Data Science Math Skills

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Course Information

Data Science Math Skills by **Duke University** is a online course you can take on this site Coursera.

Motivation for Learning & Re-learning

A lot of graduate school students struggle with Data Science courses only because of their lack of knowledge and/or understanding of Mathematics for Data Science. The course gives an overview of Mathematical concepts you will encounter while learning Data Science.

Supplemental Notes and Videos

Here's how I make my notes:

My notes include videos from Khan Academy and other websites. The content's the same, and often a bit better due to lack of errors. The text are usually from the Coursera video transcripts.

I indicate **why** it is important to learn such concepts through **Further Reading** notes.

Sets and What They're Good For

Set Basics and Vocabulary

- Set Theory
- Set Theory Operations

Further Reading

> A set is the fundamental discrete structure on which all other discrete structures are built.

Those who studied Discrete Mathematics or read a book about it will probably just re-learn a lot from this course on Set Basics.

- Applications of Set Theory in Computer Science - A list of the most obvious applications of Set Theory.
- Discrete Mathematics and Its Applications - I read most of the book as a supplemental material for a Discrete Math course. The book clearly states why a set is the foundational structure in Computer Science.

Venn Diagrams

- What are Venn diagrams?

Further Reading

- A Visual Explanation of SQL Joins

The Infinite World of Real Numbers

- What are Real Numbers?
- Multi-step Inequalities

The Jagged S Symbol

- Sigma/Summation Notation

  $\sum_{n=1}^{10} n^2$
- The Sigma has similarities to the factorial symbol, but it suggests that you add the values of i based on the stopping point n

Further Reading

- Graph-based Machine Learning

Descartes Was Really Smart

Plotting Points

- The x-axis is going to be the set of all points x-y in the Cartesian plane, x-y in R2, such that their y coordinate is zero.
- We divide the Cartesian plane into four separate regions, and these we call **quadrants**.
- Coordinate plane: quadrants

Distance Formula

- Distance formula

  $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

Point-Slope Formula for Lines

- Point Slope Form

  $y - b = m(x - a)$
- Calculating the Slope

  $(y2 - y1/x2 - x1)$

Slope-Intercept Formula

- Slope Intercept Equation
- Intro to Slope Intercept Form

  $y = mx + b$

Input-Output Machines

Functions: Mapping from Sets to Sets

- Functions on Sets - UCLA

  $f : A \to B$

Functions: Graphing in the Cartesian Plane

- Functions on a Coordinate Plane
- Vertical line test
- The **vertical line** test says: *any vertical line, intersects the graph of a function once.* If it intersects it more than once, we violate things here.

Increasing and Decreasing Functions

- A function is increasing whenever:

  $a < b$

  $f(a) < f(b)$

  $f(x) = 2^x$ – An example of an increasing function
- A function is decreasing whenever:

  $a > b$

  $f(a) > f(b)$

  $g(x) = 3^{-x}$ – An example of a decreasing function

Composition and Inverse

- How to find the inverse of a composite function
- Evaluating Composite functions
- Not every function has an inverse.
- If the graph of f fails the *horizontal line test*, the graph has no inverse.