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, Article 10 (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)*. 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

[Cat16] Guillaume Chambaret, Laure Berti-Equille, Frédéric Bouchara, Emmanuel Bruno, Vincent Martin, and Fabien Chaillan. 2022. Stochastic Pairing for Contrastive Anomaly Detection on Time Series. In *Pattern Recognit. Artif. Intell. (ICPRAI'22) (LNCS, Vol. 13364)*. 306–317. doi:10.1007/978-3-031-09282-4_26

[Cat17] Bowen Chen, Hancheng Lu, Yuang Chen, Haoyue Yuan, and Minghui Wang. 2023. DGNN: Dynamic Graph Neural Networks for Anomaly Detection in Multivariate Time Series. In *Proc. Int. Conf. Softw. Eng. Knowl. Eng. (SEKE'23)*. 415–420. doi:10.18293/SEKE2023-094

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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

[Cat20] Keyu Chen, Guoping Zhao, Zhenfeng Yao, and Zhihong Zhang. 2023. STAD: Multivariate Time Series Anomaly Detection Based on Spatio-Temporal Relationship. In *Adv. Data Min. Appl. (ADMA'23) (LNCS, Vol. 14176)*. 73–87. doi:10.1007/978-3-031-46661-8_6

[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

[Cat23] Shaowei Chen, Fangda Xu, Pengfei Wen, Shuaiwen Feng, and Shuai Zhao. 2022. A Multivariate Time Series Anomaly Detection Method Based on Generative Model. In *IEEE Int. Conf. Progn. Health Manag. (ICPHM'22)*. 137–144. doi:10.1109/ICPHM53196.2022.9815702

[Cat24] Sizheng Chen, Dong Yan, and Xing He. 2024. MTS anomaly detection based on temporal and feature correlation. In *IEEE Chin. Control Conf. (CCC'24)*. 5032–5037. doi:10.23919/CCC63176.2024.10662146

[Cat25] Tingting Chen, Xueping Liu, Bizhong Xia, Wei Wang, and Yongzhi Lai. 2020. Unsupervised Anomaly Detection of Industrial Robots Using Sliding-Window Convolutional Variational Autoencoder. *IEEE Access* 8 (2020), 47072–47081. doi:10.1109/ACCESS.2020.2977892

[Cat26] Wenchao Chen, Long Tian, Bo Chen, Liang Dai, Zhibin Duan, and Mingyuan Zhou. 2022. Deep Variational Graph Convolutional Recurrent Network for Multivariate Time Series Anomaly Detection. In *Proc. Int. Conf. Mach. Learn. (ICML'22)*, Vol. 162. 3621–3633. https://proceedings.mlr.press/v162/chen22x.html

[Cat27] Xuanhao Chen, Liwei Deng, Feiteng Huang, Chengwei Zhang, Zongquan Zhang, Yan Zhao, and Kai Zheng. 2021. DAEMON: Unsupervised Anomaly Detection and Interpretation for Multivariate Time Series. In *IEEE Int. Conf. Data Eng. (ICDE'21)*. 2225–2230. doi:10.1109/ICDE51399.2021.00228

[Cat28] Xu Chen, Qiu Qiu, Changshan Li, and Kunqing Xie. 2022. GraphAD: A Graph Neural Network for Entity-Wise Multivariate Time-Series Anomaly Detection. In *Proc. Int. ACM SIGIR Conf. Res. Dev. Inf. Retr. (SIGIR '22)*. 2297–2302. doi:10.1145/3477495.3531848

[Cat29] Yuhang Chen, Chaoyun Zhang, Minghua Ma, Yudong Liu, Ruomeng Ding, Bowen Li, Shilin He, Saravan Rajmohan, Qingwei Lin, and Dongmei Zhang. 2023. ImDiffusion: Imputed Diffusion Models for Multivariate Time Series Anomaly Detection. *Proc. VLDB Endow.* 17, 3 (2023), 359–372. doi:10.14778/3632093.3632101

[Cat30] Zekai Chen, Dingshuo Chen, Xiao Zhang, Zixuan Yuan, and Xiuzhen Cheng. 2022. Learning Graph Structures With Transformer for Multivariate Time-Series Anomaly Detection in IoT. *IEEE Internet Things J.* 9, 12 (2022), 9179–9189. doi:10.1109/jiot.2021.3100509

[Cat31] Zixin Chen, Jiong Yu, Qiyin Tan, Shu Li, and XuSheng Du. 2024. DGTAD: decomposition GAN-based transformer for anomaly detection in multivariate time series data. *Appl. Intell.* 54, 24 (2024), 13038–13056. doi:10.1007/s10489-024-05693-7

[Cat32] Antoine Chevrot, Alexandre Vernotte, and Bruno Legeard. 2022. CAE: Contextual auto-encoder for multivariate time-series anomaly detection in air transportation. *Comput. Secur.* 116, Article 102652 (2022). doi:10.1016/j.cose.2022.102652

[Cat33] Heejeong Choi, Subin Kim, and Pilsung Kang. 2023. Recurrent auto-encoder with multi-resolution ensemble and predictive coding for multivariate time-series anomaly detection. *Appl. Intell.* 53, 21 (2023), 25330–25342. doi:10.1007/s10489-023-04764-5

[Cat34] Taesung Choi, Dongkun Lee, Yuchae Jung, and Ho-Jin Choi. 2022. Multivariate Time-series Anomaly Detection using SeqVAE-CNN Hybrid Model. In *IEEE Int. Conf. Inf. Netw. (ICOIN'22)*. 250–253. doi:10.1109/ICOIN53446.2022.9687205

[Cat35] Yeji Choi, Hyunki Lim, Heeseung Choi, and Ig-Jae Kim. 2020. GAN-Based Anomaly Detection and Localization of Multivariate Time Series Data for Power Plant. In *IEEE Int. Conf. Big Data Smart Comput. (BigComp'20)*. 71–74. doi:10.1109/BigComp48618.2020.00-97

[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

[Cat37] Tao Cui, Yao Liu, and Yueming Zhu. 2024. A Graph Recurrent Attention Network for Multivariate Time Series Anomaly Detection. In *IEEE Int. Conf. Mach. Learn. Intell. Syst. Eng. (MLISE'24)*. 57–62. doi:10.1109/MLISE62164.2024.10674110

[Cat38] Tao Cui, Yueming Zhu, Yao Liu, and Jindi Liu. 2024. Time Series Anomaly Detection Using Temporal 2D-Variation Multi-Layer Feature Fusion Times Network. In *IEEE Int. Conf. Cyber Technol. Autom. Control Intell. Syst. (CYBER'24)*. 726–731. doi:10.1109/CYBER63482.2024.10748873

[Cat39] Enyan Dai and Jie Chen. 2022. Graph-Augmented Normalizing Flows for Anomaly Detection of Multiple Time Series. In *Int. Conf. Learn. Represent. (ICLR'22)*. https://openreview.net/forum?id=45L_dgP48Vd

[Cat40] Zhihao Dai, Ligang He, Shuang-Hua Yang, and Matthew Leeke. 2024. SARAD: Spatial Association-Aware Anomaly Detection and Diagnosis for Multivariate Time Series. In *Adv. Neural Inf. Process. Syst. (NeurIPS'24)*, Vol. 37. 48371–48410. doi:10.52202/079017-1533

[Cat41] Abdelkader Dairi, Tuoyuan Cheng, Fouzi Harrou, Ying Sun, and TorOve Leiknes. 2019. Deep learning approach for sustainable WWTP operation: A case study on data-driven influent conditions monitoring. *Sustain. Cities Soc.* 50, Article 101670 (2019). doi:10.1016/j.scs.2019.101670

[Cat42] Fabrizio De Vita, Giorgio Nocera, Dario Bruneo, and Sajal K. Das. 2023. A Novel Echo State Network Autoencoder for Anomaly Detection in Industrial IoT Systems. *IEEE Trans. Ind. Informat.* 19, 8 (2023), 8985–8994. doi:10.1109/TII.2022.3224981

[Cat43] Ailin Deng and Bryan Hooi. 2021. Graph Neural Network-Based Anomaly Detection in Multivariate Time Series. In *Proc. AAAI Conf. Artif. Intell. (AAAI'21)*, Vol. 35. 4027–4035. doi:10.1609/aaai.v35i5.16523

[Cat44] Liwei Deng, Xuanhao Chen, Yan Zhao, and Kai Zheng. 2021. HIFI: Anomaly Detection for Multivariate Time Series with High-order Feature Interactions. In *Database Syst. Adv. Appl. (DASFAA'21) (LNCS, Vol. 12681)*. 641–649.

[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

[Cat46] Guohui Ding, Yueyi Zhu, and Yongqiang Ren. 2024. Dynamic-Static Fusion for Spatial-Temporal Anomaly Detection and Interpretation in Multivariate Time Series. In *Web and Big Data (APWeb-WAIM'24)*. 46–61. doi:10.1007/978-981-97-7238-4_4

[Cat47] Nan Ding, HaoXuan Ma, Huanbo Gao, YanHua Ma, and GuoZhen Tan. 2019. Real-time anomaly detection based on long short-Term memory and Gaussian Mixture Model. *Comput. Electr. Eng.* 79, Article 106458 (2019). doi:10.1016/j.compeleceng.2019.106458

[Cat48] Xiaoou Ding, Yida Liu, Hongzhi Wang, Donghua Yang, and Yichen Song. 2023. SNN-AAD: Active Anomaly Detection Method for Multivariate Time Series with Sparse Neural Network. In *Database Syst. Adv. Appl. (DASFAA'23) (LNCS, Vol. 13943)*. 253–269. doi:10.1007/978-3-031-30637-2_17

[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

[Cat51] Bowen Du, Xuanxuan Sun, Junchen Ye, Ke Cheng, Jingyuan Wang, and Leilei Sun. 2023. GAN-Based Anomaly Detection for Multivariate Time Series Using Polluted Training Set. *IEEE Trans. Knowl. Data Eng.* 35, 12 (2023), 12208–12219. doi:10.1109/TKDE.2021.3128667

[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

[Cat55] Daniel Fährmann, Naser Damer, Florian Kirchbuchner, and Arjan Kuijper. 2022. Lightweight Long Short-Term Memory Variational Auto-Encoder for Multivariate Time Series Anomaly Detection in Industrial Control Systems. *Sensors* 22, 8, Article 2886 (2022). doi:10.3390/s22082886

[Cat56] Jin Fan, Zhentao Liu, Huifeng Wu, Jia Wu, Zhanyu Si, Peng Hao, and Tom H. Luan. 2023. LUAD: A lightweight unsupervised anomaly detection scheme for multivariate time series data. *Neurocomputing* 557, Article 126644 (2023). doi:10.1016/j.neucom.2023.126644

[Cat57] Jin Fan, Zehao Wang, Huifeng Wu, Danfeng Sun, Jia Wu, and Xin Lu. 2023. An Adversarial Time–Frequency Reconstruction Network for Unsupervised Anomaly Detection. *Neural Netw.* 168 (2023), 44–56. doi:10.1016/j.neunet.2023.09.018

[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

[Cat59] Xin Feng, Xingguo Jiang, Yan Sun, and Hong Luo. 2023. An Anomaly Detection Method for Multivariate Time Series Based on Cross Window. In *IEEE Int. Conf. Comput. Support. Coop. Work Des. (CSCWD'23)*. 399–404. doi:10.1109/CSCWD57460.2023.10152583

[Cat60] Yong Feng, Jinglong Chen, Zijun Liu, Haixin Lv, and Jun Wang. 2022. Full Graph Autoencoder for One-Class Group Anomaly Detection of IIoT System. *IEEE Internet Things J.* 9, 21 (2022), 21886–21898. doi:10.1109/JIOT.2022.3181737

[Cat61] Yong Feng, Zijun Liu, Jinglong Chen, Haixin Lv, Jun Wang, and Xinwei Zhang. 2023. Unsupervised Multimodal Anomaly Detection With Missing Sources for Liquid Rocket Engine. *IEEE Trans. Neural Netw. Learn. Syst.* 34, 12 (2023), 9966–9980. doi:10.1109/TNNLS.2022.3162949

[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

[Cat63] Yuye Feng, Wei Zhang, Haiming Sun, and Weihao Jiang. 2024. Spatial-Temporal Transformer with Error-Restricted Variance Estimation for Time Series Anomaly Detection. In *Adv. Knowl. Discov. Data Min. (PAKDD'24) (LNCS, Vol. 14645)*. Springer Nature Singapore, 3–14. doi:10.1007/978-981-97-2242-6_1

[Cat64] Archibald Felix Fraikin, Adrien Bennetot, and Stephanie Allassonniere. 2024. T-Rep: Representation Learning for Time Series using Time-Embeddings. In *Int. Conf. Learn. Represent. (ICLR'24)*. https://openreview.net/forum?id=3y2TfP966N

[Cat65] Shiyuan Fu, Xin Gao, Baofeng Li, Feng Zhai, Jiansheng Lu, Bing Xue, Jiahao Yu, and Chun Xiao. 2024. Multivariate time series anomaly detection via separation, decomposition, and dual transformer-based autoencoder. *Appl. Soft Comput.* 159, Article 111671 (2024). doi:10.1016/j.asoc.2024.111671

[Cat66] Shiyuan Fu, Xin Gao, Feng Zhai, Baofeng Li, Bing Xue, Jiahao Yu, Zhihang Meng, and Guangyao Zhang. 2024. A time series anomaly detection method based on series-parallel transformers with spatial and temporal association discrepancies. *Inf. Sci.* 657, Article 119978 (2024). doi:10.1016/j.ins.2023.119978

[Cat67] Rong Gao, Wei He, Lingyu Yan, Donghua Liu, Yonghong Yu, and Zhiwei Ye. 2023. Hybrid graph transformer networks for multivariate time series anomaly detection. *J. Supercomput.* 80, 1 (2023), 642–669. doi:10.1007/s11227-023-05503-w

[Cat68] Di Ge, Yuhang Cheng, Shuangshuang Cao, Yanmei Ma, and Yanwen Wu. 2024. An enhanced abnormal information expression spatiotemporal model for anomaly detection in multivariate time-series. *Complex Intell. Syst.* 10, 2 (2024), 2937–2950. doi:10.1007/s40747-023-01306-x

[Cat69] Di Ge, Zheng Dong, Yuhang Cheng, and Yanwen Wu. 2024. An enhanced spatio-temporal constraints network for anomaly detection in multivariate time series. *Knowl.-Based Syst.* 283, Article 111169 (2024). doi:10.1016/j.knosys.2023.111169

[Cat70] NingZhen Ge, Xiaoqing Weng, and QiuYing Yang. 2022. Unsupervised anomaly detection via two-dimensional singular value decomposition and subspace reconstruction for multivariate time series. *Appl. Intell.* 53, 13 (2022), 16813–16829. doi:10.1007/s10489-022-04337-y

[Cat71] Michail Giannoulis, Andrew Harris, and Vincent Barra. 2023. DITAN: A deep-learning domain agnostic framework for detection and interpretation of temporally-based multivariate ANomalies. *Pattern Recognit.* 143, Article 109814 (2023). doi:10.1016/j.patcog.2023.109814

[Cat72] Sawenbo Gong, Zhihao Wu, Yunxiao Liu, Youfang Lin, and Jing Wang. 2021. A Prediction-Augmented AutoEncoder for Multivariate Time Series Anomaly Detection. In *Neural Inf. Process. (ICONIP'21) (LNCS, Vol. 13108)*. 681–692. doi:10.1007/978-3-030-92185-9_56

[Cat73] Gastón García González, Sergio Martinez Tagliafico, Alicia Fernández Iie-Fing, Gabriel Gómez, José Acuña, and Pedro Casas. 2022. DC-VAE, Fine-grained Anomaly Detection in Multivariate Time-Series with Dilated Convolutions and Variational Auto Encoders. In *IEEE Eur. Symp. Secur. Priv. Workshops (EuroS&PW'22)*. 287–293. doi:10.1109/EuroSPW55150.2022.00035

[Cat74] Matt Gorbett, Hossein Shirazi, and Indrakshi Ray. 2023. Sparse Binary Transformers for Multivariate Time Series Modeling. In *Proc. ACM SIGKDD Int. Conf. Knowl. Discov. Data Min. (KDD'23)*. 544–556. doi:10.1145/3580305.3599508

[Cat75] Umang Goswami, Jyoti Rani, Hariprasad Kodamana, Sandeep Kumar, and Prakash Kumar Tamboli. 2023. Fault detection and isolation of multivariate time series data using spectral weighted graph auto-encoders. *J. Franklin Inst.* 360, 10 (2023), 6783–6803. doi:10.1016/j.jfranklin.2023.04.030

[Cat76] Siwei Guan, Zhiwei He, Shenhui Ma, and Mingyu Gao. 2023. Conditional normalizing flow for multivariate time series anomaly detection. *ISA Trans.* 143 (2023), 231–243. doi:10.1016/j.isatra.2023.09.002

[Cat77] Siwei Guan, Zhiwei He, Shenhui Ma, and Mingyu Gao. 2024. Multivariate time series anomaly detection with variational autoencoder and spatial–temporal graph network. *Comput. Secur.* 142, Article 103877 (2024). doi:10.1016/j.cose.2024.103877

[Cat78] Siwei Guan, Binjie Zhao, Zhekang Dong, Mingyu Gao, and Zhiwei He. 2022. GTAD: Graph and Temporal Neural Network for Multivariate Time Series Anomaly Detection. *Entropy* 24, 6, Article 759 (2022). doi:10.3390/e24060759

[Cat79] Hongtai Guo, Zhangbing Zhou, and Deng Zhao. 2023. GNN-Based Energy-Efficient Anomaly Detection for IoT Multivariate Time-Series Data. In *IEEE Int. Conf. Commun. (ICC'23)*. 2492–2497. doi:10.1109/ICC45041.2023.10278988

[Cat80] Hongtai Guo, Zhangbing Zhou, Deng Zhao, and Walid Gaaloul. 2024. EGNN: Energy-efficient anomaly detection for IoT multivariate time series data using graph neural network. *Future Gener. Comput. Syst.* 151 (2024), 45–56. doi:10.1016/j.future.2023.09.028

[Cat81] Qi Guo, Jinwei Zhang, Yong Chen, and Ruochen Liu. 2023. Multivariate Time Series Anomaly Detection in a Regularization Perspective. In *Proc. ACM Int. Conf. Comput. Artif. Intell. (ICCAI'23)*. 279–287. doi:10.1145/3594315.3594655

[Cat82] Chan Sik Han and Keon Myung Lee. 2023. Hybrid Deep Learning Model for Time Series Anomaly Detection. In *Proc. ACM Int. Conf. Res. Adapt. Converg. Syst. (RACS'23)*. Article 30, 5 pages. doi:10.1145/3599957.3606232

[Cat83] Qinfeng Han, Jinglong Chen, Jun Wang, and Yong Feng. 2024. Complex system anomaly detection via learnable temporal-spatial graph with degradation tendency segmentation. *ISA Trans.* 152 (2024), 156–166. doi:10.1016/j.isatra.2024.06.025

[Cat84] Siho Han and Simon S. Woo. 2022. Learning Sparse Latent Graph Representations for Anomaly Detection in Multivariate Time Series. In *Proc. ACM SIGKDD Int. Conf. Knowl. Discov. Data Min. (KDD '22)*. 2977–2986. doi:10.1145/3534678.3539117

[Cat85] Miki Hashimoto, Yusuke Ide, and Masayoshi Aritsugi. 2021. Anomaly detection for sensor data of semiconductor manufacturing equipment using a GAN. *Procedia Comput. Sci.* 192 (2021), 873–882. doi:10.1016/j.procs.2021.08.090

[Cat86] Hongxia He, Xi Li, Peng Chen, Juan Chen, Weijian Song, and Qinghui Xi. 2024. DGFormer: An Effective Dynamic Graph Transformer Based Anomaly Detection Model for IoT Time Series. In *Collabor. Comput. Netw. Appl. Worksharing (CollaborateCom'23) (LNICST, Vol. 562)*. 173–188. doi:10.1007/978-3-031-54528-3_10

[Cat87] Junjie He, Min Dong, Sheng Bi, Weijie Zhao, and Xutao Liao. 2019. A Deep Neural Network for Anomaly Detection and Forecasting for Multivariate Time Series in Smart City. In *IEEE Int. Conf. Cyber Technol. Autom. Control Intell. Syst. (CYBER'19)*. 615–620. doi:10.1109/CYBER46603.2019.9066655

[Cat88] Junpeng He, Zhe Dong, and Yaqing Huang. 2024. Multivariate Time Series Anomaly Detection with Adaptive Transformer-CNN Architecture Fusing Adversarial Training. In *IEEE Data Driven Control Learn. Syst. Conf. (DDCLS'24)*. 1387–1392. doi:10.1109/DDCLS61622.2024.10606841

[Cat89] Qiang He, Guanqun Wang, Lianzhi Huo, Hengyou Wang, and Changlun Zhang. 2023. ACAM-AD: Autocorrelation and attention mechanism-based anomaly detection in multivariate time series. *J. Intell. Fuzzy Syst.* 44, 6 (2023), 9039–9051. doi:10.3233/JIFS-224416

[Cat90] Qiang He, Guanqun Wang, Hengyou Wang, and Linlin Chen. 2023. Multivariate time-series anomaly detection via temporal convolutional and graph attention networks. *J. Intell. Fuzzy Syst.* 44, 4 (2023), 5953–5962. doi:10.3233/jifs-222554

[Cat91] Q. He, Y. J. Zheng, C.L. Zhang, and H. Y. Wang. 2020. MTAD-TF: Multivariate Time Series Anomaly Detection Using the Combination of Temporal Pattern and Feature Pattern. *Complexity* 2020, Article 8846608 (2020). doi:10.1155/2020/8846608

[Cat92] Sheng He, Mingjing Du, Xiang Jiang, Wenbin Zhang, and Congyu Wang. 2024. VAEAT: Variational AutoeEncoder with adversarial training for multivariate time series anomaly detection. *Inf. Sci.* 676, Article 120852 (2024). doi:10.1016/j.ins.2024.120852

[Cat93] Shiming He, Meng Guo, Bo Yang, Osama Alfarraj, Amr Tolba, Pradip Kumar Sharma, and Xi'ai Yan. 2023. Fine-Grained Multivariate Time Series Anomaly Detection in IoT. *Comput. Mater. Continua* 75, 3 (2023), 5027–5047. doi:10.32604/cmc.2023.038551

[Cat94] Sijie He, Hao Huang, Shinjae Yoo, Weizhong Yan, Feng Xue, Tianyi Wang, and Chenxiao Xu. 2021. Flight data anomaly detection and diagnosis with variable association change. In *Proc. ACM/SIGAPP Symp. Appl. Comput (SAC'21)*. 346–354. doi:10.1145/3412841.3441916

[Cat95] Shiming He, GenXin Li, Qinqing Guo, and Kun Xie. 2024. Multi-Graph Structure Learning-based Multivariate Time Series Anomaly Detection with Extended Prior Knowledge. In *IEEE Int. Conf. Comput. Support. Coop. Work Des. (CSCWD'24)*. 109–114. doi:10.1109/CSCWD61410.2024.10580531

[Cat96] Shiming He, Genxin Li, Kun Xie, and Pradip Kumar Sharma. 2024. Fusion Graph Structure Learning-Based Multivariate Time Series Anomaly Detection With Structured Prior Knowledge. *IEEE Trans. Inf. Forensics Secur.* 19 (2024), 8760–8772. doi:10.1109/TIFS.2024.3459631

[Cat97] Shiming He, Genxin Li, Tongzhijian Yi, Osama Alfarraj, Amr Tolba, Arun Kumar Sangaiah, and R. Simon Sherratt. 2024. Graph Structure Learning-Based Multivariate Time Series Anomaly Detection in Internet of Things for Human-Centric Consumer Applications. *IEEE Trans. Consum. Electron.* 70, 3 (2024), 5419–5431. doi:10.1109/TCE.2024.3409391

[Cat98] Yangdong He and Jiabao Zhao. 2019. Temporal Convolutional Networks for Anomaly Detection in Time Series. *J. Phys.: Conf. Ser* 1213, 4, Article 042050 (2019). doi:10.1088/1742-6596/1213/4/042050

[Cat99] Zilong He, Pengfei Chen, Xiaoyun Li, Yongfeng Wang, Guangba Yu, Cailin Chen, Xinrui Li, and Zibin Zheng. 2023. A Spatiotemporal Deep Learning Approach for Unsupervised Anomaly Detection in Cloud Systems. *IEEE Trans. Neural Netw. Learn. Syst.* 34, 4 (2023), 1705–1719. doi:10.1109/tnnls.2020.3027736

[Cat100] Hadi Hojjati, Mohammadreza Sadeghi, and Narges Armanfard. 2023. Multivariate Time-Series Anomaly Detection with Temporal Self-supervision and Graphs: Application to Vehicle Failure Prediction. In *Mach. Learn. Knowl. Discov. Databases (ECML PKDD'23) (LNCS, Vol. 14175)*. 242–259. doi:10.1007/978-3-031-43430-3_15

[Cat101] Ruei-Jie Hsieh, Jerry Chou, and Chih-Hsiang Ho. 2019. Unsupervised Online Anomaly Detection on Multivariate Sensing Time Series Data for Smart Manufacturing. In *IEEE Int. Conf. Serv.-Oriented Comput. Appl. (SOCA'19)*. 90–97. doi:10.1109/SOCA.2019.00021

