1. 作者: 姜山; 封松林; 吴波; 王文瑞; 鲁方林; 袁晓兵作者: Jiang Shan; Feng Songlin; Wu Bo; Wang Wenrui; Lu Fanglin; Yuan Xiaobing标题: Bearing fault diagnosis based on multi-scale feature fusion of parallel network标题: 基于并行网络多尺度特征融合的轴承故障诊断来源出版物: Transducer and Microsystem Technology来源出版物: 传感器与微系统卷: 42期: 10页: 121-125文献号: 2096-2436(2023)42:10<121:JYBXWL>2.0.TX;2-E文献类型: Article出版年: 2023摘要: Aiming at the problem that health labeled rolling bearing fault data is rare,a bearing fault diagnosis method based on multi-scale feature fusion of parallel convolutional neural network(CNN)is proposed. Firstly, different vibration data of bearings are used to obtain the expression of bearing data from different perspectives, which are respectively used as inputs of the parallel CNN. Secondly,ImageNet dataset is used to pre-train the VGG16 network,and labeled bearing fault data is used to fine-tune the pre-trained VGG16 network,the fine-tuned VGG16 network is used as feature extractor,intermediate characteristics of fault data from different perspectives are extracted respectively. Finally,a feature fusion module is designed to obtain high-level fault features through multi-scale feature fusion,and the classification module is trained with high-level fault features to realize fault diagnosis of bearings. It is verified by experiment that the proposed algorithm can conduct more comprehensive mining of bearing fault data,and the higher diagnosis accuracy is obtained finally.摘要: 针对健康带标签的滚动轴承故障数据稀少的问题,提出了一种基于并行卷积神经网络(CNN)多尺度特征融合的轴承故障诊断方法。首先,采用不同的轴承振动数据,获取对轴承数据的不同视角表达,分别作为并行CNN的输入;其次,用ImageNet数据集对VGG16网络进行预训练,并用带标签的轴承故障数据对预训练后的VGG16网络进行微调,取微调后的VGG16网络作为特征提取器,分别提取不同视角故障数据中的中间特征;最后,设计特征融合模块,通过多尺度特征融合得到高层次故障特征,并用高层次故障特征训练分类模块,实现轴承的故障诊断。经过实验验证,所提出的算法可以对轴承故障数据进行更全面的挖掘,最终获得更高的诊断准确率。入藏号: CSCD:7576471Indexed Date: 2024-01-06
2. 作者: 邓飞跃; 丁浩; 郝如江作者: Deng Feiyue; Ding Hao; Hao Rujiang标题: Fault diagnosis of rotating machinery based on residual neural network with multi-scale feature fusion标题: 基于多尺度特征融合残差神经网络的旋转机械故障诊断来源出版物: Journal of Vibration and Shock来源出版物: 振动与冲击卷: 40期: 24页: 22-28,35文献号: 1000-3835(2021)40:24<22:JYDCDT>2.0.TX;2-V文献类型: Article出版年: 2021摘要: Aiming at the problem that weak fault feature of rotating machinery,such as rolling bearing and gear,is difficult to detect under strong background noise,a novel design method of multi-scale feature fusion residual block(MSFFRB) was proposed,and a one-dimensional residual neural network was developed to diagnose fault of rotating machinery.In the proposed MSFFRB,some convolutional layers with different scales are cascaded together to extract multi-scale feature information,and the multi-scale feature information is effectively fused.It simultaneously takes into account the advantages of crossing layer identity mapping and the multi-scale feature extraction,and overcomes the disadvantage that traditional convolution layer with fixed scale only extracts single scale feature information.The proposed network can input data directly without any data preprocessing.Moreover,the architecture of the network has high flexibility and is easy to further expand.Experimental results show that the method can be effectively used for fault diagnosis of rotating machinery.Compared to the traditional CNNs,ResNets,1D-LeNets,1D-AlexNets,and MC-CNNs,the proposed method has better anti-noise performance and higher classification accuracy,which provides a new solution for rotating machinery fault diagnosis.摘要: 轴承、齿轮等旋转部件常在复杂工况下运行,环境噪声干扰大,导致故障特征微弱而难以准确诊断。基于此,该研究提出一种新的多尺度特征融合残差块(multi-scale feature fusion residual block,MSFFRB)设计方法,基于此构建了一维残差神经网络用于旋转机械故障诊断。该模型能够将不同尺度的网络卷积层级联在一起提取多尺度特征信息,在残差块内部实现了多尺度特征信息的有效融合,兼顾了残差网络跨层恒等映射与多尺度特征提取的优势,克服了传统卷积操作只能提取单一尺度特征信息的缺点。所构建的残差神经网络可以直接输入样本数据,不需要进行任何数据预处理,而且模型结构具有较高的灵活性,易于扩展。试验分析表明,所提网络可有效用于旋转机械的故障诊断,相比传统CNNs、ResNets、1D-LeNets、1D-AlexNets、MC-CNNs等5种当前常用网络,具有更好的抗噪性能,故障分类准确率更高,这为旋转机械故障诊断提供了一种新的途径。入藏号: CSCD:7127710Indexed Date: 2022-03-18
