

RESPONSIBLE INNOVATION PROJECTS

Professional Practice 2

Dr Ehsan Nabavi
Semester 1, 2021



Australian
National
University

Responsible Innovation Project

Innovation and the Future of AI

WORKSHOP 01

Workshop time: Thursday 10:00-12:00, [Zoom Link](#)

Workshop Facilitator: Dr Ali Eshraghi

Project Title: Reinforcing responsibility into language models: The case of OpenAI's language generator GPT-3

About

With recent developments of AI technologies, increasingly they are deployed and used in automated decision makings that affect our lives on daily basis. With recent success of companies such as OpenAI or Google, these AI technologies can communicate in natural language and make decisions based on interactions with humans.

OpenAI released its first commercial product in June 2020 [1]: an API for developers to access advanced technologies for building new applications and services. The API features a powerful general purpose language model, GPT-3, and has received tens of thousands of applications to date. GPT-3 is the most powerful language model ever. Its predecessor, GPT-2, released last year, was already able to spit out convincing streams of text in a range of different styles when prompted with an opening sentence. But GPT-3 is a big leap forward. The model has 175 billion parameters (the values that a neural network tries to optimize during training), compared with GPT-2's already vast 1.5 billion. GPT-3 can also produce pastiches of particular writers. Some other developers have found that GPT-3 can generate any kind of text, including guitar tabs or computer code [see 2,3,4,5]. This amazing capacity of GPT-3 has driven big Tech companies to use it in their products. OpenAI has recently agreed to license GPT-3 to Microsoft for their own products and services [6].

Challenge

While it is imperative for these systems to embed ethical principles and respect human values, their adherence is called into question. Despite GPT-3's excellent outputs, it is still prone to spewing hateful sexist and racist language. As we know if the biases present in training data it may lead AI models to generate prejudiced output. Thus GPT-3 has its own limitations when it comes to fairness, bias, and representation [7]. GPT-3 is trained mostly on internet data so GPT-3 is biased up to a certain extent since internet data is also biased and it reflects stereotypes and biases.

The project challenge is to review the ethical, social and legal concerns relating to GPT-3; investigating how it is discriminating against particular individuals or groups through biases in language; how the unconscious biases in humans and known discriminatory behaviours are embedded into these models. For instance, if we used one of the state-of-the-art language models from these corporations in chat-bot,

would that discriminate based on race, gender, religion, or nationality? How can we address social and ethical concerns related to development of language models?

Project Process

Time commitment

Students are expected to commit 3-4 hours per week on this project.

Following the design thinking framework, project teams will typically engage in these tasks over the semester.

Empathise

- Conduct an initial review to determine and define needs and expectations from GPT-3.
- Understand the context, environment and requirements in which GPT-3 is designed and built.
- Conduct a review to determine the main key social, ethical, and legal concerns around GPT-3 design and application.
- Analyse the available information/data regarding GPT-3 design, people's attitude, etc.

Ideate and prototype solutions/recommendations

- Recommendations for new or improved design and implementation for development of responsible language models (e.g. technical solutions).
- Recommendations for data analytics
- Recommend activities that OpenAI can do to address social and ethical concerns about the app.
- Recommend activities that society and communities can do for responsible development of future language models.

The recommendations/outcomes of the project need to:

- Demonstrate your responsible thinking and practice.
- Align with best practice.
- Fit within the ANU policy framework, security and privacy guidelines.

Opportunities

- Students may volunteer or continue to work on the project in an unpaid capacity at the end of the semester.
- Students may be accepted to join ANU Responsible Innovation Lab
- The Project could be showcased on the Lab's website, and team member are invited to present the project in a Webinar on Responsible Innovation on July 13, 2021.

Responsible Innovation Project

Innovation and the Future of Health

WORKSHOP 02

Workshop time: Thursday 12:00-14:00, [Zoom Link](#)

Workshop Facilitator: Joyce Yeoh

Project Title: Responsible design and development of Exoskeletons

About

Exoskeleton technology, i.e., wearable robotics, has made notable advances during the last decade, resulting in a substantial variety of applications. They are designed and built to amplify human strength and agility. In its healthcare applications, their main goal is to replace diminished or lost limb functionality, helping people regain some ambulatory freedom. Rewalk is one of the most well-known assistive exoskeletons in the world that offers the potential to restore ambulation to individuals with paraplegia [1]. This motorized exoskeleton which has approval from the Food and Drug Administration (FDA), enables individuals with lower limb disabilities, to stand, walk, and climb stairs independently. The promise of the device is to improve the quality of life and general health of disabled people, restore their dignity, enable them to work, and reduce their medical and other related expenses. ReWalk consists of four motorized joints, a wearable brace support suit, a combination of sensors, a computer-based control system, and rechargeable batteries. The robot is worn around the legs, chest and back on top of everyday clothing [to learn more listen to and watch 2, 3, 4]

Challenge

Despite all the potential benefits of Rewalk, we can see very limited use of these robots in today's world. Rewalk and other exoskeletons seem to have failed to find a place in the daily lives of individuals with paraplegia. High cost, lack of comfort, and difficulty of use can be cited as some of the reasons that have led the exoskeleton technologies to this state. On a higher level, lack of adherence to human-centred design principles in such systems may be one of the most important causes of this failure.

