Supplementary Material

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This document presents the full list of papers analyzed in this review, divided into three categories: 409 Categorized Papers (2019-2024), 12 Selected Reviews or Evaluation Papers (2019-2024) and 190 Validation Papers (2025). The 409 Categorized Papers (2019-2024) correspond to the categorized paers using the unified taxonomy. The 12 Selected Reviews or Evaluation Papers (2019-2024) comprise reviews papers as well as evaluation papers, which support the empirical development of the proposed taxonomy. The 190 Validation Papers (2025) is the set of papers retrieved from 2025 that were used to validate the taxonomy, confirming its relevance and adaptability to ongoing developments in the field.

409 Categorized Papers (2019-2024)

[Cat1] Muhammad Abdan Mulia, Muhammad Bintang Bahy, Muhammad Zain Fawwaz Nuruddin Siswantoro, Nur Rahmat Dwi Riyanto, Nella Rosa Sudianjaya, and Ary Mazharuddin Shiddiqi. 2024. KBJNet: Kinematic Bi-Joint Temporal Convolutional Network Attention for Anomaly Detection in Multivariate Time Series Data. *Data Sci. J.* 23 (2024). doi:10.5334/dsj-2024-010

[Cat2] Ahmed Abdulaal, Zhuanghua Liu, and Tomer Lancewicki. 2021. Practical Approach to Asynchronous Multivariate Time Series Anomaly Detection and Localization. In *Proc. ACM SIGKDD Int. Conf. Knowl. Discov. Data Min. (KDD'21)*. 2485–2494. doi:10.1145/3447548.3467174

[Cat3] Ahmad Ahmad, Aleksandr Kovalenko, and Ilya Makarov. 2024. Anomaly Detection Using Graph-Based Autoencoder with Graph Structure Learning Layer. In *IEEE Int. Symp. Logist. Ind. Informat. (LINDI'24)*. 89–94. doi:10.1109/LINDI63813.2024.10820392

[Cat4] Hamid Akbarian, Imadeldin Mahgoub, and Andre Williams. 2024. Autoencoder-K-Means Algorithm for Efficient Anomaly Detection to Improve Space Operations. In *IEEE Int. Conf. Smart Appl. Commun. Netw. (SmartNets'24)*. 1–6. doi:10.1109/SmartNets61466.2024.10577704

[Cat5] Julien Audibert, Pietro Michiardi, Frédéric Guyard, Sébastien Marti, and Maria A. Zuluaga. 2020. USAD: UnSupervised Anomaly Detection on Multivariate Time Series. In *Proc. ACM SIGKDD Int. Conf. Knowl. Discov. Data Min. (KDD'20)*. 3395–3404. doi:10.1145/3394486.3403392

[Cat6] Yunfei Bai, Jing Wang, Xueer Zhang, Xiangtai Miao, and Youfang Lin. 2023. CrossFuN: Multiview Joint Cross-Fusion Network for Time-Series Anomaly Detection. *IEEE Trans. Instrum. Meas.* 72 (2023), 1–9. doi:10.1109/tim.2023.3315420

[Cat7] Junpeng Bao, Han Gao, Chengpu Zhang, Wentao Jia, Junzhe Gao, and Tongzhi Yang. 2024. A Multi-scale Parallel Unsupervised Model for Multivariate Time Series Anomaly Detection. In *Artif. Intell. Appl. Innov. (AIAI'24) (IFIPAICT, Vol. 714)*. 241–251.

[Cat8] Md Abul Bashar and Richi Nayak. 2020. TAnoGAN: Time Series Anomaly Detection with Generative Adversarial Networks. In *IEEE Symp. Ser. Comput. Intell. (SSCI'20)*. 1778–1785. doi:10.1109/SSCI47803.2020.9308512

[Cat9] Ali Behrouz, Michele Santacatterina, and Ramin Zabih. 2024. Chimera: Effectively Modeling Multivariate Time Series with 2-Dimensional State Space Models. In *Adv. Neural Inf. Process. Syst. (NeurIPS'24)*, Vol. 37. 119886–119918. doi:10.52202/079017-3810

[Cat10] Jan Thieß Brockmann, Marco Rudolph, Bodo Rosenhahn, and Bastian Wandt. 2024. The voraus-AD Dataset for Anomaly Detection in Robot Applications. *IEEE Trans. Robot.* 40 (2024), 438–451. doi:10.1109/tro.2023.3332224

[Cat11] David Campos, Tung Kieu, Chenjuan Guo, Feiteng Huang, Kai Zheng, Bin Yang, and Christian S. Jensen. 2021. Unsupervised time series outlier detection with diversity-driven convolutional ensembles. *Proc. VLDB Endow.* 15, 3 (2021), 611–623. doi:10.14778/3494124.3494142

[Cat12] Danyang Cao, Di Liu, Xu Ren, and Nan Ma. 2021. Self-Adaption AAE-GAN for Aluminum Electrolytic Cell Anomaly Detection. *IEEE Access* 9 (2021), 100991–101002. doi:10.1109/ACCESS.2021.3097116

[Cat13] Yaofu Cao, Junlu Yan, Hetian Feng, Tian Wang, Yiqun Qiao, and Taiying Peng. 2023. SCAAE: Using Self-Supervised Contrastive Learning in Adversarial AutoEncoder for Anomaly Detection of Multivariate Time Series in Cyber Physics Systems. In *IEEE China Autom. Congr. (CAC'23)*. 8102–8107. doi:10.1109/CAC59555.2023.10451988

