

Formative 3 - Probability Distributions, Bayesian Probability, and Gradient Descent Implementation

Contributions Report

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1. Project Overview

This report outlines team contributions for the Probability and ML Fundamentals project. The project explores key machine learning concepts: **Probability Distributions, Bayesian Probability, and Gradient Descent.**

Main Components:

- **Part 1:** Probability Distributions – Built a bivariate normal distribution and visualizations.
- **Part 2:** Bayesian Probability – Applied Bayes' Theorem for sentiment analysis on IMDb reviews.
- **Part 3:** Gradient Descent (Manual) – Manually computed parameter updates for linear regression.
- **Part 4:** Gradient Descent (Code) – Implemented and visualized gradient descent in Python.

2. Team Contribution Summary

- **Kumi Yunis:** Led **Part 1**, implementing the bivariate normal distribution and visualizations.
- **Chol Monykuch:** Led **Part 2**, handling Bayesian probability and IMDb dataset analysis.
- **Vincent Mugabo:** Led **Part 4**, coding and visualizing gradient descent; also contributed to manual iterations

We all collaborated on **Part 3**, each completing one iteration of manual gradient descent and supporting others.

3. Individual Contributions

3.1. Vincent Mugabo

- Lead for **Part 4: Gradient Descent in Code**
- Performed **Iteration 3** of manual gradient descent
- Assisted with the implementation of part 1,2 and 3
- Implemented iterative updates, error tracking, and SciPy verification in code

3.2. Chol Monykuch

- Lead for **Part 2: Bayesian Probability**
- Implemented text preprocessing, token matching, and Bayesian calculations
- Completed **Iteration 2** of manual gradient descent
- Supported with the implementation of part 1,3 and 4.

3.3. Kumi

- Lead for **Part 1: Probability Distributions**
- Wrote bivariate PDF from scratch and created contour/3D visualizations
- Performed **Iteration 3** of manual gradient descent
- Supported with the implementation of part 2,3 and 4.

Github Repo: https://github.com/Chol1000/Formative_3_assignment.git