

2025

4Geeks Academy: data science cohort 12

# DAY 9: CALCULUS & LINEAR ALGEBRA

# TODO

## CALCULUS & LINEAR ALGEBRA

Use case, qualitative interpretations

## API REQUESTS PROJECT

Submit Interacting with an API using Python (API requests module) if you haven't done so already

## NO NEW PROJECT

Catch-up on old assignments, get ahead in reading or work on optimizer 'bonus' project

# TOPICS

01 REGRESSION

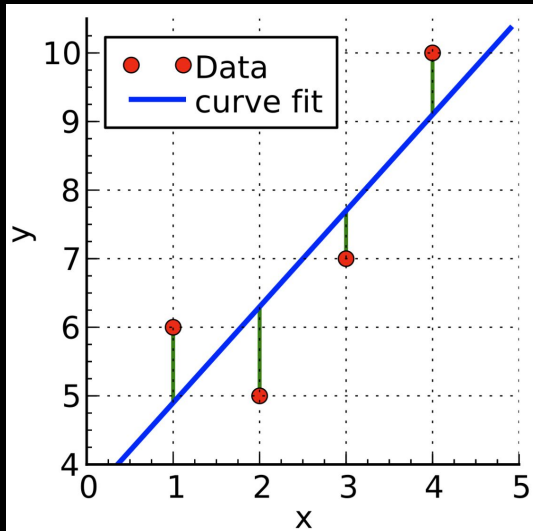
02 CALCULUS: GRADIENT DESCENT

03 LINEAR ALGEBRA: MODELS

04 LINEAR ALGEBRA: DATA

# REGRESSION

**WHAT** Method(s) to estimate the relationship (function) between input variable(s) and an output variable

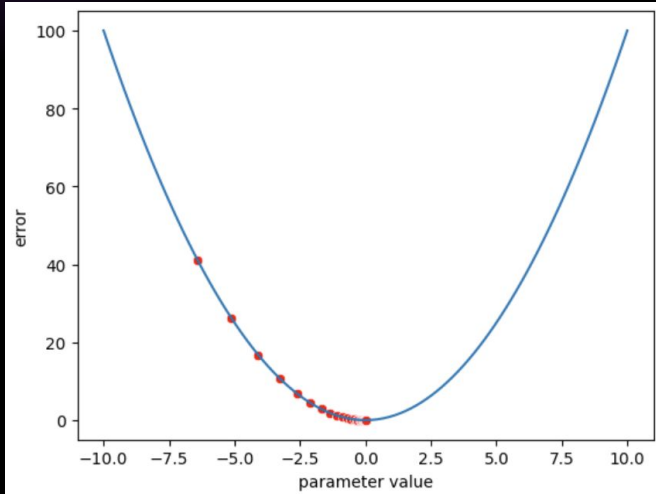


$$y = mx + b$$

The 'best' values for  $m$  &  $b$  have the lowest error (smallest green lines)

# CALCULUS: GRADIENT DESCENT

**WHAT** Calculus can be used to find the slope of a function at a given point. The slope can be used to 'optimize' that function.



## HOW

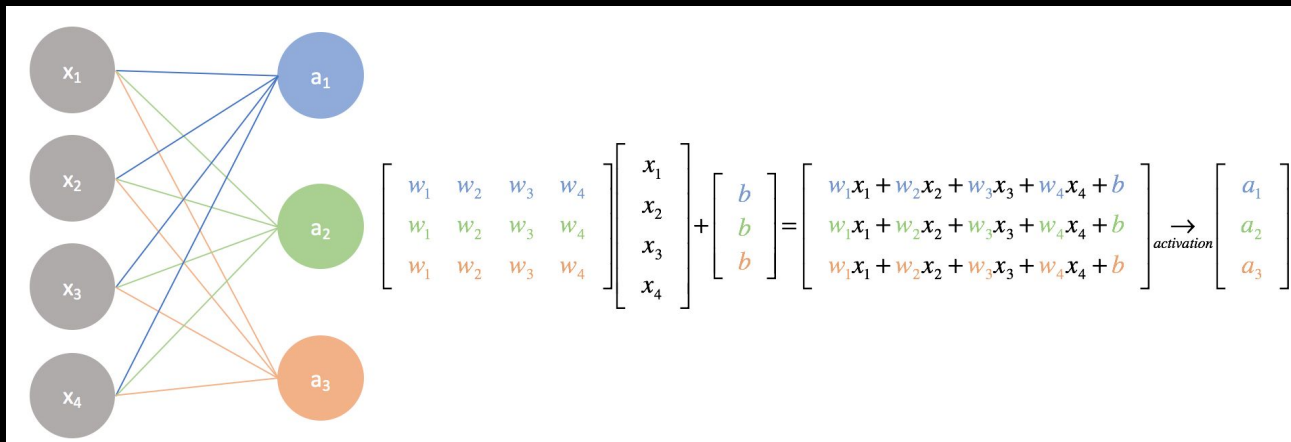
1. Pick starting value for  $m$
2. Calculate gradient of error function at that point
3. Update  $m$  by larger/smaller amount based on size/direction of gradient
4. Go to step 2

# LINEAR ALGEBRA: MODELS

**WHAT** Branch of math that deals with vectors (think: lists) and matrices (think: arrays)

**WHY** Most (all?) machine learning models are arrays and work via array multiplication

**HOW** Optimizing machine learning models is linear algebra



# LINEAR ALGEBRA: DATA

**WHAT** Branch of math that deals with vectors (think: lists) and matrices (think: arrays)

**WHY** Allows efficient (fast) operations on data

**HOW**

- **Numpy**: Python library for large, N-dimensional arrays and high-level math functions
- **Pandas**: Built on Numpy, user-friendly API for data
- **TensorFlow**: Google's deep learning library for Python - specifically optimized for fast tensor math on GPU & TPU.