

Basic Concepts in Machine Learning

Your Name

July 24, 2025

AI, ML, and Data Science Overlap

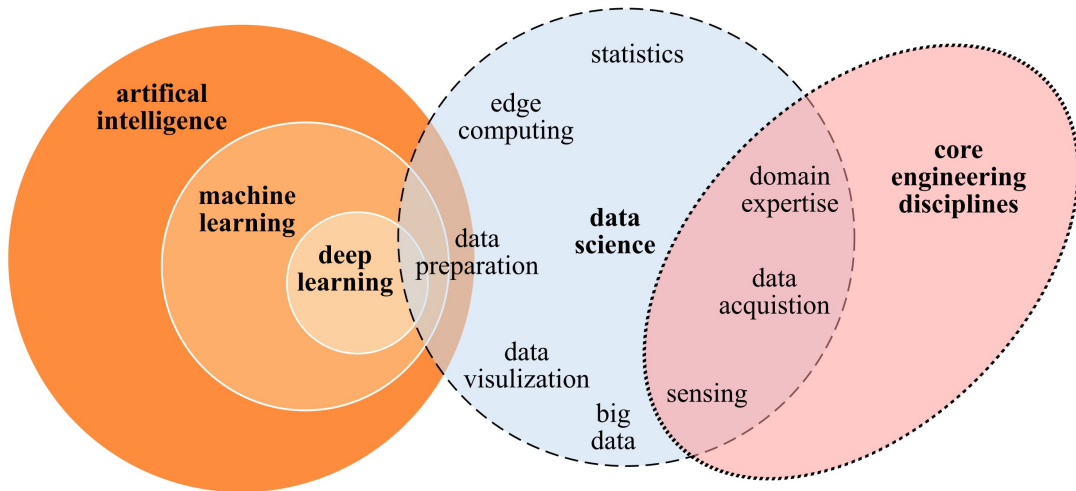


Figure: Overlap between AI, Data Science, and core engineering disciplines.

What is Machine Learning?

- ML automates analytical model building.
- Closely tied to data science ? extracting insights from structured and unstructured data.
- Systems learn from data, identify patterns, and make decisions with minimal human intervention.

Misconception: ML is Not About Robots

- ML is often confused with robotics.
- In reality, it focuses on algorithms that learn from data.
- Primary goal: prediction and decision-making from patterns in data.

Early ML Applications

- **Spam filters** ? one of the first practical ML applications.
- **Speech-to-text** ? converting spoken language to written form.
- **Medical diagnostics** ? predicting diseases from medical data and images.

Key ML Concepts & Terminologies

- **Supervised vs Unsupervised Learning** Train on labeled vs. unlabeled data.
- **Online vs Batch Learning** Incremental updates vs. training all at once.
- **Instance-based vs Model-based Learning** Memory-based predictions vs. generalized models.

Expert Systems in AI

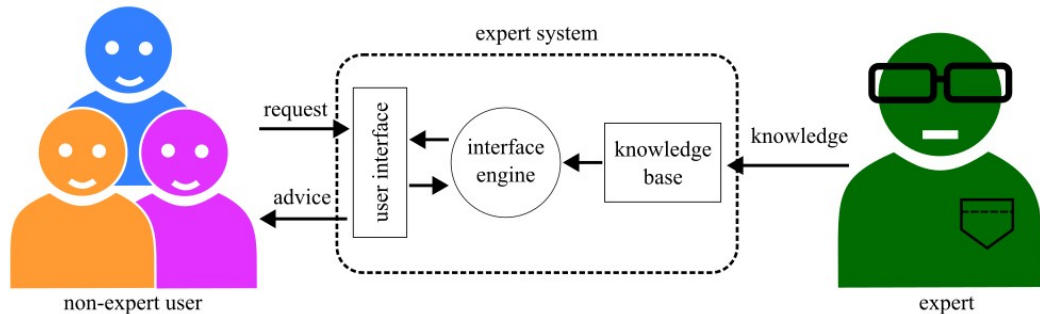


Figure: Expert systems simulate human decision-making using a knowledge base and inference rules.

AI, ML, and Data Science Overlap

- AI is the broader field, ML is a subset, and Deep Learning is a subset of ML.
- Data Science intersects with all these domains.

