

Machine Learning in Business

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Agenda

- Traditional Machine Learning
- Beyond Machine Learning: Toward Artificial Intelligence
- Ethical Issues Discussions

Traditional Machine Learning

- Machine learning is usually defined as algorithms that can learn and improve themselves without explicitly programmed to do so.
- How can machine learning algorithms “learn”?
- Why do people rely a lot on machine learning these days?
 - Individuals
 - Firms
 - Government agencies

Types of Machine Learning

- Supervised Learning
- Unsupervised Learning
- Reinforcement Learning

Supervised Learning

- Machine learning algorithms that are trained using labeled data to make predictions.
- Classification tasks vs. Regression tasks
- The training process involves feeding labeled data to the model and adjusting model parameters to optimize prediction performance.

Supervised Learning Examples

- Application Screening
- Fraud Detection
- Predictive Analytics

Unsupervised Learning

- Machine learning algorithms that are trained using unlabeled data to identify patterns and structures within the data.
- The training process focuses on data exploration, pattern recognition, and the extraction of valuable information.
- Clustering is the most popular unsupervised machine learning models, but there are many other applications.

Unsupervised Learning Examples

- Customer Segmentation
- Anomaly Detection
- Dimensionality Reduction

Reinforcement Learning

- Algorithms that train an agent to make sequential decisions in an environment to maximize cumulative rewards.
- The training process involves trials-and-errors where agents explore actions, learn from outcomes, and derive strategies to achieve long-term goals with the highest rewards.
- Primarily used in autonomous vehicle navigations, game playing, and robot control.

Using Machine Learning in Business

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Using Machine Learning in Business

- Business requirements
 - Do we really need machine learning or simple data analyses?
 - Business processes compatible with ML implementations?
 - Budget constraints?
 - User acceptance

Key Challenges

- Data availabilities
 - Insufficient or poor-quality data
 - Inconsistent data formats or missing values
 - Limited access to relevant data sources
- Skilled talents
 - There is a shortage of professionals with expertise in both machine learning and business domains.
 - Training and retaining skilled data scientists and machine learning engineers can be challenging.
 - Building a multidisciplinary team is essential for successful machine learning implementation.

Our Opportunities

- Cross-discipline skills
- Strategic decision-making and insights
- Marketing and customer-centric mindset
- Entrepreneurship knowledge

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Success Stories

- Amazon Personalized Recommendations
 - Challenge: Amazon faced the challenge of helping users discover products among the vast catalog.
 - Solution: Implemented machine learning algorithms to analyze user behavior, purchase history, and preferences.
 - Outcome: The recommendation system suggests products based on individual user interests, significantly improving user engagement and driving increased sales. Amazon attributes a significant portion of its revenue to the success of personalized recommendations.

Success Stories

- Netflix: Content Recommendation and Optimization
 - Challenge: Netflix aimed to enhance user satisfaction by recommending personalized content.
 - Solution: Utilized machine learning algorithms to analyze viewing habits, preferences, and ratings.
 - Outcome: Netflix's recommendation engine predicts what users may like, leading to a more personalized content experience. This has contributed to increased user retention and engagement, as users are more likely to discover and enjoy content tailored to their tastes.

