



**HAL**  
open science

## Explainable Anomaly Detection for Context Semantic Awareness

Hui Yang, Mostepha Redouane Khouadjia, Nacéra Bennacer Seghouani, Yue Ma, Serge Delmas

► **To cite this version:**

Hui Yang, Mostepha Redouane Khouadjia, Nacéra Bennacer Seghouani, Yue Ma, Serge Delmas. Explainable Anomaly Detection for Context Semantic Awareness. Workshop HyCHA (Hybridation Connaissances, Humain et Apprentissage Statistique), Mar 2024, Gif sur Yvette, France. hal-04521991

**HAL Id: hal-04521991**

**<https://hal.science/hal-04521991>**

Submitted on 26 Mar 2024

**HAL** is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

# Explainable Anomaly Detection for Context Semantic Awareness

Hui Yang<sup>1,2</sup>, Mostepha Redouane Khouadjia<sup>1</sup>, Nacéra Bennacer Seghouani<sup>2</sup>,  
Yue Ma<sup>2</sup>, Serge Delmas<sup>3</sup>

<sup>1</sup>*IRT SystemX*, <sup>2</sup>*LISN, CNRS, Université Paris-Saclay*, <sup>3</sup>*Airbus DS SLC*

{hui.yang, mostepha.khouadjia}@irt-systemx.fr,  
{nacera.seghouani,ma}@lisn.fr, serge.delmas@airbus.com

**Introduction** We introduce an explainable neural network for Unsupervised Video Anomaly Detection (UVAD). Video Anomaly Detection (VAD) is a critical area of research with extensive applications, especially in surveillance and security systems deployed in public spaces such as roads, factories, and shopping malls. The significance of VAD lies in its capacity to enhance safety and security measures by identifying unusual events or activities without requiring manually labeled abnormal videos for training.

**Method** The explainable neural network is designed to analyze features of individual objects, focusing on local characteristics to facilitate explainable anomaly detection. This structure enables the our neural network to provide detailed explanations for detected anomalies: for a frame detected abnormal, the areas of a frame that have significant contributions to the abnormality are recognized. Based on the local features of such areas, the actions or objects can be recognized and served for abnormality explanation.

**Interface** The web application’s interface is illustrated in Fig. 1.

- On the left-hand side, users can configure settings, such as selecting the video path, adjusting the threshold for anomaly scores, and choosing models trained with various methods. The higher the threshold, the less sensitive the abnormality detection is.
- On the right-hand side, after initiating detection by clicking the “start detection” button, the application displays the input videos along with the detected anomaly scores and explanations for each video clip, which consists of 16 frames. Additionally, it visualizes the detection results by providing an illustration.
- Users can also access a history of detected anomalies by clicking button in the bottom of the interface.

A demonstration video could be found in here. It demonstrates the usage of our system over two widely used datasets, ShanghaiTech and UFC-crime, for abnormality detection and explanation from videos. It highlights both the use cases where our system perform well and where it meets its limitation.

RUNNING... Stop

Choose a dataset for testing

ShanghaiTech

Select a video

06\_0144

input the threshold value for the abnormal score (between 0-1)

0.50

input the threshold value for action scores

0.75

Choose style of the figure of abnormal scores

bar

## Explainable Anomaly Detection for Context Semantic Awareness

Details: [The approach](#) [Project](#)



**Input video:**



Input video frames: 133

start

**Result:**

Calculate for each clip that consist of 16 frames (0.5 seconds)



■ abnormal scores (per clip)

**Illustration:**

See the details of the illustration



7:01 Clip

This frame is detected as abnormal with the following explanation: In the red bbox, the following object (resp. action) are detected:

**car (resp. sit)**

See history explanations for each abnormal frame





Figure 1: Interface of the web application for the demonstration.