

Summer School 2026  
Institut des sciences cognitives  
Université du Québec à Montréal

Knowledge, Reasoning and Decision-making

Introduction of day 4: Philosophical and formal perspectives on reasoning and decision-making:  
Coherence and abduction in reasoning and decision-making

SERGE ROBERT, CHAIR

UNIVERSITÉ DU QUÉBEC À MONTRÉAL

# A tribute to Daniel Kahneman

- ▶ Since our last Summer School, more precisely on March 27, 2024, Daniel Kahneman died
- ▶ He was a famous psychologist and economist who made very important contributions to the relations between these two fields, see his Prospect Theory of economic behavior
- ▶ This earned him the Nobel Prize of economics in 2002, (like a few other cognitive scientists, H. Simon, 1978 and, more recently, R. Thaler 2017)
- ▶ His youth as a Jewish child under the Nazi occupation in Paris deeply influenced his adult life as a researcher
- ▶ He has spent most of his career at Princeton University
- ▶ In collaboration with psychologist Amos Tversky, he changed our knowledge of human decision-making, showing notably its irrational components
- ▶ Much of our understanding of the dual process theory comes from his work, see his famous book Thinking, Fast and Slow (2011)
- ▶ His contributions will remain forever in the cognitive scientists' community

# At the intersection of formal and cognitive approaches to reasoning

- ▶ D. Marr's distinction of different explanations
- ▶ Algorithmic explanations: the psychological procedures by which human beings treat information (see our Summer School last week)
- ▶ Computational explanations: the computational (structural) operations that the algorithmic procedures realize
- ▶ The shared perspective of today:
  - ▶ To overpass the limits of strictly algorithmic explanations and strictly computational explanations towards an improvement of our understanding of human cognition
  - ▶ An interdisciplinary approach to cognition, beyond the separation of psychology, linguistics, logic, philosophy, artificial intelligence...

# Introduction to abduction

- ▶ The origin of the idea of abduction:
  - ▶ Aristotle's *Prior Analytics*: abduction as *apagôgè*, which meant something like the action of bringing back
- ▶ The important distinction made by C. S. Peirce:
  - ▶ Reasoning usually involves a rule, a case and a result
  - ▶ Induction:  $(A \dots B) \supset (A \supset B)$ : if a case and a result, then the rule
  - ▶ Deduction:  $((A \supset B) \& A) \supset B$ : if a rule and a case, then the result
  - ▶ Abduction:  $((A \supset B) \& B) \supset A$ : if a rule and a result, then the case
- ▶ Now: abduction is an algorithmic and computational procedure that is not a logically valid deductive reasoning procedure, but which plays an important role in human cognition

# Our program for today

- ▶ Paul Thagard: Coherence versus probability in models of reasoning and decision making: Lessons from the new AI
- ▶ Atocha Aliseda Llera: The place of logical abduction in the cognitive sciences
- ▶ Lorenzo Magnani: Abduction and creativity: The Eco-cognitive foundations of hypothetical reasoning
- ▶ Serge Robert: Reasoning with conditionals: abduction and deduction
- ▶ Panel of the session

# Our speakers this morning

- ▶ **Paul Thagard** is a philosopher, cognitive scientist, and author of many interdisciplinary books. He is Distinguished Professor Emeritus of Philosophy at the University of Waterloo, where he founded and directed the Cognitive Science Program. He is a faithful participant and friend of our Summer Schools.
- ▶ **Atocha Aliseda Llera** is full professor at the Institute for Philosophical Research at UNAM and National Researcher (level III). She has published and edited books and articles on Logic and Philosophy of Science. Her research topics include abductive reasoning, the logic of scientific discovery and causality in clinical reasoning.

# Ours speakers this afternoon

- ▶ **Lorenzo Magnani** is a philosopher and cognitive scientist. He is full professor at the University of Pavia, Italy, and the director of its Computational Philosophy Laboratory. He has realized many publications on abduction and its role in creative thinking.
- ▶ **Serge Robert** is professor of logic, philosophy of science and cognitive science at the Université du Québec à Montréal. He has been one of the founders of the Institut des sciences cognitives at UQAM. His field of investigation is the study of the reasoning processes at work in human cognition and in decision-making.