A Discriminative Framework for Anomaly Detection in Large Videos

Allison Del Giorno, J. Andrew Bagnell, Martial Hebert

1. MOTIVATION
Our goal is to perform anomaly detection in a unique setting, removing the reliance on data and/or temporal assumptions.

Our setting is largely unaddressed in vision-based anomaly detection, but appears often in practice.

First-time data: New systems and environments
Personalized results: Unique testing distribution
Database sifting: Exploring a single data chunk

2. APPROACH & KEY INSIGHTS
Taking a discriminative, permutation-based approach allows us to operate in this setting.

Insight #1: Density ratios directly estimate discriminability, minimizing distribution assumptions.

Density ratio concept

How we use density ratio estimation

Insight #2: Permutation testing removes temporal assumptions, avoiding false positives.

Scanning techniques
Our method

3. RESULTS
This method performs as well as other methods that require a training set.

Avenue Dataset
Similar frame- and pixel-based ROC, without using the training set.

Examples: Correct detections
- panda sneeze
- crowd running
- throwing papers
- child skipping
- subtle crowd movement
- single exit-entrance

UMN Dataset
Higher AUC on all but 1 scene.

Example: Scene 7

4. SYSTEM OVERVIEW
The framework from video to anomalies

5. FUTURE WORK
Context-driven improvements could come from feature learning, active learning, and data.

Feature learning: align with human notion of abnormality
Active learning: incorporating feedback from humans
Datasets: developing larger, more realistic benchmarks

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