[Cat102] Tzuwei Hsu, Yu-Chee Tseng, and Jen-Jee Chen. 2022. Graph Attention Transformer for Unsupervised Multivariate Time Series Anomaly Detection. In *MAChine Learn. Earth Observ. Workshop (MACLEAN'22@PKDD/ECML)*, Vol. 3343. Article 3. https://ceur-ws.org/Vol-3345/

[Cat103] Rongyao Hu, Xinyu Yuan, Yan Qiao, BenChu Zhang, and Pei Zhao. 2024. Unsupervised Anomaly Detection for Multivariate Time Series Using Diffusion Model. In *IEEE Int. Conf. Acoust. Speech Signal Process. (ICASSP'24)*. 9606–9610. doi:10.1109/ICASSP48485.2024.10447083

[Cat104] Xiaolei Hua, Lin Zhu, Shenglin Zhang, Zeyan Li, Su Wang, Chao Deng, Junlan Feng, Zhao Zhang, and Wei Wu. 2022. GenAD: General unsupervised anomaly detection using multivariate time series for large-scale wireless base stations. *Electron. Lett.* 59, 1 (2022). doi:10.1049/ell2.12683

[Cat105] Jiachen Huang, Chen Liu, Yang Yang, and Yunjia Liu. 2023. A GAN-Based Power Quality Anomaly Detection Method for Imbalanced Multivariate Time Series. In *IEEE Int. Conf. Comput. Commun. Eng. Technol. (CCET'23)*. 187–191. doi:10.1109/CCET59170.2023.10335146

[Cat106] Jie Huang, Danya Xu, and Tao Yang. 2024. Fed-SMAE: Federated-Learning Based Time Series Anomaly Detection with Shared Memory Augmented Autoencoder. In *IEEE Int. Conf. Ind. Cyber Phys. Syst. (ICPS'24)*. 1–6. doi:10.1109/ICPS59941.2024.10640001

[Cat107] Xiangheng Huang, Ningjiang Chen, Ziyue Deng, and Suqun Huang. 2024. Multivariate time series anomaly detection via dynamic graph attention network and Informer. *Appl. Intell.* 54, 17–18 (2024), 7636–7658. doi:10.1007/s10489-024-05575-y

[Cat108] Xiangming Huang, Yunpeng Wu, and Yangdong Ye. 2024. Spatio-Temporal Correlation Aware Graph Attention Network for Anomaly Detection in Multivariate Time Series. In *IEEE Int. Conf. Intell. Comput. Signal Process. (ICSP'24)*. 698–704. doi:10.1109/ICSP62122.2024.10743431

[Cat109] Yuehua Huang, Wenfen Liu, Song Li, Ying Guo, and Wen Chen. 2024. MGAD: Mutual Information and Graph Embedding Based Anomaly Detection in Multivariate Time Series. *Electronics* 13, 7, Article 1326 (2024). doi:10.3390/electronics13071326

[Cat110] Weigang Huo, Yuting Wang, and Lishou Ye. 2024. A Mixed Augmentations Method for Multivariate Time Series Contrastive Learning. In *IEEE Int. Symp. Parallel Distrib. Process. Appl. (ISPA'24)*. 1782–1789. doi:10.1109/ISPA63168.2024.00243

[Cat111] Muhammad Yasir Ishaq, Zhou Yong, Shaxin Xue, Qamar Raza, Zhijian An, and Muhammad Usama Amin. 2024. Deep Block Transformer for Anomaly Detection. In *IEEE Int. Conf. Comput. Commun. Artif. Intell. (CCAI'24)*. 481–486. doi:10.1109/CCAI61966.2024.10603098

[Cat112] Grzegorz Jabłoński. 2020. VGG Based Unsupervised Anomaly Detection in Multivariate Time Series. In *Adv. Contemp. Control (AISC, Vol. 1196)*. 1287–1296. doi:10.1007/978-3-030-50936-1_107

[Cat113] Gye-Bong Jang and Sung-Bae Cho. 2023. Multi-Instance Attention Network for Anomaly Detection from Multivariate Time Series. *Cybern. Syst.* 55, 6 (2023), 1417–1440. doi:10.1080/01969722.2023.2240651

[Cat114] Zhiwei Ji, Yi Wang, Ke Yan, Xiaojun Xie, Yang Xiang, and Jing Huang. 2022. A space-embedding strategy for anomaly detection in multivariate time series. *Expert Syst. Appl.* 206, Article 117892 (2022). doi:10.1016/j.eswa.2022.117892

[Cat115] Kai Jiang, Hui Liu, Huaijun Ruan, Jia Zhao, and Yuxiu Lin. 2023. ALAE: self-attention reconstruction network for multivariate time series anomaly identification. *Soft Comput.* 27, 15 (2023), 10509–10519. doi:10.1007/s00500-023-08467-4

[Cat116] Xin Jie, Xixi Zhou, Chanfei Su, Zijun Zhou, Yuqing Yuan, Jiajun Bu, and Haishuai Wang. 2024. Disentangled Anomaly Detection For Multivariate Time Series. In *Proc. ACM World Wide Web Conf. (WWW'24)*. 931–934. doi:10.1145/3589335.3651492

[Cat117] Hayoung Jo and Seong-Whan Lee. 2024. Edge conditional node update graph neural network for multivariate time series anomaly detection. *Inf. Sci.* 679, Article 121062 (2024). doi:10.1016/j.ins.2024.121062

[Cat118] Junaid Khan Kakar, Shahid Hussain, Sang Cheol Kim, and Hyongsuk Kim. 2024. TimeTector: A Twin-Branch Approach for Unsupervised Anomaly Detection in Livestock Sensor Noisy Data (TT-TBAD). *Sensors* 24, 8, Article 2453 (2024). doi:10.3390/s24082453

[Cat119] Hyeongwon Kang and Pilsung Kang. 2024. Transformer-based multivariate time series anomaly detection using inter-variable attention mechanism. *Knowl.-Based Syst.* 290, Article 111507 (2024). doi:10.1016/j.knosys.2024.111507

[Cat120] Jiyoung Kang, Minseok Kim, Jinuk Park, and Sanghyun Park. 2024. Time-Series to Image-Transformed Adversarial Autoencoder for Anomaly Detection. *IEEE Access* 12 (2024), 119671–119684. doi:10.1109/access.2024.3450709

[Cat121] Jingjing Kang, Guogen Wan, Jiazhong Lu, and Yuanyuan Huang. 2024. ISTAD: Scaled Transformer with Interactive Learning for Multivariate Time Series Anomaly Detection. In *IEEE Int. Conf. Pattern Recognit. Artif. Intell. (PRAI'24)*. 1030–1036. doi:10.1109/PRAI62207.2024.10827712

[Cat122] Jung Mo Kang and Myoung Ho Kim. 2023. Multivariate Time Series Anomaly Detection Based on Reconstructed Differences Using Graph Attention Networks. In *Curr. Trends Web Eng. (ICWE'22) (CCIS, Vol. 1668)*. 58–69. doi:10.1007/978-3-031-25380-5_5

[Cat123] Minseo Kang and Byunghan Lee. 2023. TiCTok: Time-Series Anomaly Detection With Contrastive Tokenization. *IEEE Access* 11 (2023), 81011–81020. doi:10.1109/access.2023.3301140

[Cat124] Zhuangwei Kang, Ayan Mukhopadhyay, Aniruddha Gokhale, Shijie Wen, and Abhishek Dubey. 2022. Traffic Anomaly Detection Via Conditional Normalizing Flow. In *IEEE Int. Conf. Intell. Transp. Syst. (ITSC'22)*. 2563–2570. doi:10.1109/ITSC55140.2022.9922061

[Cat125] Yıldız Karadayı, Mehmet N. Aydin, and A. Selçuk Öğrenci. 2020. A Hybrid Deep Learning Framework for Unsupervised Anomaly Detection in Multivariate Spatio-Temporal Data. *Appl. Sci.* 10, 15, Article 5191 (2020). doi:10.3390/app10155191

[Cat126] Vili Ketonen and Jan Olaf Blech. 2021. Anomaly Detection for Injection Molding Using Probabilistic Deep Learning. In *IEEE Int. Conf. Ind. Cyber Phys. Syst. (ICPS'21)*. 70–77. doi:10.1109/ICPS49255.2021.9468190

[Cat127] Tung Kieu, Bin Yang, Chenjuan Guo, and Christian S. Jensen. 2019. Outlier Detection for Time Series with Recurrent Autoencoder Ensembles. In *Proc. Int. Jt. Conf. Artif. Intell. (IJCAI'19)*. 2725–2732. doi:10.24963/ijcai.2019/378

[Cat128] Beomjun Kim, Jeong Won Kang, Chul-Su Kim, Oh Kuen Kwon, and Jeonghwan Gwak. 2024. Hybrid Transformer for Anomaly Detection on Railway HVAC Systems Through Feature Ensemble of Spatial–Temporal with Multi-channel GADF Images. *J. Electr. Eng. Technol.* 19, 4 (2024), 2803–2815. doi:10.1007/s42835-024-01844-5

[Cat129] Hyojoong Kim and Heeyoung Kim. 2023. Contextual anomaly detection for multivariate time series data. *Qual. Eng.* 35, 4 (2023), 686–695. doi:10.1080/08982112.2023.2179404

[Cat130] HyunGi Kim, Siwon Kim, Seonwoo Min, and Byunghan Lee. 2024. Contrastive Time-Series Anomaly Detection. *IEEE Trans. Knowl. Data Eng.* 36, 10 (2024), 5053–5065. doi:10.1109/tkde.2023.3335317

[Cat131] Minhee Kim, Elisa Ou, Po-Ling Loh, Todd Allen, Robert Agasie, and Kaibo Liu. 2020. RNN-Based online anomaly detection in nuclear reactors for highly imbalanced datasets with uncertainty. *Nucl. Eng. Des.* 364, Article 110699 (2020). doi:10.1016/j.nucengdes.2020.110699

[Cat132] Minseok Kim and Sanghyun Park. 2024. Unsupervised Multi-Head Attention Autoencoder for Multivariate Time-Series Anomaly Detection. In *IEEE Int. Conf. Big Data Smart Comput. (BigComp'24)*. 1–7. doi:10.1109/BigComp60711.2024.00011

[Cat133] Lingkun Kong, Jinsong Yu, Diyin Tang, Yue Song, and Danyang Han. 2023. Multivariate Time Series Anomaly Detection With Generative Adversarial Networks Based on Active Distortion Transformer. *IEEE Sens. J.* 23, 9 (2023), 9658–9668. doi:10.1109/JSEN.2023.3260563

[Cat134] Fulu Kou, Lixing Yu, Kun Yue, Liang Duan, and Zhongbin Li. 2024. Anomaly Detection for Multivariate Time Series with Multi-scale Feature Interactions. In *Database Syst. Adv. Appl. (DASFAA'24) (LNCS, Vol. 14854)*. 459–475. doi:10.1007/978-981-97-5569-1_30

[Cat135] Jyoti Kumari, Jimson Mathew, and Arijit Mondal. 2024. MAD-MEL: Combining Entity and Metric Learning for Anomaly Detection in Multivariate Time Series. *IEEE Sens. J.* 24, 3 (2024), 3144–3156. doi:10.1109/JSEN.2023.3339335

[Cat136] Che-Wei Kuo and Josh Jia-Ching Ying. 2023. An Unsupervised Deep Learning Framework for Anomaly Detection. In *Intell. Inf. Database Syst. (ACIIDS'23) (LNCS, Vol. 13995)*. 284–295. doi:10.1007/978-981-99-5834-4_23

[Cat137] Jokin Labaien, Tsuyoshi Idé, Pin-Yu Chen, Ekhi Zugasti, and Xabier De Carlos. 2023. Diagnostic spatio-temporal transformer with faithful encoding. *Knowl.-Based Syst.* 274, Article 110639 (2023). doi:10.1016/j.knosys.2023.110639

[Cat138] Thomas Lai, Thi Kieu Khanh Ho, and Narges Armanfard. 2024. Open-Set Multivariate Time-Series Anomaly Detection. In *Eur. Conf. Artif. Intell. (ECAI'24)*, Vol. 392. 2003 – 2010. doi:10.3233/faia240716

[Cat139] Vadim Lanko and Ilya Makarov. 2024. Graph-Attention Diffusion for Enhanced Multivariate Time-Series Anomaly Detection. *IEEE Open J. Ind. Electron. Soc.* 5 (2024), 1353–1364. doi:10.1109/OJIES.2024.3501014

[Cat140] Tuan Le, Hai Canh Vu, Amélie Ponchet-Durupt, Nassim Boudaoud, Zohra Cherfi-Boulanger, and Thao Nguyen-Trang. 2024. Unsupervised detecting anomalies in multivariate time series by Robust Convolutional LSTM Encoder–Decoder (RCLED). *Neurocomputing* 592, Article 127791 (2024). doi:10.1016/j.neucom.2024.127791

[Cat141] Byeongcheon Lee, Sangmin Kim, Muazzam Maqsood, Jihoon Moon, and Seungmin Rho. 2024. Advancing Autoencoder Architectures for Enhanced Anomaly Detection in Multivariate Industrial Time Series. *Comput. Mater. Contin.* 81, 1 (2024), 1275–1300. doi:10.32604/cmc.2024.054826

[Cat142] Jaewon Lee and Sangmin Lee. 2024. Separable contextual graph neural networks to identify tailgating-oriented traffic congestion. *Expert Syst. Appl.* 254, Article 124354 (2024). doi:10.1016/j.eswa.2024.124354

[Cat143] Jongsoo Lee, Byeongtae Park, and Dong-Kyu Chae. 2023. DuoGAT: Dual Time-oriented Graph Attention Networks for Accurate, Efficient and Explainable Anomaly Detection on Time-series. In *Proc. ACM Int. Conf. Inf. Knowl. Manag. (CIKM'23)*. 1188–1197. doi:10.1145/3583780.3614857

[Cat144] Sangyup Lee and Simon S. Woo. 2024. Saliency-Aware Time Series Anomaly Detection for Space Applications. In *Adv. Knowl. Discov. Data Min. (PAKDD'24) (LNCS, Vol. 14645)*. 327–339. doi:10.1007/978-981-97-2242-6_26

[Cat145] Dan Li, Dacheng Chen, Bo Jin, Lei Shi, Jonathan Goh, and See-Kiong Ng. 2019. MAD-GAN: Multivariate Anomaly Detection for Time Series Data with Generative Adversarial Networks. In *Artif. Neural Netw. Mach. Learn. (ICANN'19): Text and Time Series (LNCS, Vol. 11730)*. 703–716. doi:10.1007/978-3-030-30490-4_56

[Cat146] Gang Li, Zeyu Yang, Honglin Wan, and Min Li. 2022. Anomaly-PTG: A Time Series Data-Anomaly-Detection Transformer Framework in Multiple Scenarios. *Electronics* 11, 23, Article 3955 (2022). doi:10.3390/electronics11233955

[Cat147] Huan Li, Xiangjie Kong, Guojiang Shen, Xiaoran Yan, Yao Yang, and Mario Collotta. 2024. Point-Correlate Adversarial Transformer for Unsupervised Multivariate Time Series Anomaly Detection. In *IEEE Int. Conf. Comput. Support. Coop. Work Des. (CSCWD'24)*. 297–302. doi:10.1109/CSCWD61410.2024.10580188

[Cat148] Haojie Li, Hongzuo Xu, Wei Peng, Chiran Shen, and Xianwen Qiu. 2023. Multi-Scale Sampling Based MLP Networks for Anomaly Detection in Multivariate Time Series. In *IEEE Int. Conf. Parallel Distrib. Syst. (ICPADS'23)*. 1421–1428. doi:10.1109/icpads60453.2023.00202

[Cat149] Jing Li, Chang Liu, and Jianli Ding. 2024. Graph Transformer: Anomaly Prediction and Interpretation in Multivariate Time Series. In *IEEE Int. Jt. Conf. Neural Netw. (IJCNN'24)*. 1–8. doi:10.1109/IJCNN60899.2024.10650606

[Cat150] Longyuan Li, Junchi Yan, Haiyang Wang, and Yaohui Jin. 2021. Anomaly Detection of Time Series With Smoothness-Inducing Sequential Variational Auto-Encoder. *IEEE Trans. Neural Netw. Learn. Syst.* 32, 3 (2021), 1177–1191. doi:10.1109/TNNLS.2020.2980749

[Cat151] Mengyao Li, Zhiyong Li, Zhibang Yang, Xu Zhou, Yifan Li, Ziyan Wu, Lingzhao Kong, and Ke Nai. 2024. SA2E-AD: A Stacked Attention Autoencoder for Anomaly Detection in Multivariate Time Series. *ACM Trans. Knowl. Discov. Data* 18, 7, Article 174 (2024), 15 pages. doi:10.1145/3653677

[Cat152] Qiwen Li, Tijin Yan, Huanhuan Yuan, and Yuanqing Xia. 2022. Self-Attention-Based Multivariate Anomaly Detection for CPS Time Series Data with Adversarial Autoencoders. In *IEEE Chin. Control Conf. (CCC'22)*. 4251–4256. doi:10.23919/CCC55666.2022.9902551

[Cat153] Wenkai Li, Wenbo Hu, Ting Chen, Ning Chen, and Cheng Feng. 2022. StackVAE-G: An efficient and interpretable model for time series anomaly detection. *AI Open* 3 (2022), 101–110. doi:10.1016/j.aiopen.2022.07.001

[Cat154] Xi Li, Peian Wen, Peng Chen, Juan Chen, Xuming Wen, and Yunni Xia. 2024. An effective parallel convolutional anomaly multi-classification model for fault diagnosis in microservice system. *Software Qual. J.* 32, 3 (2024), 921–938. doi:10.1007/s11219-024-09672-6

[Cat155] Yuxin Li, Wenchao Chen, Bo Chen, Dongsheng Wang, Long Tian, and Mingyuan Zhou. 2023. Prototype-oriented unsupervised anomaly detection for multivariate time series. In *Proc. Int. Conf. Mach. Learn. (ICML'23)*, Vol. 202. 19407–19424. https://openreview.net/forum?id=3vO4lS6PuF

[Cat156] Yifan Li, Xiaoyan Peng, Jia Zhang, Zhiyong Li, and Ming Wen. 2023. DCT-GAN: Dilated Convolutional Transformer-Based GAN for Time Series Anomaly Detection. *IEEE Trans. Knowl. Data Eng.* 35, 4 (2023), 3632–3644. doi:10.1109/TKDE.2021.3130234

[Cat157] Yuhang Li, Ning Zhang, and Chun Zhang. 2024. A Multivariate Time Series Anomaly Detection Model Based on Wavelet Decomposition for Spatiotemporal Feature Fusion. In *IEEE Int. Symp. Comput. Eng. Intell. Commun. (ISCEIC'24)*. 197–200. doi:10.1109/ISCEIC63613.2024.10810213

[Cat158] Yi-Feng Li, Zhi-Ang Hu, Jia-Wei Gao, Yi-Sheng Zhang, Peng-Fei Li, and Hai-Zhou Du. 2024. Efficient anomaly detection method for offshore wind turbines. *J. Electron. Sci. Technol.* 22, 4, Article 100285 (2024). doi:10.1016/j.jnlest.2024.100285

[Cat159] Zhi Li, Danya Xu, Yuzhe Li, Tianyou Chai, and Tao Yang. 2023. OSVAE-GAN: Orthogonal Self-Attention Variational Autoencoder Generative Adversarial Networks for Time Series Anomaly Detection. In *IEEE Symp. Ser. Comput. Intell. (SSCI'23)*. 19–24. doi:10.1109/SSCI52147.2023.10371977

[Cat160] Zhengyu Li, Hongjie Zhang, and Wei Zheng. 2024. STformer: Spatio-Temporal Transformer for Multivariate Time Series Anomaly Detection. In *Artif. Neural Netw. Mach. Learn. (ICANN'24) (LNCS, Vol. 15021)*. 297–311. doi:10.1007/978-3-031-72347-6_20

[Cat161] Zhihan Li, Youjian Zhao, Yitong Geng, Zhanxiang Zhao, Hanzhang Wang, Wenxiao Chen, Huai Jiang, Amber Vaidya, Liangfei Su, and Dan Pei. 2022. Situation-Aware Multivariate Time Series Anomaly Detection Through Active Learning and Contrast VAE-Based Models in Large Distributed Systems. *IEEE J. Sel. Areas Commun.* 40, 9 (2022), 2746–2765. doi:10.1109/JSAC.2022.3191341

[Cat162] Zhihan Li, Youjian Zhao, Jiaqi Han, Ya Su, Rui Jiao, Xidao Wen, and Dan Pei. 2021. Multivariate Time Series Anomaly Detection and Interpretation using Hierarchical Inter-Metric and Temporal Embedding. In *Proc. ACM SIGKDD Int. Conf. Knowl. Discov. Data Min. (KDD'21)*. 3220–3230. doi:10.1145/3447548.3467075

[Cat163] Yuanfeng Lian, Yueyao Geng, and Tian Tian. 2023. Anomaly Detection Method for Multivariate Time Series Data of Oil and Gas Stations Based on Digital Twin and MTAD-GAN. *Appl. Sci.* 13, 3, Article 1891 (2023). doi:10.3390/app13031891

[Cat164] Haoran Liang, Lei Song, Junrong Du, Xuzhi Li, and Lili Guo. 2022. Consistent Anomaly Detection and Localization of Multivariate Time Series via Cross-Correlation Graph-Based Encoder–Decoder GAN. *IEEE Trans. Instrum. Meas.* 71 (2022), 1–10. doi:10.1109/TIM.2021.3139696

[Cat165] Haoran Liang, Lei Song, Jianxing Wang, Lili Guo, Xuzhi Li, and Ji Liang. 2021. Robust unsupervised anomaly detection via multi-time scale DCGANs with forgetting mechanism for industrial multivariate time series. *Neurocomputing* 423 (2021), 444–462. doi:10.1016/j.neucom.2020.10.084

[Cat166] Lifang Liang, Xuyi Qiu, Yan Zhang, Donghai Guan, Ji Zhang, and Weiwei Yuan. 2024. Stationary Multi-scale Hierarchical Dilated Graph Convolution for Multivariate Time Series Anomaly Detection. In *Big Data Secur. (ICBDS'23) (CCIS, Vol. 2100)*. 52–66. doi:10.1007/978-981-97-4390-2_5

[Cat167] Shuo Liang, Dechang Pi, and Xiangyan Zhang. 2024. Anomaly detection model for large-scale industrial systems using transfer entropy and graph attention network. *Meas. Sci. Technol.* 35, 9, Article 095104 (2024). doi:10.1088/1361-6501/ad545e

[Cat168] Zhiyu Liang, Jianfeng Zhang, Chen Liang, Hongzhi Wang, Zheng Liang, and Lujia Pan. 2023. A Shapelet-Based Framework for Unsupervised Multivariate Time Series Representation Learning. *Proc. VLDB Endow.* 17, 3 (2023), 386–399. doi:10.14778/3632093.3632103

[Cat169] Junxuan Liao, Jing Li, Yu Chen, Rongbin Gu, Ying Zhu, and Weizhou Peng. 2024. DPDGAD: A Dual-Process Dynamic Graph-based Anomaly Detection for multivariate time series analysis in cyber-physical systems. *Adv. Eng. Inform.* 61, Article 102547 (2024). doi:10.1016/j.aei.2024.102547

[Cat170] Chunming Lin, Bowen Du, Leilei Sun, and Linchao Li. 2024. Hierarchical Context Representation and Self-Adaptive Thresholding for Multivariate Anomaly Detection. *IEEE Trans. Knowl. Data Eng.* 36, 7 (2024), 3139–3150. doi:10.1109/TKDE.2024.3360640

[Cat171] Suwen Lin, Louis Faust, Sidney D'Mello, Gonzalo Martinez, and Nitesh V. Chawla. 2020. MBead: Semi-supervised Multilabel Behaviour Anomaly Detection on Multivariate Temporal Sensory Data. In *IEEE Int. Conf. Big Data (Big Data'20)*. 1089–1096. doi:10.1109/bigdata50022.2020.9378327

[Cat172] Weiwei Lin, Songbo Wang, Wentai Wu, Dongdong Li, and Albert Y. Zomaya. 2024. HybridAD: A Hybrid Model-Driven Anomaly Detection Approach for Multivariate Time Series. *IEEE Trans. Emerg. Top. Comput. Intell.* 8, 1 (2024), 866–878. doi:10.1109/TETCI.2023.3290027

[Cat173] Yijun Lin and Yao-Yi Chiang. 2022. A Semi-Supervised Learning Approach for Abnormal Event Prediction on Large Network Operation Time-Series Data. In *IEEE Int. Conf. Big Data (Big Data'22)*. 1024–1033. doi:10.1109/BigData55660.2022.10020157

[Cat174] Hao Liu, Wang Luo, Lixin Han, Peng Gao, Weiyong Yang, and Guangjie Han. 2024. Anomaly Detection via Graph Attention Networks-Augmented Mask Autoregressive Flow for Multivariate Time Series. *IEEE Internet Things J.* 11, 11 (2024), 19368–19379. doi:10.1109/JIOT.2024.3362398

[Cat175] Liang Liu, Ling Tian, Zhao Kang, and Tianqi Wan. 2023. Spacecraft anomaly detection with attention temporal convolution networks. *Neural Comput. Appl.* 35, 13 (2023), 9753–9761. doi:10.1007/s00521-023-08213-9

[Cat176] Sijie Liu, Nan Zhou, Zekun Bai, and Yafeng Wu. 2023. The Study on Multivariate Time Series Anomaly Detection via Convolutional Variational Autoencoder. In *IEEE Int. Conf. Autom. Electron. Electr. Eng. (AUTEEE'23)*. 605–610. doi:10.1109/AUTEEE60196.2023.10407274

