

Coding & STEM 4 Schools

2019 AI Workshop

Artificial Intelligence & Machine Learning

Presented by Mr Daniel Hickmott on 12th November 2019

Artificial Intelligence (AI)

- Artificial Intelligence (AI) is part of our daily lives
- What are some examples of AI that you use or are impacted by?

Defining AI

- The ability for a computer to perform human-like thought processes, "...such as the ability to reason, discover meaning, generalize, or learn from past experience"
- AI is a very large topic - includes philosophy, ethics, AI algorithms...
- Different approaches (e.g. simulating how a human brain works vs more 'traditional' statistical techniques)

Four Types of AI

- Four types of AI, categorised as **Narrow AI** or **General AI**:
 - **Narrow AI**: Reactive Machines, Limited Memory
 - **General AI**: Theory of Mind, Self-Awareness
- **General AI** does not exist yet! (except in movies)
- Most AI that we encounter is **Narrow AI** (solves specific problems, e.g. a chess playing AI)

Why Teach AI?

- Similar reasons for teaching coding to everyone:
 - Jobs (impact of automation)
 - AI Literacy
 - Understanding their world
 - Broadening participation
- In curriculum?

AI in Curriculum: Primary

- Not specifically in K-6 syllabuses
- **ICT Capability** (e.g. creating with ICT)
- **Ethical Understanding** (e.g. understanding ethical concepts and issues that relate to AI)
- **Digital Technologies in Science and Technology K-6** (e.g. ST3-2DP-T: plans and uses materials, tools and equipment to develop solutions for a need or opportunity)

AI in Curriculum: Secondary

- Digital Technologies in Technology Mandatory 7-8 (e.g. TE4-1DP designs, communicates and evaluates innovative ideas and creative solutions to authentic problems or opportunities)
- Draft syllabus for Integrated Computing 7-10 includes AI content, e.g. 'explore how artificial intelligence is used to predict patterns of behaviour'
- Draft syllabus for Software Engineering includes AI content, e.g. 'develop algorithms that describe artificial neural networks'

Resources for Teaching AI

- Likely that AI will have to be taught to some students in the near future
- There's arguments for teaching AI to every student
- How can we give students an accessible and practical introduction to creating AI?
- Our view was that there was not much out there about AI projects for students
- Luckily, Machine Learning for Kids exists!

