

Introduction to Machine Learning

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Definition

Machine learning is a field of computer science that gives computer systems the ability to "learn" with data, without being explicitly programmed.

Source:Wikipedia

Why Learn?

Learning is needed when:

- Human expertise does not exist (navigating on Mars)
- Humans are unable to explain their expertise (speech recognition)
- Solution changes in time (routing on a computer network)
- Solution needs to be adapted to particular cases (user biometrics)

What kind of Learning?

Industrial control

- Mass spectrometer analysis
- Drug design
- Astronomic discovery

Rapid data change

- Credit scoring
- Financial modelling
- Fraud detection

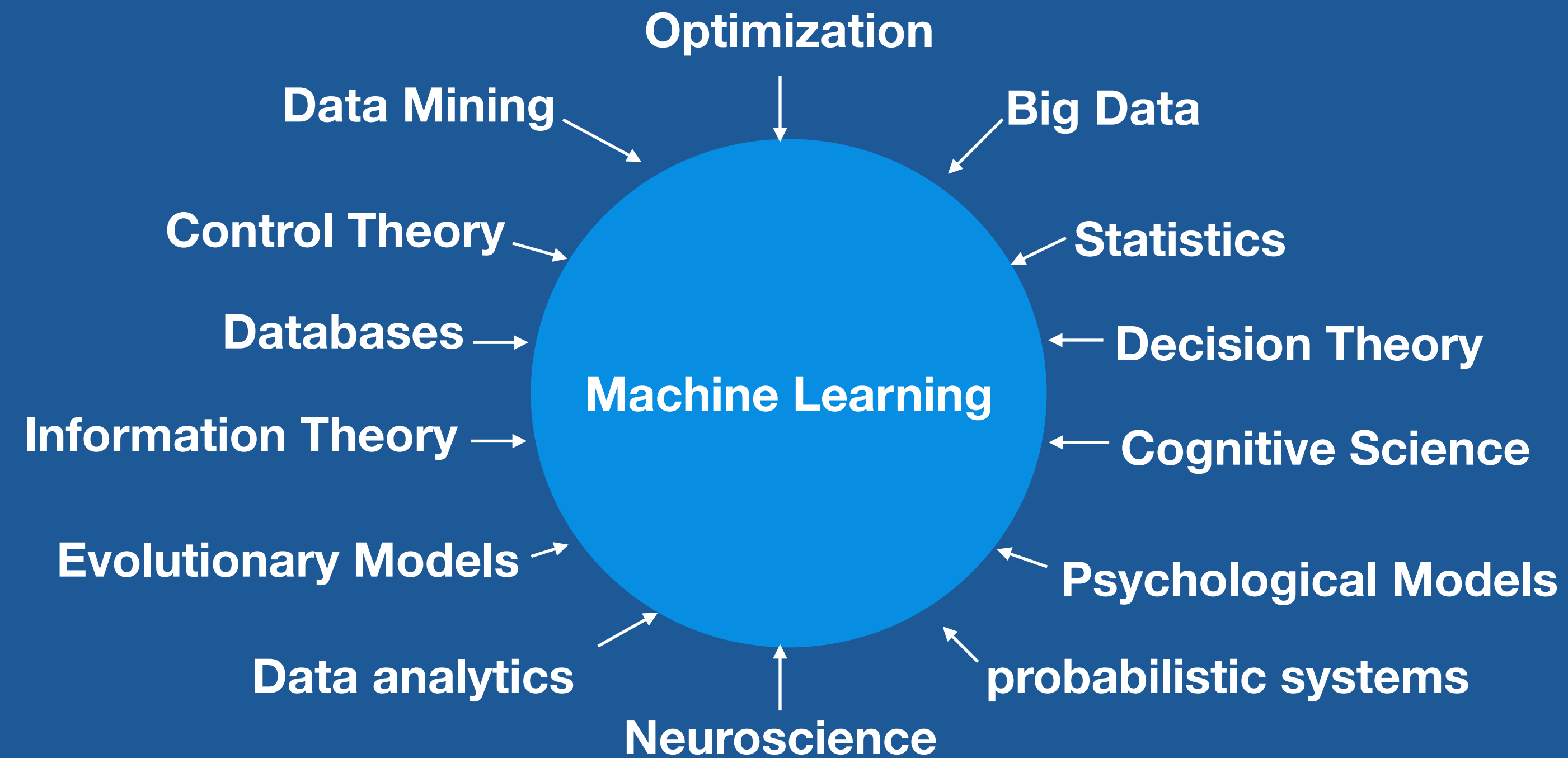
Human expertise

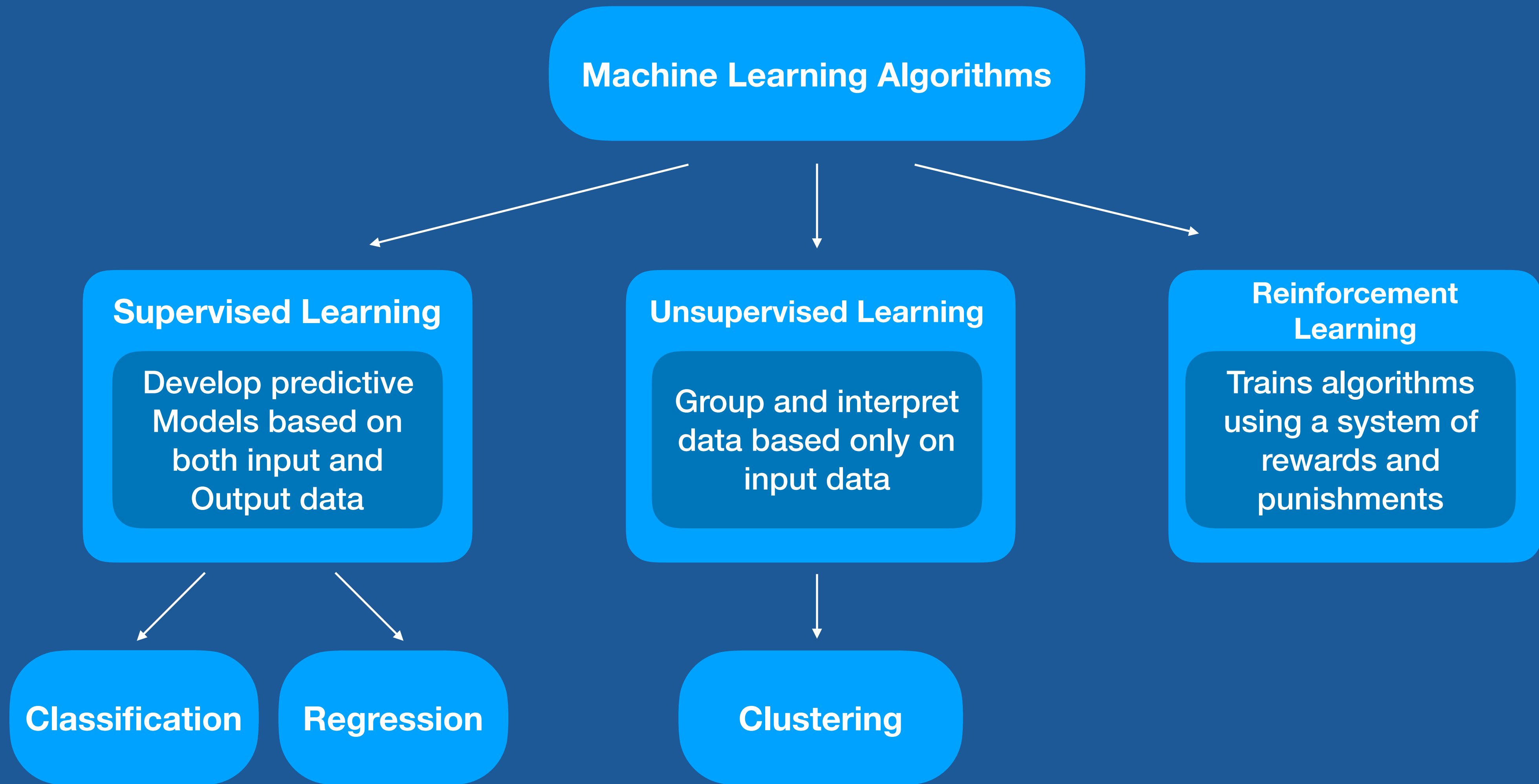
- Face/handwriting/speech recognition
- Driving a car
- Flying a plane

