An Introduction to Machine Learning By Authors Journal Full Name, Year Published

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MOTIVATION

Motivation

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MOTIVATION

- Motivation
- Continued

OUTLINE

- Introduction
- Types of Machine Learning
- Supervised Learning Algorithms
- 4 Unsupervised Learning Algorithms
- 5 Applications of Machine Learning
- 6 Conclusion



Introduction

• What is Machine Learning?

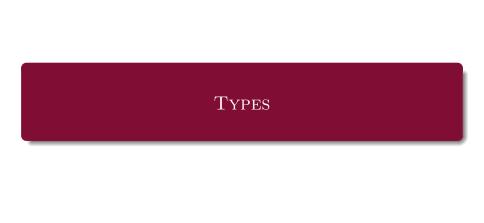
 A subset of artificial intelligence that provides systems the ability to automatically learn and improve from experience without being explicitly programmed.

• Why is it Important?

 Enables computers to find hidden insights without being explicitly programmed where to look.

Applications

• Image recognition, speech recognition, medical diagnosis, stock market trading, etc.



Types of Machine Learning

Supervised Learning

- The model is trained on labeled data.
- Examples: Regression, Classification.

Unsupervised Learning

- The model is trained on unlabeled data.
- Examples: Clustering, Association.

Reinforcement Learning

- The model learns through rewards and punishments.
- Examples: Game AI, Robotics.



SUPERVISED LEARNING ALGORITHMS

- Linear Regression
- Logistic Regression
- Decision Trees
- Support Vector Machines
- Neural Networks



Unsupervised Learning Algorithms

- K-Means Clustering
- Hierarchical Clustering
- Principal Component Analysis (PCA)
- Anomaly Detection



APPLICATIONS OF MACHINE LEARNING

Healthcare

• Disease prediction, personalized medicine.

Finance

• Fraud detection, algorithmic trading.

Transportation

• Autonomous vehicles, traffic prediction.

Retail

• Customer segmentation, demand forecasting.



Conclusion

- Machine learning is transforming industries by enabling data-driven decisions.
- Understanding the basics is essential for leveraging its full potential.
- Continuous learning and adaptation are key in this rapidly evolving field.

KEY TAKEAWAYS

Machine Learning is a powerful tool for extracting insights from data.

- It is essential to choose the right algorithm for the task.
- Data quality significantly impacts model performance.
- Ethical considerations are crucial when applying machine learning.

Note: Always validate your models with real-world data.

IMPORTANT CONSIDERATIONS

- Bias and Fairness: Ensure your models do not perpetuate biases.
- Privacy: Protect sensitive data and comply with regulations.
- Interpretability: Strive for models that are explainable.

Introduction

MATHEMATICAL FOUNDATIONS

Linear Regression Model:

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \dots + \beta_n x_n + \epsilon \tag{1}$$

- y: Dependent variable
- x_i: Independent variables
- β_i : Coefficients
- ϵ : Error term

Cost Function:

$$J(\theta) = \frac{1}{2m} \sum_{i=1}^{m} (h_{\theta}(x^{(i)}) - y^{(i)})^{2}$$
 (2)

CODE EXAMPLE: LINEAR REGRESSION IN PYTHON

```
import numpy as np
2 from sklearn.linear_model import LinearRegression
3
   Sample data
 X = np.array([[1, 1], [1, 2], [2, 2], [2, 3]])
|y| = np.dot(X, np.array([1, 2])) + 3
7
8 # Create model and fit
9 model = LinearRegression().fit(X, y)
10
11 # Predictions
predictions = model.predict(X)
print(predictions)
```

Comparison of Algorithms

Algorithm	Туре	Complexity	Interpretability
Linear Regression	Regression	Low	High
Decision Trees	Both	Medium	Medium
Neural Networks	Both	High	Low

Table: Comparison of common machine learning algorithms.

THANK YOU!



Unsupervised References I

Applications

Conclusion

References

Types

Supervised

Introduction

Additional Resources

Books:

- Pattern Recognition and Machine Learning by Christopher M.
 Bishop
- Machine Learning: A Probabilistic Perspective by Kevin P. Murphy
- Online Courses:
 - Coursera: Machine Learning by Andrew Ng
 - edX: Introduction to Artificial Intelligence (AI)

MATHEMATICAL BACKGROUND

- Probability and Statistics
- Linear Algebra
- Calculus
- Optimization Techniques