MACHINE LEARNING

Lecture 21

Applications of ML in

Natural Language Processing

Computer Vision

On the Web

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NLP Applications of ML

Text Classification: ML algorithms are used to classify text into predefined categories or labels, such as sentiment analysis (positive, negative, neutral), spam detection, topic categorization, and intent recognition for chatbots.

Sentiment Analysis: ML classifiers determine the sentiment expressed in text, helping businesses gauge customer opinions, track brand sentiment, and make informed decisions.

Named Entity Recognition (NER): ML models identify entities in text, such as names of people, organizations, locations, dates, and other important terms, which is essential for information extraction.

Text Summarization: ML techniques, such as extractive and abstractive summarization, automatically create concise summaries of longer text, saving time and aiding comprehension.

NLP Applications of ML

Language Generation: ML models like Recurrent Neural Networks (RNNs) and Transformers are used to generate human-like text, including chatbot responses, language translation, and content creation.

Machine Translation: ML-based translation models, such as neural machine translation, have significantly improved the accuracy and fluency of automated language translation.

Speech Recognition: ML algorithms convert spoken language into written text, enabling voice assistants, transcription services, and voice-activated devices.

Question Answering: ML-powered systems can understand and respond to natural language questions, as seen in chatbots and virtual assistants.

NLP Applications of ML

Information Retrieval: ML-based search engines rank and retrieve relevant documents, web pages, or information based on the user's query.

Document Classification: ML techniques categorize entire documents into predefined classes, aiding in document organization, archiving, and retrieval.

Dialogue Systems: ML-driven conversational agents engage in natural language conversations, making them valuable for customer support, virtual assistants, and more.

Text-to-Speech (TTS): ML algorithms convert text into human-like speech, enabling applications like audiobooks, accessibility tools, and voice assistants.

CV Applications of ML

Image Classification: ML algorithms classify images into predefined categories, such as identifying objects, animals, or scenes in images.

Object Detection: ML models detect and locate objects within images or videos, often used in autonomous vehicles, surveillance, and robotics.

Semantic Segmentation: ML techniques segment images into different regions, labeling each pixel with the corresponding object or category, essential for understanding complex scenes.

Face Recognition: ML algorithms identify and verify faces in images or videos, used for security, access control, and personalized user experiences.

CV Applications of ML

Gesture Recognition: ML-based systems interpret human gestures from images or videos, applied in user interfaces, sign language recognition, and human-computer interaction.

Object Tracking: ML models track the movement of objects over time in videos, crucial for surveillance, video analysis, and augmented reality.

Image Captioning: ML-powered systems generate descriptive captions for images, aiding accessibility and enabling applications for visually impaired individuals.

Medical Imaging: ML algorithms analyze medical images, assisting in diagnosis, disease detection, and medical research.

CV Applications of ML

Augmented Reality (AR): ML models enhance real-world scenes with digital information, enabling immersive experiences on devices like smartphones and smart glasses.

Satellite Image Analysis: ML techniques process satellite images for land use classification, disaster monitoring, and environmental analysis.

Quality Control: ML algorithms detect defects and anomalies in manufacturing processes by analyzing visual data.

Art Generation: ML models can create art, generate images, and replicate artistic styles, contributing to the intersection of technology and creativity.

ML Applications on the Web

Search Engines: ML algorithms power search engines to deliver more relevant search results based on user behavior and preferences, improving search accuracy.

Recommendation Systems: ML is used to suggest products, movies, music, or content based on user preferences and past interactions, enhancing user engagement.

Content Personalization: ML models tailor website content to individual users, showing them articles, ads, or products that match their interests.

ML Applications on the Web

Spam Detection: ML algorithms filter out spam emails, comments, or content on websites, enhancing user safety and experience.

User Behavior Analysis: ML techniques analyze user behavior patterns, such as clicks and navigation, to understand user preferences and improve website design.

Accessibility: ML assists in making websites more accessible for individuals with disabilities by providing features like text-to-speech, screen readers, and image descriptions.