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Welcome to this session:

Skills Bootcamp - Data Science for Social Good (Theory and Case Studies)

The session will start shortly...

Questions? Drop them in the chat.
We'll have dedicated moderators answering questions.

Skills Bootcamp Data Science Housekeeping

- The use of disrespectful language is prohibited in the questions, this is a supportive, learning environment for all - please engage accordingly. **(Fundamental British Values: Mutual Respect and Tolerance)**
- No question is daft or silly - **ask them!**
- There are **Q&A sessions** midway and at the end of the session, should you wish to ask any follow-up questions. We will be answering questions as the session progresses as well.
- If you have any questions outside of this lecture, or that are not answered during this lecture, please do submit these for upcoming Academic Sessions. You can submit these questions here: **Questions**

Skills Bootcamp Data Science Housekeeping

- For all **non-academic questions**, please submit a query: ***www.hyperiondev.com/support***
- **Report a safeguarding incident: *www.hyperiondev.com/safeguardreporting***
- We would love your feedback on lectures: ***Feedback on Lectures.***
- Find all the lecture **content** in your **Lecture Backpack** on GitHub.
- If you are hearing impaired, kindly use your computer's function through Google chrome to enable captions.

Safeguarding & Welfare

We are committed to all our students and staff feeling safe and happy; we want to make sure there is always someone you can turn to if you are worried about anything.

If you are feeling upset or unsafe, are worried about a friend, student or family member, or you feel like something isn't right, speak to our safeguarding team:

Ian Wyles
Designated Safeguarding Lead

Simone Botes

Nurhaan Snyman

Rafiq Manan

Ronald Munodawafa

Tevin Pitts

Scan to report a safeguarding concern

or email the Designated Safeguarding Lead:
Ian Wyles
safeguarding@hyperiondev.com

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Skills Bootcamp Progression Overview

✅ Criterion 1 - Initial Requirements

Specific achievements within the first two weeks of the program.

To meet this criterion, students need to, by no later than **01 December 2024 (C11)** or **22 December 2024 (C12):**

- **Guided Learning Hours** (GLH)**:** Attend a minimum of 7-8 GLH per week (lectures, workshops, or mentor calls) for a total minimum of **15 GLH**.
- **Task Completion:** Successfully complete the **first 4 of the assigned tasks**.

✅ Criterion 2 - Mid-Course Progress

Progress through the successful completion of tasks within the first half of the program.

To meet this criterion, students should, by no later than **12 January 2025 (C11)** or **02 February 2025 (C12):**

- **Guided Learning Hours** (GLH)**:** Complete at least **60 GLH**.
- **Task Completion :** Successfully complete the **first 13 of the assigned tasks**.

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Skills Bootcamp Progression Overview

✅ Criterion 3 – End-Course Progress

Showcasing students' progress nearing the completion of the course.

To meet this criterion, students should:

- **Guided Learning Hours** (GLH)**:** Complete the **total minimum required GLH,** by the **support end date.**
- **Task Completion : Complete all mandatory tasks**, including any necessary resubmissions, by the end of the bootcamp, **09 March 2025 (C11)** or **30 March 2025 (C12).**

✅ Criterion 4 - Employability

Demonstrating progress to find employment.

To meet this criterion, students should:

- **Record an Interview Invite:** Students are required to record proof of invitation to an interview by **30 March 2025 (C11)** or **04 May 2025 (C12)**.
  - **South Holland Students** are required to proof and interview by **17 March 2025.**
- **Record a Final Job Outcome :** Within 12 weeks post-graduation, students are required to record a job outcome.

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Learning Outcomes

- **Define and explain the role of data science in social good initiatives,** including areas such as public health, education, poverty reduction, and humanitarian aid.
- **Explain theoretical frameworks** for **designing data-driven solutions** that prioritize equity, sustainability, and ethical responsibility.
- **Analyse case studies** where **data science has driven positive social impact**, understanding methodologies, data sources, and ethical considerations.
- **Identify and evaluate ethical concerns** in social good applications, including issues of bias, privacy, and unintended consequences.
- **Assess potential challenges and propose solutions** to ensure responsible and impactful use of data science for social good.

Lecture Overview

- Data Science for Social Good
- Theoretical Frameworks
- Case Studies and Real World Applications
- Ethical Concerns & Solutions

Which of the following best defines “Data Science for Social Good”?

A. Using data to maximize profit in businesses

B. Applying data science techniques to address societal challenges

C. Automating social services using AI

D. Collecting public data without ethical concerns

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A. Public health
B. Disaster response
C. Predicting stock prices
D. Education accessibility

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What is one major challenge when applying data science to social good projects?

