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

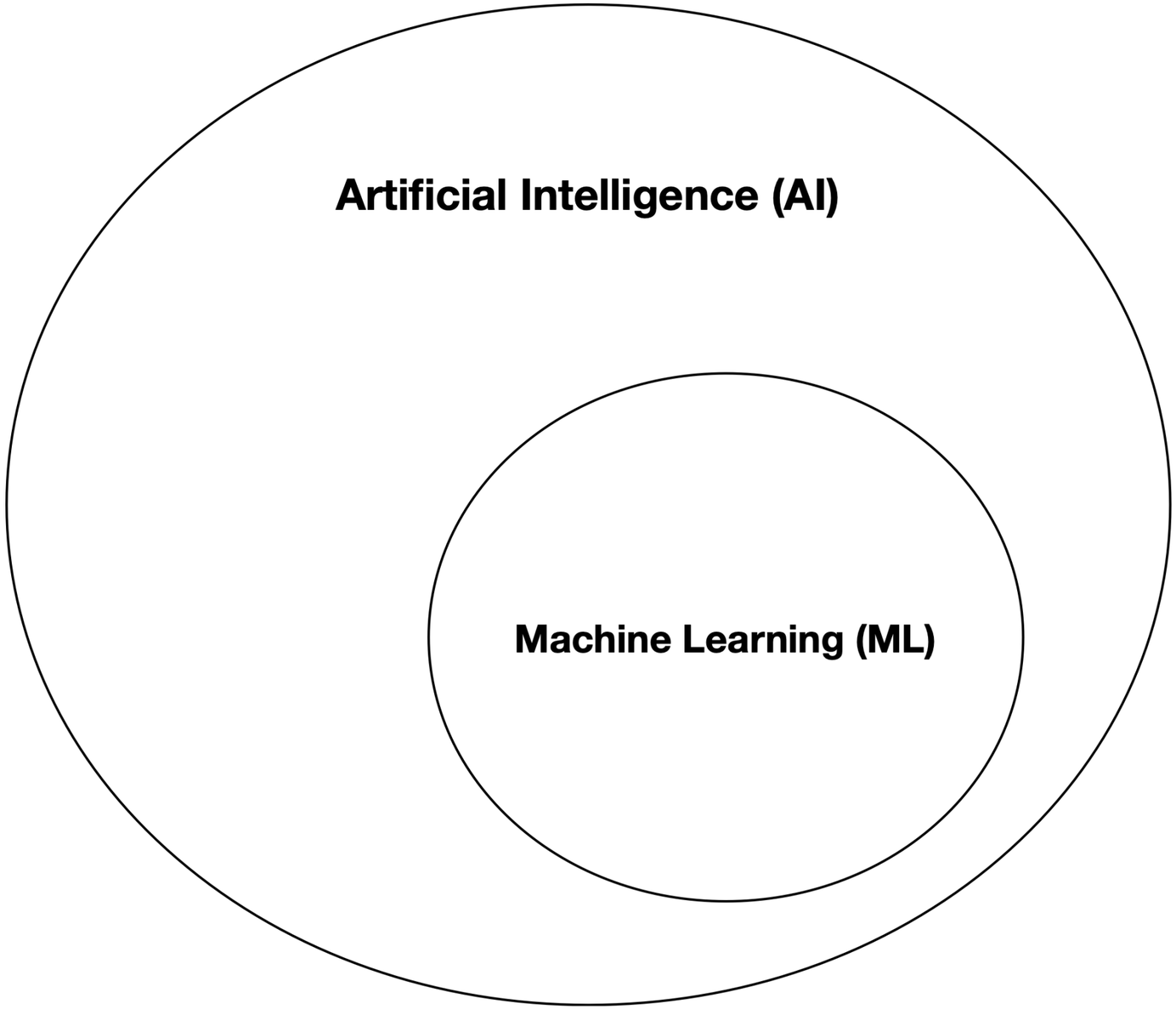
- Coded chatbots
  - ELIZA
  - Code Club's Scratch Chatbot project
  - Grok Learning's Python Chatbot
- Philosophy and History of AI
  - Turing Test
  - AI Winter

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


Artificial Intelligence (AI)
Machine Learning (ML)

Machine Learning (ML)

