Foundations

EPISTEMOLOGY & THEORY OF KNOWLEDGE

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KNOWLEDGE TREE

Part 1: Epistemological Foundations

1.1 Basic Principles
• Axiom
• Determinism / Darwinism
• Foundation

1.2 Approaches to Knowledge
• Epistemology
• Theory of Knowledge
• Justification

1.3 Perception and Knowledge
• Perception
• Belief / Cognitive biais
• Claims of Knowledge

Part 2: Analysis and Modeling

2.1 Reasoning and Modeling Methods
• Inference
• Deduction
• Induction
• Linearity / non-linearity of phenomena

2.2 Truth Principle and Proof
• Truth
• Proof
• Correspondence

Part 3: Philosophies of Knowledge

3.1 Philosophical Schools
• Empiricism
• Rationalism
• Skepticism

3.2 Key Concepts
• A priori / A posteriori
• Analytic / Synthetic
• Objectivity vs Subjectivity

3.3 Adaptability and Validation
• Pragmatism
• Verification
• Falsification

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Part VII: Introduction to Statistics:
An Example

VII.1 Point Estimation

Hypothesis Testing
Confidence Interval
VII.2 Recap of Important Probability
Theorems

KEYWORDS

- Foundations of Mathematical Thinking
- Mathematics
- Logic
- Set Theory
- Linear Algebra
- Calculus
- Statistics
- Knowledge Acquisition
- Problem Solving
- Confidence
- Precision
- Georg Cantor
- Bertrand Russell
- Mathematical Thought
- Abstract Problems
- Algorithms
- Electrical Circuits
- Control Systems
- Probability
- Inference
- STEM Fields
- Analytical Thinking
- Data Analysis
- Intellectual Exercise
- Problem-Solving Skills

- Data-Driven World
- Advanced Mathematics
- Computer Science
- Scientific Research
- Mathematical Analysis
- Learning Community
- Clarity
- Weeki Team
- Analytical Prowess
- Systematic Understanding

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Welcome to the captivating journey of "Foundations of Mathematical Thinking." This course invites you to delve into the profound world of mathematical concepts and logical reasoning, setting the stage for a transformative intellectual adventure. Picture yourself stepping into a realm where sets, logic, linear algebra, calculus, and statistics converge to equip you with a robust foundation in mathematical thinking.

As you begin this course, you'll first explore the elegant realm of set theory, where you'll grapple with the fundamental definitions of sets, decipher set notation, and engage in set operations such as union, intersection, and complement. Moving to propositional logic, you'll unravel the intricacies of logical propositions, truth tables, and the nuances of logical implication and equivalence. Predicate logic will introduce you to the power of quantifiers and predicate notation, enabling you to translate complex English statements into precise logical expressions.

In the second part, you'll journey into the heart of linear algebra for machine learning, a field essential in modern data analysis. You'll master vector and matrix operations, delve into the properties of eigenvalues and eigenvectors, and understand the magic of diagonalization. Linear transformations will become second nature as you explore their properties, matrix representations, and the flexibility of changing bases.

The third part of the course will introduce you to the calculus and optimization, where you'll delve into limits, continuity, and the fascinating Intermediate Value Theorem. Derivatives will be your tool for analyzing the behavior of functions, and you'll learn the rules of differentiation and their applications, including finding maxima and minima. Integral calculus will enable you to calculate areas, solve optimization problems, and understand the fundamental theorem of calculus.

Finally, the course will immerse you in the realm of probability and statistics, essential in making data-driven decisions. You'll explore probability basics, understand different probability distributions, including the ubiquitous normal distribution, and delve into statistical inference, where you'll learn hypothesis testing, confidence intervals, and maximum likelihood estimation.

Whether you're an aspiring mathematician, a data scientist, an engineer, or simply someone captivated by the beauty of mathematical thinking, this course is your gateway to unlocking the language of the universe.

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KEYWORDS

Connaissance   Contextualisme   Axiome   Déterminisme   Certitude   Darwinisme   Epistémologie

Fondation   Théorie de la Connaissance   Perception   Espace des Phases   Justification   Croyance   Revendications de Connaissance

Raisonnement   Empirisme   Rationalisme   Scepticisme   Intuition   A priori / A posteriori   Objectivité   Vérité

Subjectivité   Fallibilisme   Inférence   Déduction   Induction   Preuve   Analytique / Synthétique

Cohérence   Correspondance   Pragmatisme   Vérification   Falsification   Relativisme

Modèle univarié vs multivarié   Certitude