[Cat14] Chris U. Carmona, François-Xavier Aubet, Valentin Flunkert, and Jan Gasthaus. 2022. Neural Contextual Anomaly Detection for Time Series. In *Proc. Int. Jt. Conf. Artif. Intell. (IJCAI'22) (IJCAI'22)*. 2843–2851. doi:10.24963/ijcai.2022/394

[Cat15] Cristian I. Challu, Peihong Jiang, Ying Nian Wu, and Laurent Callot. 2022. Deep Generative model with Hierarchical Latent Factors for Time Series Anomaly Detection. In *Int. Conf. Artif. Intell. Stat. (AISTATS'22)*, Vol. 151. 1643–1654. https://proceedings.mlr.press/v151/challu22a.html

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[Cat18] Hongsong Chen, Xingyu Li, and Wenmao Liu. 2024. Multivariate time series anomaly detection by fusion of deep convolution residual autoencoding reconstruction model and ConvLstm forecasting model. *Comput. Secur.* 137, Article 103581 (2024). doi:10.1016/j.cose.2023.103581

[Cat19] Junfu Chen, Dechang Pi, and Xixuan Wang. 2024. A two-stage adversarial Transformer based approach for multivariate industrial time series anomaly detection. *Appl. Intell.* 54, 5 (2024), 4210–4229. doi:10.1007/s10489-024-05395-0

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[Cat21] Ningjiang Chen, Huan Tu, Xiaoyan Duan, Liangqing Hu, and Chengxiang Guo. 2022. Semisupervised anomaly detection of multivariate time series based on a variational autoencoder. *Appl. Intell.* 53 (2022), 6074–6098. doi:10.1007/s10489-022-03829-1

[Cat22] Ningjiang Chen, Huan Tu, Haoyang Zeng, and Yangjie Ou. 2024. Anomaly detection for key performance indicators by fusing self-supervised spatio-temporal graph attention networks. *Knowl.-Based Syst.* 300, Article 112167 (2024). doi:10.1016/j.knosys.2024.112167

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[Cat36] Lucas Correia, Jan-Christoph Goos, Philipp Klein, Thomas Bäck, and Anna Kononova. 2023. MA-VAE: Multi-Head Attention-Based Variational Autoencoder Approach for Anomaly Detection in Multivariate Time-Series Applied to Automotive Endurance Powertrain Testing. In *Proc. Int. Jt. Conf. Comput. Intell. (NCTA'23)*. 407–418. doi:10.5220/0012163100003595

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[Cat45] Chaoyue Ding, Shiliang Sun, and Jing Zhao. 2023. MST-GAT: A multimodal spatial–temporal graph attention network for time series anomaly detection. *Inf. Fusion* 89 (2023), 527–536. doi:10.1016/j.inffus.2022.08.011

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[Cat49] Xiyao Dong, Hui Liu, Junzhao Du, Zhengkai Wang, and Cheng Wang. 2024. Online Multivariate Time Series Anomaly Detection Method Based on Contrastive Learning. In *Adv. Intell. Comput. Technol. Appl. (ICIC'24) (LNCS, Vol. 14874)*. 468–479.

[Cat50] Zhaocai Dong, Kun Liu, Dongyu Han, Yuan Cao, and Yuanqing Xia. 2022. Reconstruction-based Multi-Scale Anomaly Detection for Cyber-Physical Systems. In *IEEE Int. Conf. Ind. Artif. Intell. (IAI'22)*. 1–6. doi:10.1109/IAI55780.2022.9976844

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[Cat52] Yaqiong Duan, Mian Xiang, Bingtao Zhou, Desu Fu, and Hongxiao Liu. 2022. TCAD: Unsupervised Anomaly Detection Based on Global Local Representation Differences. *IEEE Access* 10 (2022), 114683–114693. doi:10.1109/ACCESS.2022.3216930

[Cat53] Engy El-Shafeiy, Maazen Alsabaan, Mohamed I. Ibrahem, and Haitham Elwahsh. 2023. Real-Time Anomaly Detection for Water Quality Sensor Monitoring Based on Multivariate Deep Learning Technique. *Sensors* 23, 20, Article 8613 (2023). doi:10.3390/s23208613

[Cat54] Ayman Elhalwagy and Tatiana Kalganova. 2022. Multi-Channel LSTM-Capsule Autoencoder Network for Anomaly Detection on Multivariate Data. *Appl. Sci.* 12, 22, Article 11393 (2022). doi:10.3390/app122211393

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[Cat58] Cheng Feng and Pengwei Tian. 2021. Time Series Anomaly Detection for Cyber-physical Systems via Neural System Identification and Bayesian Filtering. In *Proc. ACM SIGKDD Int. Conf. Knowl. Discov. Data Min. (KDD'21)*. 2858–2867. doi:10.1145/3447548.3467137

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[Cat62] Yuye Feng, Wei Zhang, Yao Fu, Weihao Jiang, Jiang Zhu, and Wenqi Ren. 2024. SensitiveHUE: Multivariate Time Series Anomaly Detection by Enhancing the Sensitivity to Normal Patterns. In *Proc. ACM SIGKDD Int. Conf. Knowl. Discov. Data Min. (KDD'24)*. 782–793. doi:10.1145/3637528.3671919

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