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Introduction to Research

Course for Ph.D. students
A.Y. 2018-19

1. Scientific explanations

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What is science for?

- Explaining the occurrence of phenomena: Why did A happen? Why does B regularly happen?

- Predicting future events.

- Transforming reality: a) Changing X to Z, b) preventing B to happen, etc.

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EVENT:

A glass falling from a table and breaking

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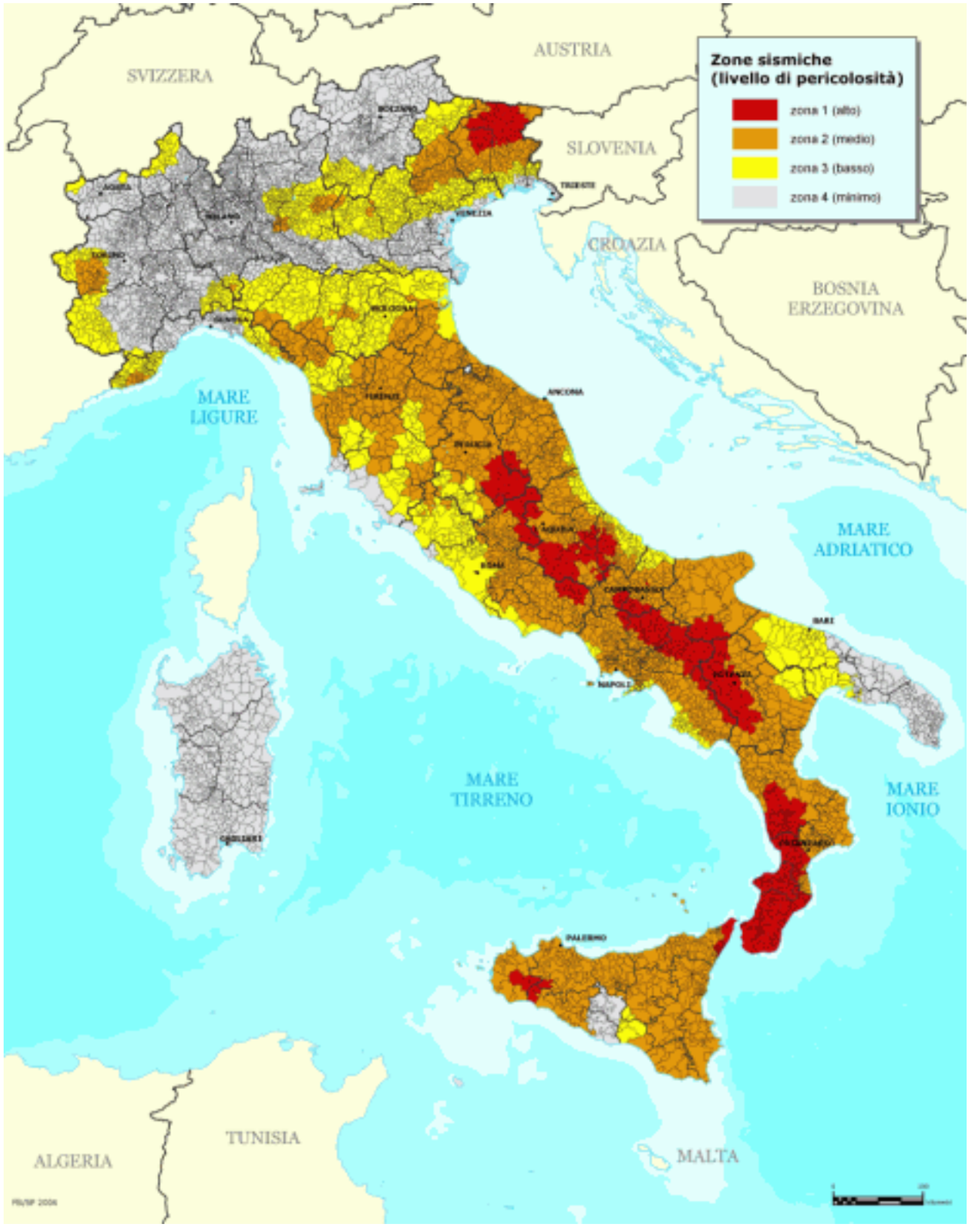

PATTERN / REGULARITY:

