Assignment 1

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August 21, 2025

1 Linear Algebra Review

1.1 Basic Operations

1. 14

2. 0

3.
$$\begin{bmatrix} 6 \\ 10 \\ 14 \end{bmatrix}$$

4.

5.

6.

7.

1.2 Matrix Algebra Rules

1.

2.

3.

4.

5.

6.

7.

8.

9.

10.

2   Probability Review

2.1   Rules of probability

1.

2.

3.

2.2   Bayes Rule and Conditional Probability

1.

2.

3.

4.

5.

3   Calculus Review

3.1   One-variable derivatives

1.

2.

3.

3.2   Multi-variable derivatives

1.

2.

3.

4.

5.

3.3 Optimization

1.

2.

3.

4.

5.

6.

3.4 Derivatives of code

See main.py for output.

4 Algorithms and Data Structures Review

4.1 Trees

1.

2.

4.2 Common Runtimes

1.

2.

3.

4.

5.

4.3 Running times of code

5 Data Exploration

5.1 Summary Statistics

1.

2.

3.

The mode is

5.2 Data Visualization

1.

2.

3.

4.

5.

6.

6 Decision Trees

6.1 Splitting rule

The particular type of feature should be

6.2 Decision Stump Implementation

Updated Error:

6.3 Decision Stump Info Gain Implementation

Updated Error:

6.4 Hard-coded Decision Trees

See code.

6.5 Decision Tree Training Error

I observe

6.6 Comparing Implementations

This