



计算机学院青年科协组织技术交流活动（第五期）

时间: 2022-05-16 作者: 文章来源: 计算机科学与技术学院 浏览: 167

2022年5月14日，计算机科学与技术学院青年科技协会以“基于时频信息融合的工业异音检测”为主题举行了第五期技术交流活动。本次活动邀请计算机学院关键老师对论文《Anomalous Sound Detection using Spectral-Temporal Information Fusion》进行介绍。

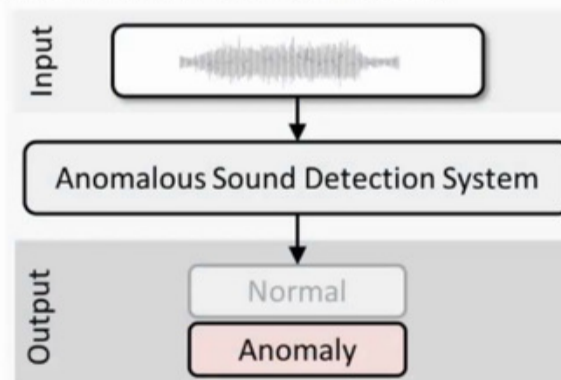
该论文入选音频信号处理领域顶级国际会议ICASSP 2022，是我校计算机学院嵌入式与物联网团队智能信号处理团队（Group of Intelligent Signal Process, GISP）与悉尼科技大学“音频声学与振动中心”及萨里大学“视觉语音信号处理中心”最新合作研究成果，提出了一种基于时频融合的自监督分类方法，通过时频域信息的融合互补，极大地提升了工业设备异常检测的性能和稳定性。



Introduction

Anomalous Sound Detection (ASD)

- ASD aims to automatically identify whether a target object is normal or abnormal from the sound emitted



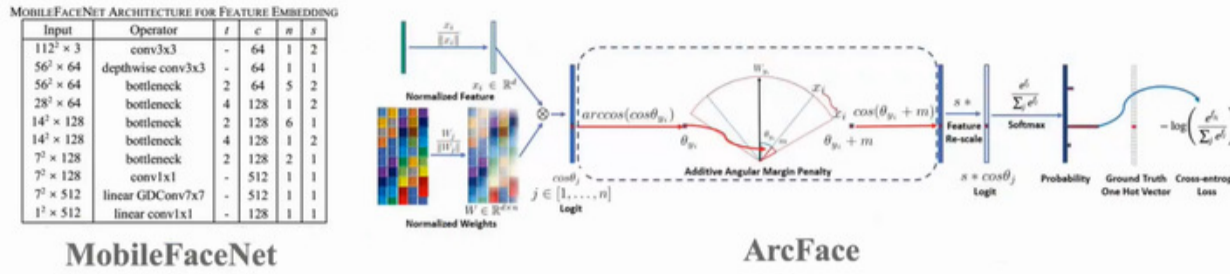
[3] Y. Koizumi, Y. Kawaguchi, K. Imoto, et. al. Description and discussion on DCASE2020 challenge task2: unsupervised anomalous sound detection for machine condition monitoring. In Proceedings of the Detection and Classification of Acoustic Scenes and Events (DCASE) Workshop, 2020, 81-85.



Proposed Method

STgram-MFN

- STgram-MFN: MobileFaceNet^[13] (MFN) is adopted as the classifier to learn the delicate representation.
- STgram-MFN (ArcFace): ArcFace^[15] is adopted to replace cross-entropy error (CEE) as the loss function to increase the distance between classes and decrease the distance within classes.



[13] S. Chen, Y. Liu, X. Gao, and Z. Han, "Mobilefacenet: Efficient CNNs for accurate real-time face verification on mobile devices," in Proceedings of Chinese Conference on Biometric Recognition (CCBR). Springer, 2018, pp. 428–438.
 [15] . Deng, J. Guo, N. Xue, and S. Zafeiriou, "Arcface: Additive angular margin loss for deep face recognition," in Proceedings of the Conference on Computer Vision and Pattern Recognition (CVPR). IEEE, 2019, pp. 4690–4699.



Experiments

Ablation Study

Table 4. Performance comparison for different input features.

Methods	LogMel-MFN		Tgram-MFN		Spec-MFN		STgram-MFN(CEE)		STgram-MFN(ArcFace)	
	AUC	mAUC	AUC	mAUC	AUC	mAUC	AUC	mAUC	AUC	mAUC
Fan	82.36	53.75	89.47	83.85	80.36	49.75	91.30	79.80	94.04	81.39
Pump	87.74	67.62	89.13	82.60	83.73	65.92	91.25	79.79	91.94	83.48
Slider	99.08	98.07	71.64	27.45	93.62	88.62	99.36	98.39	99.55	98.22
Valve	89.91	65.88	87.41	74.32	86.46	77.77	94.44	79.12	99.64	98.83
ToyCar	88.73	66.32	60.72	49.89	64.07	47.22	88.80	61.91	94.44	83.07
ToyConveyor	78.17	67.79	52.70	46.71	54.47	51.85	72.93	57.25	74.57	64.16
Average	87.67	69.91	75.18	60.80	77.12	63.52	89.68	76.04	92.36	84.86

- Log-Mel spectrogram (LogMel-MFN)
- Tgram (Tgram-MFN)
- Spectrogram (Spec-MFN)
- STgram (STgram-MFN)



计算机科学与技术学院青年科协将组织系列学术、技术交流活动，欢迎广大教师、学生参加。