Computer Vision

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***Abstract*—To provide an overview of Computer Vision, introducing its fundamental principles, methodologies, and advantages.**

I. Introduction

For our first presentation, we introduced our topic of Computer Vision (CV). We addressed the actual definition of CV, why it matters, the advantages and disadvantages, its applications, and the pipeline that helps understand a CV System Design. A CV is a digital system that assists in processing, analyzing, and making sense of data to empower the digital economy. Being categorized as both artificial intelligence (AI) and machine learning (ML) technology, it is a game-changer that allows machines to understand the world through visual perception and, as its name suggests, vision.

II. Main Section

Taking inspiration from how humans process data through observation, CV strives to process data similarly through sensing hardware to understand reality. A CV helps enable the automation of tasks and enhances efficiency through pattern recognition and various techniques. This involves Convolutional Neural Networks (CNNs), deep learning, as well as supervised and unsupervised learning methods. With that said, the use cases that are involved include Object Detection, Classification, Verification, Landmark, and Recognition; making it a finite solution for any companies to integrate within their technologies. Despite CV being around for many years (through photographic imagery), it has evolved to a reliable source that many industries gravitate towards. This includes Autonomous vehicles, medical devices, retail empowered by AI, and many more are prime examples of "who " is incorporating a CV system.

We highlighted the benefits of a well-trained CV system, including cost reduction, improved reliability, enhanced accuracy, and faster processing times. Consequently, some of the proportionate drawbacks of a CV system lie in its data dependency, the requirement of continuous monitoring, and its limitation in generalization. This is primarily attributed to its heavy reliance on high-quality training for precise performance and the requirement for a volume of specified datasets to train the system effectively. Just like other AI and ML products, it requires consistent maintenance to meet its ongoing demands. At the end of our presentation, we concluded with a sequential pipeline of a CV System Design; similar to a Software Development Life Cycle, a CV is structured in the same way going as follows: 1) Requirement Analysis, 2) Data Collection and Prepossessing, 3) Feature Extraction and Representation, 4) Model Selection and Training, 5) Evaluation Fine-Tuning, 6) Optimization and Fine-Tuning, and 7) Monitoring and Maintenance. Even though we gave more of a general overview of these steps, we will cover more in-depth on the categories in presentation 2.

III. Conclusion

Overall, as a group, we've done well providing an overview of CV. However, an area where we can improve is by focusing on a specific product that centralizes CV technologies. With that being said, in our second presentation, we will dive deeper into this aspect by using a real-world example, the "Amazon Go Store" and go more in-depth to how a CV is trained successfully.

References

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