For all their promise, exoskeletons and other wearable robotics raise a number of ethical and social concerns. They include general social concerns relate to the psychological impact on disabled individuals and their families, as well as how society might reconsider 'able-ness', and other social issues such as social justice concerns relating to access or insurer's refusal to invest in this technology.

The political aspects of development are often overlooked. Some exoskeleton manufacturers have contracts with defence to develop exoskeleton suitable for military or industrial purposes. The solution which can eventually change the life of soldiers and workers forever. [Listen to these Podcasts 5, 6]

The project challenge is to review the ethical, social and legal concerns relating to exoskeletons, and to look into design of Rewalk to find the underlying assumption about the human's autonomy an agency within it. This may include reviewing technical and social challenges of exoskeletons with a focus on the people involved in the system, identifying stakeholders of the system (user, caregiver, therapist, etc.) as well as their values, investigating the requirements of the system and comparing them with stakeholders' values.

Project Process

Time commitment

Students are expected to commit 3-4 hours per week on this project. Following the design thinking framework, project teams will typically engage in these tasks over the semester.

Empathise

- Conduct an initial review to determine and define needs and expectations from Exoskeletons.
- Understand the context, environment and requirements in which Exoskeletons are designed and built.
- Conduct a review to determine the main key social, ethical, and technical concerns around Exoskeletons design and application.
- Analyse the available information/data regarding Exoskeletons' design, people's attitude, etc.

Ideate and prototype solutions/recommendations

- Recommendations for new or improved design and implementation.
- Recommend activities that manufacturers can do to move towards a more responsible development of Exoskeletons.
- Recommendations for addressing social, ethical, and legal concerns.

The recommendations/outcomes of the project need to:

- Demonstrate your responsible thinking and practice.
- Align with best practice.
- Fit within the ANU policy framework, security and privacy guidelines.

Opportunities

- Students may volunteer or continue to work on the project in an unpaid capacity at the end of the semester.
- Students may be accepted to join ANU Responsible Innovation Lab
- The Project could be showcased on the Lab's website, and team member are invited to present the project in a Webinar on Responsible Innovation on July 13, 2021.

Responsible Innovation Project

Innovation and the Future of Cities

WORKSHOP 03

Workshop time: Thursday 14:00-16:00, [Zoom Link](#)

Workshop Facilitator: Dr Ali Eshraghi

Project Title: Responsible Urban observatory

About

Cities are increasingly recognised as key influencers, connectors and contributors to the global challenges. The recent proliferation of smart city policies across the world has given digital infrastructure, urban data and software design a critical role to play. 'Urban observatories' have thus emerged in many cities as organisations to facilitate knowledge transfer between and among different actors involved in the governance of the city. It's becoming an urban data platform to mediate between researchers and decision-makers [e.g. see [1](#), [2](#), [3](#)].

The Urban observatories trend is gaining momentum, including other technical innovative tools for better understanding cities such as digital twins. It is all thanks to rapidly evolving simulation and modeling capabilities, better interoperability and IoT sensors, and more availability of tools and computing infrastructure. This means more cities would explore opportunities to use urban observatories to make data-driven decision (in real time), and design new products and services.

Urban observatories are created and networked at different levels: local [\[2,4\]](#), national [\[1,3\]](#), and globally [\[5,6\]](#). Global Urban Observatory Network for example established by UN-HABITAT to implement the New Urban Agenda at the national and local levels. This domain is not solely occupied by government organisations and universities. The urban observatory project [\[6\]](#) created by Richard Saul Wurman (TED creator), RadicalMedia, and Esri aims to use the world's urban data to compare and contrast maps of cities.

Challenge

Since 1960, most of urban observatory experiences across the world have been oriented towards data management and visualization. They served mostly as intermediaries between urban policy makers and academicians, and less between public and decision-makers. A recent research on urban observatories have found 'dialogue' does not often take place in urban observatories [\[7\]](#). Of the thirty two observatories analysed, the study shows only 16% offer a platform for dialogue about urban challenges between different stakeholders. Whereas, most of the focus in urban observatories is given to data collection and knowledge production.

The biggest challenge is yet to come, as more cities are changing to become 'smart', and more reliant on initiative like urban observatory. There is a concern that they are moving away from dialogue-making between decision-makers and public, and instead focusing on collecting 'evidence' for improving urban governance [\[8\]](#). The challenge is how to ensure dialogue remains central in the design and development of urban observatories; How urban observatories can become more citizen-oriented? Considering various dimensions of responsible innovation [\[9\]](#), how can we address social and ethical concerns related to development of urban observatories?

You can find more resources [here](#).

Project Process

Time commitment

Students are expected to commit 3-4 hours per week on this project.

Following the design thinking framework, project teams will typically engage in these tasks over the semester.

