Confirmation

Preliminary Remarks

- Last two weeks: Probability Calculus and its Interpretations.
- How do we evaluate the success and failure of theories?
- This week: (Qualitative) Confirmation

Empirical Evidence

Question: How do we confirm or disconfirm theories?

Answer: Via empirical evidence, i.e. some form of 'observation'.

- Observation in this context is not just seeing, but refers also to the other forms of sensing, i.e. hearing, touching, smelling and tasting.
- Our senses are 'extended' by instruments.
- Examples of observation in science:
  - Seeing objects through a telescope or a microscope
  - Hearing the clicks made by a Geiger counter
  - Smelling certain chemical compounds
  - ….

Inductivism

- The simple version is known as ‘enumerative induction’. Most prominently advocated by Newton and Mill.

  Main idea: We generalise from past observations to infer laws and theories.

- Central Problem: This account is too simple.

  For example: Background hypotheses and theories influence the way we generalise from past observations.

- G. Harman suggested that enumerative induction, properly understood, really is inference to the best explanation.

  Problem: Simple inductive inferences do not offer anything by way of explanation.

Hypothetico-Deductive Method (1)

- Karl Popper:

  - Scientists almost never reason *inductively*.

  - They reason:
  (1) Conjecturally in the context of discovery.
  (2) Deductively in the context of justification.

- Hypothetico-Deductive General Schema:

  Hypothesis
  Auxiliary assumptions
  Initial conditions
  ∴ Observational Prediction

Hypothetico-Deductive Method (2)

- According to Popper, we *cannot confirm* theories but only *falsify* them.
- Popper employs the notion of *corroboration* (where corroboration ≠ confirmation) to express the idea that a theory has not yet been falsified despite tests. The more stringent the tests, the more strong the corroboration.
- Unlike Popper, most Hypothetico-Deductivists allow for confirmation:
  - Whenever the consequences agree with observation, we say that the hypothesis is confirmed.
  - Whenever they disagree, we say it is disconfirmed.

Examples (1)

(A) Semmelweis:

Fact: Higher percentage of women in First (vs. Second) Maternity Division contracted childbed fever and died of it.

Hypothesis 1: Priest passing by on his way to nearby sickroom has adverse psychological effects on women.

Prediction: Death rate reduced when priest's path changed.

Hypothesis 2: Women delivered on their backs has adverse effects on them.

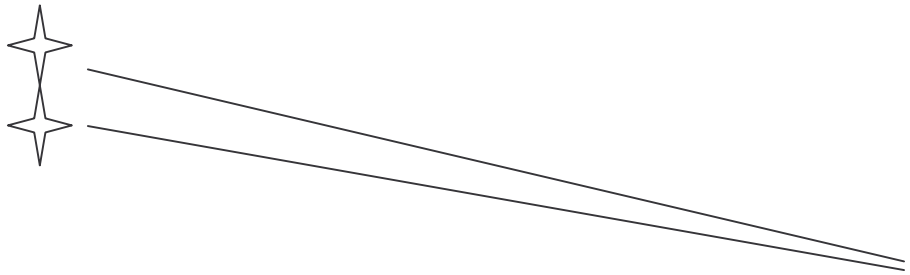
Prediction: Death rate reduced when delivered on their sides.

Hypothesis 3: Medical students introduced decomposed animal matter into women's bloodstream.

