Longitude Explorer Prize

Theme 2: Living Better

There is huge potential in how technology can help us live healthier lives.

How can we use Artificial Intelligence (AI) to help catch illnesses earlier, enable us to recover more quickly or help us stay healthy on a day to day basis?

In this pack you will find:

- An overview of the theme and how it links to the Industrial Strategy's Grand Challenges
- Examples of the opportunities and challenges within this theme
- Probing questions and sub-themes to help you think about how AI can be used within this theme
- Case studies of real examples of how AI is helping issues within this theme.

The Grand Challenges

The Grand Challenges form part of the Industrial Strategy.

The Grand Challenges aim to improve people's lives, and transform the UK's industries for the better. The four Grand Challenges are linked to the themes of the Longitude Explorer Prize:

Theme 2 Living Better

Artificial Intelligence & Data Grand Challenge is aimed at using AI and data to transform prevention, early diagnosis, and treatment of chronic diseases by 2030.

Theme 1 Living Longer (Ageing Society Grand Challenge)

Theme 3 Living Together (Future of Mobility Grand Challenge)

Theme 4 Living Greener (Clean Growth Grand Challenge)

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Living Healthier Lives

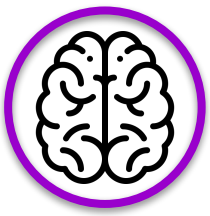
We have made huge progress in improving the health of people in society, but we also face new challenges everyday.

Here are some of the challenges we face as well as the opportunities in trying to improve our health:

Better Mental Health

How can AI help?

- How could AI be used to help people **find help & information** about mental health ?
- Can AI be used to help **detect** potential mental health issues early?



Challenges

- **1 in 10** schoolchildren have a diagnosable mental health condition
- **75%** of young people who experience a mental health problem aren't receiving treatment.[1]

Diagnosis & Detection

How can AI help?

- How can we use AI's ability to **monitor, analyse**, and **learn** to better diagnose illnesses?
- What kinds of **data** do doctors use to diagnose patients?

Challenges

- For some diseases early diagnosis is a life saver - cancer survival is **3x higher** with early diagnosis [2]
- There is room for improvement with some detection methods - standard image screening for signs of cancer return a **false negative 20 - 30%** of the time [3]

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Treatment

How can AI help?

- What can we do with AI that will improve treatment of various diseases?
- How can AI help health care workers (nurses, doctors, etc.) meet changing health needs?
- Can AI be used to help people with disabilities live move independent lives?

Challenges

There are many challenges that come with treating illnesses, disorders, or disabilities, including **cost, access** to treatment and **workload** for medical workers.

AI is already being used in surgical procedures today, helping surgeons reduce error during surgery, and in the creation of prosthetics.

Physical Activity

How can AI help?

- How can AI be used to help get and keep people active?
- Is there any information that would help people stay active? Can AI be used to analyse and share that information?
- How can AI be used to help people recover from injuries that leave them with physical challenges or disabilities?

Challenges

Less than **10%** of British teenagers meet the recommended guidelines for screen time, exercise and sleep. Obesity is a common problem with **20%** of year 6 children being classified as obese. [4] [5]

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Use Case 1

Mental Health

Woebot - and other therapy bots

Watch this 5:50 min video on Woebot and chat-bots in therapy

Chat-bots are a term used for **AI powered chat services**.

While everybody agrees that chatbots are not going to replace real mental health care professionals, they can be a **quick** and **accessible** source of information.

Everyone has mental health, and anyone can experience challenges like depression or anxiety. Below are two recent examples from the news of how mental health can impact a person. Visit https://woebot.io/ for more information.

- Jessy Nelson's experience with online trolling and depression video
- David Cox's experience with depression video

What are the challenges therapy bots are trying to solve?	How is AI being used to help?	What data is the AI using?
Quick and easy access to mental health resources and/or services.	**Machine Learning - Natural language processing** Understanding human text or speech is how chat-bots work, combining this with data from experts and machine learning.	**Data from experts** (on mental health, language, etc) **Human language examples** - used in natural language processing (a type of machine learning)

What are the risks?

Responsibility It is important that people have access to mental health care, AI chat bots should not be a replacement for standard mental health care.

How can we ensure that chat-bots are used as an extra tool and not a replacement?

Data Security Mental health data is very confidential.

How can we ensure that the data is always kept safe?

How do we make sure that people are well informed and know what the algorithms are doing with their data?

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Use Case 2

Better Diagnostics

Lunit - AI and x-ray diagnosis

Watch this 5:52 min video on AI and x-ray diagnosis

Lunit trained their INSIGHT algorithm on chest x-rays to detect lung cancer and by 2016 they had a **97%** successful detection rate for lung cancer. [6]
www.lunit.io/product/#INSIGHT-CXR-MCA

Early detection is very important, especially with diseases like cancer, where early detection increases the chances of survival.

What are the challenges AI and x-rays are trying to solve?	How is AI being used to help?	What data is the AI using?
Error prone detection methods E.g standard image screening for signs of cancer return a false negative 20 - 30% of the time	**Computer Vision / Machine Learning** AI can learn how to understand different images when trained (given a huge number of examples) with x-ray image data of confirmed tumors and confirmed no-tumor x-ray images.	**Medical data** - these kinds of AI applications will need very many examples of past medical data, e.g. past x-rays with and without cancer. As much as possible there needs to be a good representation of different genders, ages, and ethnic groups in the data to avoid bias.

What are the risks?

Decision making- AI is good at analysis but not interpretation. There will always need to be a human checking the algorithm's conclusions. There is a risk of over reliance on algorithms without the necessary checks that need to be in place

Jobs - As AI gets better at certain medical tasks, it might mean fewer jobs. Although it is important to keep in mind that AI technology will also create new jobs.

Some other examples you can check out:

- **VocalID:** using AI to create unique voices for people who have lost the ability to speak
  - **video**
  - **website**
- **HandTalk:** This is an app that translates Portuguese (spoken in Brazil) into Brazilian Sign language.
  - **video**
  - **website**
- **Zoll life vest:** a wearable defibrillator that uses AI to monitor heart rhythm and use an electric shock to restart hearts during heart attacks
  - **video**
  - **website**
- **Immersive Physiotherapy:** Uses virtual reality and AI to help people in need of physiotherapy.
  - **video**
  - **website**

References

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