Other AI Topics

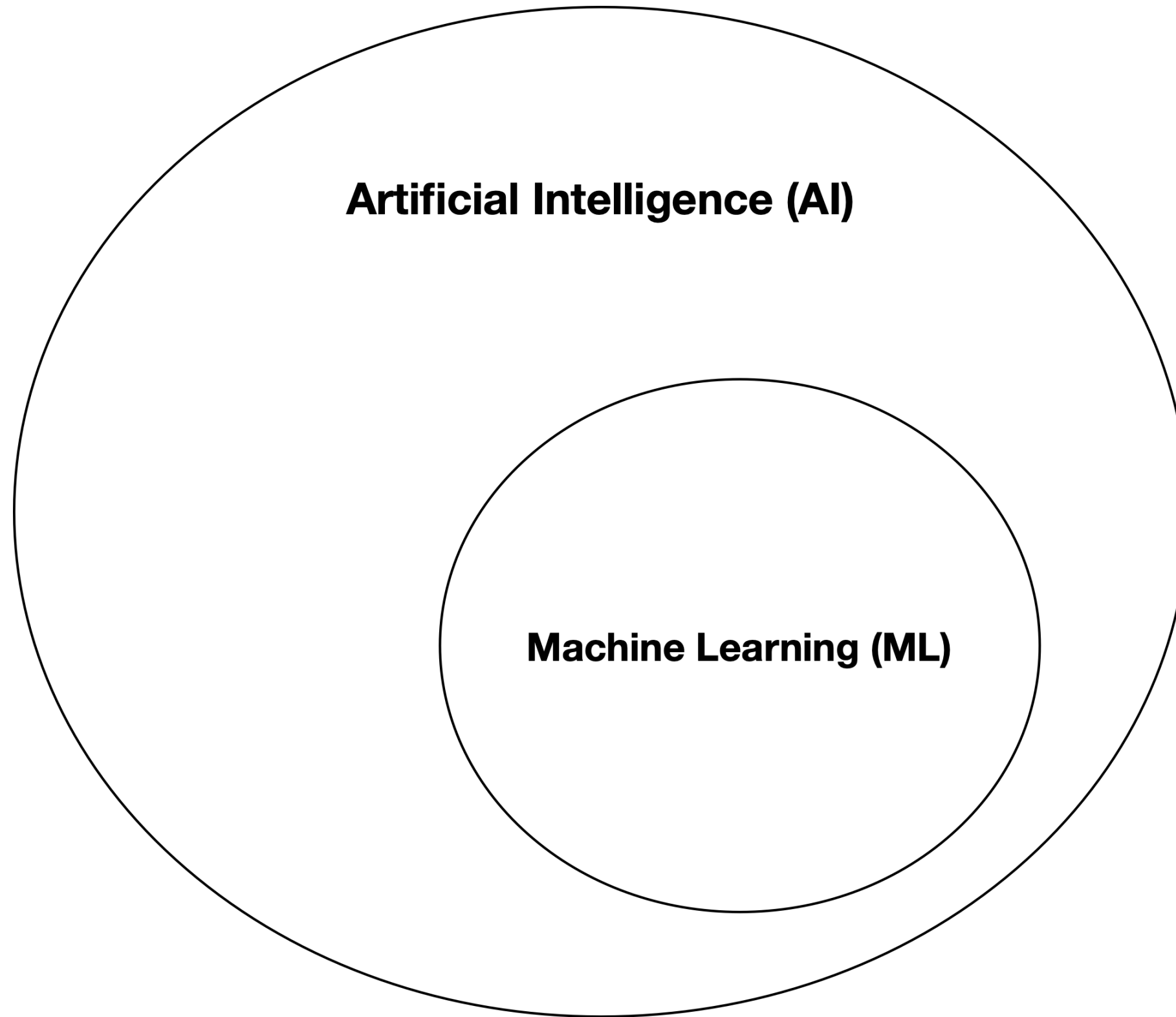
- Coded chatbots
 - ELIZA
 - Code Club's Scratch Chatbot project
 - Grok Learning's Python Chatbot
- Philosophy and History of AI
 - Turing Test
 - AI Winter

Other AI Topics

- Future of work and impact of automation:
 - The New Work Mindset (Free report)
 - Future of the Professions (Book)
 - Rise of the Robots (Book)

Other AI Topics

- Ethics:
 - Bias and Impact of Data
 - Artificial Intelligence and Emerging Technologies in Schools (Free report)
 - Critical AI Reading List