[Cat177] Wen Liu, Degang Sun, Haitian Yang, He Zhu, and Yan Wang. 2023. IAD-Net: Multivariate KPIs Interpretable Anomaly Detection with Dual Gated Residual Fusion Networks. In *IEEE Int. Conf. Trust Secur. Privacy Comput. Commun. (TrustCom'23)*. 686–693. doi:10.1109/TrustCom60117.2023.00103

[Cat178] Wenqiang Liu, Li Yan, Ningning Ma, Gaozhou Wang, Xiaolong Ma, Peishun Liu, and Ruichun Tang. 2024. Unsupervised Deep Anomaly Detection for Industrial Multivariate Time Series Data. *Appl. Sci.* 14, 2, Article 774 (2024). doi:10.3390/app14020774

[Cat179] Wei Liu, Wanying Zhang, Yating Jiang, Shan Chang, and Sun Zhang. 2024. Learning Triple-View Representation Discrepancy for Multivariate Time Series Anomaly Detection with Multi-Scale Patching. In *IEEE Int. Conf. Parallel Distrib. Syst. (ICPADS'24)*. 560–567. doi:10.1109/icpads63350.2024.00079

[Cat180] Yi Liu, Yanni Han, and Wei An. 2022. AttVAE: A Novel Anomaly Detection Framework for Multivariate Time Series. In *Sci. Cyber Secur.(SciSec'22) (LNCS, Vol. 13580)*. 407–420. doi:10.1007/978-3-031-17551-0_27

[Cat181] Zhe Liu, Xiang Huang, Jingyun Zhang, Zhifeng Hao, Li Sun, and Hao Peng. 2024. Multivariate Time-Series Anomaly Detection based on Enhancing Graph Attention Networks with Topological Analysis. In *Proc. ACM Int. Conf. Inf. Knowl. Manag. (CIKM '24)*. 1555–1564. doi:10.1145/3627673.3679614

[Cat182] Jing Long, Cuiting Luo, Ruxin Chen, Jianping Yu, and Kuan-Ching Li. 2024. A cross-layered cluster embedding learning network with regularization for multivariate time series anomaly detection. *J. Supercomput.* 80, 8 (2024), 10444–10468. doi:10.1007/s11227-023-05833-9

[Cat183] Shan Lu, Zhicheng Dong, Donghong Cai, Fang Fang, and Dongcai Zhao. 2023. MIM-GAN-based Anomaly Detection for Multivariate Time Series Data. In *IEEE Veh. Technol. Conf. (VTC'23-Fall)*. 1–7. doi:10.1109/VTC2023-Fall60731.2023.10333517

[Cat184] Yongcan Luo, Ning Chen, Zhanxiang Huang, Jiahao Zheng, Shuxin Qin, and Dapeng Oliver Wu. 2024. Pyramid Transformer for Multivariate Time Series Anomaly Detection in IoUT. In *IEEE Int. Conf. Smart Internet Things (SmartIoT'24)*. 533–539. doi:10.1109/SmartIoT62235.2024.00088

[Cat185] Jianming Lv, Yaquan Wang, and Shengjing Chen. 2023. Adaptive Multivariate Time-Series Anomaly Detection. *Inf. Process. Manag.* 60, 4, Article 103383 (2023). doi:10.1016/j.ipm.2023.103383

[Cat186] Jidong Ma and Hairu Wang. 2024. Anomaly detection in sensor data via encoding time series into images. *J. King Saud Univ. Comput. Inf. Sci.* 36, 10, Article 102232 (2024). doi:10.1016/j.jksuci.2024.102232

[Cat187] Mingrui Ma, Lansheng Han, and Chunjie Zhou. 2023. BTAD: A binary transformer deep neural network model for anomaly detection in multivariate time series data. *Adv. Eng. Inform.* 56, Article 101949 (2023). doi:10.1016/j.aei.2023.101949

[Cat188] Meng Ma, Xuanhao Hua, Yang Zhang, and Zhi Zhai. 2024. Spatiotemporal polynomial graph neural network for anomaly detection of complex systems. *Measurement* 235, Article 115035 (2024). doi:10.1016/j.measurement.2024.115035

[Cat189] Shenhui Ma, Siwei Guan, Zhiwei He, Jiahao Nie, and Mingyu Gao. 2023. TPAD: Temporal-Pattern-Based Neural Network Model for Anomaly Detection in Multivariate Time Series. *IEEE Sens. J.* 23, 24 (2023), 30668–30682. doi:10.1109/JSEN.2023.3327138

[Cat190] Shenhui Ma, Jiahao Nie, Siwei Guan, Zhiwei He, and Mingyu Gao. 2024. MPFormer: Multipatch Transformer for Multivariate Time-Series Anomaly Detection With Contrastive Learning. *IEEE Internet of Things J.* 11, 23 (2024), 38221–38237. doi:10.1109/JIOT.2024.3443910

[Cat191] Zhuang Ma, Hao Xia, and Gang Chen. 2024. MultiCon-AD: Integrated Contrastive Learning for Multivariate Time Series Anomaly Detection. In *IEEE Int. Semin. Artif. Intell. Netw. Inf. Technol. (AINIT'24)*. 2333–2338. doi:10.1109/ainit61980.2024.10581787

[Cat192] Mayra Macas and Chunming Wu. 2019. An Unsupervised Framework for Anomaly Detection in a Water Treatment System. In *IEEE Int. Conf. Mach. Learn. Appl. (ICMLA'19)*. 1298–1305. doi:10.1109/ICMLA.2019.00212

[Cat193] Chihiro Maru, Boris Brandherm, and Ichiro Kobayashi. 2022. Combining Transformer with a Discriminator for Anomaly Detection in Multivariate Time Series. In *IEEE Jt. Int. Conf. Soft Comput. Intell. Syst. & Int. Symp. Adv. Intell. Syst. (SCIS&ISIS)*. 1–7. doi:10.1109/SCISISIS55246.2022.10002131

[Cat194] Mustafa Matar, Tian Xia, Kimberly Huguenard, Dryver Huston, and Safwan Wshah. 2023. Anomaly Detection in Coastal Wireless Sensors via Efficient Deep Sequential Learning. *IEEE Access* 11 (2023), 110260–110271. doi:10.1109/access.2023.3322370

[Cat195] Mustafa Matar, Tian Xia, Kimberly Huguenard, Dryver Huston, and Safwan Wshah. 2023. Multi-Head Attention based Bi-LSTM for Anomaly Detection in Multivariate Time-Series of WSN. In *IEEE Int. Conf. Artif. Intell. Circuits Syst. (AICAS'23)*. 1–5. doi:10.1109/AICAS57966.2023.10168670

[Cat196] Fan Meng, Qunli Yang, Zhengda He, Shangdong Yang, and Weidong Tang. 2022. GUARD: Multigranularity-based Unsupervised Anomaly Detection Algorithm for Multivariate Time Series. In *IEEE Int. Conf. Commun. Image Signal Process. (CCISP'22)*. 25–30. doi:10.1109/CCIS57298.2022.10016429

[Cat197] Zhaoyang Meng, Xinning Zhu, Feng Pan, and Zheng Hu. 2023. DA-MTAD: Capturing Intra- and Inter-Metric Dependencies for Multivariate Time Series Anomaly Detection. In *IEEE Int. Conf. Syst. Man Cybern. (SMC'23)*. 2660–2666. doi:10.1109/SMC53992.2023.10394599

[Cat198] Jiawei Miao, Haicheng Tao, Haoran Xie, Jianshan Sun, and Jie Cao. 2024. Reconstruction-based anomaly detection for multivariate time series using contrastive generative adversarial networks. *Inf. Process. Manag.* 61, 1, Article 103569 (2024). doi:10.1016/j.ipm.2023.103569

[Cat199] Qiucheng Miao, Dandan Wang, Chuanfu Xu, Jun Zhan, and Chengkun Wu. 2024. An Unsupervised Long- and Short-Term Sparse Graph Neural Network for Multisensor Anomaly Detection. *IEEE Sens. J.* 24, 14 (2024), 23088–23097. doi:10.1109/JSEN.2024.3383665

[Cat200] Qiucheng Miao, Chuanfu Xu, Jun Zhan, Dong Zhu, and Chengkun Wu. 2023. An Unsupervised Short- and Long-Term Mask Representation for Multivariate Time Series Anomaly Detection. In *Neural Inf. Process. (ICONIP'22) (CCIS, Vol. 1793)*. 504–516. doi:10.1007/978-981-99-1645-0_42

[Cat201] Eric Stefan Miele, Fabrizio Bonacina, and Alessandro Corsini. 2022. Deep anomaly detection in horizontal axis wind turbines using Graph Convolutional Autoencoders for Multivariate Time series. *Energy and AI* 8, Article 100145 (2022). doi:10.1016/j.egyai.2022.100145

[Cat202] Dagyeong Na and Junseok Kwon. 2024. MRDiff: Time Series Anomaly Detection Using Multi-level Reconstruction Diffusion. In *IEEE Int. Conf. Data Min. Workshops (ICDMW'24)*. 688–695. doi:10.1109/ICDMW65004.2024.00095

[Cat203] Susumu Naito, Yasunori Taguchi, Kouta Nakata, and Yuichi Kato. 2021. Anomaly Detection for Multivariate Time Series on Large-scale Fluid Handling Plant Using Two-stage Autoencoder. In *IEEE Int. Conf. Data Min. Workshops (ICDMW'21)*. 542–551. doi:10.1109/ICDMW53433.2021.00072

[Cat204] H.D. Nguyen, K.P. Tran, S. Thomassey, and M. Hamad. 2021. Forecasting and Anomaly Detection approaches using LSTM and LSTM Autoencoder techniques with the applications in supply chain management. *Int. J. Inf. Manag.* 57, Article 102282 (2021). doi:10.1016/j.ijinfomgt.2020.102282

[Cat205] Zefei Ning, Zhuolun Jiang, Hao Miao, and Li Wang. 2023. MST-GNN: A Multi-scale Temporal-Enhanced Graph Neural Network for Anomaly Detection in Multivariate Time Series. In *Web and Big Data (APWeb-WAIM'22) (LNCS, Vol. 13421)*. 382–390. doi:10.1007/978-3-031-25158-0_29

[Cat206] Mengjia Niu, Yuchen Zhao, and Hamed Haddadi. 2023. Effective Abnormal Activity Detection on Multivariate Time Series Healthcare Data. In *Proc. ACM Int. Conf. Mob. Comput. Netw. (MobiCom'23)*. Article 134, 3 pages. doi:10.1145/3570361.3615741

[Cat207] Zijian Niu, Ke Yu, and Xiaofei Wu. 2020. LSTM-Based VAE-GAN for Time-Series Anomaly Detection. *Sensors* 20, 13, Article 3738 (2020). doi:10.3390/s20133738

[Cat208] Chandana Priya Nivarthi and Bernhard Sick. 2023. Towards Few-Shot Time Series Anomaly Detection with Temporal Attention and Dynamic Thresholding. In *IEEE Int. Conf. Mach. Learn. Appl. (ICMLA'23)*. 1444–1450. doi:10.1109/ICMLA58977.2023.00218

[Cat209] Hussain Nizam, Samra Zafar, Zefeng Lv, Fan Wang, and Xiaopeng Hu. 2022. Real-Time Deep Anomaly Detection Framework for Multivariate Time-Series Data in Industrial IoT. *IEEE Sens. J.* 22, 23 (2022), 22836–22849. doi:10.1109/JSEN.2022.3211874

[Cat210] Seungmin Oh, Le Hoang Anh, Dang Thanh Vu, Gwang Hyun Yu, Minsoo Hahn, and Jinsul Kim. 2024. Patch-Wise-Based Self-Supervised Learning for Anomaly Detection on Multivariate Time Series Data. *Mathematics* 12, 24, Article 3969 (2024). doi:10.3390/math12243969

[Cat211] Moussab Orabi, Kim Phuc Tran, Philipp Egger, and Sébastien Thomassey. 2024. Anomaly detection in smart manufacturing: An Adaptive Adversarial Transformer-based model. *J. Manuf. Syst.* 77 (2024), 591–611. doi:10.1016/j.jmsy.2024.09.021

[Cat212] Sangeeta Oswal, Subhash Shinde, and Vijayalakshmi M. 2024. Unlocking Long-Term Temporal Patterns: TCAE for Anomaly Detection in Multivariate Time Series Data. *Int. J. Eng. Trends Technol.* 72, 9 (2024), 283–296. doi:10.14445/22315381/ijett-v72i9p123

[Cat213] Jinwei Pan, Wendi Ji, Bo Zhong, Pengfei Wang, Xiaoling Wang, and Jin Chen. 2023. DUMA: Dual Mask for Multivariate Time Series Anomaly Detection. *IEEE Sens. J.* 23, 3 (2023), 2433–2442. doi:10.1109/JSEN.2022.3225338

[Cat214] Huaxin Pang, Shikui Wei, Youru Li, Ting Liu, Huaqi Zhang, Ying Qin, and Yao Zhao. 2024. Asymptotic Consistent Graph Structure Learning for Multivariate Time-Series Anomaly Detection. *IEEE Trans. Instrum. Meas.* 73 (2024), 1–10. doi:10.1109/TIM.2024.3369159

[Cat215] Xinggan Peng, Yuxuan Lin, Qi Cao, Yigang Cen, Huiping Zhuang, and Zhiping Lin. 2022. Traffic Anomaly Detection in Intelligent Transport Applications with Time Series Data using Informer. In *Int. Conf. Intell. Transp. Syst. (ITSC'22)*. 3309–3314. doi:10.1109/ITSC55140.2022.9922142

[Cat216] Tuan-Anh Pham, Jong-Hoon Lee, and Choong-Shik Park. 2022. MST-VAE: Multi-Scale Temporal Variational Autoencoder for Anomaly Detection in Multivariate Time Series. *Appl. Sci.* 12, 19, Article 10078 (2022). doi:10.3390/app121910078

[Cat217] Ioana Pintilie, Andrei Manolache, and Florin Brad. 2023. Time Series Anomaly Detection using Diffusion-based Models. In *IEEE Int. Conf. Data Min. Workshops (ICDMW'23)*. 570–578. doi:10.1109/ICDMW60847.2023.00080

[Cat218] Durga Prasad Pydi and S. Advaith. 2023. Attention boosted autoencoder for building energy anomaly detection. *Energy and AI* 14, Article 100292 (2023). doi:10.1016/j.egyai.2023.100292

[Cat219] Panpan Qi, Dan Li, and See-Kiong Ng. 2022. MAD-SGCN: Multivariate Anomaly Detection with Self-learning Graph Convolutional Networks. In *IEEE Int. Conf. Data Eng. (ICDE'22)*. 1232–1244. doi:10.1109/ICDE53745.2022.00097

[Cat220] Sibo Qi, Juan Chen, Peng Chen, Jie Li, Wenyu Shan, and Peian Wen. 2023. An Effective Dynamic Cost-Sensitive Weighting Based Anomaly Multi-classification Model for Imbalanced Multivariate Time Series. In *Web Inf. Syst. Eng. (WISE'23) (LNCS, Vol. 14306)*. 781–790. doi:10.1007/978-981-99-7254-8_60

[Cat221] Sibo Qi, Juan Chen, Peng Chen, Peian Wen, Xianhua Niu, and Lei Xu. 2023. An efficient GAN-based predictive framework for multivariate time series anomaly prediction in cloud data centers. *J. Supercomput.* 80, 1 (2023), 1268–1293. doi:10.1007/s11227-023-05534-3

[Cat222] Zhi Qi, Hong Xie, and Mingsheng Shang. 2023. A Predictive Coding Approach to Multivariate Time Series Anomaly Detection. In *Database Syst. Adv. Appl. (DASFAA'23) (LNCS, Vol. 13943)*. 188–204. doi:10.1007/978-3-031-30637-2_13

[Cat223] Shuxin Qin, Lin Chen, Yongcan Luo, and Gaofeng Tao. 2023. Multiview Graph Contrastive Learning for Multivariate Time-Series Anomaly Detection in IoT. *IEEE Internet Things J.* 10, 24 (2023), 22401–22414. doi:10.1109/JIOT.2023.3303946

[Cat224] Shuxin Qin, Yongcan Luo, and Gaofeng Tao. 2023. Memory-Augmented U-Transformer For Multivariate Time Series Anomaly Detection. In *IEEE Int. Conf. Acoust. Speech Signal Process. (ICASSP'23)*. 1–5. doi:10.1109/ICASSP49357.2023.10096179

[Cat225] Shuxin Qin, Jing Zhu, Dan Wang, Liang Ou, Hongxin Gui, and Gaofeng Tao. 2022. Decomposed Transformer with Frequency Attention for Multivariate Time Series Anomaly Detection. In *IEEE Int. Conf. Big Data (Big Data'22)*. 1090–1098. doi:10.1109/BigData55660.2022.10021063

[Cat226] Mohammad Sabbaqi, Riccardo Taormina, Alan Hanjalic, and Elvin Isufi. 2022. Graph-Time Convolutional Autoencoders. In *Proc. Learn. Graphs Conf. (LoG'22)*, Vol. 198. Article 24, 20 pages. https://openreview.net/forum?id=2HqKwHaBwv

[Cat227] M. K. Saravana, M. S. Roopa, J. S. Arunalatha, and K. R. Venugopal. 2024. Graph Laplacian Eigenvalues Empowered VAEs: A Novel Approach to Adaptive Latent Dimension Choice. *IEEE Access* 12 (2024), 135265–135282. doi:10.1109/ACCESS.2024.3460971

[Cat228] Fabian Schoch, Pascal Graf, Tobias Schmieg, Carsten Wittenberg, Carsten Lanquillon, and Nicolaj C. Stache. 2024. Deep Anomaly Detection with Extended Transformer-Based Model on Tennessee Eastman Process Dataset. In *IEEE Int. Conf. Comput. Sci. Inf. Technol. (CSIT'24)*. 1–4. doi:10.1109/CSIT65290.2024.10982582

[Cat229] Zineb Senane, Lele Cao, Valentin Leonhard Buchner, Yusuke Tashiro, Lei You, Pawel Andrzej Herman, Mats Nordahl, Ruibo Tu, and Vilhelm von Ehrenheim. 2024. Self-Supervised Learning of Time Series Representation via Diffusion Process and Imputation-Interpolation-Forecasting Mask. In *Proc. ACM SIGKDD Int. Conf. Knowl. Discov. Data Min. (KDD'24)*. 2560–2571. doi:10.1145/3637528.3671673

[Cat230] Changmin Seong, Dongjun Lim, Jiho Jang, Jonghoon Lee, Jong-Geun Park, and Yun-Gyung Cheong. 2023. Multivariate Time Series Anomaly Detection with Deep Learning Models Leveraging Inter-Variable Relationships. In *IEEE Silicon Valley Cybersecur. Conf. (SVCC'23)*. 1–8. doi:10.1109/SVCC56964.2023.10165468

[Cat231] Jiahao Shan, Donghong Cai, Fang Fang, Zahid Khan, and Pingzhi Fan. 2024. Unsupervised Multivariate Time Series Data Anomaly Detection in Industrial IoT: A Confidence Adversarial Autoencoder Network. *IEEE Open J. Commun. Soc.* 5 (2024), 7752–7766. doi:10.1109/OJCOMS.2024.3511951

[Cat232] Xuwen Shang, Jue Zhang, Xingguo Jiang, and Hong Luo. 2024. Anomaly Detection for Multivariate Time Series Based on Contrastive Learning and Autoformer. In *IEEE Int. Conf. Comput. Support. Coop. Work Des. (CSCWD'24)*. 2614–2619. doi:10.1109/CSCWD61410.2024.10580672

[Cat233] Lifeng Shen, Zhuocong Li, and James T. Kwok. 2020. Timeseries anomaly detection using temporal hierarchical one-class network. In *Adv. Neural Inf. Process. Syst. (NeurIPS'20)*, Vol. 33. 13016–13026. https://proceedings.neurips.cc/paper/2020/hash/97e401a02082021fd24957f852e0e475-Abstract.html

[Cat234] Yunfei Shi, Bin Wang, Yanwei Yu, Xianfeng Tang, Chao Huang, and Junyu Dong. 2023. Robust anomaly detection for multivariate time series through temporal GCNs and attention-based VAE. *Knowl.-Based Syst.* 275, Article 110725 (2023). doi:10.1016/j.knosys.2023.110725

[Cat235] Xiaosong Shu, Tengfei Bao, Yuhang Zhou, Ruichen Xu, Yangtao Li, and Kang Zhang. 2022. Unsupervised dam anomaly detection with spatial–temporal variational autoencoder. *Struct. Health Monit.* 22, 1 (2022), 39–55. doi:10.1177/14759217211073301

[Cat236] Haotian Si, Changhua Pei, Zhihan Li, Yadong Zhao, Jingjing Li, Haiming Zhang, Zulong Diao, Jianhui Li, Gaogang Xie, and Dan Pei. 2023. Beyond Sharing: Conflict-Aware Multivariate Time Series Anomaly Detection. In *Proc. ACM Jt. Eur. Softw. Eng. Conf. & Symp. Found. Softw. Eng. (ESEC/FSE'23)*. 1635–1645. doi:10.1145/3611643.3613896

[Cat237] Sumit Kumar Singh, Mohammad Hossein Anisi, Simon Clough, Tim Blyth, and Delaram Jarchi. 2023. CNN-BiLSTM based GAN for Anamoly Detection from Multivariate Time Series Data. In *IEEE Int. Conf. Digit. Signal Process. (DSP'23)*. 1–4. doi:10.1109/DSP58604.2023.10167937

[Cat238] Jeena Son, Seunghwan Song, and Jun-Geol Baek. 2024. Patch-Based Time-Series Anomaly Detection with Cross-Variable Attention. In *IEEE Int. Conf. Artif. Intell. Inf. Commun. (ICAIIC'24)*. 638–643. doi:10.1109/ICAIIC60209.2024.10463377

[Cat239] Junho Song, Keonwoo Kim, Jeonglyul Oh, and Sungzoon Cho. 2023. MEMTO: memory-guided transformer for multivariate time series anomaly detection. In *Adv. Neural Inf. Process. Syst. (NeurIPS'23)*, Vol. 36. 57947–57963. https://papers.nips.cc/paper_files/paper/2023/hash/b4c898eb1fb556b8d871fbe9ead92256-Abstract-Conference.html

[Cat240] Weijian Song, Xi Li, Peng Chen, Juan Chen, Jianhua Ren, and Yunni Xia. 2024. A Novel Graph Structure Learning Based Semi-Supervised Framework for Anomaly Identification in Fluctuating IoT Environment. *CMES - Comput. Model. Eng. Sci.* 140, 3 (2024), 3001–3016. doi:10.32604/cmes.2024.048563

[Cat241] Ying Song and Danjing Li. 2024. Application of a Novel Data-Driven Framework in Anomaly Detection of Industrial Data. *IEEE Access* 12 (2024), 102798–102812. doi:10.1109/ACCESS.2024.3420878

[Cat242] Yujia Song, Ruyue Xin, Peng Chen, Rui Zhang, Juan Chen, and Zhiming Zhao. 2023. Identifying performance anomalies in fluctuating cloud environments: A robust correlative-GNN-based explainable approach. *Future Gener. Comput. Syst.* 145 (2023), 77–86. doi:10.1016/j.future.2023.03.020

[Cat243] Kella Sowmya and K. Ramesh. 2024. Enhancing Anomaly Detection in Multivariate Time Series with Stacked Transformer Encoders and Adaptive Positional Embeddings. *Arab. J. Sci. Eng.* 50, 15 (2024), 12479–12494. doi:10.1007/s13369-024-09821-w

[Cat244] V. P. Stepashkina and M. I. Hushchyn. 2024. Prediction of Industrial Cyber Attacks Using Normalizing Flows. *Dokl. Math.* 110, S1 (2024), S95–S102. doi:10.1134/s1064562424602269

[Cat245] Ya Su, Youjian Zhao, Chenhao Niu, Rong Liu, Wei Sun, and Dan Pei. 2019. Robust Anomaly Detection for Multivariate Time Series through Stochastic Recurrent Neural Network. In *Proc. ACM SIGKDD Int. Conf. Knowl. Discov. Data Min. (KDD'19)*. 2828–2837. doi:10.1145/3292500.3330672

[Cat246] Jialin Sui, Jinsong Yu, Yue Song, and Jian Zhang. 2024. Anomaly Detection for Telemetry Time Series Using a Denoising Diffusion Probabilistic Model. *IEEE Sens. J.* 24, 10 (2024), 16429–16439. doi:10.1109/jsen.2024.3383416

[Cat247] Changcheng Sun, Zhiwei He, Huipin Lin, Linhui Cai, Hui Cai, and Mingyu Gao. 2023. Anomaly detection of power battery pack using gated recurrent units based variational autoencoder. *Appl. Soft Comput.* 132, Article 109903 (2023). doi:10.1016/j.asoc.2022.109903

[Cat248] Haili Sun, Yan Huang, Lansheng Han, Cai Fu, Hongle Liu, and Xiang Long. 2024. MTS-DVGAN: Anomaly detection in cyber-physical systems using a dual variational generative adversarial network. *Comput. Secur.* 139, Article 103570 (2024). doi:10.1016/j.cose.2023.103570

[Cat249] Junnan Sun, Zhigang Chen, and Yurong Qian. 2024. A Contrastive-Representative-Learning-Based Method for Multivariate Time Series Anomaly Detection. In *IEEE Int. Conf. Image Process. Comput. Vis. Mach. Learn. (ICICML'24)*. 546–549. doi:10.1109/ICICML63543.2024.10958101

[Cat250] Qi Sun, Yahui Li, Zhenpeng Hu, Chunjie Zhou, and Lu Liu. 2024. Spatial-Temporal Dependency Based Multivariate Time Series Anomaly Detection for Industrial Processes. In *Adv. Intell. Comput. Technol. Appl. (ICIC'24) (LCNS, Vol. 14874)*. 212–223. doi:10.1007/978-981-97-5618-6_18

[Cat251] Yongqian Sun, Yang Guo, Minghan Liang, Xidao Wen, Junhua Kuang, Shenglin Zhang, Hongbo Li, Kaixu Xia, and Dan Pei. 2024. Multivariate Time Series Anomaly Detection based on Pre-trained Models with Dual-Attention Mechanism. In *IEEE Int. Symp. Softw. Reliab. Eng. Workshops*

(ISSREW'24). 73–78. doi:10.1109/ISSREW63542.2024.00050

[Cat252] Zhao Sun, Qinke Peng, Xu Mou, and Muhammad Fiaz Bashir. 2022. Generic and scalable periodicity adaptation framework for time-series anomaly detection. *Multimed. Tools Appl.* 82, 2 (2022), 2731–2748. doi:10.1007/s11042-022-13304-1

[Cat253] Yifeng Tan, Guobing Li, Yuxuan Chen, and Guomei Zhang. 2022. Multivariate Time-Series Anomaly Detection in IoT Using Attention-Based Gated Recurrent Unit. In *IEEE Int. Conf. Wirel. Commun. Signal Process. (WCSP'22)*. 604–609. doi:10.1109/WCSP55476.2022.10039138

[Cat254] Chao Tang, Yunchuan Qin, Yumeng Liu, Huilong Pi, and Zhuo Tang. 2024. An Efficient Method for Detecting Abnormal Electricity Behavior. *Energies* 17, 11, Article 2502 (2024). doi:10.3390/en17112502

[Cat255] Chaofan Tang, Lijuan Xu, Bo Yang, Yongwei Tang, and Dawei Zhao. 2023. GRU-Based Interpretable Multivariate Time Series Anomaly Detection in Industrial Control System. *Comput. Mater. Contin.* 127, Article 103094 (2023). doi:10.1016/j.cose.2023.103094

[Cat256] Junnan Tang, Dan Li, and Zibin Zheng. 2024. MAD-SGS: Multivariate Anomaly Detection with Multi-scale Self-learned Graph Structures. In *Bio-Inspir. Comput.: Theories and Applications (BIC-TA'23) (CCIS, Vol. 2062)*. 17–31.