A. The lack of machine learning algorithms
B. The difficulty in accessing quality, unbiased data
C. The need for complex blockchain implementations
D. The lack of government regulations

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C. The need for complex blockchain implementations

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Data Science for Social Good

Data science has transformed industries like finance, healthcare, and technology. But can it also be a force for social good? Governments, NGOs, and research institutions increasingly use data-driven approaches to tackle challenges like poverty, climate change, and public health crises. However, implementing these solutions effectively requires overcoming issues like bias, accessibility, and ethical concerns.

Data Science for Social Good

- Have you seen examples where **data science** has been used to **solve social problems**?
- What **challenges** do you think arise when applying data science in real-world social contexts?

Data Science for Social Good

The application of data science techniques and methodologies to tackle social issues and improve the well-being of individuals and communities

- It aims to move beyond simply extracting insights from data and focuses on **creating solutions** that can **improve people's lives** and **address systemic problems**.
- **Nonprofit organizations, civic agencies, and public sectors** recognize data science's immense potential to **address social challenges** and **drive positive societal change**.

Have a look at GoogleAI's Social Impact page to see how they've been using AI for Social Good.

Data Science for Social Good

- **Key Areas of Impact:**
  - **Healthcare**: Predicting disease outbreaks, optimising hospital resources.

Source: [WHO's AI for Health Approach]

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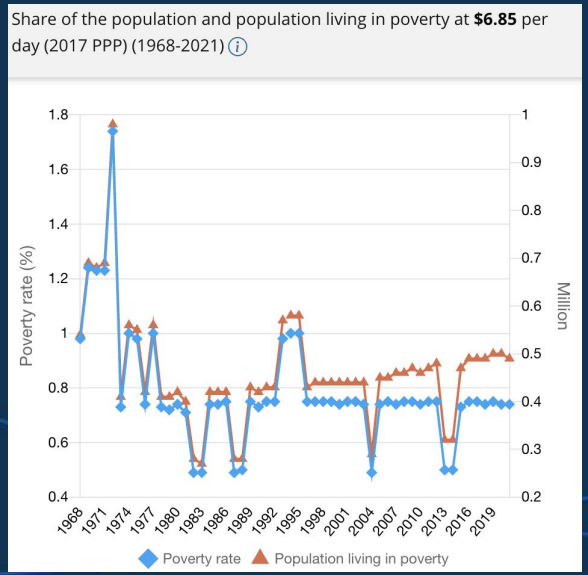
Data Science for Social Good

- **Key Areas of Impact:**
  - **Poverty & Inequality**: Identifying underserved communities, targeting aid effectively.



The World Bank has been using various tools to collect and share useful data with the aim to help track and understand poverty, its causes and its impacts.

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Data Science for Social Good

- **Key Areas of Impact:**
  - **Education**: Improving learning outcomes through personalised AI tutors.

A comparison of mean post-test performance between students taught with the active lecture and students taught with the AI tutor. Dotted line represents students' mean baseline knowledge before the lesson (i.e. the pre-test scores of both groups).
Source: "AI Tutoring Outperforms Active Learning," Gregory Kestin, Kelly Miller, Anna Klales, Timothy Milbourne, Gregorio Ponti

A Harvard study found that engagement doubled with students who were assisted by an AI tutor.

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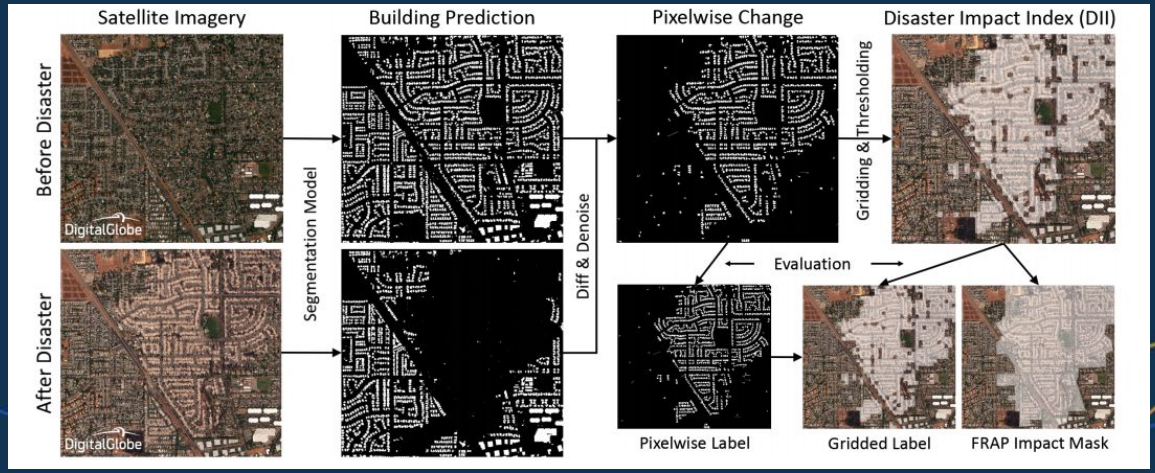
Data Science for Social Good

- **Key Areas of Impact:**
  - **Disaster Response**: Using satellite imagery & AI to detect and mitigate natural disasters.