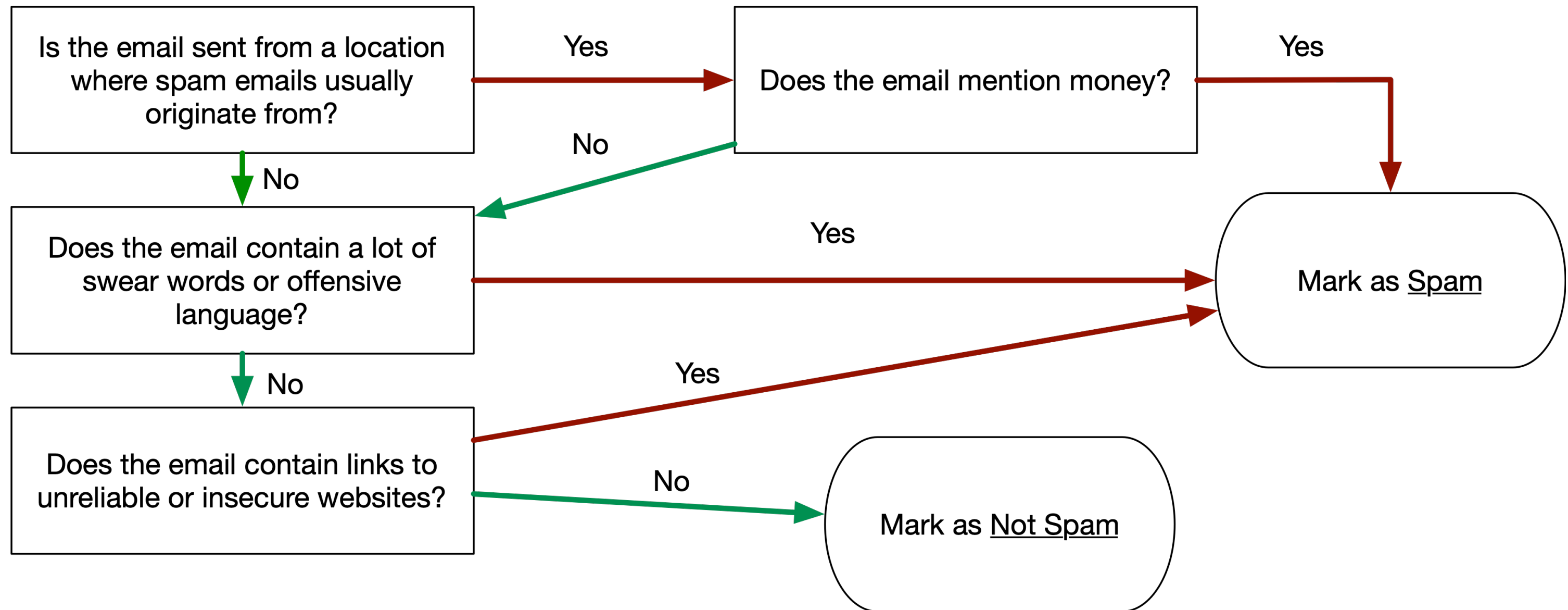
Machine Learning (ML)

- A big topic in itself, encompassing a variety of tools and techniques
- Focused on computers 'learning' from data
- Common methods of ML involve 'training' a model by giving it examples
- Can you think of where ML might be used?