Geographic distribution of seismic risk in Italy

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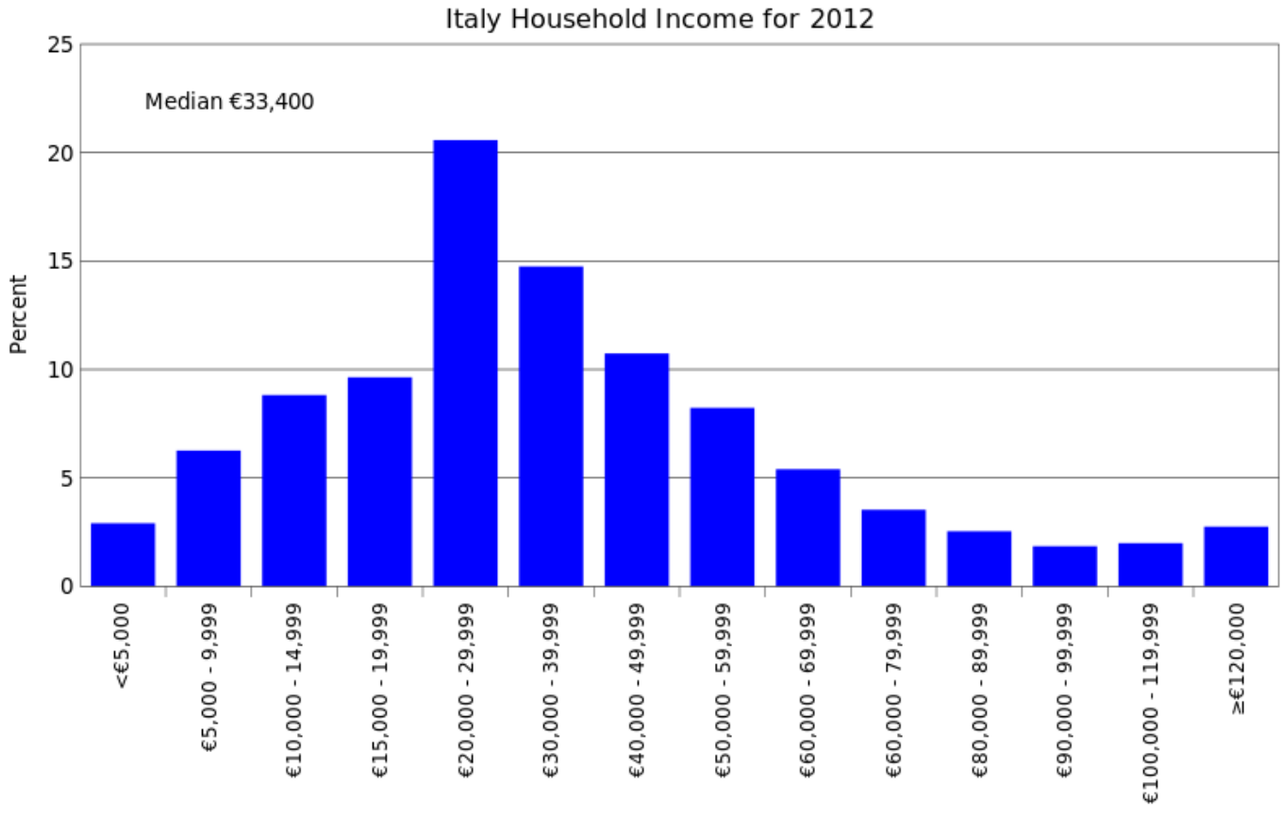
EVENT:

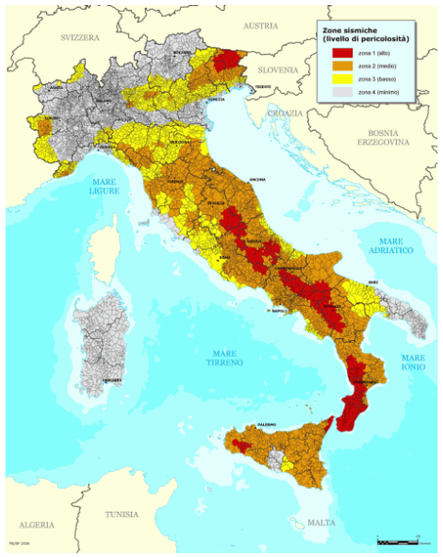
Anti-government demonstrations in Istanbul in 2013