[Cat257] Lun Tang, Enqiao Kou, Weijia Zhang, Qianlin Wu, and Qianbin Chen. 2024. IoT-FKGDL-SL: Anomaly Detection Framework Integrating Knowledge Distillation and a Swarm Learning for 5G IoT. *IEEE Internet of Things J.* 11, 23 (2024), 38601–38614. doi:10.1109/JIOT.2024.3448429

[Cat258] Haicheng Tao, Jiawei Miao, Lin Zhao, Zhenyu Zhang, Shuming Feng, Shu Wang, and Jie Cao. 2023. HAN-CAD: hierarchical attention network for context anomaly detection in multivariate time series. *World Wide Web* 26, 5 (2023), 2785–2800. doi:10.1007/s11280-023-01171-1

[Cat259] Tareq Tayeh, Sulaiman Aburakhia, Ryan Myers, and Abdallah Shami. 2022. An Attention-Based ConvLSTM Autoencoder with Dynamic Thresholding for Unsupervised Anomaly Detection in Multivariate Time Series. *Mach. Learn. Knowl. Extr.* 4, 2 (2022), 350–370. doi:10.3390/make4020015

[Cat260] Andreas Theissler, Manuel Wengert, and Felix Gerschner. 2023. ROCKAD: Transferring ROCKET to Whole Time Series Anomaly Detection. In *Adv. Intell. Data Anal. XXI (IDA'23) (LNCS, Vol. 13876)*. 419–432. doi:10.1007/978-3-031-30047-9_33

[Cat261] Yuyin Tian, Rong Gao, Lingyu Yan, Donghua Liu, and Zhiwei Ye. 2023. Dynamic Graph Learning with Long and Short-Term for Multivariate Time Series Anomaly Detection. In *Proc. IEEE Int. Conf. Intell. Data Acquis. Adv. Comput. Syst.: Technol. Appl. (IDAACS'23)*, Vol. 1. 1065–1070. doi:10.1109/IDAACS58523.2023.10348896

[Cat262] Yulong Tian, Jiaxuan Xu, Jie Zuo, and Lei Duan. 2024. AgileAD: Anchor-Guided Contrastive Learning with a General Data Augmentation Strategy for Time Series Anomaly Detection. In *IEEE Int. Conf. Tools Artif. Intell. (ICTAI'24)*. 573–577. doi:10.1109/ICTAI62512.2024.00086

[Cat263] Zhiwen Tian, Ming Zhuo, Leyuan Liu, Junyi Chen, and Shijie Zhou. 2023. Anomaly detection using spatial and temporal information in multivariate time series. *Sci. Rep.* 13, 1, Article 4400 (2023). doi:10.1038/s41598-023-31193-8

[Cat264] Fei-Fan Tu, Dong-Jie Liu, Zhi-Wei Yan, Xiao-Bo Jin, and Guang-Gang Geng. 2024. STFT-TCAN: A TCN-attention based multivariate time series anomaly detection architecture with time-frequency analysis for cyber-industrial systems. *Comput. Secur.* 144, Article 103961 (2024). doi:10.1016/j.cose.2024.103961

[Cat265] Shreshth Tuli, Giuliano Casale, and Nicholas R. Jennings. 2022. TranAD: deep transformer networks for anomaly detection in multivariate time series data. *Proc. VLDB Endow.* 15, 6 (2022), 1201–1214. doi:10.14778/3514061.3514067

[Cat266] Chaoyang Wang and Guangyu Liu. 2024. From anomaly detection to classification with graph attention and transformer for multivariate time series. *Adv. Eng. Inform.* 60, Article 102357 (2024). doi:10.1016/j.aei.2024.102357

[Cat267] Chunzhi Wang, Shaowen Xing, Rong Gao, Lingyu Yan, Naixue Xiong, and Ruoxi Wang. 2023. Disentangled Dynamic Deviation Transformer Networks for Multivariate Time Series Anomaly Detection. *Sensors* 23, 3, Article 1104 (2023). doi:10.3390/s23031104

[Cat268] Chengsen Wang, Zirui Zhuang, Qi Qi, Jingyu Wang, Xingyu Wang, Haifeng Sun, and Jianxin Liao. 2023. Drift doesn't matter: dynamic decomposition with diffusion reconstruction for unstable multivariate time series anomaly detection. In *Adv. Neural Inf. Process. Syst. (NeurIPS'23)*, Vol. 36. 10758–10774. https://papers.nips.cc/paper_files/paper/2023/hash/22f5d8e689d2a011cd8ead552ed59052-Abstract-Conference.html

[Cat269] Fan Wang, Keli Wang, and Boyu Yao. 2023. Time Series Anomaly Detection with Reconstruction-Based State-Space Models. In *Artif. Neural Netw. Mach. Learn. (ICANN'23) (LNCS, Vol. 14256)*. 74–86. doi:10.1007/978-3-031-44213-1_7

[Cat270] Fangwei Wang, Man Yan, Qingru Li, and Changguang Wang. 2023. A Multivariate Time Series Anomaly Detection Model Based on Spatio-Temporal Dual Features. In *IEEE Int. Conf. Netw. Netw. Appl. (NaNA'23)*. 416–421. doi:10.1109/NaNA60121.2023.00075

[Cat271] Jing Wang, Shikuan Shao, Yunfei Bai, Jiaoxue Deng, and Youfang Lin. 2023. Multiscale Wavelet Graph AutoEncoder for Multivariate Time-Series Anomaly Detection. *IEEE Trans. Instrum. Meas.* 72 (2023), 1–11. doi:10.1109/TIM.2022.3223142

[Cat272] Jianyu Wang, Heng Zhang, and Qiang Miao. 2024. An attention graph stacked autoencoder for anomaly detection of electro-mechanical actuator using spatio-temporal multivariate signals. *Chin. J. Aeronaut.* 37, 9 (2024), 506–520. doi:10.1016/j.cja.2024.03.024

[Cat273] Jian Wang, Delei Zhao, and Guosheng Zhao. 2024. Malicious Participants and Fake Task Detection Incorporating Gaussian Bias. *ACM Trans. Internet Technol.* 24, 4, Article 19 (2024), 19 pages. doi:10.1145/3696419

[Cat274] Ke Wang, Hao Zheng, Yuan Li, Jiajun Li, and Ahmed Louri. 2022. AGAPE: Anomaly Detection with Generative Adversarial Network for Improved Performance, Energy, and Security in Manycore Systems. In *Des. Autom. Test Eur. Conf. Exhib. (DATE'22)*. 849–854. doi:10.23919/DATE54114.2022.9774693

[Cat275] Lan Wang, Yusan Lin, Yuhang Wu, Huiyuan Chen, Fei Wang, and Hao Yang. 2021. Forecast-based Multi-aspect Framework for Multivariate Time-series Anomaly Detection. In *IEEE Int. Conf. Big Data (Big Data'21)*. 938–947. doi:10.1109/bigdata52589.2021.9671776

[Cat276] Lixu Wang, Shichao Xu, Xinyu Du, and Qi Zhu. 2024. DACR: Distribution-Augmented Contrastive Reconstruction for Time-Series Anomaly Detection. *IEEE Int. Conf. Acoust. Speech Signal Process. (ICASSP'24)* (2024), 7545–7549. doi:10.1109/ICASSP48485.2024.10447891

[Cat277] Mingjun Wang, Chuitian Rong, and Huabo Sun. 2023. Multi-Type Anomaly Detection Using One Deep Neural Model for QAR Data. In *IEEE Int. Conf. Civ. Aviat. Saf. Inf. Technol. (ICCASIT'23)*. 700–706. doi:10.1109/ICCASIT58768.2023.10351536

[Cat278] Ruoxi Wang, Jun Zhan, and Yun Sun. 2023. Spatial-Temporal Graph Neural Network Based Anomaly Detection. In *Adv. Comput. Sci. Eng. Educ. VI (ICCSEEA'23) (LNDECT, Vol. 181)*. 459–471. doi:10.1007/978-3-031-36118-0_42

[Cat279] Wenlu Wang, Pengfei Chen, Yibin Xu, and Zilong He. 2022. Active-MTSAD: Multivariate Time Series Anomaly Detection With Active Learning. In *IEEE/IFIP Int. Conf. Dependable Syst. Netw. (DSN'22)*. 263–274. doi:10.1109/DSN53405.2022.00036

[Cat280] Weilin Wang, Zhaohui Peng, Senzhang Wang, Hao Li, Min Liu, Liang Xue, and Nengwei Zhang. 2021. IFP-ADAC: A Two-stage Interpretable Fault Prediction Model for Multivariate Time Series. In *IEEE Int. Conf. Mob. Data Manag. (MDM'21)*. 29–38. doi:10.1109/MDM52706.2021.00017

[Cat281] Wenyan Wang, Enguang Zuo, Ruiting Wang, Jie Zhong, Chen Chen, Cheng Chen, and Xiaoyi Lv. 2024. Bi-Branching Feature Interaction Representation Learning for Multivariate Time Series. *Appl. Soft Comput.* 167, Article 112383 (2024). doi:10.1016/j.asoc.2024.112383

[Cat282] Xixuan Wang, Dechang Pi, Xiangyan Zhang, Hao Liu, and Chang Guo. 2022. Variational transformer-based anomaly detection approach for multivariate time series. *Measurement* 191, Article 110791 (2022). doi:10.1016/j.measurement.2022.110791

[Cat283] Xinghao Wang, Qiang Xing, Huimin Xiao, and Ming Ye. 2024. Contrastive learning enhanced by graph neural networks for Universal Multivariate Time Series Representation. *Inf. Syst.* 125, Article 102429 (2024). doi:10.1016/j.is.2024.102429

[Cat284] Yuanyi Wang, Haifeng Sun, Chengsen Wang, Mengde Zhu, Jingyu Wang, Wei Tang, Qi Qi, Zirui Zhuang, and Jianxin Liao. 2024. Interdependency Matters: Graph Alignment for Multivariate Time Series Anomaly Detection. In *IEEE Int. Conf. Data Min. (ICDM'24)*. 869–874. doi:10.1109/icdm59182.2024.00107

[Cat285] Dong Wei, Wu Sun, Xiaofeng Zou, Dan Ma, Huarong Xu, Panfeng Chen, Chaoshu Yang, Mei Chen, and Hui Li. 2024. An anomaly detection model for multivariate time series with anomaly perception. *PeerJ Comput. Sci.* 10, Article e2172 (2024). doi:10.7717/peerj-cs.2172

[Cat286] Mulugeta Weldezgina Asres, Grace Cummings, Pavel Parygin, Aleko Khukhunaishvili, Maria Toms, Alan Campbell, Seth I. Cooper, David Yu, Jay Dittmann, and Christian W. Omlin. 2021. Unsupervised Deep Variational Model for Multivariate Sensor Anomaly Detection. In *IEEE Int. Conf. Prog. Inform. Comput. (PIC'21)*. 364–371. doi:10.1109/PIC53636.2021.9687034

[Cat287] Peian Wen, Zhenyu Yang, Lei Wu, Sibo Qi, Juan Chen, and Peng Chen. 2022. A Novel Convolutional Adversarial Framework for Multivariate Time Series Anomaly Detection and Explanation in Cloud Environment. *Appl. Sci.* 12, 20, Article 10390 (2022). doi:10.3390/app122010390

[Cat288] Haixu Wu, Tengge Hu, Yong Liu, Hang Zhou, Jianmin Wang, and Mingsheng Long. 2023. TimesNet: Temporal 2D-Variation Modeling for General Time Series Analysis. In *Int. Conf. Learn. Represent. (ICLR'23)*. https://openreview.net/forum?id=ju_Uqw384Oq

[Cat289] Hongwei Wu, Rong Yang, Huang Qing, Kedong Liu, Zhuojun Jiang, Yangxi Li, and Hong Zhang. 2023. TSFN: an Effective Time Series Anomaly Detection Approach via Transformer-based Self-feedback Network. In *IEEE Int. Conf. Comput. Support. Coop. Work Des. (CSCWD'23)*. 1396–1401. doi:10.1109/CSCWD57460.2023.10152838

[Cat290] Junfeng Wu, Li Yao, Bin Liu, Zheyuan Ding, and Lei Zhang. 2021. Multi-task learning based Encoder-Decoder: A comprehensive detection and diagnosis system for multi-sensor data. *Adv. Mech. Eng.* 13, 5 (2021). doi:10.1177/16878140211013138

[Cat291] Yuhang Wu, Mengting Gu, Lan Wang, Yusan Lin, Fei Wang, and Hao Yang. 2022. Event2Graph: Event-driven Bipartite Graph for Multivariate Time-series Anomaly Detection. In *Proc. Workshop Appl. Mach. Learn. Methods Time Ser. Forecast. (AMLTS'22@CIKM)*, Vol. 3375. Article 2. doi:10.48550/arXiv.2108.06783

[Cat292] Yu-Xiang Wu and Bi-Ru Dai. 2024. STL-ConvTransformer: Series Decomposition and Convolution-Infused Transformer Architecture in Multivariate Time Series Anomaly Detection. In *Adv. Knowl. Discov. Data Min. (PAKDD'24) (LNCS, Vol. 14645)*. 41–52. doi:10.1007/978-981-97-2242-6_4

[Cat293] Feng Xia, Xin Chen, Shuo Yu, Mingliang Hou, Mujie Liu, and Linlin You. 2024. Coupled Attention Networks for Multivariate Time Series Anomaly Detection. *IEEE Trans. Emerg. Top. Comput.* 12, 1 (2024), 240–253. doi:10.1109/TETC.2023.3280577

[Cat294] Shengjie Xia, Wu Sun, Xiaofeng Zou, Panfeng Chen, Dan Ma, Huarong Xu, Mei Chen, and Hui Li. 2024. MFAM-AD: an anomaly detection model for multivariate time series using attention mechanism to fuse multi-scale features. *PeerJ Comput. Sci.* 10, Article e2201 (2024). doi:10.7717/peerj-cs.2201

[Cat295] Jiandong Xie, Yue Cui, Feiteng Huang, Chao Liu, and Kai Zheng. 2022. MARINA: An MLP-Attention Model for Multivariate Time-Series Analysis. In *Proc. ACM Int. Conf. Inf. Knowl. Manag. (CIKM'22)*. 2230–2239. doi:10.1145/3511808.3557386

[Cat296] Shujiang Xie, Lian Li, and Yian Zhu. 2024. Anomaly detection for multivariate time series in IoT using discrete wavelet decomposition and dual graph attention networks. *Comput. Secur.* 146, Article 104075 (2024). doi:10.1016/j.cose.2024.104075

[Cat297] Tianming Xie, Qifa Xu, and Cuixia Jiang. 2023. Anomaly detection for multivariate times series through the multi-scale convolutional recurrent variational autoencoder. *Expert Syst. Appl.* 231, Article 120725 (2023). doi:10.1016/j.eswa.2023.120725

[Cat298] Tianming Xie, Qifa Xu, Cuixia Jiang, Zhiwei Gao, and Xiangxiang Wang. 2024. A Robust Anomaly Detection Model for Pumps Based on the Spectral Residual With Self-Attention Variational Autoencoder. *IEEE Trans. Ind. Informat.* 20, 6 (2024), 9059–9069. doi:10.1109/TII.2024.3381790

[Cat299] Shiwang Xing, Jianwei Niu, and Tao Ren. 2023. GCFormer: Granger Causality based Attention Mechanism for Multivariate Time Series Anomaly Detection. In *IEEE Int. Conf. Data Min. (ICDM'23)*. 1433–1438. doi:10.1109/ICDM58522.2023.00187

[Cat300] YuBo Xing, DongSheng Liu, and YiXin Bao. 2024. Industrial Anomaly Detection Based on Factorized Temporal-Channel Fusion. *IEEE Sens. J.* 24, 21 (2024), 34977–34986. doi:10.1109/JSEN.2024.3452955

[Cat301] Weixuan Xiong, Peng Wang, Xiaochen Sun, and Jun Wang. 2024. SiET: Spatial information enhanced transformer for multivariate time series anomaly detection. *Knowl.-Based Syst.* 296, Article 111928 (2024). doi:10.1016/j.knosys.2024.111928

[Cat302] Yihao Xiong, Jinbo Wang, Yuanlin Xin, Chi Zhang, and Panpan Xue. 2023. An Attention Mechanism Based Approach for Multivariate Time Series Anomaly Detection. In *IEEE Int. Conf. Dependable Syst. Their Appl. (DSA'23)*. 173–181. doi:10.1109/DSA59317.2023.00030

[Cat303] Zhiying Xiong, Qilin Fan, Kai Wang, Xiuhua Li, Xu Zhang, and Qingyu Xiong. 2022. PRAD: Unsupervised KPI Anomaly Detection by Joint Prediction and Reconstruction of Multivariate Time Series. In *IEEE Smartworld, Ubiquitous Intell. & Comput., Scal. Comput. & Commun., Digit. Twin, Privacy Comput., Metaverse, Auton. & Trusted Veh. (SmartWorld/UIC/ScalCom/DigitalTwin/PriComp/Meta'22)*. 384–391. doi:10.1109/SmartWorld-UIC-ATC-ScalCom-DigitalTwin-PriComp-Metaverse56740.2022.00075

[Cat304] Haoran Xu and Yuansheng Lou. 2023. Multivariate Time Series Anomaly Detection: a Hybrid Method Based on GRU-SAE and GAIN. In *IEEE Inf. Technol. Netw. Electron. Autom. Control Conf. (ITNEC'23)*, Vol. 6. 32–38. doi:10.1109/ITNEC56291.2023.10082407

[Cat305] Jiehui Xu, Haixu Wu, Jianmin Wang, and Mingsheng Long. 2022. Anomaly Transformer: Time Series Anomaly Detection with Association Discrepancy. In *Int. Conf. Learn. Represent. (ICLR'22)*. doi:10.48550/arXiv.2110.02642

[Cat306] Kang Xu, Yuan Li, Yixuan Li, Liyan Xu, Ruiyao Li, and Zhenjiang Dong. 2023. Masked Graph Neural Networks for Unsupervised Anomaly Detection in Multivariate Time Series. *Sensors* 23, 17, Article 7552 (2023). doi:10.3390/s23177552

[Cat307] Lijuan Xu, Xiao Ding, Dawei Zhao, Alex X. Liu, and Zhen Zhang. 2023. A Three-Dimensional ResNet and Transformer-Based Approach to Anomaly Detection in Multivariate Temporal–Spatial Data. *Entropy* 25, 2, Article 180 (2023). doi:10.3390/e25020180

[Cat308] Qifa Xu, Tianming Xie, Cuixia Jiang, Qiliang Cheng, and Xiangxiang Wang. 2024. Adaptive Working Condition Recognition With Clustering-Based Contrastive Learning for Unsupervised Anomaly Detection. *IEEE Trans. Ind. Informat.* 20, 10 (2024), 12103–12113. doi:10.1109/TII.2024.3413952

[Cat309] Yinsong Xu, Yulong Ding, Jie Jiang, Runmin Cong, Xuefeng Zhang, Shiqi Wang, Sam Kwong, and Shuang-Hua Yang. 2024. Skip-patching spatial–temporal discrepancy-based anomaly detection on multivariate time series. *Neurocomputing* 609, Article 128428 (2024). doi:10.1016/j.neucom.2024.128428

[Cat310] Zheng Xu, Yumeng Yang, Xinwen Gao, and Min Hu. 2023. DCFF-MTAD: A Multivariate Time-Series Anomaly Detection Model Based on Dual-Channel Feature Fusion. *Sensors* 23, 8, Article 3910 (2023). doi:10.3390/s23083910

[Cat311] Bing Xue, Xin Gao, Baofeng Li, Feng Zhai, Jiansheng Lu, Jiahao Yu, Shiyuan Fu, and Chun Xiao. 2024. A robust multi-scale feature extraction framework with dual memory module for multivariate time series anomaly detection. *Neural Netw.* 177, Article 106395 (2024). doi:10.1016/j.neunet.2024.106395

[Cat312] Bing Xue, Xin Gao, Feng Zhai, Baofeng Li, Jiahao Yu, Shiyuan Fu, Lingli Chen, and Zhihang Meng. 2023. A contrastive autoencoder with multi-resolution segment-consistency discrimination for multivariate time series anomaly detection. *Appl. Intell.* 53, 23 (2023), 28655–28674. doi:10.1007/s10489-023-04985-8

[Cat313] Yapeng Xue. 2023. Research on Time Series Anomaly Detection Based on Graph Neural Network. In *IEEE Int. Conf. Electr. Automat. Comput. Eng. (ICEACE'23)*. 1670–1674. doi:10.1109/ICEACE60673.2023.10442027

[Cat314] Haodong Yan, Fudong Li, Jinglong Chen, Zijun Liu, Jun Wang, Yong Feng, and Xinwei Zhang. 2023. A graph embedded in graph framework with dual-sequence input for efficient anomaly detection of complex equipment under insufficient samples. *Reliab. Eng. Syst. Saf.* 238, Article 109418 (2023). doi:10.1016/j.ress.2023.109418

[Cat315] Weizhong Yan. 2019. Detecting Gas Turbine Combustor Anomalies Using Semi-supervised Anomaly Detection with Deep Representation Learning. *Cogn. Comput.* 12, 2 (2019), 398–411. doi:10.1007/s12559-019-09710-7

[Cat316] Bo Yang, Weishan Long, Yucheng Zhang, Zerui Xi, Jian Jiao, and Yufeng Li. 2024. Multivariate time series anomaly detection: Missing data handling and feature collaborative analysis in robot joint data. *J. Manuf. Syst.* 75 (2024), 132–149. doi:10.1016/j.jmsy.2024.06.006

[Cat317] Jingyu Yang and Zuogong Yue. 2023. Learning Hierarchical Spatial-Temporal Graph Representations for Robust Multivariate Industrial Anomaly Detection. *IEEE Trans. Ind. Informat.* 19, 6 (2023), 7624–7635. doi:10.1109/TII.2022.3216006

[Cat318] Jingyu Yang, Zuogong Yue, and Ye Yuan. 2023. Deep probabilistic graphical modeling for robust multivariate time series anomaly detection with missing data. *Reliab. Eng. Syst. Saf.* 238, Article 109410 (2023). doi:10.1016/j.ress.2023.109410

[Cat319] Kai Yang, Shaoyu Dou, Pan Luo, Xin Wang, and H. Vincent Poor. 2022. Robust Group Anomaly Detection for Quasi-Periodic Network Time Series. *IEEE Trans. Netw. Sci. Eng.* 9, 4 (2022), 2833–2845. doi:10.1109/tnse.2022.3170364

[Cat320] Luoxiao Yang and Zijun Zhang. 2021. Wind Turbine Gearbox Failure Detection Based on SCADA Data: A Deep Learning-Based Approach. *IEEE Trans. Instrum. Meas.* 70 (2021), 1–11. doi:10.1109/TIM.2020.3045800