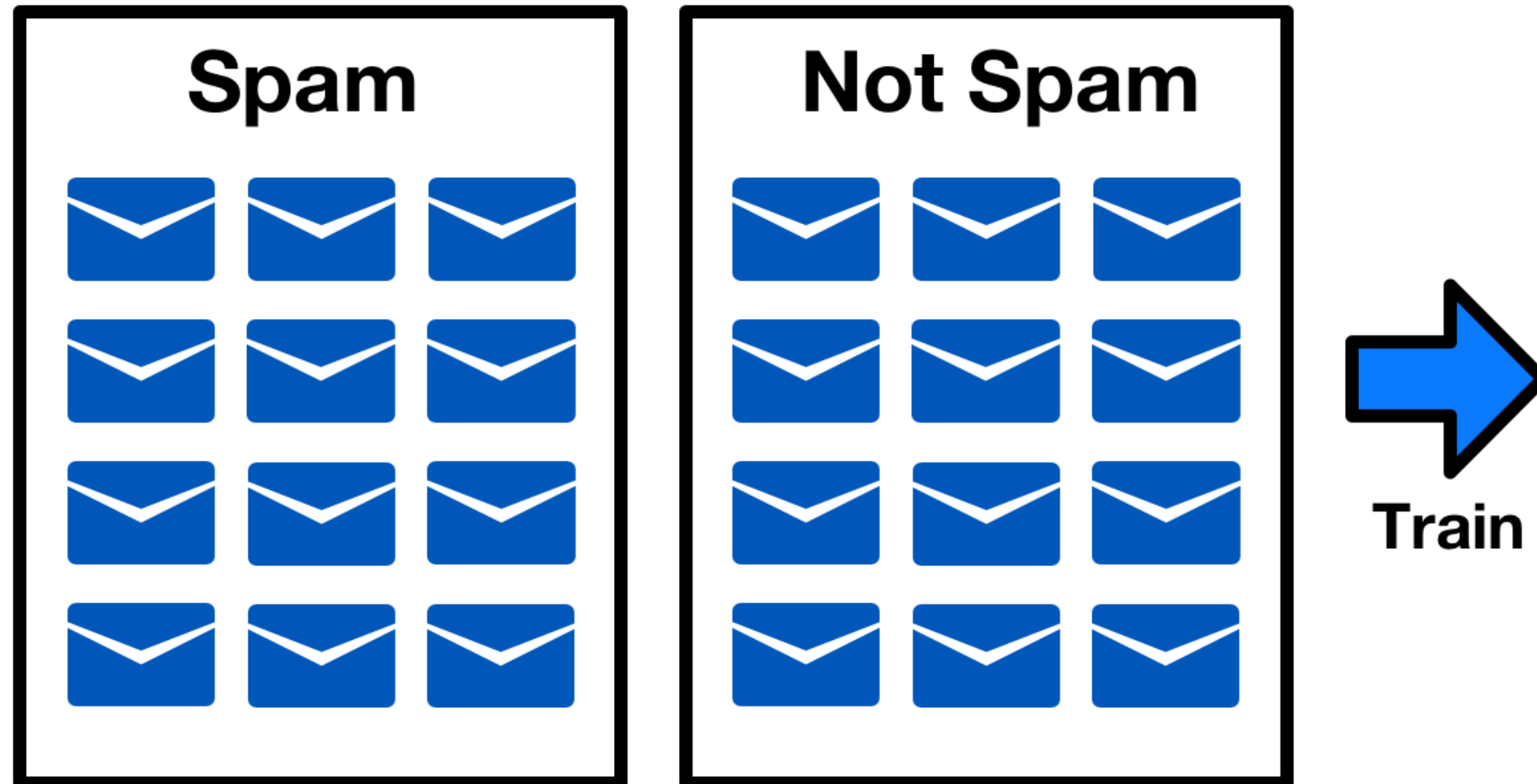
Detecting Spam: Coding vs ML

- Usually when coding we break down a problem into steps and rules
- We could come up with some rules to detect spam
- Where does the email come from?
- It could be spam if it's from Nigeria
- What if our friend is staying in Nigeria?
- We could mark emails from Nigeria that mention money as spam

Detecting Spam: Coding



Detecting Spam: ML



Examples of AI & ML

Health and Medicine

- Detecting when people have falls
- Finding tumours in medical scans

Engineering and Construction

- Creating buildings and cities
- Managing power grids

Examples of AI & ML

Education and Training

- Adapting lessons from students' data
- Predicting whether students will complete uni

Entertainment and Media

- Recommending us movies to watch
- Writing movie scripts

Examples of AI & ML

Business and Marketing

- Customer segmentation for targeted advertising
- Detecting fraudulent transactions

Quick Activity

Find an example of how AI or ML is applied in one of the following areas and explain it to the group:

- Health and Medicine
- Engineering and Construction
- Education and Training
- Entertainment and Media
- Business and Marketing

