Mathematics for Data Science

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Course outline

- Calculus
  - Sets, Functions, continuity, composition, derivatives, chain rule, maxima/minima, equation of lines, curves
- Linear algebra
  - Matrices, dot products, determinants, Eigen values, Singular value decomposition
- Statistics
  - Descriptive statistics, Probability, Probability distribution, Linear regression / correlation, Bayesian rule
- Discrete mathematics

Introduction to Python

Installation

- Anaconda
  - https://www.anaconda.com/products/individual

Doing basic mathematics

- 1 + 2
- +, -, *, /, **, %, //
- Variables
- print
- What is a program?
- What does a compiler/ interpreter do?

Sets

- Natural numbers = {1, 2, 3, 4, …}
- Whole numbers = {0,1,2,…}
- Integers = {…,-2,-1,0,1,2,…}
- Real Numbers
- Even numbers = {…,-2,0,2,4, …}
- Odd numbers = {…,-3,-1,1,3, …}
- Prime numbers = {2,3,5,7,…}

Data types

- int
- float
- string

Equation of line

- y=mx+b
- Plotting a line
- Slope
- y-intercept
- Roots of an equation
- Quadratic equation
- Program to solve quadratic equation

Checking a number is even or odd

Formula

- Unit conversion
- C to F
- Km to m

Multiplication table

Statistics

- Mean
- Median
- Mode
- Range

- Variance

$$\text{variance} = \frac{\sum \left(x_i - x_{\text{mean}} \right)^2}{n}.$$

- Standard deviation

- Correlation

$$\text{correlation} = \frac{n \sum xy - \sum x \sum y}{\sqrt{\left(n \sum x^2 - \left(\sum x \right)^2 \right) \left(n \sum y^2 - \left(\sum y \right)^2 \right)}}.$$

Functions

- Composition

Vectors

- height_weight_age = [70,170, 40]
- Adding two vectors
- Subtracting two vectors
- Scalar multiplication
- Dot product
- Magnitude
- Distance

Matrices

- Shape
- Adding two matrix
- Multiplying two matrix