[Cat321] Qian Yang, Jiaming Zhang, Junjie Zhang, Cailing Sun, Shanyi Xie, Shangdong Liu, and Yimu Ji. 2024. Graph Transformer Network Incorporating Sparse Representation for Multivariate Time Series Anomaly Detection. *Electronics* 13, 11, Article 2032 (2024). doi:10.3390/electronics13112032

[Cat322] Songlin Yang, Jing Li, Kuanzhi Shi, Yu Chen, Yunlong Zhu, Xudong He, Jinlong Wu, and Chenling Pan. 2024. Spatial-Temporal Interaction Decoding Transformer for Unsupervised Multivariate Time Series Anomaly Detection. In *IEEE Int. Conf. Acoust. Speech Signal Process. (ICASSP'24)*. 5440–5444. doi:10.1109/ICASSP48485.2024.10448347

[Cat323] Xuekang Yang, Hui Li, Xingyu Feng, and Zixiong Jin. 2023. Variable-wise generative adversarial transformer in multivariate time series anomaly detection. *Appl. Intell.* 53, 23 (2023), 28745–28767. doi:10.1007/s10489-023-05029-x

[Cat324] Yaming Yang, Zhuo Li, Pingping Lin, Juanyong Duan, Hao Zhang, Tianmeng Yang, Congrui Huang, Zhengjie Lin, Yunhai Tong, and Yujing Wang. 2024. Characteristic-Aware Time-Series Representation Learning for Unsupervised Anomaly Detection. In *IEEE Int. Jt. Conf. Neural Netw. (IJCNN'24)*. 1–9. doi:10.1109/IJCNN60899.2024.10650866

[Cat325] Yiyuan Yang, Chaoli Zhang, Tian Zhou, Qingsong Wen, and Liang Sun. 2023. DCdetector: Dual Attention Contrastive Representation Learning for Time Series Anomaly Detection. In *Proc. ACM SIGKDD Int. Conf. Knowl. Discov. Data Min. (KDD '23)*. 3033–3045. doi:10.1145/3580305.3599295

[Cat326] Honglei Yao, Donglan Liu, Yingxian Chang, Xin Liu, and Chaofan Tang. 2024. Time Series Anomaly Detection Based on Normalized Flow and Bayesian Networks. In *IEEE Int. Conf. Data Sci. Cyberspace (DSC'24)*. 515–522. doi:10.1109/DSC63484.2024.00077

[Cat327] Yueyue Yao, Jianghong Ma, Shanshan Feng, and Yunming Ye. 2024. SVD-AE: An asymmetric autoencoder with SVD regularization for multivariate time series anomaly detection. *Neural Netw.* 170 (2024), 535–547. doi:10.1016/j.neunet.2023.11.023

[Cat328] Motie Yassine and Flaus Théo. 2023. Anomaly Detection for Industrial Sensors Using Transformers. In *IEEE Int. Conf. Future Internet Things Cloud (FiCloud'23)*. 167–174. doi:10.1109/FiCloud58648.2023.00032

[Cat329] Yu Ye, Bailin Feng, and Wujun Tao. 2021. MILAD: Robust Anomaly Detection for Electric Vehicles with Label Noise. *J. Phys.: Conf. Ser* 2132, 1, Article 012047 (2021). doi:10.1088/1742-6596/2132/1/012047

[Cat330] Yufeng Ye, Qichao He, Peng Zhang, Jie Xiao, and Zhao Li. 2023. Multivariate Time Series Anomaly Detection with Fourier Time Series Transformer. In *IEEE Int. Conf. Cloud Netw. (CloudNet'23)*. 381–388. doi:10.1109/CloudNet59005.2023.10490086

[Cat331] Shuang Yi, Sheng Zheng, Senquan Yang, Guangrong Zhou, and Jiajun Cai. 2024. Anomaly Detection for Asynchronous Multivariate Time Series of Nuclear Power Plants Using a Temporal-Spatial Transformer. *Sensors* 24, 9, Article 2845 (2024). doi:10.3390/s24092845

[Cat332] Umaporn Yokkampon, Abbe Mowshowitz, Sakmongkon Chumkamon, and Eiji Hayashi. 2022. Robust Unsupervised Anomaly Detection With Variational Autoencoder in Multivariate Time Series Data. *IEEE Access* 10 (2022), 57835–57849. doi:10.1109/ACCESS.2022.3178592

[Cat333] Bing Yu, Yang Yu, Gang Xiang, and RuiShi Lin. 2024. Triple Attention: An Integrated Approach for Interpretable Anomaly Detection in Temporal and Association Dimensions. *IEEE Trans. Instrum. Meas.* 73 (2024), 1–12. doi:10.1109/TIM.2024.3460930

[Cat334] Bing Yu, Yang Yu, Jiakai Xu, Gang Xiang, and Zhiming Yang. 2024. MAG: A Novel Approach for Effective Anomaly Detection in Spacecraft Telemetry Data. *IEEE Trans. Ind. Informat.* 20, 3 (2024), 3891–3899. doi:10.1109/TII.2023.3314852

[Cat335] Jiahao Yu, Xin Gao, Baofeng Li, Feng Zhai, Jiansheng Lu, Bing Xue, Shiyuan Fu, and Chun Xiao. 2024. A filter-augmented auto-encoder with learnable normalization for robust multivariate time series anomaly detection. *Neural Netw.* 170 (2024), 478–493. doi:10.1016/j.neunet.2023.11.047

[Cat336] Jiahao Yu, Xin Gao, Feng Zhai, Baofeng Li, Bing Xue, Shiyuan Fu, Lingli Chen, and Zhihang Meng. 2024. An adversarial contrastive autoencoder for robust multivariate time series anomaly detection. *Expert Syst. Appl.* 245, Article 123010 (2024). doi:10.1016/j.eswa.2023.123010

[Cat337] Jinsong Yu, Yue Song, Diyin Tang, Danyang Han, and Jing Dai. 2021. Telemetry Data-Based Spacecraft Anomaly Detection With Spatial–Temporal Generative Adversarial Networks. *IEEE Trans. Instrum. Meas.* 70 (2021), 1–9. doi:10.1109/TIM.2021.3073442

[Cat338] Ling-rui Yu, Qiu-hong Lu, and Yang Xue. 2024. DTAAD: Dual Tcn-attention networks for anomaly detection in multivariate time series data. *Knowl.-Based Syst.* 295, Article 111849 (2024). doi:10.1016/j.knosys.2024.111849

[Cat339] Pengfei Yu, Xiaoming Zhou, Longdan Chen, Jun Qi, and Liang Bai. 2023. Anomaly Detection Model for Data Interactions Based on Temporal Features in Electric Power Data Centers. In *IEEE Int. Conf. Commun. Image Signal Process. (CCISP'23)*. 580–586. doi:10.1109/CCISP59915.2023.10355803

[Cat340] Rongwei Yu, Yong Wang, and Wang Wang. 2024. AMAD: Active learning-based multivariate time series anomaly detection for large-scale IT systems. *Comput. Secur.* 137, Article 103603 (2024). doi:10.1016/j.cose.2023.103603

[Cat341] Yuan-Cheng Yu, Yen-Chieh Ouyang, Ling-Wei Wu, Chun-An Lin, and Kuo-Yu Tsai. 2024. Multivariate Time-Series Anomaly Detection in IoT with a Bi-Dual GM GRU Autoencoder. In *IEEE Comput. Softw. Appl. Conf. (COMPSAC'24)*. 746–754. doi:10.1109/COMPSAC61105.2024.00106

[Cat342] Anni Yuan, Chunming Zou, Yong Wang, and Jinming Hu. 2024. Multivariate Time Series Anomaly Detection Based on Time-Frequency Dynamic Analysis. In *IEEE Int. Conf. Commun. Circuits Syst. (ICCCAS'24)*. 375–379. doi:10.1109/ICCCAS62034.2024.10652754

[Cat343] X. Yuan, Ke Ning, K. Wei, Yan-Lin He, Qun-Xiong Zhu, Ming-Qing Zhang, Yi Luo, and Yang Zhang. 2024. A Hybrid MTS Anomaly Detection Method Based on Reconstruction and Adaptive Spatial-Temporal Graph Network. In *IEEE Data Driven Control Learn. Syst. Conf. (DDCLS'24)*. 263–267. doi:10.1109/DDCLS61622.2024.10606793

[Cat344] Zhihan Yue, Yujing Wang, Juanyong Duan, Tianmeng Yang, Congrui Huang, Yunhai Tong, and Bixiong Xu. 2022. TS2Vec: Towards Universal Representation of Time Series. In *Proc. AAAI Conf. Artif. Intell. (AAAI'22)*, Vol. 36. 8980–8987. doi:10.1609/aaai.v36i8.20881

[Cat345] Fanyu Zeng, Mengdong Chen, Cheng Qian, Yanyang Wang, Yijun Zhou, and Wenzhong Tang. 2023. Multivariate time series anomaly detection with adversarial transformer architecture in the Internet of Things. *Future Gener. Comput. Syst.* 144 (2023), 244–255.

[Cat346] Zefan Zeng, Jiugang Lei, Guang Jin, Chi Xu, and Lu Zhang. 2022. Detecting Anomalies in Satellite Telemetry Data based on Causal Multivariate Temporal Convolutional Network. In *IEEE Int. Conf. Big Data Artif. Intell. (BDAI'22)*. 63–74. doi:10.1109/BDAI56143.2022.9862616

[Cat347] Jun Zhan, Siqi Wang, Xiandong Ma, Chengkun Wu, Canqun Yang, Detian Zeng, and Shilin Wang. 2022. STGAT-MAD: Spatial-Temporal Graph Attention Network For Multivariate Time Series Anomaly Detection. In *IEEE Int. Conf. Acoust. Speech Signal Process. (ICASSP'22)*. 3568–3572. doi:10.1109/ICASSP43922.2022.9747274

[Cat348] Jun Zhan, Chengkun Wu, Xiandong Ma, Canqun Yang, Qiucheng Miao, and Shilin Wang. 2022. Abnormal vibration detection of wind turbine based on temporal convolution network and multivariate coefficient of variation. *Mech. Syst. Signal Process.* 174, Article 109082 (2022). doi:10.1016/j.ymssp.2022.109082

[Cat349] Jun Zhan, Chengkun Wu, Canqun Yang, Qiucheng Miao, and Xiandong Ma. 2024. HFN: Heterogeneous feature network for multivariate time series anomaly detection. *Inf. Sci.* 670, Article 120626 (2024). doi:10.1016/j.ins.2024.120626

[Cat350] Ang Zhang, Xiaoyong Zhao, and Lei Wang. 2021. CNN and LSTM based Encoder-Decoder for Anomaly Detection in Multivariate Time Series. In *IEEE Inf. Technol. Netw. Electron. Autom. Control Conf. (ITNEC'21)*, Vol. 5. 571–575. doi:10.1109/ITNEC52019.2021.9587207

[Cat351] Chuanlei Zhang, Yicong Li, Jie Li, Guixi Li, and Hui Ma. 2023. Multivariate Time Series Anomaly Detection Method Based on mTranAD. In *Adv. Intell. Comput. Technol. Appl. (ICIC'23) (LCNS, Vol. 14089)*. 52–63. doi:10.1007/978-981-99-4752-2_5

[Cat352] Chuxu Zhang, Dongjin Song, Yuncong Chen, Xinyang Feng, Cristian Lumezanu, Wei Cheng, Jingchao Ni, Bo Zong, Haifeng Chen, and Nitesh V Chawla. 2019. A deep neural network for unsupervised anomaly detection and diagnosis in multivariate time series data. In *Proc. AAAI Conf. Artif. Intell. (AAAI'19)*, Vol. 33. 1409–1416. doi:10.1609/aaai.v33i01.33011409

[Cat353] Chuanlei Zhang, Songlin Wu, Ming Gao, Yubo Li, Gongcheng Shi, Yicong Li, and Hui Ma. 2024. Anomaly Detection Method for Multivariate Time Series Data Based on BLTranAD. In *Adv. Intell. Comput. Technol. Appl. (ICIC'24) (LNCS, Vol. 14874)*. 16–26. doi:10.1007/978-981-97-5618-6_2

[Cat354] Chaoli Zhang, Tian Zhou, Qingsong Wen, and Liang Sun. 2022. TFAD: A Decomposition Time Series Anomaly Detection Architecture with Time-Frequency Analysis. In *Proc. ACM Int. Conf. Inf. Knowl. Manag. (CIKM'22)*. 2497–2507. doi:10.1145/3511808.3557470

[Cat355] Guangyao Zhang, Xin Gao, Lei Wang, Bing Xue, Shiyuan Fu, Jiahao Yu, Zijian Huang, and Xu Huang. 2022. Probabilistic autoencoder with multi-scale feature extraction for multivariate time series anomaly detection. *Appl. Intell.* 53, 12 (2022), 15855–15872. doi:10.1007/s10489-022-04324-3

[Cat356] Haitao Zhang, Yibo Wang, and Qilong Han. 2024. USTG:Multivariate Time Series Anomaly Detection via Unsupervised Spatial-Temporal Graph Learning. In *IEEE Int. Conf. Behav. Soc. Comput. (BESC'24)*. 1–6. doi:10.1109/BESC64747.2024.10780512

[Cat357] Hongwei Zhang, Yuanqing Xia, Tijin Yan, and Guiyang Liu. 2021. Unsupervised Anomaly Detection in Multivariate Time Series through Transformer-based Variational Autoencoder. In *IEEE Chin. Control Decis. Conf. (CCDC'21)*. 281–286. doi:10.1109/CCDC52312.2021.9601669

[Cat358] Jing Zhang, Chao Wang, Xianbo Zhang, and Zezhou Li. 2022. Multi-Attention Integrated Convolutional Network for Anomaly Detection of Time Series. In *IEEE Int. Conf. Comput. Autom. Eng. (ICCAE'22)*. 91–96. doi:10.1109/iccae55086.2022.9762449

[Cat359] Kai Zhang, Yushan Jiang, Lee Seversky, Chengtao Xu, Dahai Liu, and Houbing Song. 2021. Federated Variational Learning for Anomaly Detection in Multivariate Time Series. In *IEEE Int. Perform. Comput. Commun. Conf. (IPCCC'21)*. 1–9. doi:10.1109/IPCCC51483.2021.9679367

[Cat360] Kai Zhang, Chao Li, Qinmin Yang, Wei Lin, and Linsong Yuan. 2023. Segmentation-Based Adversarial Denoising Auto-Encoder for Anomaly Detection in Multivariate Time Series Data. In *IEEE Int. Conf. Inf. Sci. Technol. (ICIST'23)*. 608–615. doi:10.1109/ICIST59754.2023.10367117

[Cat361] Lianming Zhang, Wenji Bai, Xiaowei Xie, Liying Chen, and Pingping Dong. 2024. TMANomaly: Time-Series Mutual Adversarial Networks for Industrial Anomaly Detection. *IEEE Trans. Ind. Informat.* 20, 2 (2024), 2263–2271. doi:10.1109/TII.2023.3288226

[Cat362] Meixian Zhang, Xue Shi, Jiaxin Huang, Lide Su, and Yanan Zhang. 2024. DynTrackr: A Robust Two-Stage Framework with Attribute Enhancement for KPI Anomaly Detection. In *IEEE Int. Symp. Softw. Reliab. Eng. Workshops (ISSREW'24)*. 169–176. doi:10.1109/ISSREW63542.2024.00069

[Cat363] Rui Zhang, Juan Chen, Yujia Song, Wenyu Shan, Peng Chen, and Yunni Xia. 2023. An Effective Transformation-Encoding-Attention Framework for Multivariate Time Series Anomaly Detection in IoT Environment. *Mobile Netw. Appl.* 29, 5 (2023), 1551–1563. doi:10.1007/s11036-023-02204-9

[Cat364] Shuo Zhang, XiaoFei Chen, JiaYuan Chen, Qiao Jiang, and Hejiao Huang. 2020. Anomaly Detection of Periodic Multivariate Time Series under High Acquisition Frequency Scene in IoT. In *IEEE Int. Conf. Data Min. Workshops (ICDMW'20)*. 543–552. doi:10.1109/ICDMW51313.2020.00078

[Cat365] Shipeng Zhang and Jing Liu. 2023. Multivariate Time Series Anomaly Detection Based on Graph Neural Network for Big Data Scheduling System. In *Web Inf. Syst. Eng. (WISE'23) (LNCS, Vol. 14306)*. 791–800. doi:10.1007/978-981-99-7254-8_61

[Cat366] Wei Zhang, Ping He, Ting Li, Fan Yang, and Ying Liu. 2023. A Memory-Guided Anomaly Detection Model with Contrastive Learning for Multivariate Time Series. *Comput. Mater. Continua* 77, 2 (2023), 1893–1910. doi:10.32604/cmc.2023.044253

[Cat367] Wei Zhang, Ping He, Chuntian Qin, Fan Yang, and Ying Liu. 2024. A graph attention network-based model for anomaly detection in multivariate time series. *J. Supercomput.* 80, 6 (2024), 8529–8549. doi:10.1007/s11227-023-05772-5

[Cat368] Weishan Zhang, Yuqian Wang, Leiming Chen, Yong Yuan, Xingjie Zeng, Liang Xu, and Hongwei Zhao. 2023. Dynamic Circular Network-Based Federated Dual-View Learning for Multivariate Time Series Anomaly Detection. *Bus. Inf. Syst. Eng.* 66, 1 (2023), 19–42. doi:10.1007/s12599-023-00825-8

[Cat369] Wei Zhang, Jiaqi Xu, Yihan Liu, and Meijuan Yang. 2024. Anomaly Identification of Flight Test Time Series Data Based on Improved LSTM. In *IEEE Int. Conf. Electr. Mech. Comput. Eng. (ICEMCE'24)*. 1044–1050. doi:10.1109/icemce64157.2024.10862782

[Cat370] Weiqi Zhang, Chen Zhang, and Fugee Tsung. 2022. GRELEN: Multivariate Time Series Anomaly Detection from the Perspective of Graph Relational Learning. In *Proc. Int. Jt. Conf. Artif. Intell. (IJCAI'22)*. 2390–2397. doi:10.24963/ijcai.2022/332

[Cat371] Xiaoxia Zhang, Shang Shi, HaiChao Sun, Degang Chen, Guoyin Wang, and Kesheng Wu. 2024. ACVAE: A novel self-adversarial variational auto-encoder combined with contrast learning for time series anomaly detection. *Neural Netw.* 171 (2024), 383–395. doi:10.1016/j.neunet.2023.12.023

[Cat372] Xianbo Zhang, Chao Wang, Jing Zhang, Feng Lin, and Zezhou Li. 2022. Attention Based CNN-LSTM Network for Anomaly Pattern Classification of Multivariate Time Series. In *IEEE Data Driven Control Learn. Syst. Conf. (DDCLS'22)*. 1015–1020. doi:10.1109/ddcls55054.2022.9858500

[Cat373] Xiao Zhang, Shuqing Xu, Huashan Chen, Zekai Chen, Fuzhen Zhuang, Hui Xiong, and Dongxiao Yu. 2024. Rethinking Robust Multivariate Time Series Anomaly Detection: A Hierarchical Spatio-Temporal Variational Perspective. *IEEE Trans. Knowl. Data Eng.* 36, 12 (2024), 9136–9149. doi:10.1109/TKDE.2024.3466291

[Cat374] Xianbo Zhang, Jing Zhang, Chao Wang, Feng Lin, and Zezhou Li. 2022. CANet: Convolutional Attention-based Network for Multivariate Time Series Anomaly Detection. In *IEEE Int. Conf. Intell. Comput. Signal Process. (ICSP'22)*. 1625–1630. doi:10.1109/icsp54964.2022.9778305

[Cat375] Xiang Zhang, Ziyuan Zhao, Theodoros Tsiligkaridis, and Marinka Zitnik. 2022. Self-Supervised Contrastive Pre-Training For Time Series via Time-Frequency Consistency. In *Adv. Neural Inf. Process. Syst. (NeurIPS'22)*, Vol. 35. 3988–4003. https://papers.nips.cc/paper_files/paper/2022/hash/194b8dac525581c346e30a2cebe9a369-Abstract-Conference.html

[Cat376] Yuxin Zhang, Yiqiang Chen, Jindong Wang, and Zhiwen Pan. 2023. Unsupervised Deep Anomaly Detection for Multi-Sensor Time-Series Signals. *IEEE Trans. Knowl. Data Eng.* 35, 2 (2023), 2118–2132. doi:10.1109/TKDE.2021.3102110

[Cat377] Yong Zhang, Bingjie Li, and Xinqi Zhang. 2023. Deep Learning-Based Anomaly Detection for Time-Series Data in Industrial Control Systems. In *IEEE Chin. Control Conf. (CCC'23)*. 8825–8829. doi:10.23919/CCC58697.2023.10241095

[Cat378] Yuxin Zhang, Jindong Wang, Yiqiang Chen, Han Yu, and Tao Qin. 2023. Adaptive Memory Networks With Self-Supervised Learning for Unsupervised Anomaly Detection. *IEEE Trans. Knowl. Data Eng.* 35, 12 (2023), 12068–12080. doi:10.1109/tkde.2021.3139916

[Cat379] Zhe Zhang, Yuhao Chen, Huixue Wang, Qiming Fu, Jianping Chen, and You Lu. 2023. Anomaly detection method for building energy consumption in multivariate time series based on graph attention mechanism. *PLOS ONE* 18, 6, Article e0286770 (2023). doi:10.1371/journal.pone.0286770

[Cat380] Zhen Zhang, Zhiqiang Geng, and Yongming Han. 2024. Graph Structure Change-Based Anomaly Detection in Multivariate Time Series of Industrial Processes. *IEEE Trans. Ind. Informat.* 20, 4 (2024), 6457–6466. doi:10.1109/TII.2023.3347000

[Cat381] Zhijie Zhang, Wenzhong Li, Wangxiang Ding, Linming Zhang, Qingning Lu, Peng Hu, Tong Gui, and Sanglu Lu. 2023. STAD-GAN: Unsupervised Anomaly Detection on Multivariate Time Series with Self-training Generative Adversarial Networks. *ACM Trans. Knowl. Discov. Data* 17, 5, Article 71 (2023), 18 pages. doi:10.1145/3572780

[Cat382] Ze Zhang, Yue Yao, Windo Hutabarat, Michael Farnsworth, Divya Tiwari, and Ashutosh Tiwari. 2024. Time Series Anomaly Detection in Vehicle Sensors Using Self-Attention Mechanisms. *IEEE Trans. Intell. Transp. Syst.* 25, 11 (2024), 15964–15976. doi:10.1109/TITS.2024.3415435

[Cat383] Binjie Zhao, Jiahao Nie, Siwei Guan, Han Wang, Zhiwei He, and Mingyu Gao. 2022. Hierarchical Feature Fusion based Reconstruction Network for Unsupervised Anomaly Detection. In *IEEE Int. Conf. Emerg. Technol. Fact. Autom. (ETFA'22)*. 1–6. doi:10.1109/ETFA52439.2022.9921590

[Cat384] Hang Zhao, Yujing Wang, Juanyong Duan, Congrui Huang, Defu Cao, Yunhai Tong, Bixiong Xu, Jing Bai, Jie Tong, and Qi Zhang. 2020. Multivariate Time-Series Anomaly Detection via Graph Attention Network. In *IEEE Int. Conf. Data Min. (ICDM'20)*. 841–850. doi:10.1109/ICDM50108.2020.00093

[Cat385] Mengjie Zhao and Olga Fink. 2024. DyEdgeGAT: Dynamic Edge via Graph Attention for Early Fault Detection in IIoT Systems. *IEEE Internet Things J.* 11, 13 (2024), 22950–22965. doi:10.1109/JIOT.2024.3381002

[Cat386] Mengmeng Zhao, Haipeng Peng, Lixiang Li, and Yeqing Ren. 2024. Graph Attention Network and Informer for Multivariate Time Series Anomaly Detection. *Sensors* 24, 5, Article 1522 (2024). doi:10.3390/s24051522

[Cat387] Mengmeng Zhao, Haipeng Peng, Lixiang Li, and Yeqing Ren. 2024. Multivariate Time Series Anomaly Detection Based on Spatial-Temporal Network and Transformer in Industrial Internet of Things. *Comput. Mater. Contin.* 80, 2 (2024), 2815–2837. doi:10.32604/cmc.2024.053765

[Cat388] Peihai Zhao, Xiaoyan Chang, and Mimi Wang. 2021. A Novel Multivariate Time-Series Anomaly Detection Approach Using an Unsupervised Deep Neural Network. *IEEE Access* 9 (2021), 109025–109041. doi:10.1109/access.2021.3101844

[Cat389] Tianzi Zhao, Liang Jin, Xiaofeng Zhou, Shuai Li, Shurui Liu, and Jiang Zhu. 2023. Unsupervised Anomaly Detection Approach Based on Adversarial Memory Autoencoders for Multivariate Time Series. *Comput. Mater. Contin.* 76, 1 (2023), 329–346. doi:10.32604/cmc.2023.038595

[Cat390] Xiaonan Zhao, Wenchao Chen, Qingshan Yin, Benqiang Wang, Zhiyun Li, and Jianhua Wang. 2022. Bidirectional Deep Variational RNN for Refining Anomaly Detection of Multivariate Time Series. In *IEEE Jt. Int. Inf. Technol. & Artif. Intell. Conf. (ITAIC'22)*, Vol. 10. 1504–1509. doi:10.1109/ITAIC54216.2022.9836567

[Cat391] Xigang Zhao, Peng Liu, Saïd Mahmoudi, Sahil Garg, Georges Kaddoum, and Mohammad Mehedi Hassan. 2024. DDANF: Deep denoising autoencoder normalizing flow for unsupervised multivariate time series anomaly detection. *Alex. Eng. J.* 108 (2024), 436–444. doi:10.1016/j.aej.2024.07.013

