Introduction to Artificial Intelligence Fundamentals Homework Sheet

Student Name: _____

Class: _____

Due Date: _____

Introduction and Instructions

Welcome to the Introduction to Artificial Intelligence Fundamentals homework sheet! This activity is designed to introduce you to the basic concepts and applications of machine learning algorithms. Please read the instructions carefully and complete all the activities to the best of your ability.

Instructions:

1. Read each question and activity carefully.
2. Complete all the activities and questions.
3. Use the space provided to write your answers.
4. Submit your completed homework sheet to your instructor.

Multiple Choice Questions

Choose the correct answer for each question:

1. What is the main difference between supervised and unsupervised learning?
    - a) Supervised learning uses labeled data, while unsupervised learning uses unlabeled data.
    - b) Supervised learning uses unlabeled data, while unsupervised learning uses labeled data.
    - c) Supervised learning is used for regression, while unsupervised learning is used for classification.
    - d) Supervised learning is used for classification, while unsupervised learning is used for regression.

2. Which of the following is an example of a supervised learning algorithm?
    - a) K-means clustering
    - b) Linear regression
    - c) Decision trees
    - d) All of the above

3. What is the purpose of feature selection in machine learning?
    - a) To reduce the dimensionality of the data
    - b) To increase the accuracy of the model
    - c) To reduce overfitting
    - d) To improve the interpretability of the model

Short Answer Questions

1. Describe the difference between regression and classification problems. Provide an example of each. (50 words)

2. What is overfitting in machine learning? Provide an example of how it can occur. (50 words)

3. Describe the concept of clustering in machine learning. Provide an example of how it can be used in a real-world application. (50 words)

Case Study

Read the following case study and answer the questions:

Case Study: A company wants to use machine learning to predict customer churn. They collect data on customer demographics, usage patterns, and billing information.

1. What type of machine learning algorithm would be suitable for this problem? (20 words)

2. What features would you select for the model? (20 words)

3. How would you evaluate the performance of the model? (20 words)

Project

Implement a simple machine learning algorithm using a programming language of your choice. The algorithm should be able to perform a task such as classification or regression.

1. Write a brief report describing your approach and results. (100 words)
2. Include your code and any relevant output or visualizations.

Conclusion and Reflection

1. What did you learn from this activity? (20 words)

2. What challenges did you face? (20 words)

3. How can you apply machine learning to a real-world problem? (20 words)

Extension Activities (Optional)

Choose any combination:

1. Design and explain a chemical battery
    - Draw detailed diagrams
    - Write half-equations
    - Calculate potential voltage

2. Create a chemical reaction simulation
    - Use online modeling tools
    - Show concentration changes
    - Demonstrate equilibrium shifts

3. Write a scientific paper analyzing a recent chemical discovery
    - Include primary research
    - Evaluate methodology
    - Discuss implications

Additional Resources

For further learning and exploration:

- Machine Learning by Andrew Ng on Coursera
- Python Machine Learning by Sebastian Raschka
- Machine Learning: A Probabilistic Perspective by Kevin P. Murphy

Glossary

Key terms and definitions:

- Supervised learning: a type of machine learning where the algorithm is trained on labeled data
- Unsupervised learning: a type of machine learning where the algorithm is trained on unlabeled data
- Regression: a type of machine learning algorithm used for predicting continuous outcomes
- Classification: a type of machine learning algorithm used for predicting categorical outcomes