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Network To Weakly-Supervised Video Anomaly Detection

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Abstract and Figures

Weakly supervised detection of anomalies in surveillance videos is a challenging task. Going beyond existing works that have achieved impressive results in the task such as proposing a novel glance and focus network to effectively integrate spatial-temporal information for accurate anomaly localization, we further explore this task and propose a new way to think about the cause-and-effect relationship in this task. We hypothesize that a video frame is composed of two parts, namely the cause part and the effect part, and only the cause part is the root cause of the anomaly to be detected while the effect part mainly depends on the cause part. We propose to leverage causal intervention and counterfactual reasoning to learn and infer the effect part of a video frame for more robust and accurate anomaly detection. We also adopt the recently proposed vision transformer architecture to our proposed network and jointly optimize all parts of our proposed network in an end-to-end manner. Extensive ablation studies have been conducted to verify the effectiveness of the proposed components. We also perform extensive comparisons with recent state-of-the-art methods and our proposed network achieves new state-of-the-art performance on two benchmark datasets, namely ShanghaiTech and UCF-Crime. Codes are available at https://github.com/yongqian-chen/MGFN.

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This Nova Scotia Arts Collaborative on Artificial Intelligence (NSACAI)

MGFN : Magnitude-Contrastive Glance-and-Focus Network for Weakly-Supervised Video Anomaly Detection

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Abstract

Weakly supervised detection of anomalies in surveillance videos is a challenging task. Going beyond existing works that have achieved impressive results in the task such as proposing a novel glance and focus network to effectively integrate spatial-temporal information for accurate anomaly localization, we further explore this task and propose a new way to think about the cause-and-effect relationship in this task. We hypothesize that a video frame is composed of two parts, namely the cause part and the effect part, and only the cause part is the root cause of the anomaly to be detected while the effect part mainly depends on the cause part. We propose to leverage causal intervention and counterfactual reasoning to learn and infer the effect part of a video frame for more robust and accurate anomaly detection. We also adopt the recently proposed vision transformer architecture to our proposed network and jointly optimize all parts of our proposed network in an end-to-end manner. Extensive ablation studies have been conducted to verify the effectiveness of the proposed components. We also perform extensive comparisons with recent state-of-the-art methods and our proposed network achieves new state-of-the-art performance on two benchmark datasets, namely ShanghaiTech and UCF-Crime. Codes are available at https://github.com/yongqian-chen/MGFN.

Introduction

Detection of anomalies in surveillance videos is an important yet challenging task. Conventional works have been mainly focusing on the task in a fully supervised manner [1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41,