Personalization

- Personalised news
- Movie recommendation
- Device preference learning

The ML ensemble

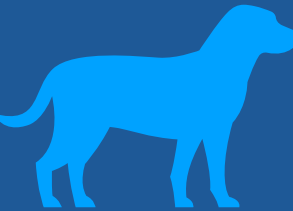
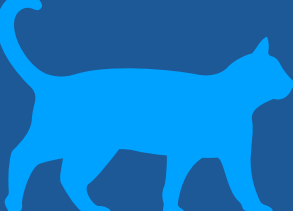


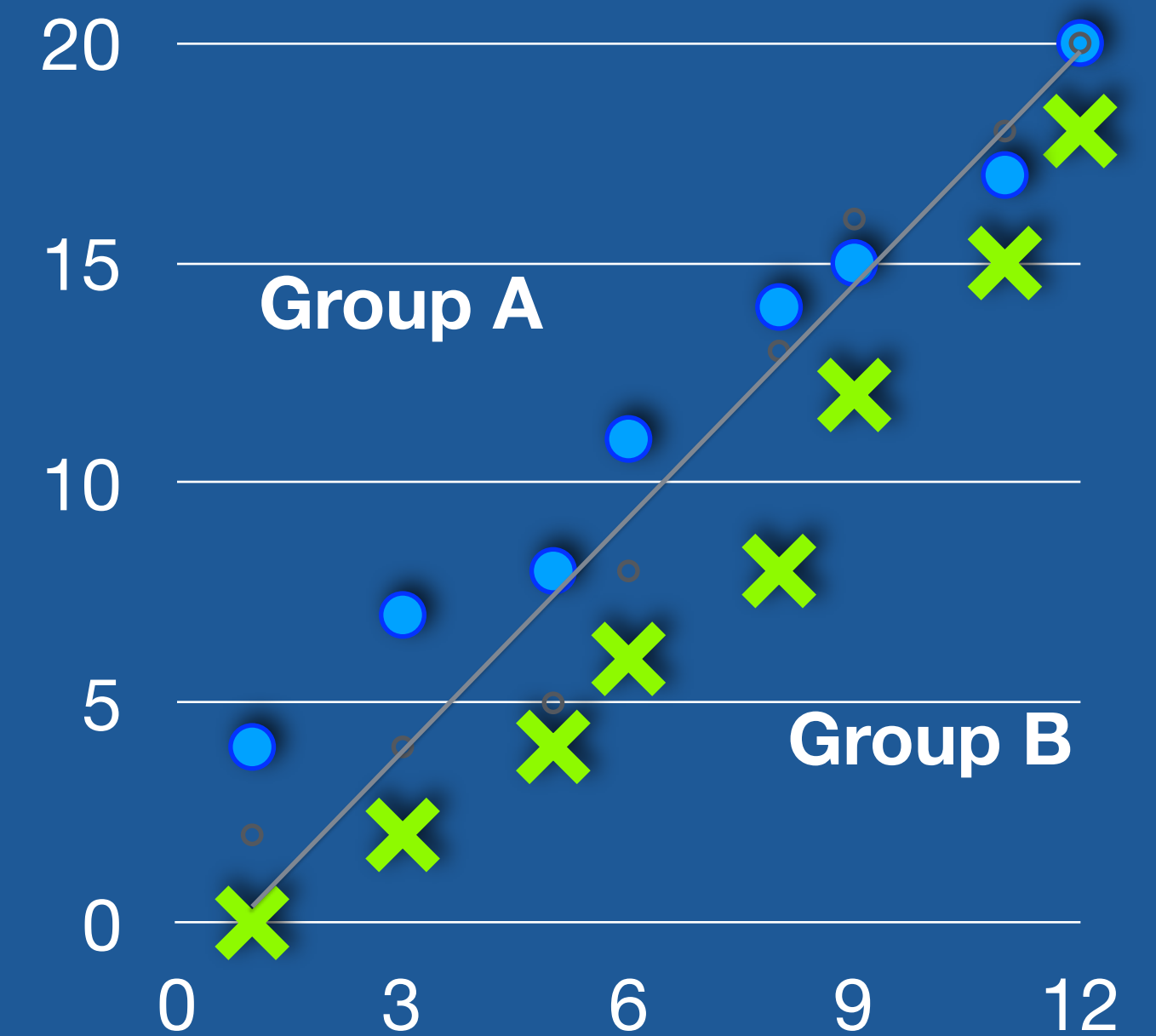


Classification Techniques

predict categorical responses

Examples:

- Is the animal in the image a  or a 
- Whether an email is spam or not
- Whether its cancer or just a tumour

