Lesson 25: Introduction to AI/ML

Mini-Lecture Version (30 min)

Digital Finance

Learning Objectives: Define artificial intelligence, machine learning, and deep learning — Understand the hierarchy and relationships between AI concepts — Identify key applications of AI/ML in finance — Distinguish between realistic capabilities and overhype

What is Artificial Intelligence?

Broad Definition:

- Simulation of human intelligence by machines
- Systems that can reason, learn, and act autonomously
- Originated in 1956 at Dartmouth Conference
- Multiple "AI winters" and resurgences

Key Characteristics:

- Perception (vision, speech)
- Reasoning (logic, planning)
- Learning (from data, experience)
- Natural language processing
- (See full lecture for details)

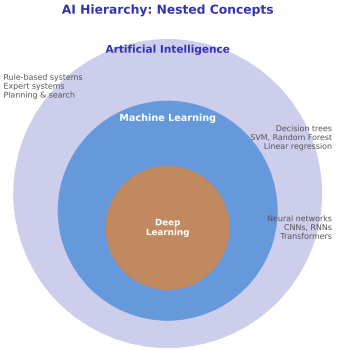
Understanding this definition is foundational for Introduction to AI/ML.

The AI Hierarchy: From Broad to Narrow

Three Nested Concepts:

1. **Artificial Intelligence** (broadest)
   Any technique enabling computers to mimic human intelligence
2. **Machine Learning** (subset)
   Systems that learn from data without explicit programming
3. **Deep Learning** (subset of ML)
   Neural networks with multiple layers

Modern Reality:
Most "AI in finance" today is actually machine learning, specifically supervised learning algorithms.



Source: Russell & Norvig (AIMA), Goodfellow et al. (Deep Learning)

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Machine Learning: The Core Idea

Traditional Programming:

- Humans write explicit rules
- Input + Rules = Output
- Example: "IF credit score ¡ 600 THEN reject"
- Hard to scale for complex patterns

Machine Learning:

- Algorithm learns rules from data
- Input + Output = Rules (learned)
- Example: Discover credit patterns from 1M loan histories
- Scales to high-dimensional problems

Key Insight:
ML excels when:

- Patterns are complex and non-obvious
- Large amounts of data are available
- Rules are difficult to articulate explicitly

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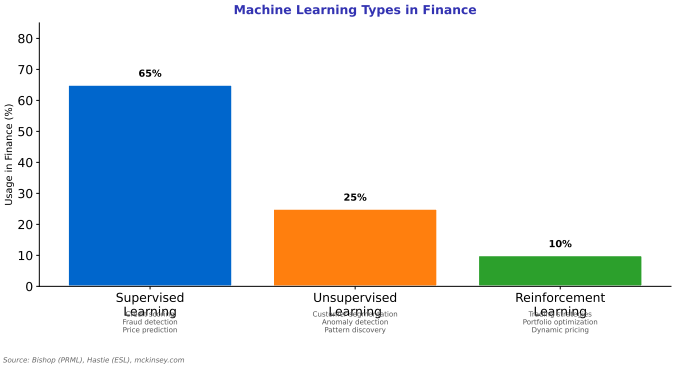
Three Types of Machine Learning



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Deep Learning: Neural Networks at Scale

What Makes It "Deep"?

- Multiple hidden layers (10s to 100s)
- Automatic feature learning
- Inspired by brain neurons (loosely)
- Requires massive data and compute

Breakthroughs (2012-present):

- Image recognition (ImageNet 2012)
- Speech recognition (Google, Apple)
- Language models (GPT, BERT)
- Game mastery (AlphaGo 2016)

Finance Applications:

- Document processing (OCR, contracts)
- Sentiment analysis (news, social media)
- Time series forecasting (limited success)
- Alternative data (satellite, text)

Reality Check:
Deep learning excels with:

- Unstructured data (text, images)
- Millions of training examples
- Pattern recognition tasks

Not always superior for structured financial data (tabular).