[Cat392] Bolong Zheng, Lingfeng Ming, Kai Zeng, Mengtao Zhou, Xinyong Zhang, Tao Ye, Bin Yang, Xiaofang Zhou, and Christian S. Jensen. 2024. Adversarial Graph Neural Network for Multivariate Time Series Anomaly Detection. *IEEE Trans. Knowl. Data Eng.* 36, 12 (2024), 7612–7626. doi:10.1109/TKDE.2024.3419891

[Cat393] Jiuhao Zheng, Jiangyong Duan, Ke Zhang, and Zhongsong Ma. 2024. Multi-Scale Deep Convolutional Time Series Anomaly Detection Based on Correlation Matrix. In *IEEE Int. Symp. Comput. Inf. Process. Technol. (ISCIPT'24)*. 613–617. doi:10.1109/iscipt61983.2024.10672758

[Cat394] Minglei Zheng, Junfeng Man, Dian Wang, Yanan Chen, Qianqian Li, and Yong Liu. 2023. Semi-supervised multivariate time series anomaly detection for wind turbines using generator SCADA data. *Reliab. Eng. Syst. Saf.* 235, Article 109235 (2023). doi:10.1016/j.ress.2023.109235

[Cat395] Weihong Zheng. 2022. Anomaly detection of multivariate industrial sensing data based on graph attention network. In *IEEE Int. Conf. Smart City Informat. (iSCI'22)*. 14–21. doi:10.1109/iSCI57775.2022.00012

[Cat396] Yu Zheng, Huan Yee Koh, Ming Jin, Lianhua Chi, Khoa T. Phan, Shirui Pan, Yi-Ping Phoebe Chen, and Wei Xiang. 2024. Correlation-Aware Spatial–Temporal Graph Learning for Multivariate Time-Series Anomaly Detection. *IEEE Trans. Neural Netw. Learn. Syst.* 35, 9 (2024), 11802–11816. doi:10.1109/TNNLS.2023.3325667

[Cat397] Yu Zheng, Huan Yee Koh, Ming Jin, Lianhua Chi, Haishuai Wang, Khoa T. Phan, Yi-Ping Phoebe Chen, Shirui Pan, and Wei Xiang. 2024. Graph spatiotemporal process for multivariate time series anomaly detection with missing values. *Inf. Fusion* 106, Article 102255 (2024). doi:10.1016/j.inffus.2024.102255

[Cat398] Bin Zhou, Shenghua Liu, Bryan Hooi, Xueqi Cheng, and Jing Ye. 2019. BeatGAN: anomalous rhythm detection using adversarially generated time series. In *Proc. Int. Jt. Conf. Artif. Intell. (IJCAI'19)*. 4433–4439. doi:10.24963/ijcai.2019/616

[Cat399] Hao Zhou, Ke Yu, Xuan Zhang, Guanlin Wu, and Anis Yazidi. 2022. Contrastive autoencoder for anomaly detection in multivariate time series. *Inf. Sci.* 610 (2022), 266–280. doi:10.1016/j.ins.2022.07.179

[Cat400] Liwen Zhou, Qingkui Zeng, and Bo Li. 2022. Hybrid Anomaly Detection via Multihead Dynamic Graph Attention Networks for Multivariate Time Series. *IEEE Access* 10 (2022), 40967–40978. doi:10.1109/ACCESS.2022.3167640

[Cat401] Qihang Zhou, Jiming Chen, Haoyu Liu, Shibo He, and Wenchao Meng. 2023. Detecting multivariate time series anomalies with zero known label. In *Proc. AAAI Conf. Artif. Intell. (AAAI'23)*, Vol. 37. 4963–4971. doi:10.1609/aaai.v37i4.25623

[Cat402] Xiaobo Zhou, Cuini Dai, Weixu Wang, and Tie Qiu. 2024. Global–Local Association Discrepancy for Multivariate Time Series Anomaly Detection in IIoT. *IEEE Internet of Things J.* 11, 7 (2024), 11287–11297. doi:10.1109/JIOT.2023.3330696

[Cat403] Xiaohui Zhou, Yijie Wang, Hongzuo Xu, Mingyu Liu, and Ruyi Zhang. 2023. Local-Adaptive Transformer for Multivariate Time Series Anomaly Detection and Diagnosis. In *IEEE Int. Conf. Syst. Man Cybern. (SMC'23)*. 89–95. doi:10.1109/SMC53992.2023.10394229

[Cat404] Yuanlin Zhou, Yingxuan Song, and Mideng Qian. 2021. Unsupervised Anomaly Detection Approach for Multivariate Time Series. In *IEEE Int. Conf. Softw. Qual. Reliab. Secur. Companion (QRS-C'21)*. 229–235. doi:10.1109/QRS-C55045.2021.00042

[Cat405] Yikui Zhou, Jie Wang, Junnan Tang, Chao Gou, Zigui Jiang, Dan Li, and See-Kiong Ng. 2023. MP-GAN: Cyber-Attack Detection and Localization for Cyber-Physical Systems with Multi-Process Generative Adversarial Networks*. In *IEEE Int. Conf. Artif. Intell. Things Syst. (AIoTSys'23)*. 186–193. doi:10.1109/AIoTSys58602.2023.00049

[Cat406] Guangyu Zhu, Yuchun Guo, and Yishuai Chen. 2024. MN-GAT: Incorporating Metric Names into Metric Correlation Graphs for Anomaly Detection. In *IEEE World Conf. Comput. Commun. Technol. (WCCCT'24)*. 98–103. doi:10.1109/WCCCT60665.2024.10541442

[Cat407] Guowei Zhu, Hexiao Zhou, Xinyuan Wang, and Qingchun Wang. 2024. Anomaly Detection for Coal-fired Boiler via Adversarial VAE Based Method. In *IEEE Int. Conf. Mobil. Sens. Netw. (MSN'24)*. 1074–1081. doi:10.1109/msn63567.2024.00148

[Cat408] Wei Zhu, Weijian Li, E. Ray Dorsey, and Jiebo Luo. 2023. Unsupervised anomaly detection by densely contrastive learning for time series data. *Neural Netw.* 168 (2023), 450–458. doi:10.1016/j.neunet.2023.09.038

[Cat409] Chunming Zou, Anni Yuan, and Jinming Hu. 2024. BiLSTM-Based Anomaly Detection in Multivariate Time Series with Attention Mechanism and Dual Analysis. In *IEEE Int. Conf. Inf. Syst. Comput. Aided Educ. (ICISCAE'24)*. 379–384. doi:10.1109/ICISCAE62304.2024.10761506

12 Selected Reviews or Evaluation Papers (2019-2024)

[Rev1] Julien Audibert, Pietro Michiardi, Frédéric Guyard, Sébastien Marti, and Maria A. Zuluaga. 2022. Do deep neural networks contribute to multivariate time series anomaly detection? *Pattern Recognit.* 132, Article 108945 (2022). doi:10.1016/j.patcog.2022.108945

[Rev2] Mohammed Ayalew Belay, Sindre Stenen Blakseth, Adil Rasheed, and Pierluigi Salvo Rossi. 2023. Unsupervised Anomaly Detection for IoT-Based Multivariate Time Series: Existing Solutions, Performance Analysis and Future Directions. *Sensors* 23, 5, Article 2844 (2023). doi:10.3390/s23052844

[Rev3] Kukjin Choi, Jihun Yi, Changhwa Park, and Sungroh Yoon. 2021. Deep Learning for Anomaly Detection in Time-Series Data: Review, Analysis, and Guidelines. *IEEE Access* 9 (2021), 120043–120065. doi:10.1109/ACCESS.2021.3107975

[Rev4] Lucas Correia, Jan-Christoph Goos, Philipp Klein, Thomas Bäck, and Anna V. Kononova. 2024. Online model-based anomaly detection in multivariate time series: Taxonomy, survey, research challenges and future directions. *Eng. Appl. Artif. Intell.* 138, Article 109323 (2024). doi:10.1016/j.engappai.2024.109323

[Rev5] Daniel Fährmann, Laura Martín, Luis Sánchez, and Naser Damer. 2024. Anomaly Detection in Smart Environments: A Comprehensive Survey. *IEEE Access* 12 (2024), 64006–64049. doi:10.1109/ACCESS.2024.3395051

[Rev6] Astha Garg, Wenyu Zhang, Jules Samaran, Ramasamy Savitha, and Chuan-Sheng Foo. 2022. An Evaluation of Anomaly Detection and Diagnosis in Multivariate Time Series. *IEEE Trans. Neural Netw. Learn. Syst.* 33, 6 (2022), 2508–2517. doi:10.1109/tnnls.2021.3105827

[Rev7] Dongwen Li, Shenglin Zhang, Yongqian Sun, Yang Guo, Zeyu Che, Shiqi Chen, Zhenyu Zhong, Minghan Liang, Minyi Shao, Mingjie Li, Shuyang Liu, Yuzhi Zhang, and Dan Pei. 2023. An Empirical Analysis of Anomaly Detection Methods for Multivariate Time Series. In *IEEE Int. Symp. Softw. Reliab. Eng. (ISSRE'23)*. 57–68. doi:10.1109/issre59848.2023.00014

[Rev8] Gen Li and Jason J. Jung. 2023. Deep learning for anomaly detection in multivariate time series: Approaches, applications, and challenges. *Inf. Fusion* 91 (2023), 93–102. doi:10.1016/j.inffus.2022.10.008

[Rev9] Moussab Orabi, Kim Phuc Tran, Sébastien Thomassey, and Philip Egger. 2024. Anomaly Detection for Catalyzing Operational Excellence in Complex Manufacturing Processes: A Survey and Perspective. In *Artificial Intelligence for Safety and Reliability Engineering: Methods, Applications, and Challenges (Springer Series in Reliability Engineering)*. 49–78. doi:10.1007/978-3-031-71495-5_4

[Rev10] Sebastian Schmidl, Phillip Wenig, and Thorsten Papenbrock. 2022. Anomaly detection in time series: a comprehensive evaluation. *Proc. VLDB Endow.* 15, 9 (2022), 1779–1797. doi:10.14778/3538598.3538602

[Rev11] Usman Ahmad Usmani, Izzatdin Abdul Aziz, Jafreezal Jaafar, and Junzo Watada. 2024. Deep Learning for Anomaly Detection in Time-Series Data: An Analysis of Techniques, Review of Applications, and Guidelines for Future Research. *IEEE Access* 12 (2024), 174564–174590. doi:10.1109/access.2024.3495819

[Rev12] Zahra Zamanzadeh Darban, Geoffrey I. Webb, Shirui Pan, Charu Aggarwal, and Mahsa Salehi. 2024. Deep Learning for Time Series Anomaly Detection: A Survey. *Comput. Surveys* 57, 1, Article 15 (2024), 42 pages. doi:10.1145/3691338

190 Validation Papers (2025)

[Val1] S. Abilasha and Sahely Bhadra. 2025. Warping resilient robust anomaly detection for multivariate time series. *Mach. Learn.* 114, 2, Article 29 (2025). doi:10.1007/s10994-024-06689-7

[Val2] Yilixiati Abudurexiti, Guangjie Han, Fan Zhang, and Li Liu. 2025. An explainable unsupervised anomaly detection framework for Industrial Internet of Things. *Comput. Secur.* 148, Article 104130 (2025). doi:10.1016/j.cose.2024.104130

[Val3] Kartik Aggarwal, Kella Sowmya, and K. Ramesh. 2025. DASTAD: Dual Aspect Self-supervised Transformer-based Anomaly Detection in Multivariate Time-Series. *Arab. J. Sci. Eng.* (2025). doi:10.1007/s13369-025-10300-z

[Val4] Sarah Alnegheimish, Zelin He, Matthew Reimherr, Akash Chandrayan, Abhinav Pradhan, and Luca D'Angelo. 2025. M^2AD: Multi-Sensor Multi-System Anomaly Detection through Global Scoring and Calibrated Thresholding. In *Int. Conf. Artif. Intell. Stat. (AISTATS'25)*, Vol. 258. 4384–4392. https://proceedings.mlr.press/v258/alnegheimish25a.html

[Val5] Saba Arshad, Minho Ha, and Tae-Hyoung Park. 2025. STAD: Self-Supervised Transformer for Anomaly Detection in Multi-Variate Time Series Data. *IEEE Access* 13 (2025), 178006–178020. doi:10.1109/ACCESS.2025.3616597

[Val6] Md Abul Bashar and Richi Nayak. 2025. ALGAN: Time Series Anomaly Detection with Adjusted-LSTM GAN. *Int. J. Data Sci. Anal.* 20, 6 (2025), 5719–5737. doi:10.1007/s41060-025-00810-2

[Val7] Mohammed Ayalew Belay, Adil Rasheed, and Pierluigi Salvo Rossi. 2025. Autoregressive Density Estimation Transformers for Multivariate Time Series Anomaly Detection. In *IEEE Int. Conf. Acoust. Speech Signal Process. (ICASSP'25)*. 1–5. doi:10.1109/ICASSP49660.2025.10888728

[Val8] Mohammed Ayalew Belay, Adil Rasheed, and Pierluigi Salvo Rossi. 2025. Sparse Non-Linear Vector Autoregressive Networks for Multivariate Time Series Anomaly Detection. *IEEE Signal Process. Lett.* 32 (2025), 331–335. doi:10.1109/lsp.2024.3520019

[Val9] Mehdi Boudjelli, Sihem Cherrared, Pedro B. Velloso, Xiaofeng Huang, Fabrice Guillemin, and Stefano Secci. 2025. DREAM: Dual foREcAsting Model for Network Anomaly Detection. In *IEEE Netw. Oper. Manag. Symp. (NOMS'25)*. 1–7. doi:10.1109/NOMS57970.2025.11073605

[Val10] Roberto Canonico, Francesco Lista, Annalisa Navarro, Giancarlo Sperlí, and Andrea Vignali. 2025. Threat detection in reconfigurable Cyber–Physical Systems through Spatio-Temporal Anomaly Detection using graph attention network. *Comput. Secur.* 156, Article 104509 (2025). doi:10.1016/j.cose.2025.104509

[Val11] Guoyan Cao, Yue Wu, Dengxiu Yu, and Zhen Wang. 2025. Attack Detection and Location Using State Forecasting in Multivariate Time Series of ICS. *IEEE Trans. Netw. Sci. Eng.* 12, 4 (2025), 2989–3001. doi:10.1109/TNSE.2025.3555764

[Val12] Jiazhen Chen, Mingbin Feng, and Tony S. Wirjanto. 2025. Prospective Multi-Graph Cohesion for Multivariate Time Series Anomaly Detection. In *Proc. ACM Int. Conf. Web Search Data Min. (WSDM'25)*. 98–106. doi:10.1145/3701551.3703494

[Val13] Lingli Chen, Xin Gao, Jing Liu, Yunkai Zhang, Xinping Diao, Taizhi Wang, Jiawen Lu, and Zhihang Meng. 2025. A multivariate time series anomaly detection method with Multi-Grain Dynamic Receptive Field. *Knowl.-Based Syst.* 309, Article 112768 (2025). doi:10.1016/j.knosys.2024.112768

[Val14] Ting Chen, Xinyue Ren, Jinzhou Lai, Hongming Tan, Fangming Liu, and Wai Kin Victor Chan. 2025. Toward Transformer-compatible multivariate time series learning via visibility graph-based structural encoding. *Knowl.-Based Syst.* 329, Article 114389 (2025). doi:10.1016/j.knosys.2025.114389

[Val15] Tingyang Chen, Bolong Zheng, Shuncheng Liu, Zhujiong Fan, Zhi Xu, Lingsen Yan, Kai Zeng, Tao Ye, and Xiaofang Zhou. 2025. Compatible Unsupervised Anomaly Detection with Multi-Perspective Spatio-Temporal Learning. In *IEEE Int. Conf. Data Eng. (ICDE'25)*. 4066–4078. doi:10.1109/icde65448.2025.00303

[Val16] Xiangling Chen, Xiaorui Huang, and Ruliang Xiao. 2025. LHR-STD: Learning Heterogeneous Representations through Spatiotemporal Decoupling. In *IEEE Int. Conf. Electron. Commun. Artif. Intell. (ICECAI'25)*. 703–707. doi:10.1109/ICECAI66283.2025.11170480

[Val17] Xiao Chen, Tongxiang Li, Zuozuo Ma, Jing Chen, Jingfeng Guo, and Zhiliang Liu. 2025. CiTranGAN: Channel-Independent Based-Anomaly Detection for Multivariate Time Series Data. *Electronics* 14, 9, Article 1857 (2025). doi:10.3390/electronics14091857

[Val18] Xiangling Chen, Weifu Zhu, Zhixia Zeng, Zhipeng Qiu, and Ruliang Xiao. 2025. Anomaly Detection Model Based on Anomaly Representation Reinforcement and Path Iterative Modeling. *Concurr. Comput.: Pract. Exp.* 37, 21–22, Article e70245 (2025). doi:10.1002/cpe.70245

[Val19] Ziwei Chen, Jianjian Jiang, Xiangmin Luo, Fangyuan Lei, Xiaochen Yuan, and Jin Zhan. 2025. Dual-channel hypergraph networks in the time–frequency domain for learning advanced spatiotemporal dependencies in multivariate time series. *Neurocomputing* 648, Article 130600 (2025). doi:10.1016/j.neucom.2025.130600

[Val20] Qisen Cheng, Kaushik Balakrishnan, Zhihong Pan, Yunyoung Kyung, Younggil Jin, and Jaewon Kim. 2025. Automated Malfunction Detection for Robotic Arms in Panel Manufacturing Using Deep Latent State Space Model. *SID Symp. Dig. Techn. Pap.* 56, 1 (2025), 274–277. doi:10.1002/sdtp.18143

[Val21] Yucheol Cho, Jae-Hyeok Lee, Gyeongdo Ham, Donggon Jang, and Dae-shik Kim. 2025. Generality-aware self-supervised transformer for multivariate time series anomaly detection. *Appl. Intell.* 55, 7, Article 604 (2025). doi:10.1007/s10489-025-06481-7

[Val22] Yeji Choi, Kwanghoon Sohn, and Ig-Jae Kim. 2025. Dual Transformers With Latent Amplification for Multivariate Time Series Anomaly Detection. *IEEE Access* 13 (2025), 136433–136445. doi:10.1109/ACCESS.2025.3594473

[Val23] Rémi Cogranne, Marius Letourneau, and Guillaume Doyen. 2025. A Hybrid Autoencoder–Transformer Model for Detection of Attacks on Low Latency Services. In *IEEE Int. Conf. Adv. Mach. Learn. Data Sci. (AMLDS'25)*. 839–844. doi:10.1109/AMLDS63918.2025.11159464

[Val24] Lorenzo Colombi, Michela Vespa, Nicolas Belletti, Matteo Brina, Simon Dahdal, Filippo Tabanelli, Francesco Resca, Elena Bellodi, Mauro Tortonesi, Cesare Stefanelli, and Massimiliano Vignoli. 2025. Embedding Models for Multivariate Time Series Anomaly Detection in Industry 5.0. *Data Sci. Eng.* (2025). doi:10.1007/s41019-025-00295-w

[Val25] Kai Cui, Liangbin Gao, Xianjun Deng, Shenghao Liu, Lingzhi Yi, Shibo He, and Hongwei Lu. 2025. Multiview Spatial–Temporal Interaction Attention- Based Multivariate Time Series Anomaly Detection for Distributed Industrial Control Networks. *IEEE Trans. Netw.* (2025), 1–15. doi:10.1109/TON.2025.3614179

[Val26] Zhe Cui, Di Zang, Junqi Zhang, and Keshuang Tang. 2025. MGCL: Multiorder Graph Neural Network With Cross-Learning for Multivariate Time-Series Anomaly Detection. *IEEE Trans. Instrum. Meas.* 74 (2025), 1–14. doi:10.1109/tim.2025.3577826

[Val27] Zahra Zamanzadeh Darban, Geoffrey I. Webb, Shirui Pan, Charu C. Aggarwal, and Mahsa Salehi. 2025. CARLA: Self-supervised contrastive representation learning for time series anomaly detection. *Pattern Recognit.* 157, Article 110874 (2025). doi:10.1016/j.patcog.2024.110874

[Val28] Zahra Zamanzadeh Darban, Yiyuan Yang, Geoffrey I. Webb, Charu C. Aggarwal, Qingsong Wen, Shirui Pan, and Mahsa Salehi. 2025. DACAD: Domain Adaptation Contrastive Learning for Anomaly Detection in Multivariate Time Series. *IEEE Trans. Knowl. Data Eng.* 37, 8 (2025), 4485–4496. doi:10.1109/tkde.2025.3569909

[Val29] Da Ding, Youquan Wang, Haicheng Tao, Jia Wu, and Jie Cao. 2025. A Dual-Discriminator Generative Adversarial Network for Anomaly Detection. *IEEE Trans. Neural Netw. Learn. Syst.* 36, 10 (2025), 19285–19296. doi:10.1109/TNNLS.2025.3585978

[Val30] Xianghua Ding, Jingnan Wang, Yiqi Liu, and Uk Jung. 2025. Multivariate Time Series Anomaly Detection Using Working Memory Connections in Bi-Directional Long Short-Term Memory Autoencoder Network. *Appl. Sci.* 15, 5, Article 2861 (2025). doi:10.3390/app15052861

[Val31] Shuaibo Dong, Shibao Sun, and Pengcheng Zhao. 2025. Deep Learning with Multi-Attention for Unsupervised Industrial Anomaly Detection. In *IEEE Int. Conf. Artif. Intell. Electromech. Autom. (AIEA'25)*. 5–8. doi:10.1109/AIEA66061.2025.11159669

[Val32] Hui Dou, Pengcheng Shi, Yiwen Zhang, Pengfei Chen, and Zibin Zheng. 2025. DeAnomaly: Anomaly Detection for Multivariate Time Series Using Robust Decomposition and Memory-Augmented Diffusion Models. *IEEE Trans. Instrum. Meas.* 74 (2025), 1–14. doi:10.1109/tim.2025.3570337

[Val33] Xin Du, Chunjie Zhou, Yu-Chu Tian, and Jing Xie. 2025. Data-augmented robust multivariate anomaly detection for industrial cyber-physical systems with incomplete features. *Int. J. Mach. Learn. & Cyber.* 16, 11 (2025), 8661–8686. doi:10.1007/s13042-025-02700-2

[Val34] Xing Fang, Yuanfang Chen, Zakirul Alam Bhuiyan, Xiajun He, Guangxu Bian, Noel Crespi, and Xiaoyuan Jing. 2025. Mixer-transformer: Adaptive anomaly detection with multivariate time series. *J. Netw. Comput. Appl.* 241, Article 104216 (2025). doi:10.1016/j.jnca.2025.104216

[Val35] Chen Feng, Jun Fan, Guang Jin, Jintao Liu, and Siya Chen. 2025. STE-RS: A novel framework for robust anomaly detection in UAV flight data. *Results Eng.* 27, Article 106801 (2025). doi:10.1016/j.rineng.2025.106801

[Val36] Chen Feng, Jun Fan, Zhiliang Liu, Guang Jin, and Siya Chen. 2025. Unmanned Aerial Vehicle Anomaly Detection Based on Causality-Enhanced Graph Neural Networks. *Drones* 9, 6, Article 408 (2025). doi:10.3390/drones9060408

[Val37] Yuye Feng and Yongfeng Niu. 2025. Time Series Anomaly Detection via Reconstruction-Limited Probability Estimation. In *Pattern Recognit. Artif. Intell. (ICPRAI'24) (LNCS, Vol. 14892)*. 447–461. doi:10.1007/978-981-97-8702-9_30

[Val38] Cong Gao, Hongye Ma, Qingqi Pei, and Yanping Chen. 2025. Dynamic graph-based graph attention network for anomaly detection in industrial multivariate time series data. *Appl. Intell.* 55, 7, Article 517 (2025). doi:10.1007/s10489-025-06412-6

[Val39] Huangyining Gao, Ruyue Xin, Peng Chen, Xi Li, Ning Lu, and Peng You. 2025. Memory-augment graph transformer based unsupervised detection model for identifying performance anomalies in highly-dynamic cloud environments. *J. Cloud Comp.* 14, 1, Article 40 (2025). doi:10.1186/s13677-025-00766-5

[Val40] Rong Gao, Jiming Wang, Yonghong Yu, Jia Wu, and Li Zhang. 2025. Enhanced graph diffusion learning with dynamic transformer for anomaly detection in multivariate time series. *Neurocomputing* 619, Article 129168 (2025). doi:10.1016/j.neucom.2024.129168

[Val41] Yu Gao, Jin Qi, Hongjiang Ye, Ying Sun, Xiaoxuan Hu, Zhenjiang Dong, and Yanfei Sun. 2025. Variational Graph Attention Networks With Self-Supervised Learning for Multivariate Time Series Anomaly Detection. *IEEE Trans. Instrum. Meas.* 74 (2025), 1–13. doi:10.1109/tim.2024.3502890

[Val42] Yao Gao, Rui Su, Xianye Ben, and Lei Chen. 2025. EST transformer: enhanced spatiotemporal representation learning for time series anomaly detection. *J. Intell. Inf. Syst.* 63, 3 (2025), 783–805. doi:10.1007/s10844-025-00918-8

[Val43] Wang Ge, Lv Congyue, and Xing Shiwang. 2025. Multivariate Time Series Anomaly Detection in Cyber Security Systems via Stein Discrepancy. In *IEEE Int. Wirel. Commun. Mob. Comput. Conf. (IWCMC'25)*. 961–966. doi:10.1109/IWCMC65282.2025.11059531

