

# Inductive reasoning

Produces logical conclusions by extending knowledge through

- Generalization

*90% of the **respondents** to the poll are happy with the workload at CUHK; thus 90% of the **all** students are happy [etc...]*

- Individualization

*90% of the students are happy with the workload at CUHK; thus **any** student of ERG3910 is happy [etc...] with probability 90%*

Inductive reasoning is innate to the human brain

# Inductive reasoning

## Advantages

- Hypotheses and conjectures
- Idea associations
- Creativity, guess, intuition
- Experimental (physical world)

## Shortcomings

- Lack of rigor, contradictory
- Easy to deceive
- Short-sightedness
- Anthropocentrism

# Deductive reasoning

Produces logical conclusions by exploiting or testing knowledge through

- Logic rules

*All students have a brain; thus everything that **does not** have a brain is **not** a student*

- Contradiction

*The hypothesis "Newton laws of gravitation are true" leads to an **unaccountable** inaccuracy on the motion of Mercury; hence, the hypothesis is **wrong***

Deductive reasoning ensures coherence of the knowledge

# Deductive reasoning

## Advantages

- Rigorous and preserves coherence
- Very powerful to test hypotheses
- Objectivity
- Predictive, allows remote comparisons

## Shortcomings

- Does not create knowledge
- Non-human, ill-adapted to human thinking
- Needs hypotheses, axioms, but does not create them

## Guidelines for reasoning

Use **inductive** reasoning for finding new results, **deductive** reasoning for consolidating this new knowledge.

**Inductive reasoning** is the bricks of knowledge

Particularly sensitive to visual stimuli.

- Beauty, symmetry, repetition
- Schematization, simplification

**Deductive reasoning** is the cement of knowledge

Use mathematics for rigor.

- Predictions
- Attention to details, contradictions

**NOTE**: The two reasoning modes are interleaved.