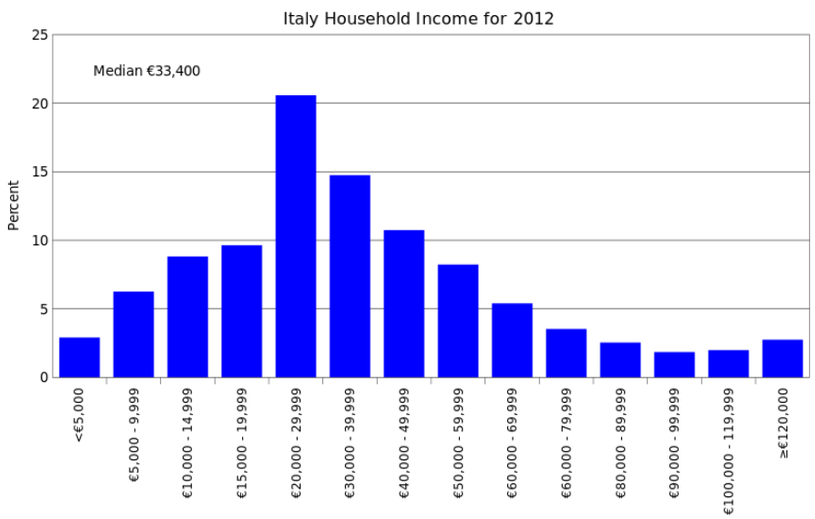


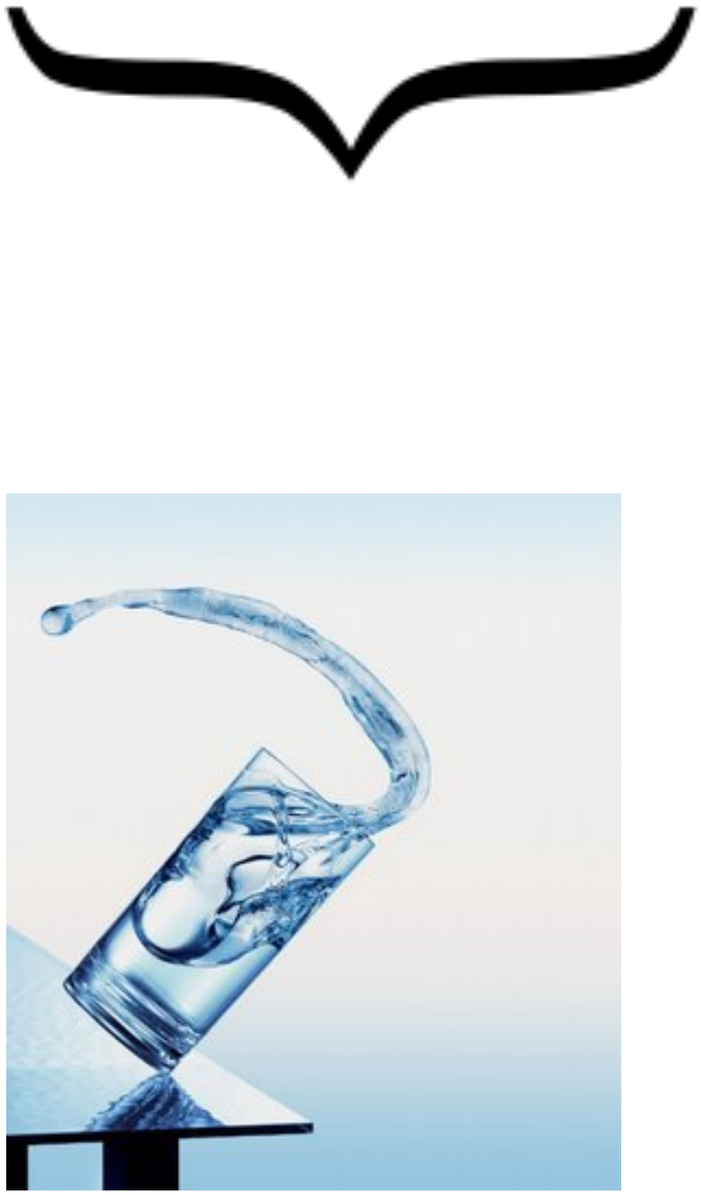
PATTERN:

