Semi-supervised learning towards video understanding

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Description:

Substantial efforts have been made in the Computer Vision/Pattern recognition communities to **detect and recognise abnormal and criminal activities** based in surveillance footage.
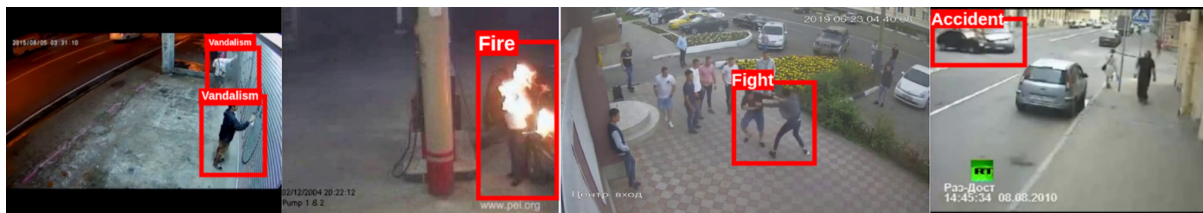

Figure 1: Illustration of some examples of abnormal event detection and recognition (at the pixel level).

DeepNeuronic (http://www.deepneuronic.com/) is a company focused on building efficient Machine Learning-based products to solve and automate daily problems through computer vision and help to take a step forward towards smarter cities. In the past, they deployed CovidSight (http://covidsight.pt/), a computer vision solution to tackle the Covid-19 spread through a unified framework that automatically verifies the compliance of multiple safety rules in real-time.

In this context, and sponsored by **DeepNeuronic**, this work aims at the development of a deep learning-based solution for video understanding through video image processing. In practice, the goal is to recognise suspicious actions/dynamics at the pixel level and explicitly detect abnormal events. Since previous works on abnormal event detection are mainly focused at the frame level [1,2], the development of the proposed dissertation will contribute to the advent of this field, mainly at detection precision and inference time.

This work comprises a Research Grant ("Bolsa de Investigação", according to FCT: Fundação para a Ciência e Tecnologia regulations, 835.98€/month, from September 01st, 2021 to August 31st, 2022), **given by** the **University of Beira Interior** and **sponsored by DeepNeuronic**, under the patronage law.

Workplan:

- **Comparative study** of the recently published and highly popular action recognition and abnormal event detection algorithms;

- **Acquisition** and **annotation** of a **dataset** for development and evaluation purposes;

- **Development, implementation** and **test** of deep learning-based solutions for abnormal event recognition;

- Writing of **Technical Report**, describing all the work carried out in the scope of the dissertation;

- Writing of the **M.Sc. Dissertation.**

Pre-requisites:

- Basic skills in English writing/reading;

- Good programming skills, preferably in Python language, PyTorch and TensorFlow frameworks;

- Previous knowledge about Machine Learning and Artificial Intelligence.

References:

[1] Waqas Sultani, Chen Chen, and Mubarak Shah. Real-world anomaly detection in surveillance videos. In Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition, pages 6479–6488, 2018.

[2] Bruno Degardin and Hugo Proença, "Human activity analysis: Iterative weak/self-supervised learning frameworks for detecting abnormal events," in IEEE International Joint Conference on Biometrics. IEEE, 2020.