Steps in Developing ML Solutions

1. Identifying a Problem
2. Modelling the Problem
3. Collecting the Data
4. Training the Model
5. Evaluating the Model

Models

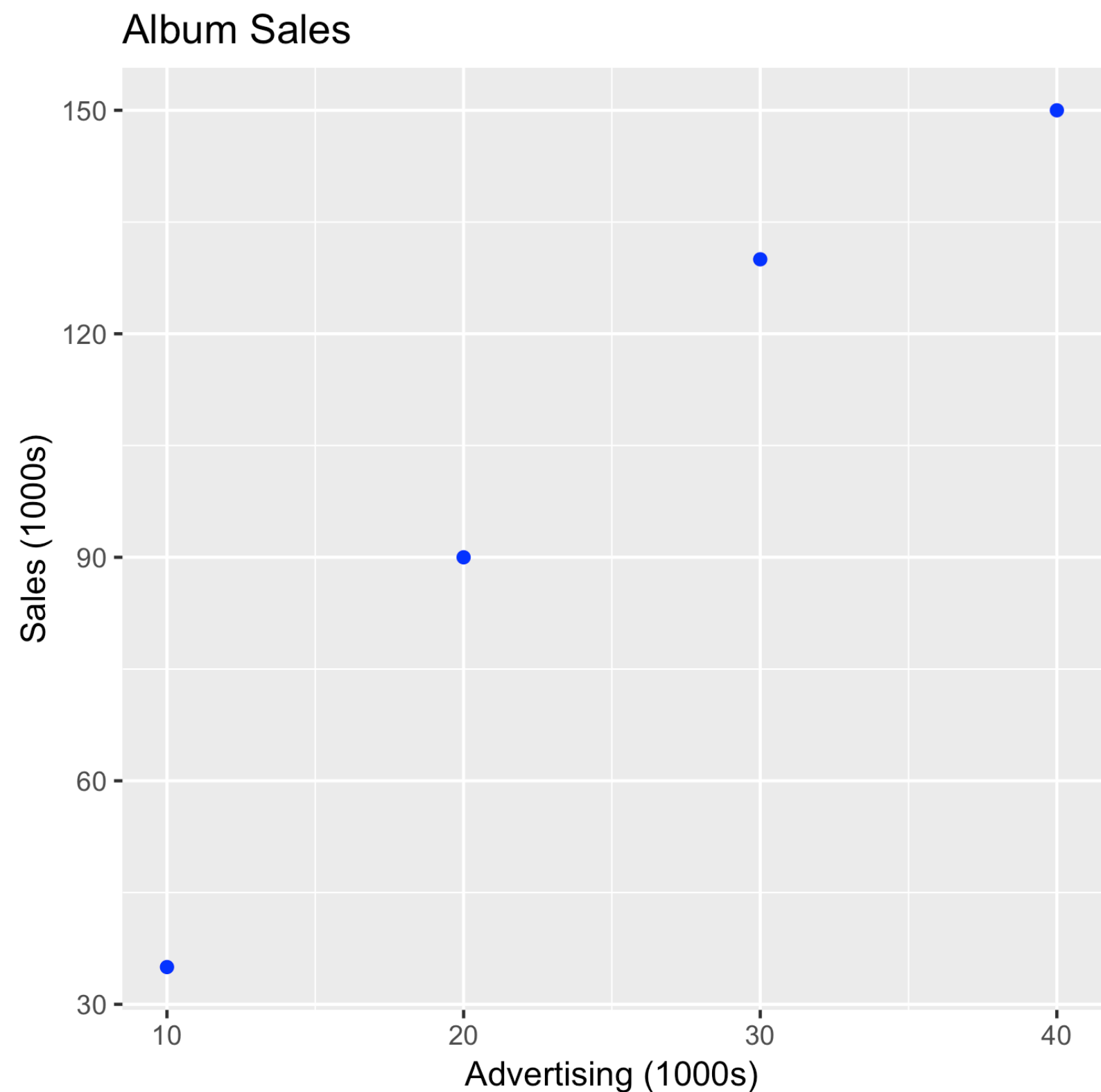
- A representation of a real world phenomenon, which we could use for explanation or prediction
- Engineering models (e.g. constructing buildings)
- Financial models
- Statistical models¹
- We gather 'real world' data and define variables that 'model' a phenomenon

