

Mathematics and Statistics for AI: Post-Class Assignments

Basic Assignment: Understanding Data Representation and Analysis

Title: Working with AI Platform Data

Objective: Apply basic math and statistical concepts in an AI business context.

Choose ONE of the following tasks to complete:

Option 1: Data Types and Matching

The One Hour AI Solution platform matches clients with AI engineers based on skills and requirements.

Problem Statement: Two AI engineers have the following skill vectors (representing expertise in: machine learning, data preprocessing, statistical analysis, visualization, cloud deployment) on a scale of 0-10:

- Engineer A: [9, 5, 8, 4, 7]
- Engineer B: [6, 9, 5, 8, 5]

A new client project has requirements represented as: [8, 7, 7, 6, 4]

Tasks:

1. Calculate the Euclidean distance between the client's requirements and each engineer's skills
2. Based on your calculation, identify which engineer is a better match for the project
3. Briefly explain what this distance metric means in the context of matching clients with engineers

Option 2: Understanding Service Times

The One Hour AI Solution platform tracks how long it takes engineers to solve different types of problems.

Problem Statement: The platform has collected data on resolution times (in minutes) for algorithm optimization problems: 35, 48, 42, 63, 52, 38, 45, 57, 41, 50

Tasks:

1. Calculate the mean and median of these resolution times
2. Find the standard deviation of the data
3. Explain how the platform could use these statistics to set client expectations for service time

Deliverable: A one-page document showing your calculations and brief explanations.

Estimated time: 30-45 minutes

Intermediate Assignment: Applying Math to Improve AI Services

Title: Optimizing AI Consulting Services

Objective: Use intermediate mathematical concepts to solve business optimization problems.

Scenario: The One Hour AI Solution platform is working to improve how they price and deliver their services.

Problem Statement: The platform has a cost function for price prediction based on problem complexity (w_1) and required expertise (w_2):

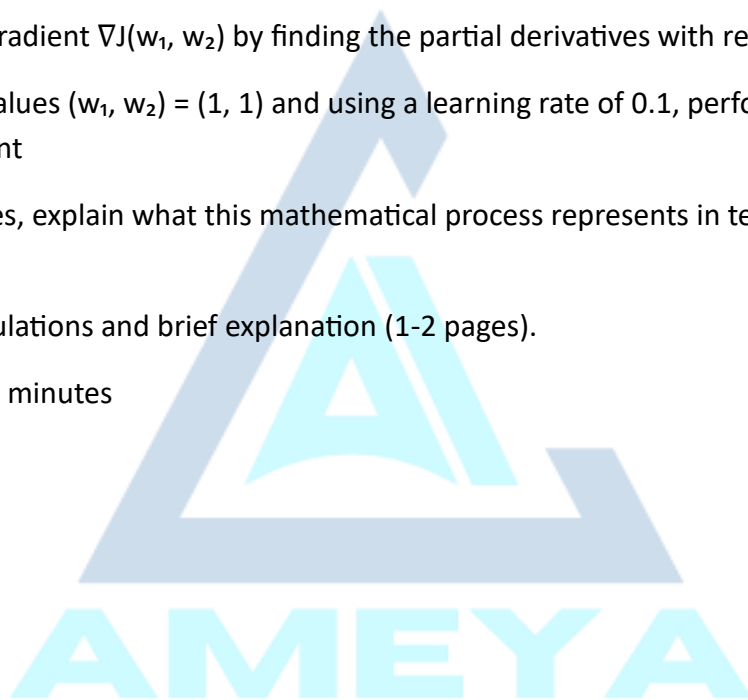
$$J(w_1, w_2) = (w_1 - 4)^2 + 2(w_2 - 3)^2 + w_1w_2$$

Tasks:

1. Calculate the gradient $\nabla J(w_1, w_2)$ by finding the partial derivatives with respect to each weight
2. Starting with values $(w_1, w_2) = (1, 1)$ and using a learning rate of 0.1, perform 2 iterations of gradient descent
3. In 2-3 sentences, explain what this mathematical process represents in terms of the platform's pricing model

Deliverable: Your calculations and brief explanation (1-2 pages).

Estimated time: 45-60 minutes



Advanced Assignment: Probability for Decision Making

Title: Using Probability to Classify AI Clients

Objective: Apply Bayesian probability to make business predictions.

Scenario: The One Hour AI Solution platform wants to predict which clients will need extended consultations versus quick solutions.

Problem Statement: The platform has analyzed historical data and found:

- 70% of all clients are businesses (B)
- 30% of all clients are individual developers (I)
- 80% of business clients require extended consultations (E)
- 40% of individual developers require extended consultations (E)
- 60% of business clients require additional data preprocessing (D)
- 30% of individual developers require additional data preprocessing (D)

Tasks:

1. Calculate $P(B|E)$ - the probability that a client is a business, given that they required an extended consultation
2. Calculate $P(I|D)$ - the probability that a client is an individual developer, given that they required additional data preprocessing
3. In 3-4 sentences, explain how the platform could use these probabilities to better allocate their engineering resources

Deliverable: Your calculations and explanation (1-2 pages).

Estimated time: 45-60 minutes