[Val44] Yongli Gu, Xiang Yan, Hanlin Qin, Naveed Akhtar, Shuai Yuan, Honghao Fu, Shuowen Yang, and Ajmal Mian. 2025. HDTCNet: A hybrid-dimensional convolutional network for multivariate time series classification. *Pattern Recognit.* 168, Article 111837 (2025). doi:10.1016/j.patcog.2025.111837

[Val45] A. Guan, Ch. Zhu, L. Kong, Y. Nan, P. Lu, Sh. Liu, and Y. Zhao. 2025. Anomaly Detection Method for Meteorological Data Based on Neural Networks. *Russ. Meteorol. Hydrol.* 50, 2 (2025), 102–114. doi:10.3103/s1068373924600338

[Val46] Qingrui Guo, Shuangwu Chen, Dong Jin, and Yao Chen. 2025. Anomaly Detection Based on Graph Attention Networks in Semiconductor Manufacturing Processes. In *IEEE Int. Conf. Artif. Intell. Electromech. Autom. (AIEA'25)*. 32–37. doi:10.1109/AIEA66061.2025.11160592

[Val47] Tae Wook Ha and Myoung Ho Kim. 2025. Multivariate Time Series Anomaly Detection Using Directed Hypergraph Neural Networks. *Appl. Artif. Intell.* 39, 1 (2025). doi:10.1080/08839514.2025.2538519

[Val48] Shinwoo Ham, Hyuntaek Jung, and Eun Yi Kim. 2025. Enhancing Multivariate Time Series Anomaly Detection With 2D Spatial Representations and Channel Attention. *IEEE Signal Process. Lett.* 32 (2025), 4094–4098. doi:10.1109/LSP.2025.3619873

[Val49] Wajdi Hammami, Soumaya Cherkaoui, and Shengrui Wang. 2025. Enhancing Network Anomaly Detection with Quantum GANs and Successive Data Injection for Multivariate Time Series. In *IEEE Int. Wirel. Commun. Mob. Comput. Conf. (IWCMC'25)*. 1667–1672. doi:10.1109/iwcmc65282.2025.11059562

[Val50] Junfeng Hao, Peng Chen, Juan Chen, and Xi Li. 2025. Effectively detecting and diagnosing distributed multivariate time series anomalies via Unsupervised Federated Hypernetwork. *Inf. Process. Manag.* 62, 4, Article 104107 (2025). doi:10.1016/j.ipm.2025.104107

[Val51] Pengcheng He, Xiaoyang Tan, and Yuehua Cheng. 2025. Boundary-aware adversarial ensemble learning for multivariate time series anomaly detection. *Knowl.-Based Syst.* 327, Article 114168 (2025). doi:10.1016/j.knosys.2025.114168

[Val52] Shiming He, Qingqing Guo, Genxin Li, Kun Xie, and Pradip Kumar Sharma. 2025. Multivariate Time Series Anomaly Detection Based on Multiple Spatiotemporal Graph Convolution. *IEEE Trans. Instrum. Meas.* 74 (2025), 1–14. doi:10.1109/tim.2024.3493890

[Val53] Shiming He, Genxin Li, Jin Wang, Kun Xie, and Pradip Kumar Sharma. 2025. Uni-directional graph structure learning-based multivariate time series anomaly detection with dynamic prior knowledge. *Int. J. Mach. Learn. & Cyber.* 16, 1 (2025), 267–283. doi:10.1007/s13042-024-02212-5

[Val54] Yue He, Xiaoliang Chen, Duoqian Miao, Hongyun Zhang, Xiaolin Qin, Shangyi Du, and Peng Lu. 2025. Graph-enhanced anomaly detection framework in multivariate time series using Graph Attention and Enhanced Generative Adversarial Networks. *Expert Syst. Appl.* 271, Article 126667 (2025). doi:10.1016/j.eswa.2025.126667

[Val55] Thi Kieu Khanh Ho and Narges Armanfard. 2025. Contaminated multivariate time-series anomaly detection with spatio-temporal graph conditional diffusion models. In *Proc. Conf. Uncertain. Artif. Intell. (UAI'25)*, Vol. 286. 1710–1729. https://proceedings.mlr.press/v286/ho25a.html

[Val56] Maximilian Hoh, Henry Schaub, Nico Leuze, and Alfred Schöttl. 2025. Rethinking Time Series Anomaly Detection: A Scalable Transformer-Based Framework for Large Contexts. In *IEEE Int. Conf. Control Autom. Robot. (ICCAR'25)*. 295–302. doi:10.1109/ICCAR64901.2025.11072949

[Val57] Khalid Hossen, Alif Nur, Md Junaed Al Habib, Niloy Saha Durjoy, and Sheikh Mohammad Aiyan. 2025. Vision Transformer Masked Autoencoders for Unsupervised Anomaly Detection in Time Series. In *IEEE Int. Conf. Quantum Photon. Artif. Intell. Netw. (QPAIN'25)*. 1–6. doi:10.1109/QPAIN66474.2025.11171974

[Val58] Wei Hu, Jianqiu Xu, and Xujian Zhao. 2025. Multivariate Time-Series Data Anomaly Detection via Dimension Independence and Reconstruction. In *Proc. ACM Int. Conf. Data Storage Data Eng. (DSDE'25)*. 15–22. doi:10.1145/3725472.3725475

[Val59] Xiaoyu Huang, Weidong Chen, Bo Hu, and Zhendong Mao. 2025. Graph Mixture of Experts and Memory-augmented Routers for Multivariate Time Series Anomaly Detection. In *Proc. AAAI Conf. Artif. Intell. (AAAI'25)*, Vol. 39. 17476–17484. doi:10.1609/aaai.v39i16.33921

[Val60] Xiaorui Huang, Ruliang Xiao, and Xiangling Chen. 2025. CKADformer: Enhanced Transformer with Causal Convolution and KAN for Multivariate Time Series Anomaly Detection. In *IEEE Int. Conf. Electron. Commun. Artif. Intell. (ICECAI'25)*. 568–571. doi:10.1109/ICECAI66283.2025.11171201

[Val61] Yashi Huang, Peishun Liu, Rongjia Han, Tian Yin, Quanjie Dou, Yibao Song, and Mengqi Luo. 2025. FreqWave-TranDuD: A Multivariate Time Series Anomaly Detection Method Based on Wavelet and Fourier Transforms. *IEEE Access* 13 (2025), 68384–68397. doi:10.1109/access.2025.3557571

[Val62] Alaa Hussien Ali, Hind Almisbahi, Entisar Alkayal, and Abeer Almakky. 2025. Enhancing Real-Time Anomaly Detection of Multivariate Time Series Data via Adversarial Autoencoder and Principal Components Analysis. *Electronics* 14, 15, Article 3141 (2025). doi:10.3390/electronics14153141

[Val63] Vincent Jacob and Yanlei Diao. 2025. Unsupervised Anomaly Detection in Multivariate Time Series across Heterogeneous Domains. *Proc. VLDB Endow.* 18, 6 (2025), 1691–1704. doi:10.14778/3725688.3725699

[Val64] Jaeseok Jang and Hyuk-Yoon Kwon. 2025. TAIL-MIL: time-aware and instance-learnable multiple instance learning for multivariate time series anomaly detection. In *Proc. AAAI Conf. Artif. Intell. (AAAI'25)*, Vol. 39. 17582–17589. doi:10.1609/aaai.v39i17.33933

[Val65] Seong Hyun Jeon, Keon Kim, and Yong Suk Choi. 2025. FEFM: Feature Extraction and Fusion Module for Enhanced Time Series Anomaly Detection. In *Proc. ACM/SIGAPP Symp. Appl. Comput. (SAC'25)*. 1130–1137. doi:10.1145/3672608.3707794

[Val66] Xudong Jia, Defu Cao, Niangxi Zhuang, Wei Peng, Baokang Zhao, Peng Xun, Haojie Li, and Chiran Shen. 2025. MultiverseAD: Enhancing spatial-temporal synchronous attention networks with causal knowledge for multivariate time series anomaly detection. *Neural Netw.* 192, Article 107903 (2025). doi:10.1016/j.neunet.2025.107903

[Val67] Xudong Jia, Wei Peng, Chiran Shen, Baokang Zhao, and Peng Xun. 2025. Spatio-Temporal Mixed Graph Neural Controlled Differential Equations with Adaptive Connection Sampling for Irregular Multivariate Time Series Anomaly Detection. In *IEEE Int. Conf. Acoust. Speech Signal Process. (ICASSP'25)*. 1–5. doi:10.1109/ICASSP49660.2025.10888536

[Val68] Xianguang Jia, Jie Qu, Yingying Lyu, Mengyi Guo, Jinke Zhang, and Fengxiang Guo. 2025. A Prediction-Based Anomaly Detection Method for Traffic Flow Data with Multi-Domain Feature Extraction. *Appl. Sci.* 15, 6, Article 3234 (2025). doi:10.3390/app15063234

[Val69] Yong Jin, Yanh hua Gao, Wei dong Lou, Ze liang Zheng, and Sheng duo Gan. 2025. AD-FGP: Industrial Multivariate Time-Series Anomaly Detection via Fusion of Generative and Predictive Models. *J. Inf. Sci. Eng.* 41, 1 (2025), 155–171. doi:10.6688/JISE.202501_41(1).0009

[Val70] Minha Kim, Kishor Kumar Bhaumik, Amin Ahsan Ali, and Simon S. Woo. 2025. MIXAD: Memory-Induced Explainable Time Series Anomaly Detection. In *Pattern Recognit. (ICPR'24) (LNCS, Vol. 15309)*. 242–257. doi:10.1007/978-3-031-78189-6_16

[Val71] Jun Kong, Kang Wang, Min Jiang, and Xuefeng Tao. 2025. Gmad: multivariate time series anomaly detection based on graph matching learning. *Int. J. Mach. Learn. & Cyber.* 16, 5–6 (2025), 3793–3808. doi:10.1007/s13042-024-02482-z

[Val72] Yusheng Kong, Jingwei Guo, Lei Ren, Guoliang Kang, Yazhe Wang, and Jinhu Lü. 2025. DADN: A Dynamic Anomaly Detection Network for Multivariate Time Series Data of the Industrial Internet of Things. *IEEE Trans. Ind. Informat.* 21, 8 (2025), 6294–6304. doi:10.1109/TII.2025.3563540

[Val73] Disen Lan, Guibin Zhang, and Rongjin Guo. 2025. Diffusion Graph Model for Time Series Anomaly Detection via Anomaly-aware Graph Sparsification and Augmentation. In *Proc. ACM World Wide Web Conf. (WWW'25)*. 2207–2214. doi:10.1145/3701716.3717376

[Val74] Gang Li, Mingchao Ge, Jin Wan, Delong Han, Min Li, and Mingle Zhou. 2025. MemMambaAD: Memory-augmented state space model for multivariate time series anomaly detection. *Eng. Appl. Artif. Intell.* 158, Article 111308 (2025). doi:10.1016/j.engappai.2025.111308

[Val75] Gang Li, Mingchao Ge, Mingle Zhou, Jin Wan, and Delong Han. 2025. Time Series Anomaly Detection via Temporal Dependencies and Multivariate Correlations Integrating. In *Neural Inf. Process. (ICONIP'24) (LNCS, Vol. 15288)*. 384–398.

[Val76] Jiahao Li, Yiqiang Chen, Yunbing Xing, Yang Gu, and Xiangyuan Lan. 2025. Contrast Memory for Unsupervised Anomaly Detection. In *IEEE Int. Conf. Acoust. Speech Signal Process. (ICASSP'25)*. 1–5. doi:10.1109/ICASSP49660.2025.10888471

[Val77] Jiahao Li, Yiqiang Chen, Yunbing Xing, Yang Gu, and Xiangyuan Lan. 2025. HYMAN: Hybrid Memory and Attention Network for Unsupervised Anomaly Detection. In *IEEE Int. Conf. Acoust. Speech Signal Process. (ICASSP'25)*. 1–5. doi:10.1109/icassp49660.2025.10890028

[Val78] Jiazhen Li, Zhenhua Yu, Qingchao Jiang, and Zhixing Cao. 2025. One-Class Classification Constraint in Reconstruction Networks for Multivariate Time Series Anomaly Detection. *IEEE Trans. Instrum. Meas.* 74 (2025), 1–13. doi:10.1109/TIM.2025.3548251

[Val79] Kunqi Li, Zhiqin Tang, Shuming Liang, Zhidong Li, and Bin Liang. 2025. MLAD: A Multi-Task Learning Framework for Anomaly Detection. *Sensors* 25, 13, Article 4115 (2025). doi:10.3390/s25134115

[Val80] Mengxuan Li, Ke Liu, Hongyang Chen, Jiajun Bu, Hongwei Wang, and Haishuai Wang. 2025. TSINR: Capturing Temporal Continuity via Implicit Neural Representations for Time Series Anomaly Detection. In *Proc. ACM SIGKDD Conf. Knowl. Discov. Data Min. V.1 (KDD'25)*. 671–682. doi:10.1145/3690624.3709266

[Val81] Qi Li, Zhenyu Zhang, Yong Zhang, Zhao Zhang, Lin Zhu, Xiaolei Hua, Renkai Yu, Xinwen Fan, Zhe Lei, and Junlan Feng. 2025. JCCMTM: Joint channel-independent and channel-dependent strategy for masked multivariate time-series modeling. *Neural Netw.* 192, Article 107922 (2025). doi:10.1016/j.neunet.2025.107922

[Val82] Ruoheng Li, Zhongyao Liu, Xi Zhu, Lin Li, and Xianbin Cao. 2025. Detecting Multivariate Time Series Anomalies With Cascade Decomposition Consistency. *IEEE Trans. Instrum. Meas.* 74 (2025), 1–14. doi:10.1109/TIM.2025.3547479

[Val83] Shijiang Li, Zhihai Wang, Xiaokang Wang, Zihao Yin, and Muyun Yao. 2025. Frequency-enhanced and decomposed transformer for multivariate time series anomaly detection. *Appl. Intell.* 55, 7, Article 556 (2025). doi:10.1007/s10489-025-06441-1

[Val84] Yiming Li, Yuchun Guo, Yishuai Chen, Zhong Cao, and Shuowen Liang. 2025. Self-Supervised Spatio-Temporal Representation Learning for Microservice Anomaly Detection. In *IEEE World Conf. Comput. Commun. Technol. (WCCCT'25)*. 278–284. doi:10.1109/WCCCT65447.2025.11027933

[Val85] Yushi Li, Zhenyu Wen, Ziwen Chen, Jie Mei, Mengxue Lin, and Ming Zhu. 2025. Diffusion models with self-conditioning guidance for multivariate time series anomaly detection. *Knowl.-Based Syst.* 330, Article 114511 (2025). doi:10.1016/j.knosys.2025.114511

[Val86] Yi Li, Zhangbing Zhou, Boris Sedlak, and Schahram Dustdar. 2025. MGG-AD: Multi-Granularity Graph-Based Anomaly Detection in IoT Systems. In *IEEE Int. Conf. Web Serv. (ICWS'25)*. 1–10. doi:10.1109/ICWS67624.2025.00096

[Val87] Zezhong Li, Wei Guo, Jianpeng An, Qi Wang, Yingchun Mei, Rongshun Juan, Tianshu Wang, Yang Li, and Zhongke Gao. 2025. AD2T: Multivariate Time-Series Anomaly Detection With Association Discrepancy Dual-Decoder Transformer. *IEEE Sens. J.* 25, 7 (2025), 11710–11721. doi:10.1109/jsen.2025.3543835

[Val88] Qian Liang and Xiang Yin. 2025. Transformer-Based Contrastive Learning With Dynamic Masking and Adaptive Pathways for Time Series Anomaly Detection. *Expert Syst.* 42, 8, Article e70102 (2025). doi:10.1111/exsy.70102

[Val89] Shuowen Liang, Yuchun Guo, Yishuai Chen, Zhong Cao, Yiming Li, and Ruoyao Zhang. 2025. HiGraph: Learning Hierarchical Graph for Multivariate Time Series Anomaly Detection in Microservice Systems. In *IEEE World Conf. Comput. Commun. Technol. (WCCCT'25)*. 302–308. doi:10.1109/wccct65447.2025.11028023

[Val90] Bo Liu, Lingling Tao, Xiaodan Chen, and Zhijun Li. 2025. VDDFormer: A Variable Dependency Discrepancy-Based Transformer for Multivariate Time Series Anomaly Detection . *IEEE Trans. on Big Data* (2025), 1–14. doi:10.1109/TBDATA.2025.3600004

[Val91] Chen Liu, Shibo He, Shizhong Li, Zhenyu Shi, and Wenchao Meng. 2025. Detecting Both Seen and Unseen Anomalies in Time Series. *ACM Trans. Knowl. Discov. Data* 19, 4, Article 87 (2025), 29 pages. doi:10.1145/3717071

[Val92] Hong Liu, Xiuxiu Qiu, Yiming Shi, and Zelin Zang. 2025. USD: Unsupervised Soft Contrastive Learning for Fault Detection in Multivariate Time Series. In *IEEE Int. Conf. Acoust. Speech Signal Process. (ICASSP'25)*. 1–5. doi:10.1109/ICASSP49660.2025.10890487

[Val93] Han Liu, Zheng Zhang, Liang Xi, and Fengbin Zhang. 2025. Multivariate Time Series Anomaly Detection With Hierarchical Component-Aware. *IEEE Internet of Things J.* 12, 22 (2025), 48587–48596. doi:10.1109/JIOT.2025.3605933

[Val94] Jie Liu, Qilin Li, Senjian An, Bradley Ezard, and Ling Li. 2025. EdgeConvFormer: An Unsupervised Anomaly Detection Method for Multivariate Time Series. In *Pattern Recognit. (ICPR'24) (LNCS, Vol. 15304)*. 367–382. doi:10.1007/978-3-031-78128-5_24

[Val95] Shen Liu, Jinglong Chen, Zijun Liu, Jun Wang, and Z. Jane Wang. 2025. Graph embedded patch-sense autoencoder with prior knowledge for multi-component system anomaly detection. *Reliab. Eng. Syst. Saf.* 256, Article 110784 (2025). doi:10.1016/j.ress.2024.110784

[Val96] Weiwei Liu, Cong Liu, Xuefen Niu, and Changming Xu. 2025. Time Series Anomaly Detection Based on Asymmetric Autoencoder and Gaussian Mixture Model. In *IEEE Int. Conf. Comput. Inf. Sci. Appl. Technol. (CISAT'25)*. 10–15. doi:10.1109/CISAT66811.2025.11181795

[Val97] Yuehan Liu, Wenhao Wang, and Yunpeng Wu. 2025. TiTAD: Time-Invariant Transformer for Multivariate Time Series Anomaly Detection. *Electronics* 14, 7, Article 1401 (2025). doi:10.3390/electronics14071401

[Val98] Zehao Liu, Mengzhou Gao, and Pengfei Jiao. 2025. GCAD: Anomaly Detection in Multivariate Time Series from the Perspective of Granger Causality. In *Proc. AAAI Conf. Artif. Intell. (AAAI'25)*, Vol. 39. 19041–19049. doi:10.1609/aaai.v39i18.34096

[Val99] Zhaoyang Liu, Zhijian Yang, Xingpeng Zheng, and Xin Xie. 2025. Denoising-Enhanced Dynamic Graph Modeling for Anomaly Detection in Multivariate Time Series. In *IEEE Int. Symp. Adv. Electr., Electron. Comput. Eng. (ISAEECE'25)*. 652–657. doi:10.1109/ISAEECE66033.2025.11159890

[Val100] Weishan Long, Bo Yang, Yucheng Zhang, Shilong Wang, Yan He, and Yufeng Li. 2025. Dynamic anomaly detection in industrial robot clusters: A statistical-deep learning hybrid approach. *Mech. Syst. Signal Process.* 234, Article 112863 (2025). doi:10.1016/j.ymssp.2025.112863

[Val101] Zexin Lu. 2025. A Robust Anomaly Detection Approach for IIoT Time Series. In *Proc. ACM Int. Conf. Front. Intell. Manuf. Autom. (CFIMA'24)*. 168–173. doi:10.1145/3704558.3707091

[Val102] Qingqing Luo and Jiangang Dong. 2025. Time Series Anomaly Detection Model Based on Memory-enhanced Transformer and Graph Network Joint Training. In *Proc. ACM Int. Conf. Comput. Model. Simul. Data Anal. (CMSDA'24)*. 357–363. doi:10.1145/3727993.3728054

[Val103] Yongcan Luo, Jingxuan Chen, Shuxin Qin, and Dapeng Wu. 2025. Dual Graph Learning for Multivariate Time Series Anomaly Detection in IoUT. *IEEE Trans. Netw. Sci. Eng.* (2025), 1–16. doi:10.1109/tnse.2025.3598425

[Val104] Shenhui Ma, Huanbin Zheng, Siwei Guan, Xiaorong Zheng, Teng Ma, Zhekang Dong, and Mingyu Gao. 2025. ST-MambaAD: Spatial-Temporal Mamba for Multivariate Time Series Anomaly Detection. In *IEEE Interregional NEWCAS Conf. (NEWCAS'25)*. 1–4. doi:10.1109/newcas64648.2025.11107158

[Val105] Yuan Ma, Weiwei Liu, Changming Xu, Luyi Bai, Ende Zhang, and Junwei Wang. 2025. Multivariate Time Series Anomaly Detection Based on Inverted Transformer with Multivariate Memory Gate. *Entropy* 27, 9, Article 939 (2025). doi:10.3390/e27090939

[Val106] Yuxiang Ma, Xiaodong Tao, Haiyang Wang, Huijie Ma, and Ying Cao. 2025. Anomaly Detection Model for Edge Network Infrastructure Based on Time Series. In *Adv. Intell. Comput. Technol. Appl. (ICIC'25) (LNCS, Vol. 15850)*. 370–381. doi:10.1007/978-981-96-9884-4_31

[Val107] Yuxiang Ma, Haiyang Wang, Haoqi Guan, Xiaodong Tao, and Hongjian Yin. 2025. Contrastive Learning for Robust Time Series Anomaly Detection in Cyber-Physical Systems. In *Adv. Intell. Comput. Technol. Appl. (ICIC'25) (LNCS, Vol. 15851)*. 343–354. doi:10.1007/978-981-96-9849-3_29

[Val108] Danling Meng, Xinyuan Zhou, Shiyong Lan, Wenwu Wang, Weihong Yuan, and Ruiyi Lu. 2025. MRGNN: Mamba-Register-Based Graph Neural Network for Unsupervised Anomaly Detection in Multivariate Time Series. In *Adv. Intell. Comput. Technol. Appl. (ICIC'25) (LNCS, Vol. 15853)*. 511–522. doi:10.1007/978-981-96-9894-3_42

[Val109] Moritz Müller, Gunar Ernis, and Michael Mock. 2025. Anomaly Detection in Multivariate Time Series Using Uncertainty Estimation. In *Informed Machine Learning. Cognitive Technologies (Cognitive Technologies)*. 313–229. doi:10.1007/978-3-031-83097-6_14

[Val110] Abhijit Nimbalkar. 2025. Anomnet: a Hybrid Framework for Multivariate Time Series Anomaly Detection Using Attention-Augmented State Space Models. In *IEEE Int. Conf. Comput. Technol. & Data Commun. (ICCTDC'25)*. 1–6. doi:10.1109/ICCTDC64446.2025.11158106

[Val111] Chunquan Pan, Liyun Su, Lang Xiong, Jialing Yang, and Fenglan Li. 2025. CT-DDPM: Anomaly detection of multivariate time series with copula and transformer-based denoising diffusion probabilistic models. *Inf. Sci.* 717, Article 122279 (2025). doi:10.1016/j.ins.2025.122279

[Val112] Cheng Qian, Wenzhong Tang, and Yanyang Wang. 2025. RGAnomaly: Data reconstruction-based generative adversarial networks for multivariate time series anomaly detection in the Internet of Things. *Future Gener. Comput. Syst.* 167, Article 107751 (2025). doi:10.1016/j.future.2025.107751

[Val113] Shuxin Qin, Jing Zhu, Aipeng Guo, Yansong Yang, Lu Wang, and Gaofeng Tao. 2025. MambaAD: Multivariate time series anomaly detection in IoT via multi-view Mamba. *Neurocomputing* 655, Article 131385 (2025). doi:10.1016/j.neucom.2025.131385

[Val114] Tobias Engelhardt Rasmussen, Facundo Esteban Castellá Algán, and Andreas Baum. 2025. Anomaly detection in broadband networks: Using normalizing flows for multivariate time series. *Signal Process.* 230, Article 109874 (2025). doi:10.1016/j.sigpro.2024.109874

[Val115] Muhammad Anas Raza, Mohammad Wardat, and Anyi Liu. 2025. DeepTrAnS: Mixer-based Unsupervised Time Series Anomaly Detection for Servers. In *IEEE Intell. Cybersecur. Conf. (ICSC'25)*. 91–98. doi:10.1109/ICSC65596.2025.11139978

[Val116] Mahshid Rezakhani, Tolunay Seyfi, and Fatemeh Afghah. 2025. A Transfer Learning Framework for Anomaly Detection in Multivariate IoT Traffic Data. In *IEEE Int. Conf. Commun. (ICC'25)*. 4975–4980. doi:10.1109/ICC52391.2025.11161334