— A big topic in itself, encompassing a variety of tools and techniques

— Focused on computers 'learning' from data

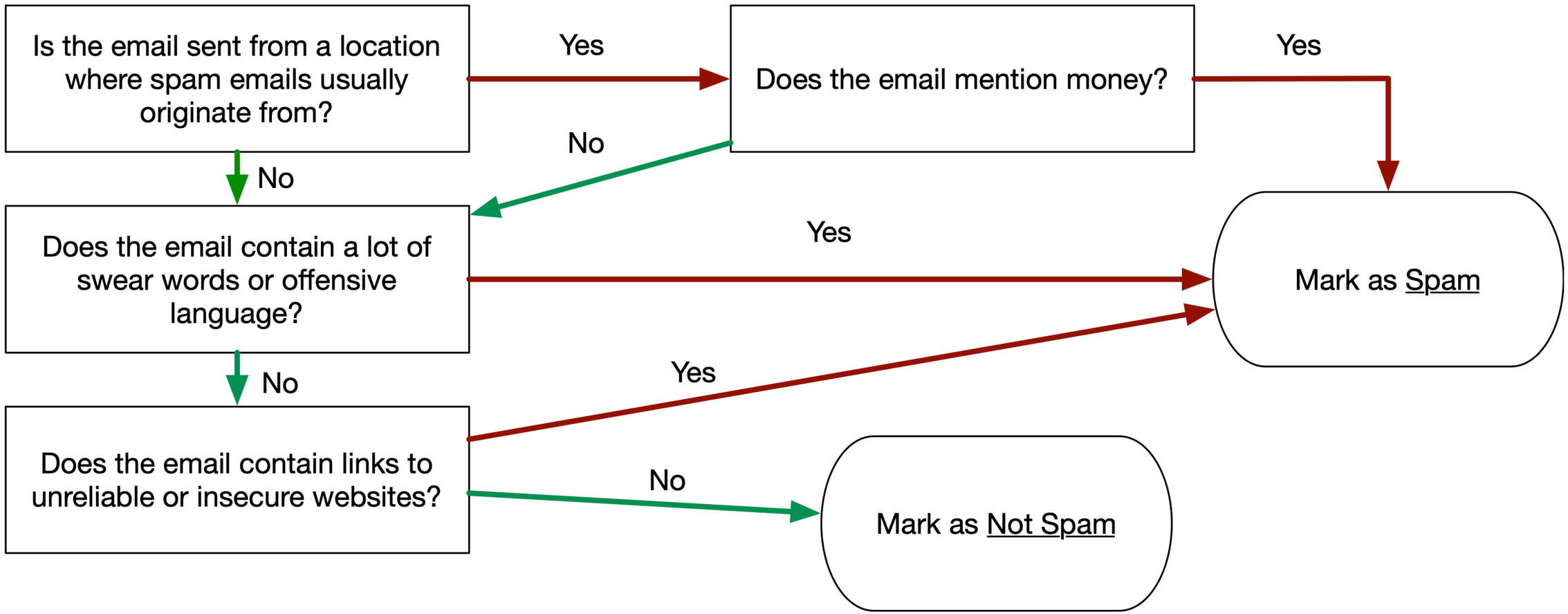
— Common methods of ML involve 'training' a model by giving it examples

— Can you think of where ML might be used?

