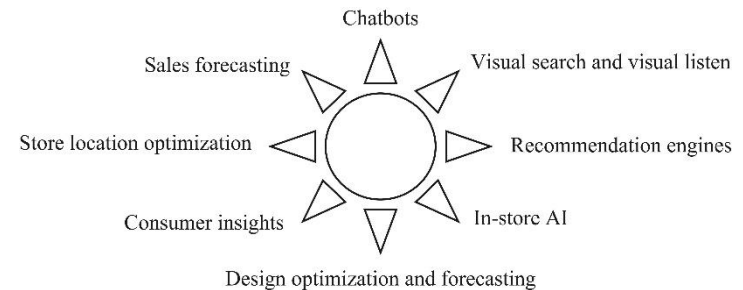   - Precise personalized promotion

Figure 4. Retail application of AI

  - Observe and learn from large sets of data and make decisions without the need for human involvement
  - Figure 4 above shows eight different ways AI can be used in e-commerce.

Elements of concerns with AI

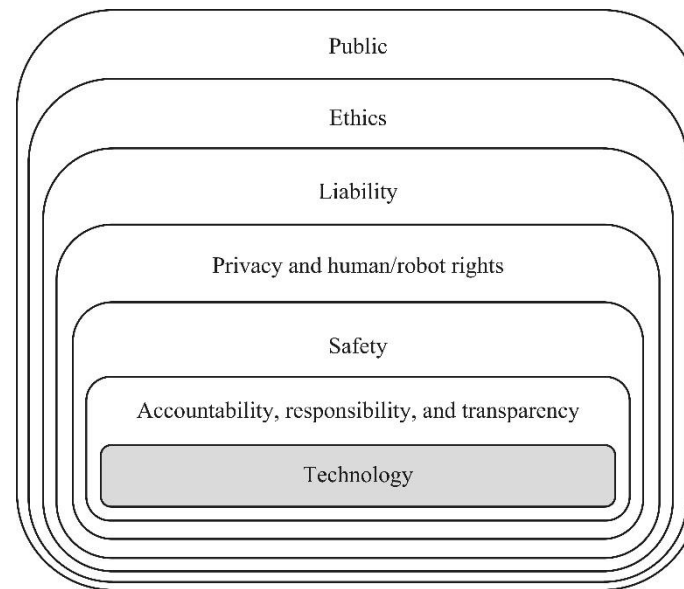- Important concerns for identifying emerging AI risks:

Figure 5. Elements of concern about future AI

Ethical Concerns with AI

- Ethics, in the context of AI, refers to whether, when, and how autonomous devices should make decisions, and what values should guide those decisions.

- The values embedded into AI systems will determine whether, and how, these systems will act in moral situations.

- AI systems give rise to a range of important and hard ethical issues.

Ethical Concerns with AI

- Potential ethical issues with AI:
  1. Issues about safety, security, the prevention of harm, and the mitigation of risks. (EU, 2018)
  2. Issues about ways to implement AI including trust, fairness, and honesty in AI models.

- These issues require ethical analysis based on the facts before starting the evaluation.
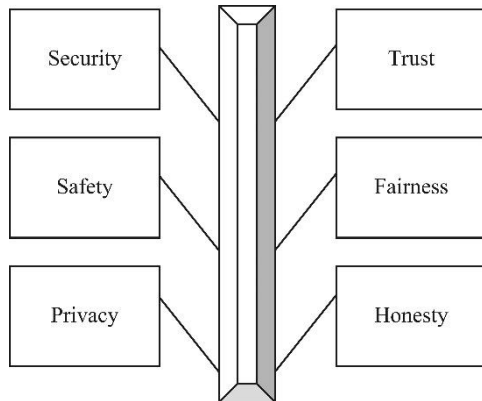

Figure 6. Ethical issues for AI

Ethical Concerns with AI

- AI will never generate trust in the way humans do.

- To trust AI systems is by:
  - Building trustworthy algorithms
  - Designing algorithm that are aware of their uncertainty
  - Making well founded decisions

- Effective mechanism in algorithms must be developed to filter our biases and build ethics into AI with ability to read between the lines to get closer to common sense reasoning.

Ethical Concerns with AI

- To achieve effective AI outcomes, algorithms should be built and trained to be:
  - Ethically-sound and neutral
  - Not agnostic to prevent bias automated decision-making.
  - Transparent and interpretable
- Two ways to address ethical perspectives on AI and robotics:
  1. The engineers are aware of ethical challenges to be present
  2. In the context of advanced autonomous systems, the systems should be able to do ethical decision-making to reduce the risks of unwanted behaviour.

Impact of AI on employment

- There are legitimate concerns that AI applications on a large scale may exacerbate inequality. Eg. Impact on unskilled workers; to be replaced by robots and autonomous systems.

- AI has major implications for labour markets.

- It affects employment in two major ways
  1. Directly displacing workers from tasks they were previously performing.
  2. Increasing the demand for labour in industries that arise or develop due to technological progress.

Legal implication of AI

- How to legally regulate robots and AI-related technologies?

- The European Group on Ethics (EGE) ethical principles and democratic prerequisites of AI

Principle	Summary
Human dignity	Recognition of the inherent human state of being worthy of respect.
Autonomy	Freedom of human being
Responsibility	Autonomous systems should only be developed and used in ways that serve the global, social and environmental good.

