UNSW
ELEC4122/GSOE9510
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LECTURE OUTLINE
Uncertainty & Risk

The future: People & materials fail; things will go wrong ... unpredictably.
"the known, the known unknown, the unknown unknown" (& the incorrectly known!)

Uncertainty means risk.

'decision theory'
= math tools (esp probability theory) for making choices when **information missing/uncertain**,

e.g., maximising expected values, game theory, eq'ns of conflict, ...

But what to optimise remains a **choice**.

risk assessment:

$$\text{effective risk} = \sum_j \text{hazard}_j \text{ severity} \times \text{its likelihood}$$

Can we measure severity? Or assign probabilities for an innovation?

When is risk worth taking?!

ethics of risk:

Consider technological system (innovation) as *social experiment*.

Before innovation, inform; after, monitor, respond & correct,

i.e. $\exists$ **on-going** responsibility.

[*exercise: Define informed consent.*]

Design principles for teams/systems.

- Make failure/mistake difficult.
- Make it clear if failure/mistake happened.
- Make it easy to recover from failure/mistake. [*exercise: Define safe exit.*]

If technology involves 'unpredictable interactions,' encourage autonomy & breadth of skills.

9 reasons people "fail":

model: set of assumptions, to simplify, for prediction [*cf* systems

indicator: signal chosen to reveal state (i.e. progress), for **given** model [*cf* inverse problems

but can become goals in themselves!

Numbers cannot replace value judgments. They only hide them.
Whatever 'tool' is used, ethics bulit into the assumptions.