Empathise

- Conduct an initial review to determine and define needs and expectations from urban observatories (in different countries); look into their missions and visions and which aspect are highlighted in setting up urban observatories.
- Understand the context, the key stakeholders involved in designing and developing urban observatories.
- Conduct a review to determine the main key social, ethical, and technical concerns around urban observatories design and application. Focus more on the relationship between policymakers and public.
- Analyse the available data regarding observatories' design, people's attitude, applications, regulatory concerns etc.

Ideate and prototype solutions/recommendations

- Recommendations for new or improved design and implementation.
- Recommendations on how urban observatories, an urban innovation, should be developed based on the responsible innovation framework [9].
- Recommend activities that urban planners can use to build dialogue-centered urban observatories.

The recommendations/outcomes of the project need to:

- Demonstrate your responsible thinking and practice.
- Align with best practice.
- Fit within the ANU policy framework, security and privacy guidelines.

Opportunities

- Students may volunteer or continue to work on the project in an unpaid capacity at the end of the semester.
- Students may be accepted to join ANU Responsible Innovation Lab
- The Project could be showcased on the Lab's website, and team member are invited to present the project in a Webinar on Responsible Innovation on July 13, 2021.

Responsible Innovation Project

Innovation and the Future of Earth

WORKSHOP 04

Workshop time: Thursday 16:00-18:00, [Zoom Link](#)

Workshop Facilitator: Joyce Yeoh

Project Title: Using Earth observation data responsibly: The case of Digital Earth Africa

About

Digital Earth platforms are becoming very popular across the world, including in Australia [1,2]. These platforms use spatial data and images recorded by satellites orbiting our planet to detect physical changes in counties and continents in unprecedented detail. They prepare these vast volumes of Earth observation data and makes them available to governments and industry for easy use. By investing in these technology, governments and companies across the world would have a better understanding of what is happening in their environment, where it is happening, and what the causes of change are to provide insights into the past, present and (likely) future. When prepared and analysed using high performance computing, this data provides a wealth of information to governments and industry for monitoring the environment, increasing productivity in the agriculture and mining industries, and also supports the rapidly growing market for spatial information and services.

Digital Earth Africa is a project that aims to provide a routine, reliable and operational service, using Earth observations to deliver decision-ready products enabling policy makers, scientists, the private sector and civil society to address social, environmental and economic changes on the continent and develop an ecosystem for innovation across sectors [see 3,4,5,6,7]. The platform will process openly accessible and freely available data to produce decision-ready products. Working closely with the AfriGEO community, DE Africa will be responsive to the information needs, challenges and priorities of the African continent. DE Africa will leverage and build on existing capacity to enable the use of Earth observations to address key challenges across the continent.

Challenge

Sustainable socio-ecological systems are typically those that possess timely and effective feedback mechanisms between bio-geo-chemical earth systems and the social institutions embedded within them. However, the recent history of technological innovation has more often than not enhanced our alienation from the life-sustaining mechanisms of the earth system. How can a technical innovation like the Open Data Cube (Earth Observation data; Digital Earth Africa) be effectively instituted/utilised to help create a sustainable socio-ecological system? At whatever scale you think is appropriate (local, regional, continental), consider the governance, financial, social, and ethical frameworks necessary to ensure this digital innovation can deliver on its promise to support a more sustainable and prosperous Africa. Try focusing your analysis around a single Sustainable Development Goal [9] (e.g. climate Action, water resources, land degradation etc.)

You can find more resources [here](#). Through this link, you will find documents that can help you better understand Digital Earth Africa, Socio-Ecological-Systems (SES), adaptive environmental governance, and the Sustainable Development Goals. The Digital Earth Africa folder has some material that summarizes DEA, some of Geosciences Australia products, and also a document written by one of stakeholders in Ghana attempting to place DEA within a SES framework.

Project Process

Time commitment

Students are expected to commit 3-4 hours per week on this project.

Following the design thinking framework, project teams will typically engage in these tasks over the semester.

Empathise

- Conduct an initial review to determine and define needs and expectations from Digital Earth platforms, and more specifically from Digital Earth Africa;
- Understand the context, environment and requirements;
- Conduct a review to determine the main key social, ethical, and technical concerns around design and application of Digital Earth Africa.
- Analyse the available data regarding Digital Earth Platform design, people's attitude, applicability, investment, etc.

Ideate and prototype solutions/recommendations

- Recommendations for new or improved design and implementation of Digital Earth platforms.
- Develop a methodology to consider the social and ethical parameters for a responsible design and implementation of such project.
- Consider the governance, financial, social, and ethical frameworks necessary to ensure this digital innovation can deliver on its promise to support a more sustainable and prosperous Africa
- Recommendations on How can Digital Earth Africa be effectively instituted/utilised to help create a sustainable socio-ecological system?

The recommendations/outcomes of the project need to:

- Demonstrate your responsible thinking and practice.
- Align with best practice.
- Fit within the ANU policy framework, security and privacy guidelines.

Opportunities

- Students may volunteer or continue to work on the project in an unpaid capacity at the end of the semester.
- Students may be accepted to join ANU Responsible Innovation Lab
- The Project could be showcased on the Lab's website, and team member are invited to present the project in a Webinar on Responsible Innovation on July 13, 2021.