Overview: Computer Vision

Pre-work: Computer Vision

Agenda

- **Introduction**
- **Use Cases**

Introduction

Introduction to Computer Vision

- Computer Vision is the branch of Artificial Intelligence that enables machines like cameras and computers to derive meaningful insights from digital images, videos, and other visual inputs.

- Computer Vision allows a machine to gain a high-level understanding of visual inputs and take actions based on the inference gained from these inputs. The process behind Computer Vision typically involves image acquisition, image screening, image analysis and identifying and extracting information from images.

Source: Wikimedia Commons

An example of a modern-day Computer Vision application:
An Image Segmentation and Object Detection model that is able to classify objects & vehicles on the road - such models are extensively used in Autonomous Vehicle development

Use Cases

Use Cases for Computer Vision

- **Autonomous Vehicles**

  - Self-driving cars, having long been a part of science fiction, are inching closer to reality due to the latest advances in camera-based and sensor-based Computer Vision and Deep Learning.
  - Autonomous vehicles use neural networks to detect lane lines, avoid obstacles and navigate on roads. Today's high performance processors, graphic cards and the vast amount of training data available, are helping self-driving cars go from concept to reality, in terms of being able to perform the calculations per second necessary for safe autonomous driving.
  - While they represent one of the most difficult engineering frontiers for modern computer vision, autonomous vehicles have the potential to become one of society's most significant transportation innovations, and can help save time and lives if they are able to drive significantly more safely and efficiently than the average human driver.


The Autonomous Vehicles being developed by Tesla, Waymo (Google) and Cruise represent the cutting-edge in terms of applying Computer Vision to full self-driving.

Source: Wikimedia Commons

Use Cases for Computer Vision

- **Retail**

  - Computer Vision has been applied to several ideas in the Retail space, such as Theft Prevention, Footfall / Heatmap Analysis, Inventory Management, and even Self-Checkout / Cashierless Stores.

  - Amazon for example, has been operating a chain of Self-Checkout convenience stores in the US and UK, called **Amazon Go.** These stores rely on Computer Vision algorithms to eliminate the need for long checkout lines in front of a cashier to physically scan the products you wish to purchase - the e-receipts are automatically generated and sent to the user's device for payment.
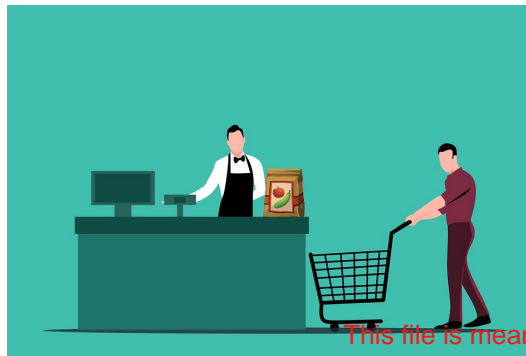
The need for a cashier in supermarkets could be automated using Computer Vision algorithms such as those used in Amazon Go

Source: Pixabay

Use Cases for Computer Vision

- **Banking, Financial Services & Insurance**

  - The financial sector has plenty of opportunities and use cases to apply computer vision, ranging from Authentication & Security, Fraud Detection, Optical Character Recognition (OCR), Digital Payment solutions and even retail-style customer behavior understanding.

  - Computer Vision has also been applied to Insurance use cases like claim settlement in property and casualty insurance, auto insurance as well as drone inspection for damage assessment in places that would represent a risk for human-driven manual inspection processes.

Computer Vision has greatly contributed to OCR, which is increasingly used in Banking & Finance to recognize text in images

Source: Wikimedia Commons

Use Cases for Computer Vision

- **Healthcare**

  - Computer Vision is now also being extensively applied in the field of Healthcare, especially around tasks pertaining to medical imaging, which are a key component of diagnosis for several conditions. These include Eye Disease Detection as well as detection of Lung Cancer, Brain Tumor and other types of tumors from medical image scans.
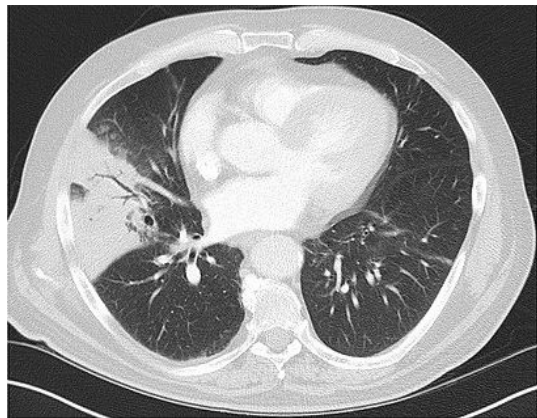
Source: Wikimedia Commons

Google AI researchers recently created a Computer Vision AI model capable of accurately detecting lung cancer from screening tests, outperforming even human radiologists with 8 yrs of work experience
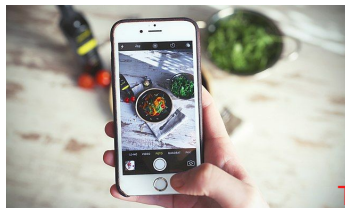
New-Age Applications of Computer Vision

- **Smartphone Camera Applications**

  - Due to the emergence of high-quality cameras on smartphones, several camera-oriented digital Computer Vision applications such as QR code scanners, image filters on apps like Instagram & Snapchat, facial detection and facial recognition, as well as image-to-text OCR applications like Google Lens have come to prominence.

- **Augmented Reality & Virtual Reality**

  - The growing adoption of Augmented & Virtual Reality in several niche use cases, such as Education, Gaming and other forms of entertainment, has seen Computer Vision applied to several tasks important in developing such applications, like Inside-Out / Outside-In Tracking and In-Depth Sense Estimation.

Smartphones &
AR/VR are two of the
new-age applications
of computer vision

Source: Wikimedia Commons

Thank You