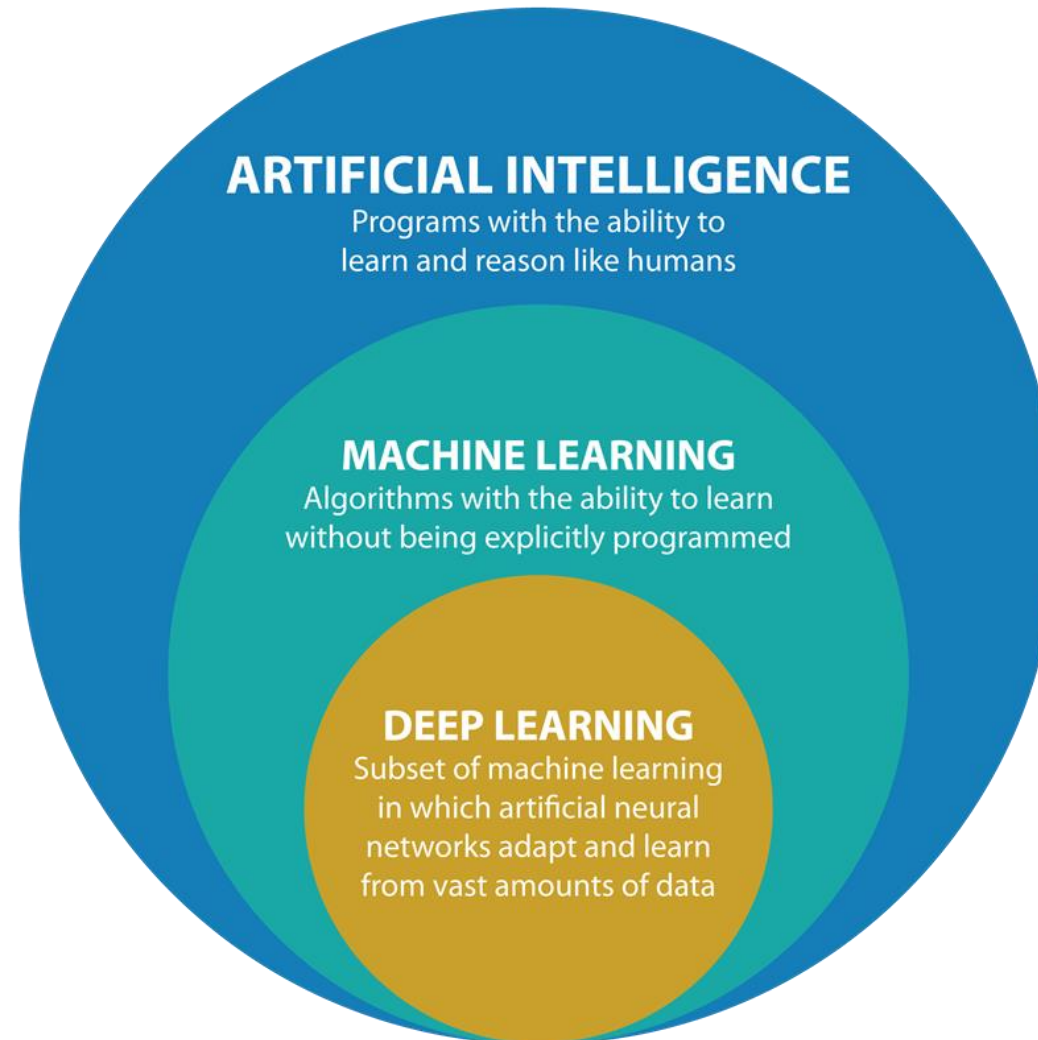
Success Stories

- Google: AdWords and Predictive Bidding
 - Challenge: Google wanted to improve the efficiency of its online advertising platform, AdWords.
 - Solution: Implemented machine learning algorithms for predictive bidding, considering factors like user behavior, device, and demographics.
 - Outcome: Advertisers using Google's AdWords experience more effective ad placements. Machine learning optimizes bidding strategies, helping advertisers achieve better returns on investment by targeting the right audience with relevant ads.

10-Min Break

Any Questions?

Beyond Machine Learning



Beyond Machine Learning

- Deep Learning-based application
- Generative AI
- Artificial general intelligence (AGI)

Deep Learning

- Using “deep” neural networks to model
- Require a large dataset
- Computationally intensive
- Typically used for unstructured data

In Event of Moon Disaster

<https://arts.mit.edu/in-event-of-moon-disaster/>

<https://www.youtube.com/watch?v=LWLadJFI8Pk&t=208s>

Lip-syncing AI

<https://twitter.com/i/status/1617494748331122688>

<https://twitter.com/i/status/1618987800388587521>

Bruce Willis in Russian Ads

<https://www.dailymotion.com/video/x83i85w>

<https://www.youtube.com/watch?v=Hp4jbs7ivSY>

Deepfake

- Now “easy” to use
- Do not require many pictures/videos to develop a faceset
- Implications on businesses?
- Implications on society?

Other Deep learning-based applications

- Algorithmic trading
- Language translation/speech recognition
- Object detection/image recognition
- Cybersecurity – Threat identification/prevention

Generative AI

- Generative AI (GenAI) refers to a class of artificial intelligence algorithms designed to generate new, original content or data.
- It goes beyond traditional AI by creating new examples rather than predicting existing ones, making it valuable for content creation and innovation.

Text Generation

- Generative Pre-Trained Transformers (GPT)
 - ChatGPT
 - Google Bard
- Generate content based on prompts
- Can be pre-trained for specific data

Image Generation

- Generate images based on descriptions
 - StableDiffusion
 - Midjourney
- Generate images based on contexts
 - Adobe Generative Fill

Stable Diffusion with Brain Activity

<https://sites.google.com/view/stablediffusion-with-brain/>



Left: Overview of our framework. Right: Presented images (redbox, top row) and images reconstructed from human brain activity (grey box, bottom row).

Pope Francis with Jacket



Business Applications of GenAI

- Customer services
 - ChatBot
 - Automated Email
- Training and skill development
- Review generation
- Implications in education

Artificial General Intelligence

- AGI refers to a type of artificial intelligence that possesses the ability to understand, learn, and apply knowledge across a wide range of tasks at a level comparable to human intelligence.
- It implies a system that can generalize its understanding and adapt to diverse contexts, demonstrating a broad spectrum of cognitive abilities.
- AGI aims to replicate or mimic human cognitive functions, including reasoning, problem-solving, perception, and natural language understanding.

Artificial General Intelligence

- How close are we to AGI?
- Any ethical and safety considerations?
- Achieving AGI remains an active area of research and is considered a long-term goal in the field of artificial intelligence.
- Researchers face challenges such as developing robust learning algorithms, addressing ethical concerns, and ensuring the alignment of AGI goals with human values.

10-Min Break

Any Questions?

Ethical Issues in ML/AI

- Bias and Fairness Issues
 - What should be considered “fair”?
 - How to ensure the fairness?
 - Behavioral responses to fairness

Ethical Issues in ML/AI

- Privacy Issues
 - What data can companies collect?
 - How should companies use the data they have?
 - Opt-in vs. Opt-out

Ethical Issues in ML/AI

- Transparency and Explainability Issues
 - Do we need to understand how ML/AI make prediction?
 - Ensuring models are explainable is crucial for building trust, as stakeholders may demand accountability and understanding of the reasoning behind AI-driven decisions.

Ethical Issues in ML/AI

- Autonomy and Accountability Issues
 - Do we need to make sure that the data we have are correct?
 - Do we need to make accurate predictions?
 - Who should be responsible for damages caused by ML/AI?

Ethical Issues in ML/AI

- Job Displacement and Economic Impact
 - Automation and AI-driven technologies have the potential to displace jobs, leading to economic and social implications.
 - Ethical considerations include addressing the impact on employment, fostering reskilling initiatives, and mitigating potential societal inequalities resulting from technological advancements.

Thank you!