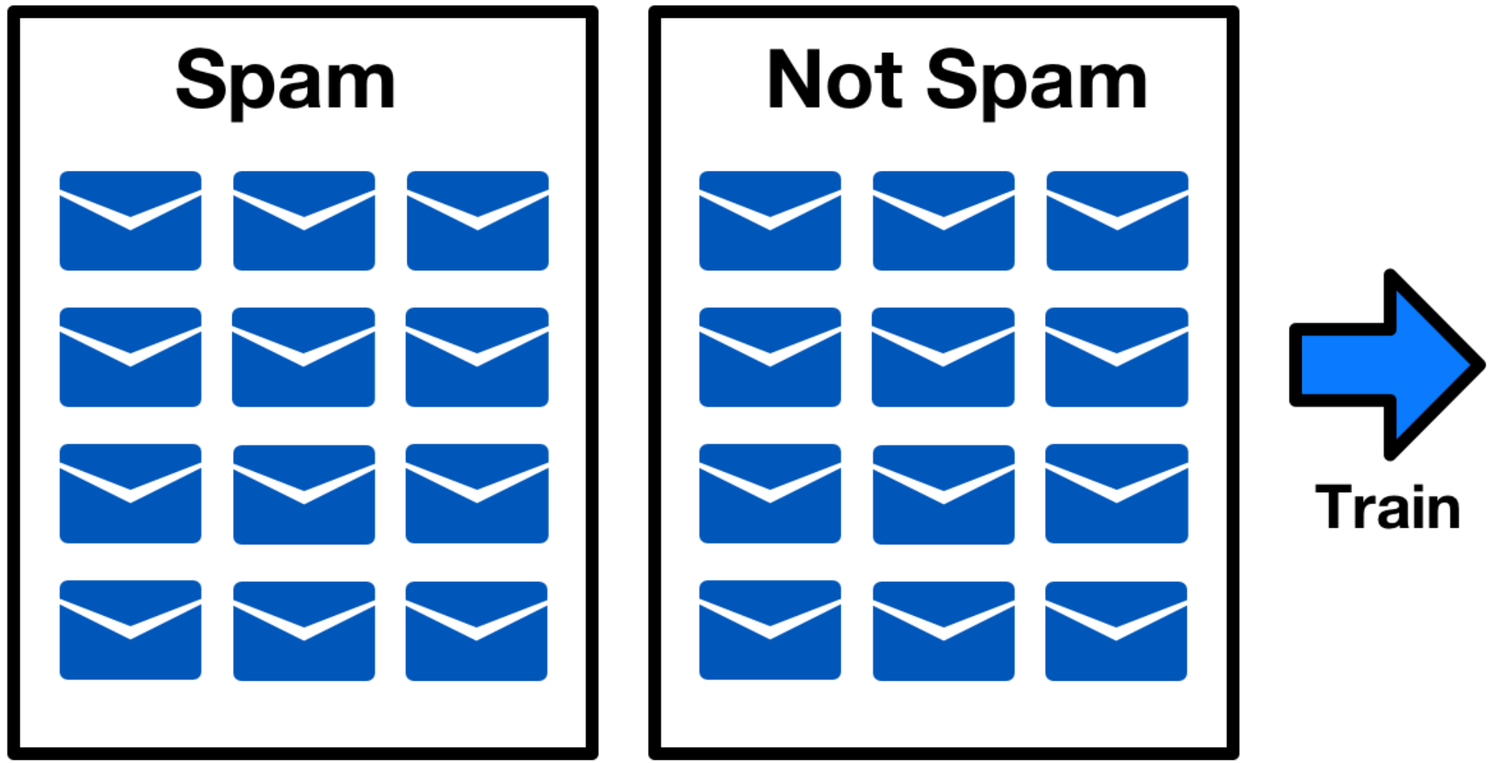
Detecting Spam: Coding vs ML

— 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 models[1]

