CS Get-Skilled Academy

Machine Learning
Course Prerequisites

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Teaching, Training and Coaching for more than a decade!

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Python Programming Skills

- You need to be a good coder
- Coding mistakes:
  - Normal coding bugs
  - A scientific mistake leading to wrong calculations
- You should have debugging skills
- You better implemented some 300 lines of code basic projects
- Some topics: read/write files, numpy, basics of classes

Mathematics

- Machine learning involve many mathematical topics
  - Probability
  - Statistics
  - Calculus
  - Linear Algebra
  - Geometry
- The better you are in math, the easier studying machine learning
- Good news: you can count on minimal math and do good progress then expand your math skills later
  - Each topic (depth) requires a specific subset of prerequisites
  - The puzzle: which math topics?!

Minimal Math: Geometry

- Line equation: y = mc+cx (understand the slope: +ve, -ve, steepness)
- Hyperplane: line / plane
- Notes
  - Once the course starts, we need these topics

Calculus

- Find min of quadratic function using differentiation
- Functions: local minima and saddle points
- Derivative Rules (be skilled in **chain rule**)
- Common Derivatives: polynomials, log and exponential
- **Partial derivatives**
- Compute the partial derivatives of these functions relative to x and y:
  - (2x-4)^5 + 4yx, 6(2x^3-4)^5 + 4yx, sqrt(4yx), log(2x^3 + 4yx), exp(2x3^ + 4yx)
- Notes: This is a must basics early in the course

Linear Algebra

- Vector and Matrix
  - operations: add, multiply, scalar, **matrix-matrix multiplication**, transpose
- Apply the operations using python Numpy
  - Pronounced: num-bye or num-bee

Probability & Statistics

- Conditional probability
- Rules in probability
- Expected value
- Distributions: Bernoulli, Uniform, binomial, exponential, **normal (2D Gaussian)**
- Statistics: mean, median, mode, variance, covariance, standard deviation, percentile

Algorithms

- Graph representation
- Basics of graph traversal
- Basics of DP

Background lectures

- I will **refresh some** of these topics
- My assumption: you know them but refreshing
- Examples
  - Normal Distribution
  - Linear Equation
  - Calculs
  - Graph Representation
- So overall, **don’t worry if** you have fair math background sometime ago

Beyond the course

- After the course, it is highly recommended to consider the next 5-years of your life as sharpening more
  - Your mathematical skills
  - Your machine learning background: depth and breadth

Relevant Materials

- Note: I did not try
- Stanford CS229: First 3 lectures about prerequisites
- Cousera: Mathematics for Machine Learning Specialization
- Cousera: Mathematics for Machine Learning and Data Science Specialization
- Udemy: Mathematical Foundations of Machine Learning
- AnaHr channel
- Eng Ahmed Fathi: linear algebra
- My Udemy courses for Python and Algorithms

"Acquire knowledge and impart it to the people."

"Seek knowledge from the Cradle to the Grave."