Legal implication of AI

- The European Group on Ethics (EGE) ethical principles and democratic prerequisites of AI (Cont..)

Principle	Summary
Justice, equity, and solidarity	AI should contribute to global justice and equal access to the benefits and advantages that AI, robotics and 'autonomous' system can bring.
Democracy	Key decisions on the regulation of AI development and application should be the result of democratic debate and public engagement.
Rule of law and accountability	Rule of law, access to justice, and the right to redress and a fair trial provide the necessary framework for ensuring the observance of potential AI regulation.

Legal implication of AI

- The European Group on Ethics (EGE) ethical principles and democratic prerequisites of AI (Cont..)

Principle	Summary
Security, safety, bodily and mental integrity	3 Forms: 1. External safety for their environment and users 2. Reliability and internal robustness 3. Emotional safety with respect to human interaction
Data protection and privacy	The right to protect personal information and right to respect for privacy.
Sustainability	Inline with basic preconditions for life of our planet and preservation of good environment for future generation.

Social implication of AI

- Artificial intelligence is likely to be challenged when it comes to making the right decision.

- 'Machine' has to determine whether to act in favour of the owner (or user), or in favour of others.
  - Eg. Autonomous vehicle
  - Inevitably, such vehicles will sometimes be forced to choose between two evils, such as running over pedestrians or sacrificing themselves and their passenger to save the pedestrians.

Social implication of AI

- Some key questions from the mentioned problem;
  - How to code the algorithm to make the 'right' decision in such a situation?
  - And does the 'right' decision even exist?

- Humans are
  - Social
  - Compassionate
  - care for one another
  - Etc.

- Developers and engineers are in a difficult position.
  - I.e. Either to develop machines that are save but very few would want to buy, or to develop machines that may kill many to save one and will probably sell easily.

Social implication of AI

- Three Laws of Robotics (Isaac Asimov, 1942).
    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 the second law.
    4. Later on, Asimov added the fourth law, which states that a robot may not harm humanity, or, by inaction, allow humanity to come to harm.
- But this does not cover social dilemmas, or situations, where the machine inevitably has to select between two evils.

National framework for conduct of research

- The National Statement on Ethical Conduct in Human Research ('National Statement') is intended for use by:
    - any researcher conducting research with human participants;
    - any member of an ethical review body reviewing that research;
    - those involved in research governance; and
    - potential research participants.

National framework for conduct of research

- The purpose of the National Statement is to promote ethically good human research.

- The National Statement must be used to inform the design, ethical review and conduct of human research.

- The National Statement sets national standards for use by any individual, institution or organisation conducting human research.
  - This includes human research undertaken by governments, industry, private individuals, organisations, or networks of organisations.

National framework for conduct of research

- There is no generally agreed definition of research; however, it is widely understood to include at least investigation undertaken to gain knowledge and understanding or to train researchers.

- Human research is conducted with or about people, or their **data** or tissue.

- Human participation in research involved via:
    - taking part in surveys, interviews or focus groups;
    - undergoing psychological, physiological or medical testing or treatment;
    - being observed by researchers;

National framework for conduct of research

- Human participation in research involved via (Cont):
    - researchers having access to their personal documents or other materials;
    - the collection and use of their body organs, tissues or fluids (eg skin, blood, urine, saliva, hair, bones, tumour and other biopsy specimens) or their exhaled breath;
    - access to their information (in individually identifiable, re-identifiable or non-identifiable form) as *part of an existing published or unpublished source or database*.

- A judgement that a human research proposal meets the requirements of this National Statement and is ethically acceptable must be made before research

National framework for conduct of research

- Human research is governed by Australian law that establishes rights for participants and imposes general and specific responsibilities on researchers and institutions.

- Research ethics is only part of an institution's responsibilities for research governance.

- In the field of ICT research; any systems should support principles such as basic human rights, safety, privacy, integrity, and dignity. Eg:
  - The user will be able to decide whether to use the system or not.
  - The system collects and processes information concerning the user
  - Privacy is also respected because the system is not intended to share or provide data to other systems or services

National framework for conduct of research

- The elements of research based on the national framework for conduct of research:
  - Element 1: Research Scope, Aims, Themes, Questions and Methods
  - Element 2: Recruitment
  - Element 3: Consent
  - Element 4: Collection, Use and Management of Data and Information
  - Element 5: Communication of Research Findings or Results to Participants
  - Element 6: Dissemination of Research Outputs and Outcomes
  - Element 7: After the Project

Summaries

- What are the benefits of AI?

- How can AI both destroy and create jobs?

- Can AI be ethical?

- How to design AI systems so that they function ethically?

- What are the social implication of AI?

- What are the legal implication of AI?

- What types of ICT researches that require ethics consideration?

Next Week

QUIZ 2

- Week 3 & 4 materials
- During the tutorial time (11.00 – 13.00)
- 20 questions, 20 mins
- If you plan to be away, do inform me!
- Adverse circumstance approval is required for a make up quiz

Next Week

- Legal System for IT practitioners
- Contract agreement
- Intellectual Property, Patents, Copyright,
- Technology Transfer
- Occupational Health and Safety
- Non-Disclosure and Data Protection
- Financial responsibility

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