[Val117] Hao Rong, Yunpeng Wu, Haopeng Pei, and Wenhao Wang. 2025. Spatial and Temporal Correlation Aware Network for Anomaly Detection in Multivariate Time Series. In *Proc. ACM Asia-Pac. Artif. Intell. Big Data Forum (AIBDF'24)*. 738–743. doi:10.1145/3718491.3718611

[Val118] Padmaksha Roy, Almuatazbellah Boker, and Lamine Mili. 2025. Beyond Marginals: Learning Joint Spatio-Temporal Patterns for Multivariate Anomaly Detection. *Trans. Mach. Learn. Res.* (2025). https://openreview.net/forum?id=iETTv1okjX

[Val119] Jan Schuster, Alexander Wölfel, Fabian Brunner, and Christian Bergler. 2025. PredTrAD – Prediction-based Transformer for Anomaly Detection in Multivariate Time Series Data. In *Interspeech 2025*. 3873–3877. doi:10.21437/interspeech.2025-501

[Val120] Ke-Yuan Shen. 2025. Learn hybrid prototypes for multivariate time series anomaly detection. In *Int. Conf. Learn. Represent. (ICLR'25)*. https://openreview.net/forum?id=8TBGdH3t6a

[Val121] Hongjun Sheng, Xinggan Peng, Van Kwan Zhi Koh, Bihan Wen, and Zhiping Lin. 2025. TWavefussion: Wavelet-based Diffusion with Transformer for Multivariate Time Series Anomaly Detection. In *IEEE Int. Symp. Circuits Syst. (ISCAS'25)*. 1–5. doi:10.1109/ISCAS56072.2025.11043617

[Val122] Charalampos Shimillas, Kleanthis Malialis, Konstantinos Fokianos, and Marios M. Polycarpou. 2025. Transformer-Based Multivariate Time Series Anomaly Localization. In *IEEE Symp. Comput. Intell. Eng. Cyber-Phys. Syst. (CIES'25)*. 1–8. doi:10.1109/CIES64955.2025.11007637

[Val123] Yifan Song, Yu Liu, and Shaolong Shu. 2025. Dynamic Soft Contrastive Learning for Time Series Anomaly Detection. In *IEEE Int. Conf. Acoust. Speech Signal Process. (ICASSP'25)*. 1–5. doi:10.1109/ICASSP49660.2025.10889377

[Val124] Shimin Sun, Xiangyun Liu, Li Han, Ze Wang, and Yong Zhu. 2025. SAE-GAN: integrating stacked attention autoencoder and generative adversarial networks for multivariate time series anomaly detection. *Appl. Intell.* 55, 16, Article 1033 (2025). doi:10.1007/s10489-025-06927-y

[Val125] Song Sun, Yan Zhou, Suyan Yao, and Jingbing Xu. 2025. Enhancing Unsupervised Anomaly Detection in Multivariate Time Series with Variational Autoencoders and Multiresolution LSTM. In *Adv. Data Min. Appl. (ADMA'24) (LNCS, Vol. 15390)*. 372–385. doi:10.1007/978-981-96-0840-9_26

[Val126] Zeyu Tan, Shiwen He, Hang Zhan, Yongming Huang, and Siyu Huang. 2025. Graphormer-Based Bayesian Network Conditional Normalizing Flow for Multivariate Time Series Anomaly Detection in Communication Networks. In *IEEE Wirel. Commun. Netw. Conf. (WCNC'25)*. 1–6. doi:10.1109/WCNC61545.2025.10978548

[Val127] Qideng Tang, Chaofan Dai, Yahui Wu, and Haohao Zhou. 2025. MLP-Mixer based Masked Autoencoders are Effective, Explainable and Robust for Time Series Anomaly Detection. *Proc. VLDB Endow.* 18, 3 (2025), 798–811. doi:10.14778/3712221.3712243

[Val128] Huixin Tian, Hao Kong, Shikang Lu, and Kun Li. 2025. Unsupervised anomaly detection of multivariate time series based on multi-standard fusion. *Neurocomputing* 611, Article 128634 (2025). doi:10.1016/j.neucom.2024.128634

[Val129] Jiyu Tian, Mingchu Li, Lingling Fang, and Liming Chen. 2025. SSDCL: Semi-Supervised Denoising-Aware Contrastive Learning for Time Series Anomaly Detection in Cyber-Physical Systems. *IEEE Trans. Inf. Forensics Secur.* 20 (2025), 7302–7316. doi:10.1109/TIFS.2025.3588674

[Val130] Giovanni Trappolini, Antonio Purificato, Federico Siciliano, Luigi D'Addona, Anna Maria Spagnolo, Domenico Dato, and Fabrizio Silvestri. 2025. Quantized Auto Encoder-Based Anomaly Detection for Multivariate Time Series Data in 5G Networks. *IEEE Access* 13 (2025), 82668–82679. doi:10.1109/ACCESS.2025.3568133

[Val131] Davide Villaboni, Francesco Bazzani, Alberto Castellini, and Alessandro Farinelli. 2025. Transformer-Based Anomaly Detection for Mobile Robots. In *IEEE Eur. Conf. Mob. Robots (ECMR'25)*. 1–6. doi:10.1109/ecmr65884.2025.11163081

[Val132] Anmin Wang, Qi Zhang, Mingrui Zhu, Chao Xu, Jie Li, and Jinsong Bao. 2025. A Novel Spatio-Temporal Reconstruction Approach for Multivariate Time Series Anomaly Detection in Heavy Industry Equipment Monitoring. In *Proc. ACM Asia-Pac. Artif. Intell. Big Data Forum (AIBDF'24)*. 761–766. doi:10.1145/3718491.3718615

[Val133] Chao Wang, Haochen Shi, Jie Hu, Xin Yang, Junbo Zhang, Shengdong Du, and Tianrui Li. 2025. Pre-training Enhanced Transformer for multivariate time series anomaly detection. *Inf. Fusion* 121, Article 103171 (2025). doi:10.1016/j.inffus.2025.103171

[Val134] Chuang Wang, Zidong Wang, Hongli Dong, Stanislao Lauria, Weibo Liu, Yiming Wang, Futra Fadzil, and Xiaohui Liu. 2025. Fusionformer: A Novel Adversarial Transformer Utilizing Fusion Attention for Multivariate Anomaly Detection. *IEEE Trans. Neural Netw. Learn. Syst.* 36, 8 (2025), 14479–14492. doi:10.1109/tnnls.2025.3542719

[Val135] Honglan Wang, Jing Li, Yu Chen, Xuxi Zou, Zeng Zeng, Jinlong Wu, Chenlin Pan, Yuqi Lu, Rongbin Gu, Xudong He, and Rui Zhang. 2025. DifNet: Difference-based multi-resolution decomposition for time series anomaly detection. *Appl. Intell.* 55, 7, Article 680 (2025). doi:10.1007/s10489-025-06551-w

[Val136] Hao Wang, Yingjian Liu, Haoyu Yin, Xiangyun Zheng, Zonghai Zha, Minghuan Lv, and Zhongwen Guo. 2025. Res2coder: A two-stage residual autoencoder for unsupervised time series anomaly detection. *Appl. Intell.* 55, 11, Article 804 (2025). doi:10.1007/s10489-025-06684-y

[Val137] Haodong Wang and Huaxiong Zhang. 2025. An Anomaly Detection Method for Multivariate Time Series Data Based on Variational Autoencoders and Association Discrepancy. *Mathematics* 13, 7, Article 1209 (2025). doi:10.3390/math13071209

[Val138] Huanjie Wang, Weijia Zhang, Jianzheng Yang, Quan Wei, and Guiming Du. 2025. Robust Anomaly Detection via Neighborhood-Adversarial Signal-Noise Disentanglement. In *Proc. ACM Int. Conf. Intell. Syst. Commun. Comput. Netw. (ISCCN'25)*. 181–184. doi:10.1145/3732945.3732972

[Val139] Jiajia Wang. 2025. Enhancing Anomaly Detection in Multivariate Time Series with Hybrid Deep Learning Architecture. In *IEEE Int. Conf. Neural Netw. Inf. Commun. Eng. (NNICE'25)*. 1040–1045. doi:10.1109/NNICE64954.2025.11064389

[Val140] Kang Wang, Jun Kong, Meicheng Zhang, Min Jiang, and Tianshan Liu. 2025. MAD-DGTD: Multivariate time series Anomaly Detection based on Dynamic Graph structure learning with Time Delay. *Neurocomputing* 635, Article 129887 (2025). doi:10.1016/j.neucom.2025.129887

[Val141] Lulu Wang and Chengqing Li. 2025. Adjacent Neighborhood Transformer-based Diffusion Model for Anomaly Detection under Incomplete Industrial Data Sources. In *Proc. ACM Int. Conf. Web Search Data Min. (WSDM'25)*. 577–585. doi:10.1145/3701551.3703565

[Val142] Liyuan Wang, Yong Zhou, Wuping Ke, Desheng Zheng, Fan Min, and Hui Li. 2025. Harmful data enhanced anomaly detection for quasi-periodic multivariate time series. *Appl. Intell.* 55, 7, Article 572 (2025). doi:10.1007/s10489-025-06461-x

[Val143] Meng Wang, Hui Wang, Zhenhao Cao, Yuan Qiu, Xu Chen, and Weichao Ding. 2025. Large Language Models Can be Few-Shot Server Anomaly Detector. In *IEEE Int. Conf. Mach. Learn. Intell. Syst. Eng. (MLISE'25)*. 280–284. doi:10.1109/mlise66443.2025.11100205

[Val144] Qiushi Wang, Yueming Zhu, Zhicheng Sun, Dong Li, and Yunbin Ma. 2025. A Multi-scale Patch Mixer Network for Time Series Anomaly Detection. *Eng. Appl. Artif. Intell.* 140, Article 109687 (2025). doi:10.1016/j.engappai.2024.109687

[Val145] Qiushi Wang, Yueming Zhu, Zhicheng Sun, Dong Li, and Yunbin Ma. 2025. Self-attention-based graph transformation learning for anomaly detection in multivariate time series. *Complex Intell. Syst.* 11, 5, Article 214 (2025). doi:10.1007/s40747-025-01839-3

[Val146] Taoyu Wang, Dan Wu, Jun Wang, Jinwei Zhao, Haoming Wang, Dongnan Xie, Hongtao Zhang, and Xinhong Hei. 2025. Learning in Two-Scales Through LSTM-GPT2 Fusion Network: A Hybrid Approach for Time Series Anomaly Detection. *Sensors* 25, 6, Article 1849 (2025). doi:10.3390/s25061849

[Val147] Tingting Wang, Chunming Zou, Yuqing Liu, Lin Zhou, and Yong Wang. 2025. TGM: An Industrial Sensor Network Anomaly Detection. In *Adv. Intell. Comput. Technol. Appl. (ICIC'25) (CCIS, Vol. 2565)*. 395–407.

[Val148] Xu Wang, Qisheng Xu, Kele Xu, Ting Yu, Bo Ding, Dawei Feng, and Yong Dou. 2025. Large Pretrained Foundation Model for Key Performance Indicator Multivariate Time Series Anomaly Detection. *IEEE Open J. Comput. Soc.* 6 (2025), 177–188. doi:10.1109/ojcs.2024.3521217

[Val149] Yaxuan Wang, Hao Cheng, Jing Xiong, Qingsong Wen, Han Jia, Ruixuan Song, Liyuan Zhang, Zhaowei Zhu, and Yang Liu. 2025. Noise-Resilient Point-wise Anomaly Detection in Time Series Using Weak Segment Labels. In *Proc. ACM SIGKDD Conf. Knowl. Discov. Data Min. V.1 (KDD'25)*. 1551–1562. doi:10.1145/3690624.3709257

[Val150] Chixuan Wei, Jidong Yuan, Yi Zhang, Zhongyang Yu, Yanze Liu, and Haiyang Liu. 2025. Ranking Neighborhood and Class Prototype Contrastive Learning for Time Series. *IEEE Trans. Big Data* 11, 4 (2025), 1907–1917. doi:10.1109/tbdata.2024.3495509

[Val151] XiaoLong Wei, QingJie Liu, and ZhiAn Pan. 2025. Frequency-aware variational autoencoder with reinforcement learning for borehole strain anomaly detection. *Earth Sci. Inform.* 18, 4, Article 526 (2025). doi:10.1007/s12145-025-02010-9

[Val152] Mi Wen, ZheHui Chen, Yun Xiong, and YiChuan Zhang. 2025. LGAT: A novel model for multivariate time series anomaly detection with improved anomaly transformer and learning graph structures. *Neurocomputing* 617, Article 129024 (2025). doi:10.1016/j.neucom.2024.129024

[Val153] Xingjian Wu, Xiangfei Qiu, Zhengyu Li, Yihang Wang, Jilin Hu, Chenjuan Guo, Hui Xiong, and Bin Yang. 2025. CATCH: Channel-Aware multivariate Time Series Anomaly Detection via Frequency Patching. In *Int. Conf. Learn. Represent. (ICLR'25)*. https://openreview.net/forum?id=

m08aK3xxdJ

[Val154] Yixiao Wu, Zhen Li, Jinglong Chen, Yong Feng, Zijun Liu, and Jun Wang. 2025. Multi-scale graph-level anomaly detection of complex equipment via a subgraph augmented contrastive self-supervised network. *Meas. Sci. Technol.* 36, 9, Article 096127 (2025). doi:10.1088/1361-6501/ae03df

[Val155] Zhichao Wu, Li Zhu, Zitao Yin, Xirong Xu, Jianmin Zhu, Xiaopeng Wei, and Xin Yang. 2025. MAFCD: Multi-level and adaptive conditional diffusion model for anomaly detection. *Inf. Fusion* 118, Article 102965 (2025). doi:10.1016/j.inffus.2025.102965

[Val156] Qinghui Xi, Xi Li, Peng Chen, Juan Chen, Xianhua Niu, and Lei Xu. 2025. Parallel heterogeneous graph learning based internet of things multivariate time series anomaly detection and explanation via cross-channel feature fusion. *J. Supercomput.* 81, 13, Article 1261 (2025). doi:10.1007/s11227-025-07717-6

[Val157] Siqi Xia, Sutharshan Rajasegarar, Lei Pan, Christopher Leckie, Sarah M. Erfani, and Jeffrey Chan. 2025. ConDGAD: Multi-augmentation Contrastive Learning for Dynamic Graph Anomaly Detection. In *Pattern Recognit. (ICPR'24) (LNCS, Vol. 15325)*. 416–431. doi:10.1007/978-3-031-78389-0_28

[Val158] Bo-Wen Xiao, Hong-Jie Xing, and Chun-Guo Li. 2025. MulGad: Multi-granularity contrastive learning for multivariate time series anomaly detection. *Inf. Fusion* 119, Article 103008 (2025). doi:10.1016/j.inffus.2025.103008

[Val159] Tianshun Xiao and Feng Zeng. 2025. AnomalyTK: A Multivariate Time Series Anomaly Detection Method. In *IEEE Int. Conf. Sensor-Cloud Edge Comput. Syst. (SCECS'25)*. 360–366. doi:10.1109/scecs65243.2025.11065321

[Val160] Xin Xie, Wenbin Zheng, Shenping Xiong, and Tao Wan. 2025. MTAD-Kanformer: multivariate time-series anomaly detection via kan and transformer. *Applied Intell.* 55, 11, Article 796 (2025). doi:10.1007/s10489-025-06650-8

[Val161] Yuxin Xie and Li Deng. 2025. ADKANet: Multivariate Time Series Anomaly Detection with Kolmogorov-Arnold Network and Transformer. In *Proc. ACM Int. Conf. Comput. Inf. Big Data Appl. (CIBDA'25)*. 239–243. doi:10.1145/3746709.3746752

[Val162] Yongzheng Xie, Hongyu Zhang, and Muhammad Ali Babar. 2025. Multivariate Time Series Anomaly Detection by Capturing Coarse-Grained Intra- and Inter-Variate Dependencies. In *Proc. ACM World Wide Web Conf. (WWW'25)*. 697–705. doi:10.1145/3696410.3714941

[Val163] Yajing Xing, Jinbiao Tan, Rui Zhang, and Jiafu Wan. 2025. Robust Anomaly Detection of Multivariate Time Series Data via Adversarial Graph Attention BiGRU. *Big Data Cogn. Comput.* 9, 5, Article 122 (2025). doi:10.3390/bdcc9050122

[Val164] Lijuan Xu, Bailing Wang, Dawei Zhao, and Xiaoming Wu. 2025. DAN: Neural network based on dual attention for anomaly detection in ICS. *Expert Syst. Appl.* 263, Article 125766 (2025). doi:10.1016/j.eswa.2024.125766

[Val165] Qing Xu, Dazhong Ma, Haoran Zhao, and Qiuye Sun. 2025. An Online Anomaly Monitoring Method Based on Multiscale Spatiotemporal Graph Learning for Wind Turbine. *IEEE Trans. Ind. Informat.* 21, 11 (2025), 8750–8758. doi:10.1109/TII.2025.3586066

[Val166] Yinkang Xu, Haowei Li, Zhiying Xiong, Qilin Fan, Xiuhua Li, and Cheng Zhang. 2025. Multivariate Time Series Anomaly Detection Based on Device-Edge-Cloud Collaboration in Internet of Things. In *6GN Future Wirel. Netw. (6GN'24) (LNICST, Vol. 615)*. 98–110.

[Val167] Bing Xue, Xin Gao, Heping Lu, Baofeng Li, Feng Zhai, Meng Xu, Taizhi Wang, and Jiawen Lu. 2025. A dual-reconstruction self-rectification framework with momentum memory-augmented network for multivariate time series anomaly detection. *Appl. Soft Comput.* 182, Article 113558 (2025). doi:10.1016/j.asoc.2025.113558

[Val168] April Yujie Yan, Traci Jenelle Speed, and Casey Overby Taylor. 2025. Relapse prediction using wearable data through convolutional autoencoders and clustering for patients with psychotic disorders. *Sci. Rep.* 15, 1, Article 18806 (2025). doi:10.1038/s41598-025-03856-1

[Val169] Li Yan, Hailin Hu, Kun Yang, Gaozhou Wang, Ti Guan, and Yanwei Zheng. 2025. Variational Autoencoder Based Automatic Clustering for Multivariate Time Series Anomaly Detection. In *Wirel. Artif. Intell. Comput. Syst. Appl. (WASA'24) (LNCS, Vol. 14999)*. 151–162. doi:10.1007/978-3-031-71470-2_13

[Val170] Wenjie Yang, Wenchao Chu, Xingfu Wu, Lianlin Zhou, Jiayi Wang, Hua Yang, and Zirui Li. 2025. Industrial multivariate time-series data anomaly detection incorporating attention mechanisms and adversarial training. *Int. J. Comput. Integr. Manuf.* (2025), 1–19. doi:10.1080/0951192x.2025.2452985

[Val171] Muyan Yao, Dan Tao, Peng Qi, and Ruipeng Gao. 2025. Scalable Large Model for Unlabeled Anomaly Detection With Trio-Attention U-Transformer and Manifold-Learning Siamese Discriminator. *IEEE Trans. Serv. Comput.* 18, 2 (2025), 1012–1025. doi:10.1109/tsc.2025.3536306

[Val172] Yueyue Yao and Zhi-Xin Yang. 2025. DDConv: Disentangled Dual Branch Convolutional Network for Anomaly Detection in Server Machines. *IEEE Internet of Things J.* 12, 18 (2025), 37327–37338. doi:10.1109/JIOT.2025.3583424

[Val173] Jiahao Yu, Xin Gao, Taizhi Wang, Heping Lu, Baofeng Li, Feng Zhai, Bing Xue, and Zhihang Meng. 2025. A feature matching-based method for few-shot multivariate time series anomaly detection with symmetric patch mask Siam Transformer. *Eng. Appl. Artif. Intell.* 154, Article 110894 (2025). doi:10.1016/j.engappai.2025.110894

[Val174] Xinying Yu, Kejun Zhang, Yaqi Liu, Bing Zou, Jun Wang, Wenbin Wang, and Rong Qian. 2025. Adversarial Transformer-Based Anomaly Detection for Multivariate Time Series. *IEEE Trans. Ind. Informat.* 21, 3 (2025), 2471–2480. doi:10.1109/tii.2024.3507211

[Val175] Yuan-Cheng Yu, Yen-Chieh Ouyang, and Chun-An Lin. 2025. CBMAD: Anomaly Detection in IoT Network Traffic via Consistent Bidirectional Mamba Autoencoder. In *IEEE Int. Conf. High Perform. Switch. Routing (HPSR'25)*. 1–6. doi:10.1109/HPSR64165.2025.11038914

[Val176] Yuan-Cheng Yu, Yen-Chieh Ouyang, and Chun-An Lin. 2025. PGTAD: Real-Time and Lightweight Multivariate Time-Series Anomaly Detection for IoT Using Patch Gate GRU Autoencoder. *IEEE Access* 13 (2025), 168654–168675. doi:10.1109/ACCESS.2025.3610684

[Val177] Yuan-Cheng Yu, Yen-Chieh Ouyang, and Chun-An Lin. 2025. TriP-LLM: A Tri-Branch Patch-Wise Large Language Model Framework for Time-Series Anomaly Detection. *IEEE Access* 13 (2025), 168643–168653. doi:10.1109/ACCESS.2025.3613663

[Val178] Zhanneng Zeng, Renfang Wang, Hong Qiu, Xiufeng Liu, and Xu Cheng. 2025. A Correlation-Aware Diffusion Model for Multivariate Time Series Anomaly Detection with Missing Values. In *IEEE Int. Conf. Comput. Support. Coop. Work Des. (CSCWD'25)*. 813–818. doi:10.1109/CSCWD64889.2025.11033566

[Val179] Yuting Zhan, Bo Yang, and Yiping Ma. 2025. Anomaly Detection for Small Hydropower Based on Deep Spatio-Temporal Modeling. In *IEEE Int. Conf. Mechatron. Technol. Intell. Manuf. (ICMTIM'25)*. 624–630. doi:10.1109/ICMTIM65484.2025.11040954

[Val180] Anqin Zhang, Pengzhou Chen, Yufei Gu, and Ting Zhang. 2025. Dynamic graph contrastive learning for multivariate time series anomaly detection. *J. Supercomput.* 81, 8, Article 974 (2025). doi:10.1007/s11227-025-07455-9

[Val181] Huaqi Zhang, Huaxin Pang, Yufeng Zhao, Guandong Gao, Yang Song, Shikui Wei, and Yao Zhao. 2025. Spatio-Temporal Weighted Graph Reason Learning for Multivariate Time-Series Anomaly Detection. *IEEE Internet of Things J.* 12, 15 (2025), 29373–29383. doi:10.1109/JIOT.2025.3569316

[Val182] Jing Zhang, Xin Wang, Yang Yang, HongGang Miao, and Shun Yang. 2025. A novel anomaly detection method for multivariate time series based on spatial-temporal graph learning. *J. King Saud Univ. Comput. Inf. Sci.* 37, 1–2, Article 9 (2025). doi:10.1007/s44443-025-00024-3

[Val183] Wei Zhang, Ping He, Shengrui Wang, Fan Yang, and Ying Liu. 2025. A Hybrid Spiking Model for Anomaly Detection in Multivariate Time Series. *Expert Syst.* 42, 8, Article e70086 (2025). doi:10.1111/exsy.70086

[Val184] Wei Zhang, Xin Li, Jing Li, Jian Ma, Pengfei Kong, Shuo Zhang, and Ying Liu. 2025. A time–frequency contrastive learning model for anomaly detection in multivariate time series. *Complex Intell. Syst.* 11, 12, Article 475 (2025). doi:10.1007/s40747-025-02119-w

[Val185] Wenxin Zhang and Cuicui Luo. 2025. Decomposition-based multi-scale transformer framework for time series anomaly detection. *Neural Netw.* 187, Article 107399 (2025). doi:10.1016/j.neunet.2025.107399

[Val186] Xiaoxia Zhang, Guangyao Wang, Yi Chen, Wenzhi Yang, and Guoyin Wang. 2025. Inter-layer explainable variational autoencoder model for multivariate time series anomaly detection. *Eng. Appl. Artif. Intell.* 159, Article 111585 (2025). doi:10.1016/j.engappai.2025.111585

[Val187] Yanfang Zhang and Chen Gong. 2025. Anomaly Detection Representation Learning Framework Towards Mixed Time Series with Scalable Multivariate Fusion. In *Adv. Data Min. Appl. (ADMA'24) (LNCS, Vol. 15387)*. 256–268. doi:10.1007/978-981-96-0811-9_18

[Val188] Mengmeng Zhao, Haipeng Peng, and Lixiang Li. 2025. Multivariate Time-Series Anomaly Detection Based on Dynamic Graph Neural Networks and Self-Distillation in Industrial Internet of Things. *IEEE Internet of Things J.* 12, 9 (2025), 12181–12192. doi:10.1109/jiot.2024.3520362

[Val189] Hanbing Zhu, Nan Xiao, Hefei Ling, Zongyi Li, Yuxuan Shi, Chuang Zhao, Hongxu Ji, Ping Li, and Hui Liu. 2025. TSAD: Temporal–spatial association differences-based unsupervised anomaly detection for multivariate time-series. *Neurocomputing* 648, Article 130611 (2025). doi:10.1016/j.neucom.2025.130611

[Val190] Kun Zhu, Pengyu Song, and Chunhui Zhao. 2025. Fuzzy State-Driven Cross-Time Spatial Dependence Learning for Multivariate Time-Series Anomaly Detection. *IEEE Trans. Neural Netw. Learn. Syst.* 36, 3 (2025), 4532–4544. doi:10.1109/tnnls.2024.3371109