Computer Vision Projects 2026-27

Contents

Sustainable and Privacy-Preserving Biometrics in Education

Supervisor: Tasmina Islam

Areas: Artificial Intelligence, Machine learning / Deep learning, Computer vision, Human-centred computing (human-computer interaction), Education

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Project Description

The growth of online and hybrid education has created new challenges for ensuring fairness and security in assessment. Traditional remote proctoring systems often depend on continuous webcam monitoring, raising concerns around privacy, accessibility, and environmental sustainability due to the energy and storage demands of video-heavy approaches.

This project aims to explore the design of sustainable and privacy-preserving biometric systems for education. The project will investigate how AI-driven biometric authentication methods can provide continuous but unobtrusive identity verification in online assessment while addressing three key issues:

Privacy-preserving authentication: developing methods that protect raw biometric data through on-device processing, secure template storage, or federated approaches.

Fairness and accessibility: auditing performance across diverse student groups and learning environments, ensuring transparency and inclusivity.

Ecological sustainability: benchmarking against conventional proctoring to quantify and reduce energy use, bandwidth, and carbon footprint.

The project will deliver prototype systems and evaluation frameworks that consider accuracy, fairness, privacy, and ecological impact together. The outcomes will contribute to the development of responsible, inclusive, and environmentally conscious online assessment technologies.

Investigating Human Perception through Quantum Cognition

Supervisor: Rita Borgo / Andrew Meso

Areas: Computer vision, Human-centred computing (human-computer interaction), Quantum Computing

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Project Description

This PhD project explores a novel application of quantum cognitive theory to the study of Bertin's retinal variables, fundamental visual encodings such as colour, shape, size, and position. While traditional models treat these variables as independent channels processed in isolation, emerging evidence suggests that perception may instead involve non-classical, quantum-like dynamics. This research aims to investigate whether interpretations of visual encodings exhibit phenomena such as superposition, interference, and contextuality.

Self-Supervised Foundation Models for Video Panoptic Understanding

Supervisor: Luis C. Garcia Peraza Herrera

Areas: Artificial Intelligence, Machine learning / Deep learning, Computer vision

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Project Description

The development of foundation models has transformed AI, and video is the next frontier. Video Foundation Models (ViFMs) have shown great promise in high-level tasks like action recognition and text-based retrieval. However, there remains an unmet need for powerful, general-purpose representations that can support dense, pixel-level understanding tasks such as panoptic segmentation.

While self-supervised learning (SSL) has become the dominant paradigm for pre-training visual models without relying on labeled data, current SSL objectives are suboptimal for tasks requiring fine-grained, pixel-level understanding. Existing pretext tasks [1] focus on capturing motion and high-level semantics, making them unsuitable for panoptic segmentation.

Despite the importance of panoptic segmentation, there is no widely adopted self-supervised pre-training strategy specifically designed to learn representations tailored to this task in the video domain. This project aims to bridge this gap by developing a novel SSL objective that leverages the inherent structure and motion in unlabeled videos as a supervisory signal for learning panoptic representations.

We will design and train a new video foundation model using a novel self-supervised pre-training strategy, tailored to the specific requirements of panoptic segmentation. Our approach will focus on exploiting the structural information present in videos to learn rich, pixel-level representations that support complex scene understanding tasks.

References

[1] Zhao et al., "VideoPrism: A Foundational Visual Encoder for Video Understanding", ICML 2024.