
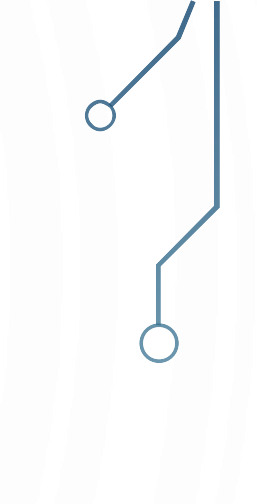
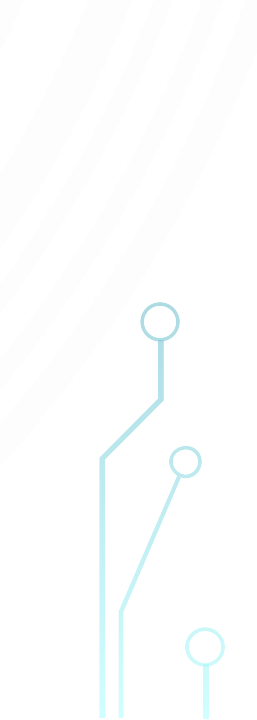


A decorative graphic on the left side of the slide consisting of a network of thin, light blue lines. These lines form a complex, branching pattern that resembles a circuit board or a neural network. Some lines end in small circles, while others are open. The overall effect is a modern, technological aesthetic.

INTRODUCTION TO **ARTIFICIAL INTELLIGENCE** FOR IT & NON-IT PROFESSIONALS



FOUNDATIONS OF AI


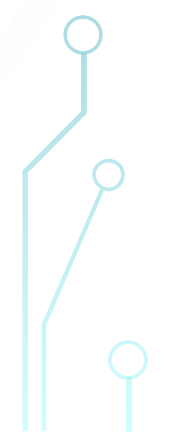
- Disciplines that contributed ideas, viewpoints, and techniques to AI.
 - In general, one is forced to concentrate on a small number of people, events, and ideas and to ignore others that also were important.
 - History: Organized around a series of questions.
 - Not Exhaustive list.
 - Note, however, that not all disciplines have been working toward AI as their ultimate goal, e.g. medical domain
- 
- 
- 

FOUNDATIONS OF AI

Philosophy	Knowledge Rep., Logic, Foundation of AI (is AI possible?)
Maths	Search, Analysis of search algos, logic
Economics	Expert Systems, Decision Theory, Principles of Rational Behavior
Psychology	Behavioristic insights into AI programs
Neuroscience (Brain Science)	Learning, Neural Nets
Control theory and Cybernetics	Information Theory & AI, Entropy, Robotics
Computer Sc. & Engg.	Systems for AI
Linguistics	Verbal behavior ,computational linguistics or NLP



PHILOSOPHY

1. Can formal rules be used to draw valid conclusions?
 2. How does the mind arise from a physical brain?
 3. Where does knowledge come from?
 4. How does knowledge lead to action?
- 
- 

PHILOSOPHY

- Logic: Rational part of the mind
- Aristotle formulated a precise set of laws governing the Rational Part of the mind.
- Syllogisms: used for Reasoning (eg, Deduction).
- Allow one to generate conclusions (mechanically), from initial premises.
- Deduction/Deductive Reasoning: If $A > B$, and $B > C$, then we can deduce that $A > C$
- Ahmed is a man. All men are mortal. Therefore, by deductive reasoning:
Ahmed is mortal


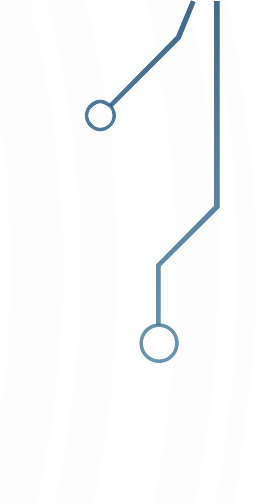
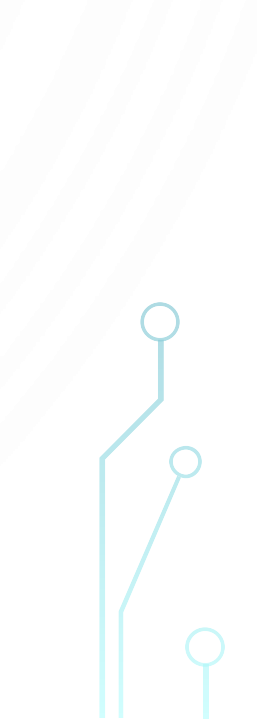
PHILOSOPHY

- Mechanical calculators were made 2000 years later
- **Speculation:** *machines might not just calculate, but actually be able to think and act on their own*
- Purely physical conceptualization of the mind means that it has no room for free will
- **Physical mind has No Free Will:** So, if it is governed by physical laws then it has no more free will, just like, say, a rock “deciding” to fall to the ground.