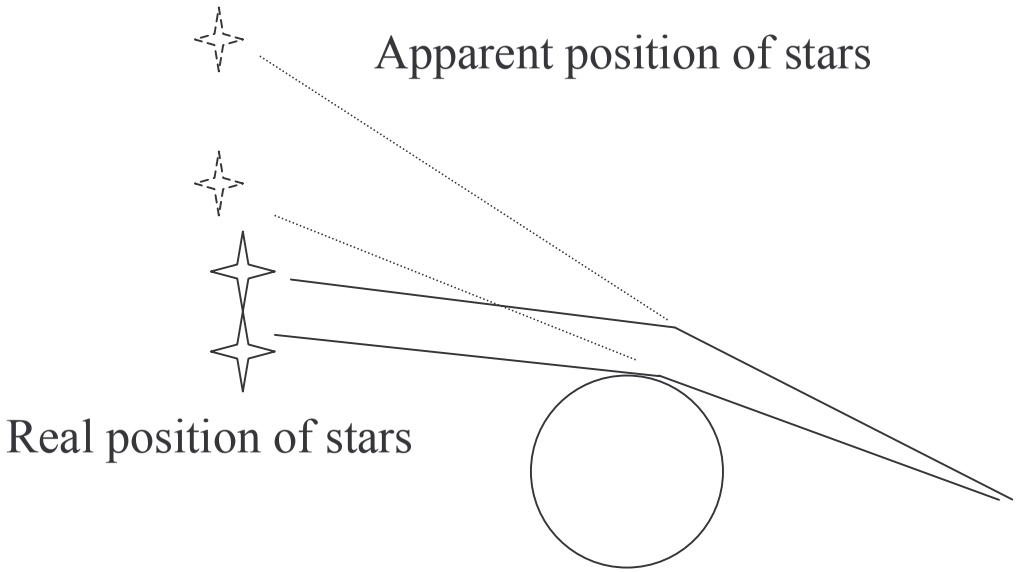
Prediction: Death rate reduced when hands cleaned.

Examples (2)

(B) Einstein's GTR tested by Eddington's expedition:



Stars at night



Stars during day (eclipse)

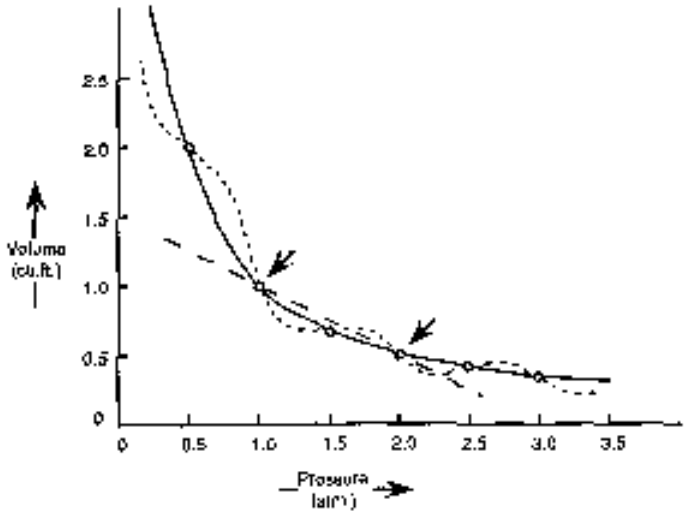
Some Problems/Limitations (1)

(1) False hypotheses can entail true conclusions.

- Valid arguments with true conclusions can still have one or more false premises.

(2) Underdetermination of theories by evidence (UTE).

Curve-fitting example



NB: UTE is a problem for any theory of confirmation.

Paradox of the Ravens

- Consider the hypothesis:

  H_1: All ravens are black (x) (Rx $\supset$ Bx)

  - Confirmed by positive instances such as Ra & Ba
  - Disconfirmed by negative instances such as Rc & ~Bc

- H_1 is logically equivalent to:

  H_2: All non-black things are non-ravens (x) (~Bx $\supset$ ~Rx)

- According to the equivalence condition: If $H \equiv H'$ and E confirms H, then E confirms H'.

- Notice that if we accept the above then any non-black non-raven thing confirms H_1. For example, a white sock confirms H_1.

Hempel's Criteria of Confirmation

- Carl Hempel provides a list of criteria that practicing scientists employ to test a hypothesis.

  (1) Quantity of evidence

  (2) Variety of evidence

  (3) Precision of measurement and observation

  (4) Novel Prediction

  (5) Theoretical Support

  (6) Simplicity

Food for Thought

- Can we express confirmation relations in quantitative terms? How would we go about assigning values?

Reading

- Earman, J. and Salmon, W.C. (1999) 'The Confirmation of Scientific Hypotheses', in M. Salmon et al. (eds.) Introduction to the Philosophy of Science, Indianapolis: Hackett Publishing Company, ch. 2, pp. 42-49.

- Hempel, C.G. (1962) 'Criteria of Confirmation and Acceptability', in Curd and Cover, pp. 445-459.