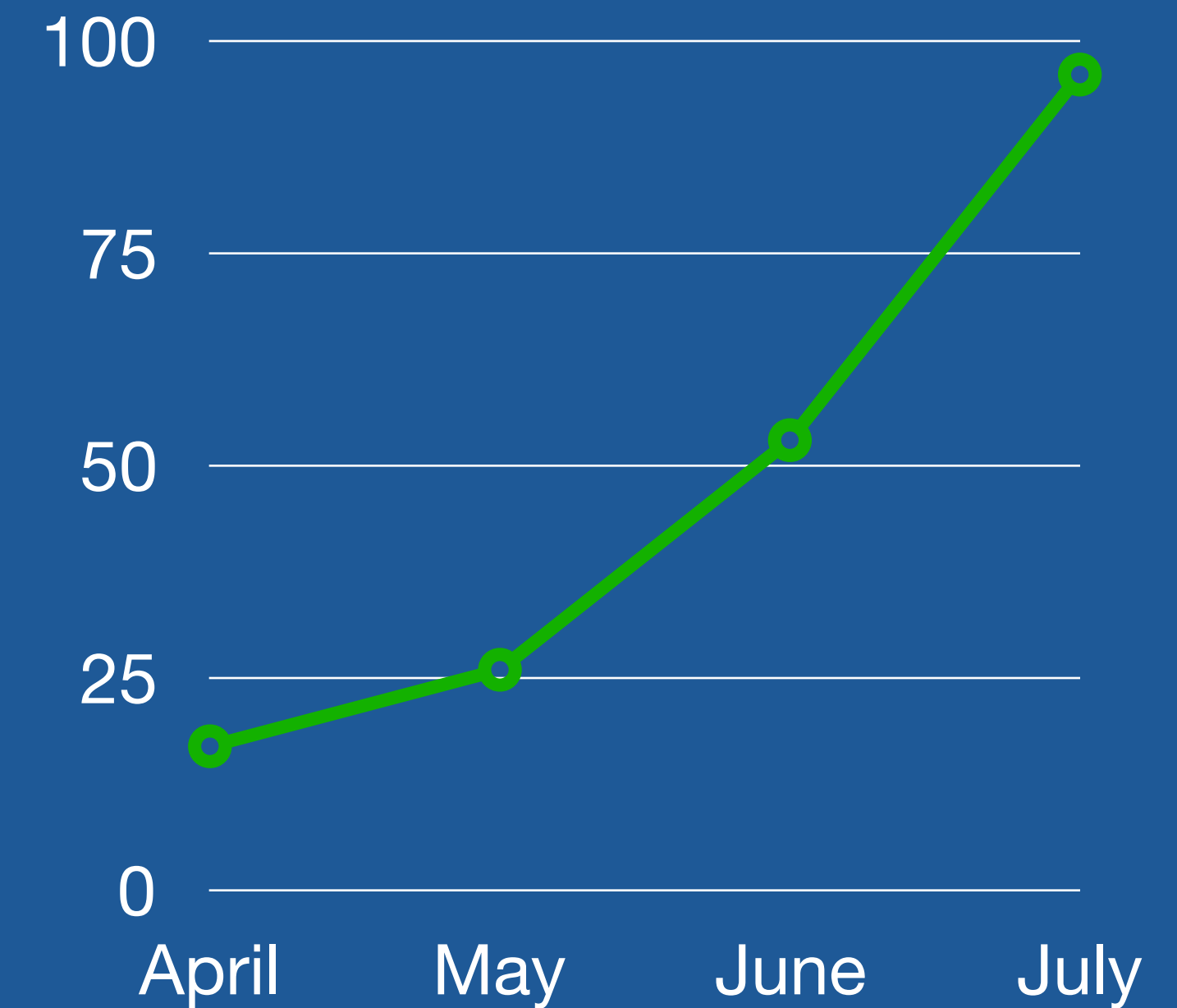


Regression Techniques

predict continuous responses

Examples:

- Changes in temperature
- Fluctuations in power demand
- Variation in stock prices



Preparing Data

- Filling in Missing Data (Imputing Data)
- Detecting and removing Outliers
- Smoothing
 - Removing noise by averaging values
- Filtering, Sampling
 - Keeping only selected representative values
- Feature Extraction
 - e.g. in a photo database, which people are wearing glasses?
which have more than one person? which are outdoors?