Source: Detecting Disaster Damage with AI

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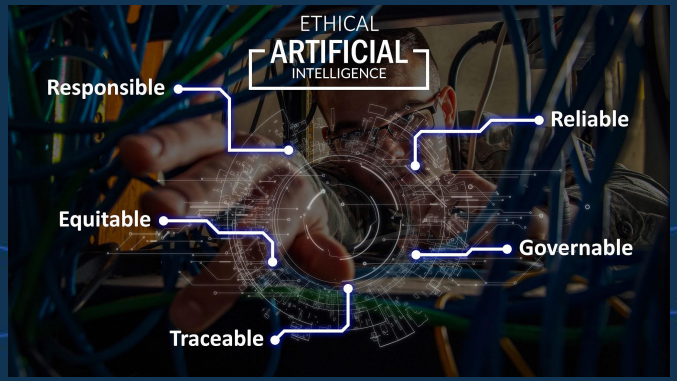
Theoretical

- **How to Design Data Solutions for Social Good:**
  - **Fairness & Bias:** Avoiding bias in algorithms to ensure equitable outcomes.
  - **Transparency & Interpretability:** Making AI-driven decisions understandable.
  - **Sustainability:** Long-term benefits rather than short-term fixes.



Theoretical

- We can aim to ensure that our tools and methodologies are aligned with the overarching goals of Data Science for Social Good using these frameworks as guidelines:
  - *Data4Good Framework* – balancing impact with ethics by laying out a roadmap for responsible data sharing in the UAE.
  - *AI Ethics Guidelines* – proposed by organizations like the EU, UNESCO to provide a global resource for policymakers, regulators, academics, the private sector and civil society to find solutions to the most pressing challenges posed by Artificial Intelligence.

Let’s Breathe!

Let’s take a small break before moving on to the next topic.

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Case Studies

- **Predicting Crime in Chicago Using AI**

  Researchers at the University of Chicago developed an algorithm to predict crime by analysing the time and spatial coordinates of discrete events. The model successfully predicted crimes across various U.S. cities, including Chicago, Atlanta, and Los Angeles. However, it also **revealed biases in police responses**, indicating **increased attention in wealthier neighborhoods** at the expense of less advantaged areas.

Case Studies

- **NASA's AI for Disaster Response**

  NASA, in collaboration with IBM Research, developed an **open-source artificial intelligence model** to support a variety of weather and climate applications. This AI model leverages NASA's extensive satellite data to improve the resolution of regional and local weather and climate models. It supports applications such as **tracking changes in land use**, **monitoring disasters**, and **predicting crop yields** worldwide.

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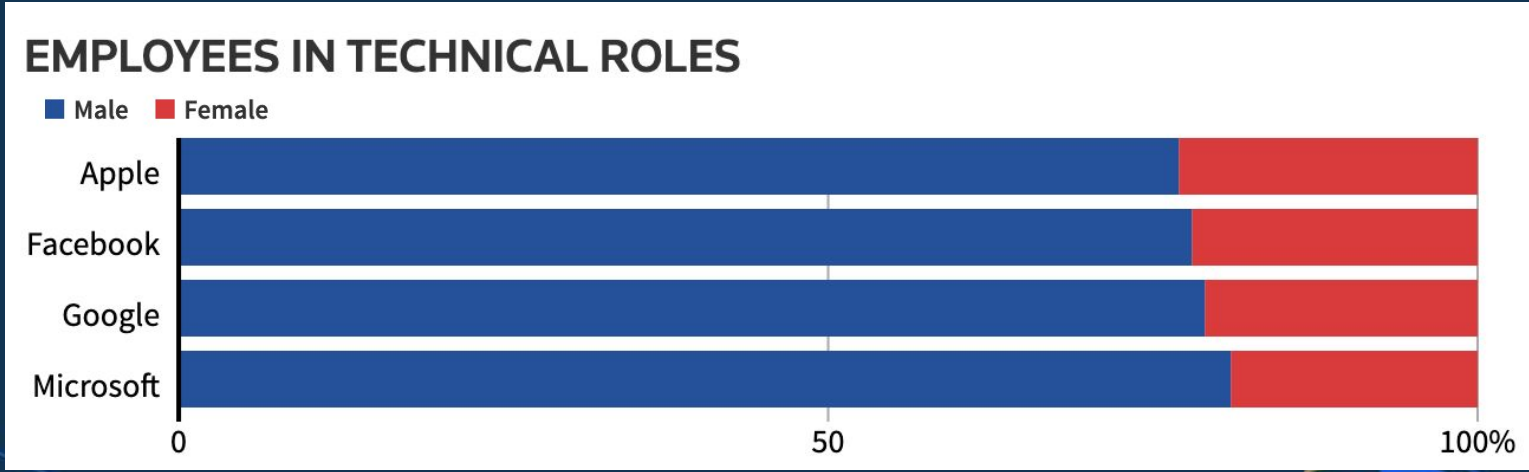
Ethical Considerations

