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Course:	MSC (COMPUTER SCIENCE WITH ADVANCED PRACTICE)
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1. Project Title

Real-Time Object Detection and E-Commerce Integration in Streaming Videos Using CNNs

2. What problem are you trying to solve?

Currently, users watching videos may want to purchase products they see, but they often have to search manually for those items. This creates a disconnect between content consumption and shopping. By developing a system that uses convolutional neural networks (CNNs) for real-time object detection and instantly linking detected objects to relevant e-commerce products, you can improve the shopping experience, making it more efficient, interactive, and convenient for users.

3. Research Question.

How can we make convolutional neural networks faster and more accurate at detecting objects in live videos, and connect those objects to online products instantly, making it easy for viewers to shop as they watch?

4. Hypothesis.

By optimizing convolutional neural networks (CNNs) for real-time object detection in streaming videos and integrating them with e-commerce platforms, it is possible to create a seamless user experience where detected objects are accurately identified and linked to relevant products, leading to improved user engagement and a more efficient shopping process. This system will enhance both video content consumption and online purchasing by reducing the time and effort required for viewers to find and buy products seen in the video.

5. Objectives of the project.

Develop a Real-Time Object Detection System: Implement and optimize convolutional neural networks (CNNs) to detect and recognize objects in streaming videos in real time, ensuring high accuracy and minimal latency.

Integrate E-Commerce Linkage: Design a mechanism that connects detected objects to relevant e-commerce products, providing users with direct purchase options for items seen in the video.

Optimize Performance for Streaming Environments: Ensure that the object detection system can handle the dynamic nature of live or pre-recorded video streams without compromising speed or video quality.

Enhance User Experience: Create a seamless, user-friendly interface that allows viewers to interact with the detected objects and make purchases easily, improving the overall shopping experience.

Evaluate System Effectiveness: Measure the system's performance in terms of detection accuracy, speed, user engagement, and conversion rates (clicks and purchases) to assess its impact on both video content consumption and online shopping.

Ensure Scalability and Adaptability: Design the system to be scalable across different types of videos, platforms, and devices while allowing for easy updates and adaptations to new e-commerce trends and technologies.

6. Expected end products.

Real-Time Object Detection System: A fully developed, optimized convolutional neural network (CNN)-based model capable of detecting and recognizing objects in streaming videos with high accuracy and low latency.

E-Commerce Link Integration Platform: A system that links detected objects to relevant e-commerce products, allowing users to seamlessly purchase items they see in the video through clickable links or overlays.

User Interface for Video Streaming Platforms: A user-friendly interface integrated with video streaming platforms that enables real-time interaction with detected objects and offers users convenient access to purchase options.

Performance Analytics Dashboard: A dashboard providing insights into system performance, including detection accuracy, response time, user engagement metrics (such as clicks and interactions), and e-commerce conversion rates (purchases made through linked products).

Web Application Prototypes: Prototypes of web applications demonstrating the functionality of real-time object detection and e-commerce integration, showcasing how the technology can be applied across different platforms and devices.

Scalability Framework for Integration: A flexible and scalable architecture for integrating the object detection and e-commerce linkage system into various video platforms, ensuring compatibility with different types of video content and e-commerce catalogues.

Technical Documentation and User Guide: Detailed documentation outlining system architecture, implementation steps, and instructions for integrating the solution into different video streaming platforms or e-commerce websites.

7. Ethical Considerations.

Protecting User Privacy:

Since the system will detect objects in videos that users are watching, it's important to make sure their personal information isn't collected without their permission. The system needs to follow privacy laws and ensure that users know exactly what data is being used and how it's stored.

Getting User Consent:

Users should be fully aware that objects in the videos are being detected and linked to e-commerce products. They should have the choice to opt out if they don't want to interact with these features. This ensures the system is transparent and respects user preferences.

Clear Advertising:

It's crucial that users know when an item shown in a video is linked to a product for sale. If the link is part of an advertisement or a paid promotion, this should be clearly indicated, so users aren't misled into thinking it's part of the video content itself.

Avoiding Bias in Detection and Recommendations:

The object detection system must be fair and unbiased, meaning it should accurately detect and link to a wide variety of objects and products without favouring specific brands or categories. Ensuring that the system is trained on diverse data helps avoid biases and provides equal exposure for all kinds of products.

Respecting User Control:

Users should have full control over whether they want to engage with the detected objects and e-commerce links. The system should not overwhelm them with suggestions or push them into making purchases they might not want. It should enhance their experience, not force it.

Copyright and Intellectual Property:

Videos often contain content that belongs to creators. It's important to respect intellectual property rights, ensuring that any product links or detections don't interfere with the rights of video creators or violate copyright laws.

Responsible Consumer Engagement:

While the system is designed to make shopping easier, it's important to avoid promoting impulsive buying behaviour. The goal should be to enhance convenience, not to push people into making unnecessary purchases, especially for vulnerable users like young people.

7.1. Ethics Declaration:

	True	**False**
My project is entirely literature based and/or technical,	**True**	
My Project does not use any form of participants,	**True**	
My Project does not use external inputs (e.g. liaising with someone in industry),	**True**	
My Project does not require me to do work off campus (e.g. in a company),	**True**	

My Project does not use secondary data sets		**False**

8. Justification for master's level project.

This project is well-suited for a master's level endeavour due to its focus on developing a novel integration of advanced technologies—specifically, real-time object detection using convolutional neural networks (CNNs) and their application within e-commerce environments. Here are the key reasons why this project aligns with the expectations of master's level work:

Novelty of Application: The integration of real-time object detection in streaming videos with e-commerce is a relatively unexplored area, especially in terms of creating a seamless user experience. While both object detection and e-commerce solutions exist independently, combining them to allow users to interact with and purchase products directly from videos introduces a new, innovative application. This originality demonstrates a significant contribution to the field of computer vision and online shopping.

Complexity of Techniques: Implementing and optimizing CNNs for real-time object detection involves sophisticated techniques in deep learning, including model selection, data preprocessing, and training methodologies. Mastery of these techniques is essential, as they require an in-depth understanding of neural network architectures, performance tuning, and optimization strategies that are characteristic of graduate-level work.

Primary Research Component: The project includes a primary research component where the effectiveness of different CNN architectures (such as YOLO, SSD, or Faster R-CNN) can be compared in real-time scenarios. This research will involve experimental design, data collection, and quantitative analysis of performance metrics (e.g., accuracy, latency, and user engagement), aligning with the rigorous research standards expected at the master's level.

Interdisciplinary Nature: This project bridges multiple disciplines, including computer science, machine learning, human-computer interaction, and e-commerce. The ability to synthesize knowledge from these diverse fields reflects the complexity and depth appropriate for master's level study. It requires critical thinking and the ability to apply theoretical concepts to practical problems, both essential skills for graduate education.

Ethical and Societal Implications: Addressing the ethical considerations of privacy, transparency, and algorithmic bias adds depth to the project. This not only enhances the technical aspect but also promotes a responsible approach to technology development, emphasizing the importance of ethical implications in modern computing, a topic increasingly relevant at the graduate level.

Real-World Relevance: The potential real-world applications of this project in the growing fields of video streaming and online shopping further justify its appropriateness for master's level work. The project can provide significant insights for businesses looking to enhance user engagement and shopping experiences, illustrating a clear connection between academic research and practical implementation.