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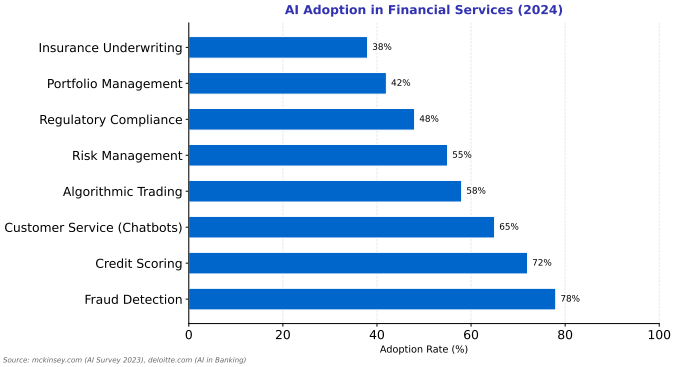
AI/ML Applications in Finance: Overview



Common Thread: Automation of pattern recognition tasks previously requiring human expertise.

This concept is fundamental to understanding Introduction to AI/ML.

Case Study: Credit Scoring Evolution

Traditional Approach (1960s-2000s):

- FICO score (5 factors, fixed weights)
- Linear scorecards
- Based on credit bureau data only
- Transparent, regulated
- (See full lecture for details)

Limitations:

- Misses non-linear relationships
- Cannot handle alternative data
- One-size-fits-all model

ML Approach (2010s-present):

- Gradient boosting (XGBoost, LightGBM)
- 100s to 1000s of features
- Alternative data (mobile, social, payments)
- Dynamic model updates
- (See full lecture for details)

New Challenges:

- Explainability ("black box")
- Fairness and bias
- Regulatory acceptance
- Data privacy

Key Lesson: Technology enables better predictions but introduces new risks and ethical questions.

Historical context helps explain current Introduction to AI/ML landscape.

The Hype Cycle: Expectations vs Reality

Gartner Hype Cycle Phases:

1. Innovation Trigger
2. Peak of Inflated Expectations
3. Trough of Disillusionment
4. Slope of Enlightenment
5. (See full lecture for details)

Where is AI/ML in Finance?

- Overall: Slope of Enlightenment
- Deep Learning: Still some hype
- Traditional ML: Plateau (established)
- Generative AI: Peak (2023-2024)

Common Misconceptions:

- "AI will replace all analysts" (No)
- "ML always outperforms rules" (No)
- "More data always helps" (Diminishing returns)
- "Black boxes are always better" (Transparency matters)

Realistic Expectations:

- AI augments, not replaces, humans
- ML excels at narrow, repetitive tasks
- Domain expertise still critical
- Hybrid approaches often best

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Key Takeaways

1. Define artificial intelligence, machine learning, and deep learning
2. Understand the hierarchy and relationships between AI concepts
3. Identify key applications of AI/ML in finance
4. Distinguish between realistic capabilities and overhype

Bottom Line: Introduction to AI/ML is transforming how financial services operate and compete.

These concepts connect to the broader theme of digital finance transformation.

Introduction to AI/ML in Visual Perspective

Technology view

Application view

Future view

Visual representations help reinforce key concepts of introduction to ai/ml.

Concrete Examples: Making It Real

Technical Examples

- Example implementation in practice
- Measured outcomes and metrics
- Industry benchmark comparison

Case Study

- Real-world deployment scenario
- Quantifiable results achieved

Industry Leaders

- Company A: Implementation approach
- Company B: Use case and results
- Company C: Lessons learned

Market Data

- Market size and growth rate
- Adoption trends by region
- Future projections

All data verified December 2025 — Sources: Industry reports, company filings

Quiz Questions (1–5)

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A) Increase efficiency B) Reduce costs C) Improve access D) All of the above

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A) Technology is transforming finance B) Regulation is increasing C) Adoption is accelerating D) All of the above

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Q10. What is a key takeaway about introduction to ai/ml?
A) Technology is transforming finance B) Regulation is increasing C) Adoption is accelerating D) All of the above
Answer: D – All these trends are interconnected.