Distribution of Italian household income

Events and regularities







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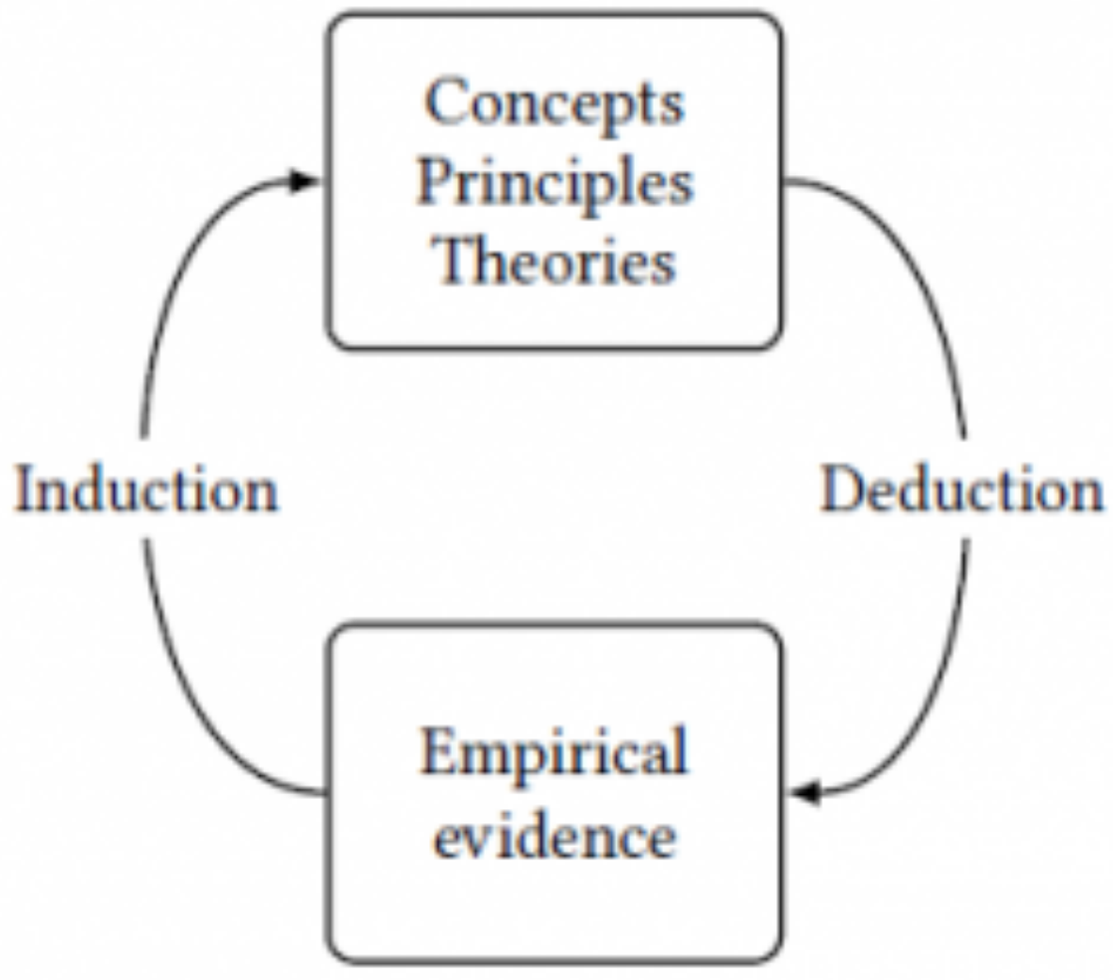
Introduction to Research - A.Y. 2018-19 - Lecture 1: Scientific explanations

Induction vs. deduction



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Explaining phenomena through general laws

LAW: a) applying a force on a physical object causes motion, b) every particle attracts another with some force.

CONDITIONS: a) a glass is a physical object, b) an object (me) applied a force on the glass so that it changed its position outside the table.

LAW: economic growth in market-economy societies bring about protests for better living conditions.

CONDITIONS: a) Turkey has a market-based economy, b) Turkish GDP has increased by almost 3.5 times between 2000 and 2013.