¹ Andy Field's 'Discovering Statistics Using SPSS' explains these really well

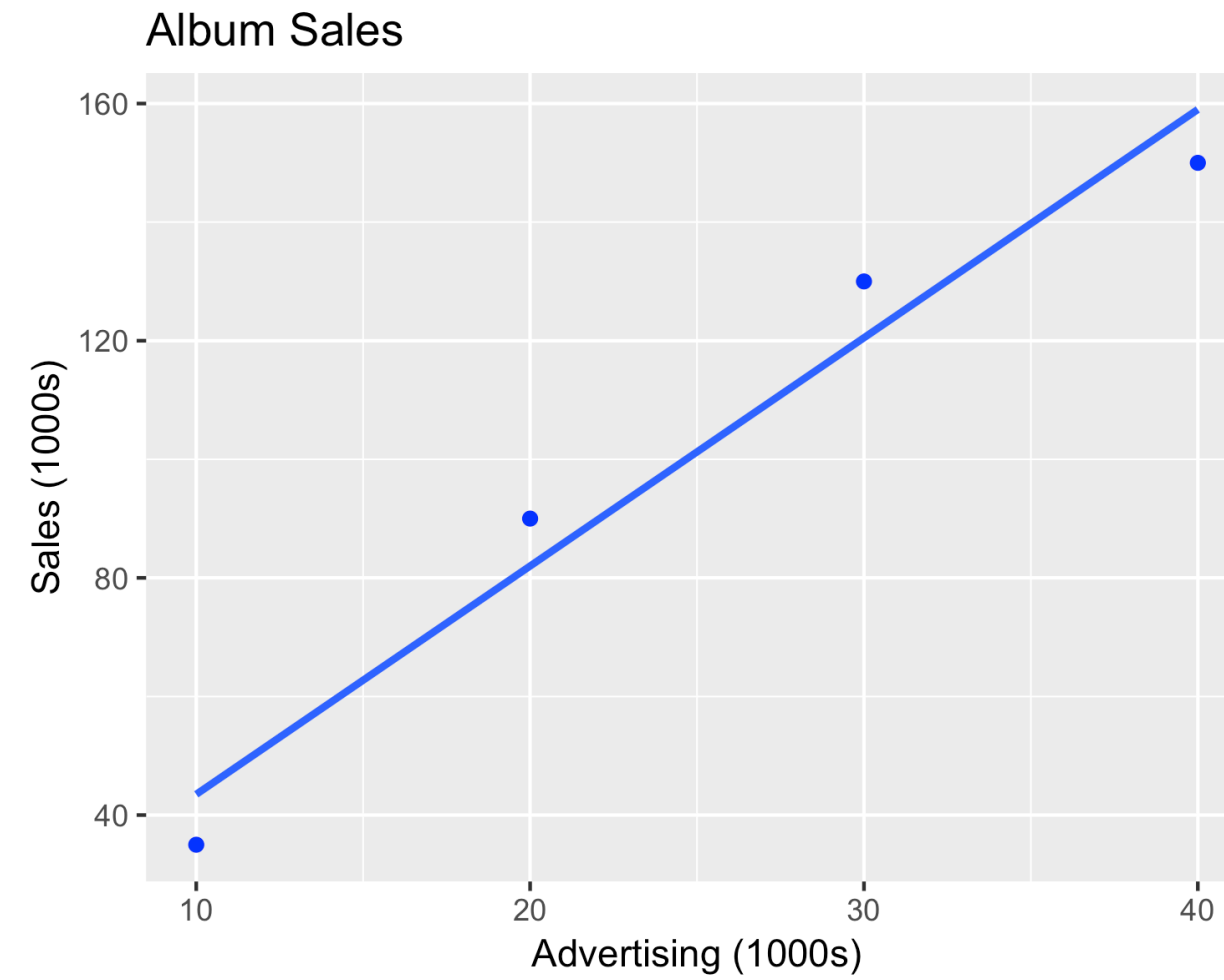
Album Sales

— Amounts in 1000s

Ad \$	Sales
10	35
20	90
30	130
40	150



Album Sales: Model



$$Sales = 3.85 \times \text{Advertising Costs} + 5$$

Types of ML Algorithms

- Supervised
 - Classification
 - Regression
- Unsupervised
 - Clustering
- Reinforcement Learning

Creating a Smart Assistant

- In the next session, we will work through an example of an ML project
- You will applying all the steps you learned about earlier
- We will use the [Machine Learning for Kids](#) website