- **Bias in AI Models**: How biased datasets can reinforce discrimination.



Amazon had to scrap it's recruiting tool after observing that the model was biased against women since it had been trained on biased hiring data.

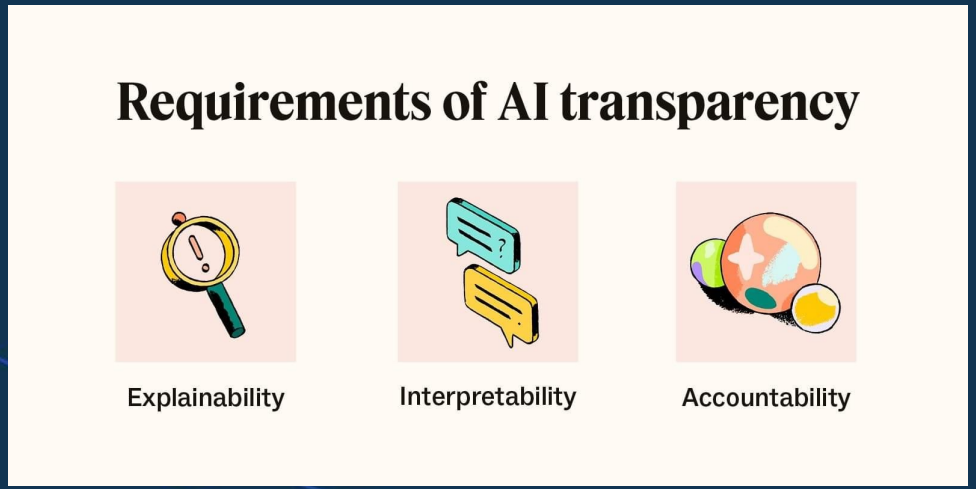
Ethical Considerations

- **Privacy & Consent**: Handling personal data responsibly.

Governments, corporations, universities and other researchers frequently rely on data collected from marginalized populations, yet these communities rarely benefit equitably from the insights or policies derived from their information. This imbalance raises significant ethical concerns about privacy, exploitation, and agency. This guideline was released to aid in responsible and equitable data sharing.

Ethical Considerations

- **Transparency & Accountability**: Ensuring AI decisions can be explained.



Whenever AI is being used, it's important that decisions made by the system are explainable (we know **why** the decision was made), interpretable (we know understand **how** the system works) and accountable (we can **correct mistakes** and the system **learns from mistakes**). If not, systems could be biased, unreliable or untrustworthy.

Future of Data Science

- **Emerging Technologies in AI & Data Science:**
  - Federated Learning for privacy-preserving AI.
  - Explainable AI (XAI) for better transparency.
  - AI-driven climate solutions (carbon footprint tracking).
- **How Students Can Get Involved**
  - Open-source projects for social good (DataKind, UNICEF's AI initiatives).
  - Collaborate with NGOs, research groups working on AI for Good.

Which of the following is a key challenge when applying machine learning to social good?

A. The presence of bias in datasets
B. The high cost of implementing AI solutions
C. The lack of advanced AI models
D. The difficulty in hiring data scientists

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Which technique is commonly used to ensure fairness in social good applications?

A. Collecting more unverified data
B. Prioritizing speed over accuracy
C. Using explainable AI models to detect bias
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What is one way data science has improved disaster response?

A. Creating better insurance policies for affected individuals
B. Reducing government involvement in emergency situations
C. Ensuring all countries receive the same level of aid
D. Predicting disaster impact using satellite and weather data

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Summary

- ★ Data science has the power to **drive social change** when used **responsibly**.
- ★ Case studies show its impact on **health, disaster response, education, and poverty reduction**.
- ★ **Challenges like bias, privacy, and scalability** must be carefully managed.
- ★ **Ethical considerations** should always be at the core of social good applications.

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Q & A SECTION

Please use this time to ask any questions relating to the topic, should you have any.

Thank you for attending

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SKILLS FOR LIFE
SKILLS BOOTCAMPS

Department for Education