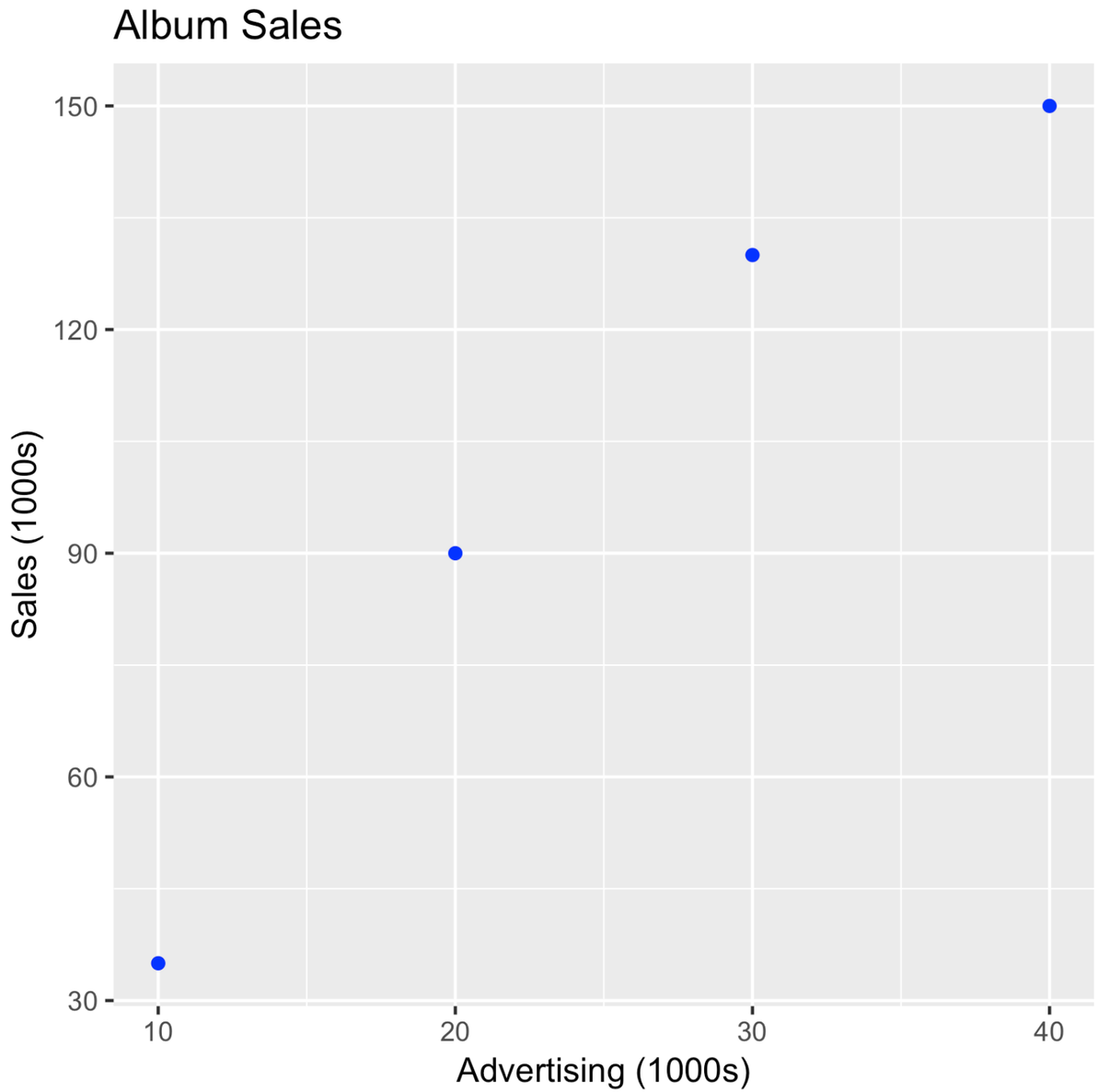
— We gather 'real world' data and define variables that 'model' a phenomenon

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

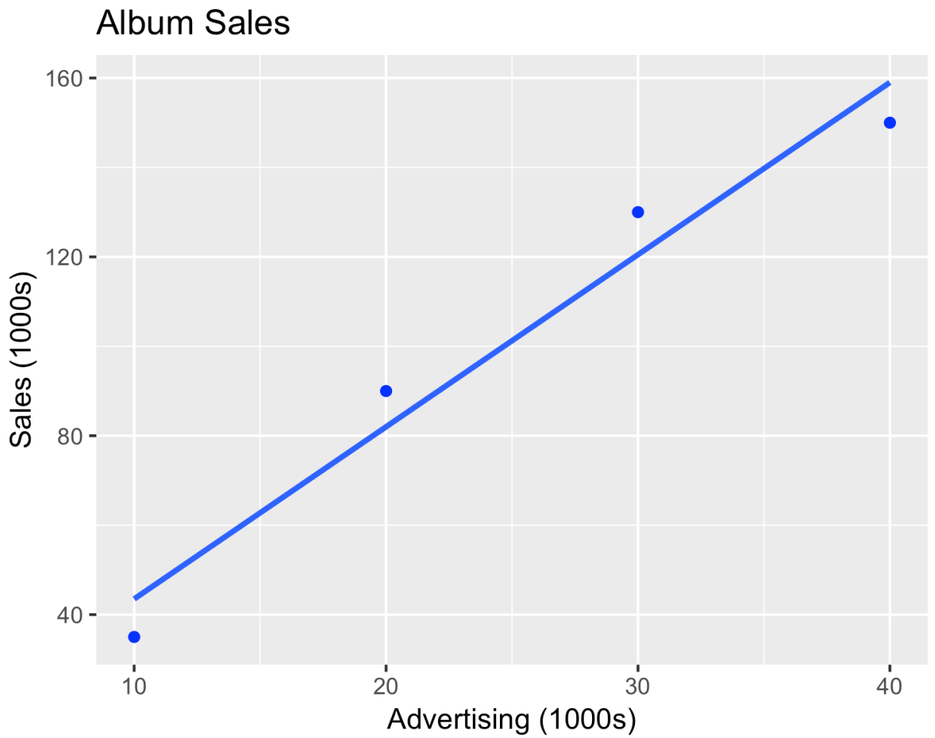
Album Sales

— 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