Core Topics

Introduction to Computer Science & Programming

- Declarative vs. Imperative Knowledge
- Basic Structure of a Computer
  - Flow of Control
  - Turing-complete syntax & static-typing semantics

- Data Types
  - Basic Types: Booleans, Numbers, Strings
  - Advanced Types: Vectors, Matrices, Trees
  - Classes and Objects

- Control Flow
  - Branching
  - Iteration

- Programming Models
  - Newton-Raphson
  - Fractions
  - Scientific Notation

- Mathematical Concepts
  - Complex Numbers
  - Roots

- Algorithm Analysis
  - Asymptotic Notations
  - Big O-Notation
  - Logarithmic, Quadratic, Exponential

- Flow Charts

- Computer Systems
  - Amortization
  - Data Structures

- Problem Solving
  - Scientific Method
  - Greedy Algorithms
  - Dynamic Programming

- Decision Making
  - Decision Trees
  - Modules, Classes

- Software Engineering
  - Test-Driven Development
  - Refactoring

- Computer Models
  - Random Walks
  - Monte Carlo Simulation
  - Statistics

- Financial Applications
  - Stock Market Simulation
  - Continuous Knapsack Problem