PHILOSOPHY

Rationalism

- **Reasoning**: importance of Power of reasoning in understanding the world
 - **Dualism**: (Descartes) Part of human mind (or soul) exempt from physical laws
 - **Materialism**: Brain under laws of physics constitutes the **mind**. Free will is simply the way that the perception of available choices appears to the choosing entity.
- 
- 
- 

PHILOSOPHY

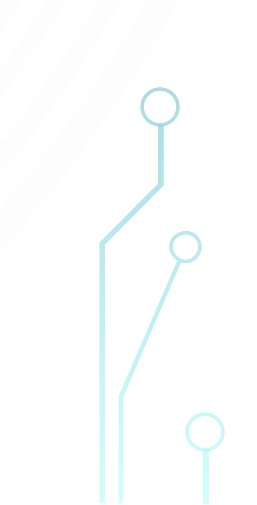
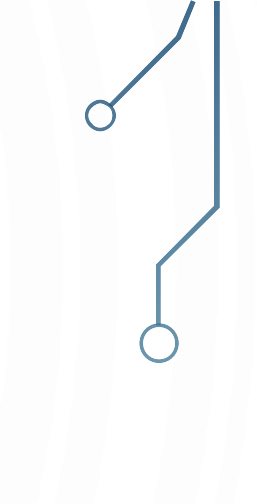

- **Induction: Generalization** from a small set of facts to a wider set. General rules are acquired by exposure to repeated associations between their elements. Moves from specific instances into generalized conclusion.
- **Conclusion:** In general, all monkeys eat bananas (Durkin pp 92)
- **Example:** *This marble from the bag is black. That marble from the bag is black. A third marble from the bag is black. Therefore all the marbles in the bag are black.*



MATHS

1. What are the formal rules to draw valid conclusions?
2. What can be computed?
3. How to reason with uncertain Information ?

Boolean Logic/Propositional logic: The leap to a formal science requires a level of mathematical formalization in three fundamental areas: **logic, computation, and probability (uncertainty)**.


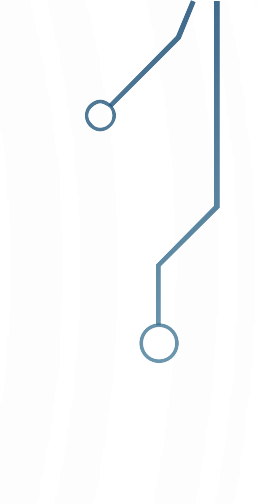
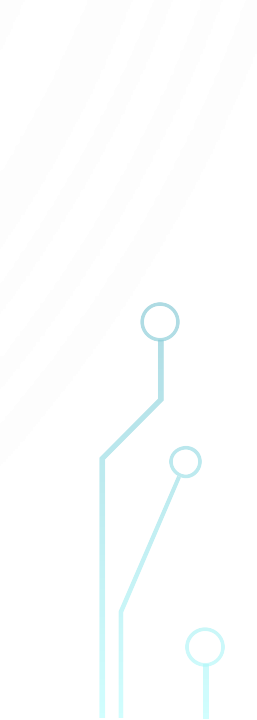


MATHS: INCOMPLETENESS THEOREM

1. Limits of Logic Computation: **There are limitations on Deduction. Not everything can be computed logically.**
2. Some functions on integers cannot be represented by an Algorithm, i.e., these functions cannot be computed. (elementary theory of natural numbers, Peano arithmetic pp8)
3. **Turing: Computable functions.** Some functions cannot be computed by the Turing machine.
4. **No machine can tell *in general* whether a given program will return an answer on a given input or will it run forever.**



MATHS: TRACTABILITY

1. Intractable Problems: Exponential growth
 2. Divide the problem
 3. NP Completeness: How to identify Intractable problems
 - 4. Work on AI has helped explain why some instances of NP-complete problems are hard, while others are easy.*
- 
- 
- 



ECONOMICS

Economics: Expert Systems, Decision Theory, Principles of rational behavior.

Satisficing: making decisions that are good enough





PSYCHOLOGY

Economics: Expert Systems, Decision Theory, Principles of rational behavior.

Satisficing: making decisions that are good enough (pp10)

Psychology:

Neuroscience/Brain Science

How do brains process information?

Control theory and cybernetics

CS and engineering: :Systems for AI





NEUROSCIENCE

Neuroscience/Brain Science

How do brains process information?





CONTROL THEORY AND CYBERNETICS

- How can artifacts operate under their own control?
- 
- 



COMPUTER SCIENCE AND ENGINEERING

CS and Engineering: :Systems for AI

How can we build an efficient computer?





LINGUISTICS

- How does language relate to thought?
- 
- 