Deductive-Nomological (D-N) model

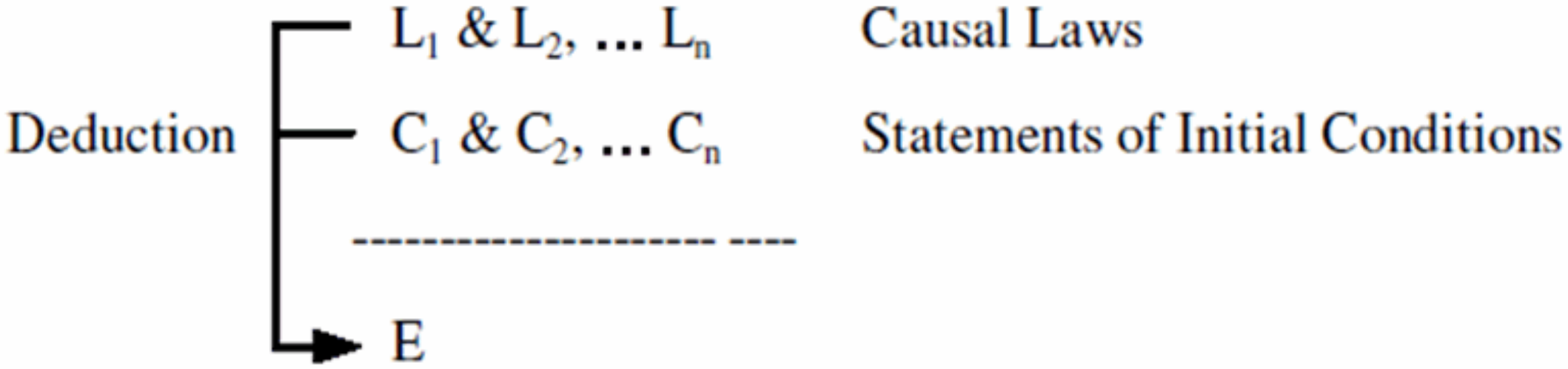


Figure 1. Structure of scientific explanation.

PROBLEM:

1) John Jones had a streptococcal infection.

2) He was treated with penicillin.

3) He recovered from the infection

LAW: Most observed streptococcus-infected patients treated with penicillin recovered within 5 days

CONDITION: John Jones treated my streptococcus infection by taking penicillin for 5 days

Inductive-Statistical (I-S) model

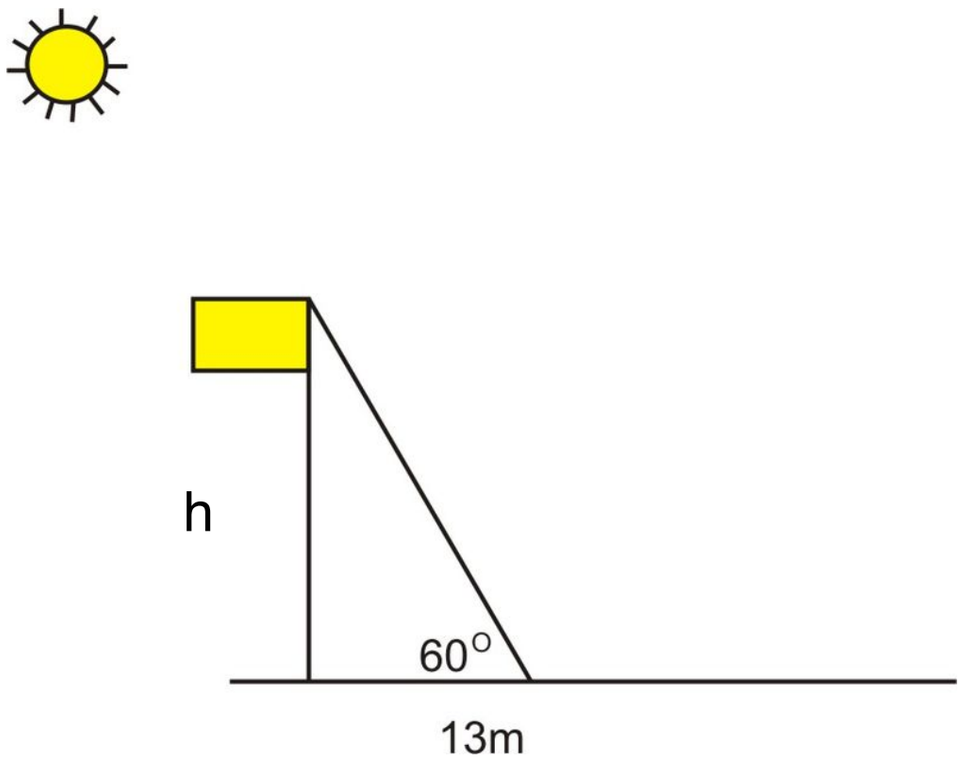
L1, L2, L3, L4,… Statistical laws

C1, C2, C3, C4,… Conditions

———————— (high probability)

Explanandum

Problems of D-N/I-S



LAW: rectilinear propagation of light

CONDITION 1: angle *theta* of the sun above the horizon

CONDITION 2: flagpole with height *h*

EXPLANANDUM: the shadow of the flagpole has length *s*

LAW: rectilinear propagation of light

CONDITION 1: angle *theta* of the sun above the horizon

CONDITION 2: shadow of the flagpole with length *s* E

EXPLANANDUM: the flagpole's height is *h*

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Assignment

Think of your PhD research project and identify its *explanandum*