Couldn’t find a decent meme about learning, here’s a puppy instead
Learning outcomes

Learn findings from behavioural economics
See cognitive bias examples
Compare different learning mechanisms
“Thinking, fast and slow”

Cognitive psychology says we have two ways of thinking:

**Reasoning:** slow, voluntary, controlled, effortful, serial

**Intuition:** fast, spontaneous, associative, effortless
What is this?
What's the most common pet after dogs?
“Irrational” individual behaviour

Framing effect and risk preferences
Reference points

We are more susceptible to changes
(And because of this we make the wrong decisions)
Small: $3
Large: $7
Small: $3  
Medium: $6.5  
Large: $7
Examples

£200k
Examples

£200k  £600k
Examples

£200k

£300k

£600k
The economist experiment
The economist experiment

Digital only subscription $59

Print only subscription $129

Print+digital subscription $129
The economist experiment

Pricing of the famous magazine “the economist” is changed frequently

Some prices are unreasonable

Prof. Dan Ariely used this setting for an experiment with his students
The economist experiment

Digital only subscription  $59

Print+digital subscription  $129
68% chose digital only
32% chose print+digital
68% chose digital only
32% chose print+digital

Total revenue = $8,012
The economist experiment

- Digital only subscription $59
- Print only subscription $129
- Print+digital subscription $129
0% print only

Print only subscription  $129

Print+digital subscription  $129
0% print only
16% digital only
84% print+digital

Total revenue = $11,444
The economist experiment

43% revenue boost!!!
If I prefer a over b, and b over c, I will prefer a over c.
Beware... the decoy effect

consumers will tend to have a specific change in preference between two options when also presented with a third option that is asymmetrically dominated.
Examples

<table>
<thead>
<tr>
<th>Voters’ Perceptions</th>
<th>Candidate A</th>
<th>Candidate B</th>
<th>Candidate C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strong on national security</td>
<td>+++</td>
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<td>Fresh face in Washington</td>
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<td>Chances of winning the election</td>
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</tr>
</tbody>
</table>
Examples

Voters’ Perceptions

- Strong on national security
  - Candidate A: +++
  - Candidate B: +++
  - Candidate C: ++

- Fresh face in Washington
  - Candidate A: +++
  - Candidate B: +
  - Candidate C: +

- Chances of winning the election
  - Candidate A: +++
  - Candidate B: +++
  - Candidate C: +
Examples

**Stock A:** long-term growth 20% - dividend yield 2%

**Stock B:** long-term growth 10% - dividend yield 7%
Examples

Situation 1

Long Term Growth

Dividend Yield

- A (20% growth, 5% yield)
- B (10% growth, 10% yield)
Examples

**Stock A:** long-term growth 20% - dividend yield 2%

**Stock B:** long-term growth 10% - dividend yield 7%

**Stock C:** long-term growth 15% - dividend yield 1%
Examples

Situation 2

Long Term Growth

Dividend Yield

Decoy

Points:
- A: 20% Growth, 10% Dividend Yield
- B: 10% Growth, 5% Dividend Yield
- C: 10% Growth, 10% Dividend Yield
Examples

**Stock A:** long-term growth 20% - dividend yield 2%

**Stock B:** long-term growth 10% - dividend yield 7%

**Stock D:** long-term growth 7% - dividend yield 4.5%
Examples

**Situation 3**

- **Long Term Growth**
  - 20%
  - 10%
- **Dividend Yield**
  - 5%
  - 10%

Decoy
Mental accounting

We keep “compartments” in our memory
Mental accounting

Imagine that you have decided to see a show where admission is **$10 per ticket**. As you enter the theatre you discover that you have **lost a $10 bill**. Would you still **pay $10 for a ticket** for the show?

Imagine that you have decided to see a show and **paid** the admission price of **$10 per ticket**. As you enter the theatre you discover that you have **lost the ticket**. Would you pay $10 for **another ticket**?
Mental accounting

Imagine that you have decided to see a show where admission is $10 per ticket. As you enter the theatre you discover that you have lost a $10 bill. Would you still pay $10 for a ticket for the show?

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Mental accounting

Yes: 88%

Imagine that you have decided to see a show and paid the admission price of $10 per ticket. As you enter the theatre you discover that you have lost a $10 bill. Would you still pay $10 for a ticket for the show?

Yes: 46%
Example

£50 now or £100 in six months?
Example

£50 now or £100 in six months?

£50 in 6 months or £100 in a year?
Hyperbolic discounting

We are not good at judging time.

We want everything now.

Instant gratification.
Hyperbolic discounting

Classical economics

\[ \frac{1}{1 + k} \]
Hyperbolic discounting

Classical economics

Reality (Behavioural economics)

\[
\frac{1}{1 + k}
\]

\[
\frac{1}{1 + kt}
\]
Learning

Agents have a **limited** or even a **wrong comprehension** of their environment.

They master **only a subset of all the actions** that can be conceived in order to face a given situation.

They have an **imprecise understanding of** their own **goals** and **preferences**.
Objects of Learning

Models of the world
Parameters within a given model
Actions
Realised outcomes
Types of Learning

Individual learning        Social learning
Types of Learning

- Individual learning
- Social learning

  - Statistical learning
  - Fitness learning

    - Econometrics
    - Likelihood
    - Evolutionary algorithms
    - Reinforcement learning
Exercise

Can you name a situation where you would need learning agents?
Summary
(How to design agents)

Foundations of decision making

Characteristics of Individual behaviour (bounded rationality)

Learning processes