3. 作者: Tao, T (Tao, Tao); Jia, XF (Jia, Xiao-Feng); Su, DF (Su, Da-Fu); Zhang, XL (Zhang, Xin-Le); Gao, JF (Gao, Jia-Fu); Xu, RZ (Xu, Run-Ze); Mo, L (Mo, Lei); Wang, XJ (Wang, Xiu-Jun)书籍团体作者: IEEE标题: Fault Diagnosis of Rolling Bearings Based on Cross Attention Network with Multi -Scale Feature Fusion来源出版物: 2024 CROSS STRAIT RADIO SCIENCE AND WIRELESS TECHNOLOGY CONFERENCE, CSRSWTC 2024丛书标题: Cross Strait Quad Regional Radio Science and Wireless Technology Conference页: 295-297DOI: 10.1109/CSRSWTC64338.2024.10811569文献类型: Proceedings Paper出版年: 2024摘要: Rolling bearings are critical in mechanical systems, and their failure can cause significant economic and safety risks. Timely fault diagnosis is essential to prevent unplanned downtime. This paper introduces a new method for rolling bearing fault diagnosis using a cross -attention network and multi-scale feature fusion. The original vibration signal is decomposed using Variational Mode Decomposition (VMD) for time-domain features, and frequency-domain features are extracted via Fast Fourier Transform (FFT). A Bidirectional Temporal Convolutional Network (BiTCN) extracts time-domain features, while a Bidirectional Gated Recurrent Unit (BiGRU) captures frequency -domain patterns. These features are integrated through a cross -attention mechanism and classified for fault identification. Evaluated on the Case Western Reserve University (CWRU) bearing dataset, the method achieves 98.67% accuracy, outperforming traditional techniques.会议名称: 2024 Cross Strait Radio Science and Wireless Technology Conference会议日期: NOV 04-07, 2024会议地点: PEOPLES R CHINA会议赞助商: Institute of Electrical and Electronics Engineers Inc入藏号: WOS:001414377800098Indexed Date: 2025-03-01
4. 条作者: 张晓锋; 郝如江; 程旺; 夏晗铎; 段泽森作者: Zhang Xiaofeng; Hao Rujiang; Cheng Wang; Xia Handuo; Duan Zesen标题: Research on Gearbox Fault Diagnosis Combining Multi-scale Feature Fusion and Improved ResNet标题: 多尺度特征融合与改进ResNet结合的齿轮箱故障诊断研究来源出版物: Mechanical Science and Technology for Aerospace Engineering来源出版物: 机械科学与技术卷: 42期: 10页: 1699-1704文献号: 1003-8728(2023)42:10<1699:DCDTZR>2.0.TX;2-I文献类型: Article出版年: 2023摘要: The deep residual network can use skip connections to directly pass the input information to the output, so it can build a deeper layer to improve the training effect of the neural network; but in complex working conditions,the influence of redundant noise will make the diagnostic performance of residual network drop significantly. Considering the noise reduction performance of the soft threshold and the adaptive screening feature performance of the attention mechanism,a set of adaptive threshold blocks are embedded in the residual module, which utilizes the attention mechanism to weight the features according to different degrees of importance and automatically set different thresholds for each sample to eliminate the interference of random noise on fault diagnosis. Furtherly,considering that the gearbox fault signal is highly time-varying,and the features learned by the CNN model have a certain scale invariance,a multi-scale convolution kernel and a feature fusion model are proposed to improve the network model,which significantly improves the phenomenon of feature loss. The final experiment shows that in the case of noise,the accuracy of the improved model is significantly improved; after adding multi-scale feature fusion,the number of iterations required by the network is greatly reduced,and the fault diagnosis accuracy of the improved network is further increased by 2 percentage points. Efficiency of network learning is significantly increased by 40%.摘要: 深度残差网络使用跳跃连接,通过直接将输入信息绕道传到输出,能够搭建更深的层数来改善神经网络的训练效果;但是在复杂工况下,冗余噪声的影响会使残差网络的诊断性能大幅下降。考虑到软阈值的降噪性能与注意力机制的自适应筛选特征性能,所以在残差模块中嵌入一组自适应阈值块,利用注意力机制根据重要程度不同来对特征进行加权,自动地给各个样本设置不同的阈值来消除随机噪声对故障诊断的干扰。考虑到齿轮箱故障信号时变性较强,而CNN模型学习到的特征具有一定的尺度不变性,为此提出多尺度卷积核与特征融合模型对网络模型进行改进,明显改善了特征丢失的现象。最后实验表明在噪声情况下,改进模型的准确率显著提升;且在加入多尺度特征融合之后网络所需迭代次数大幅度缩减,同时改进后网络的故障诊断准确率进一步提高了2个百分点,学习效率显著提高40%。入藏号: CSCD:7584777Indexed Date: 2024-01-12
5. 作者: Zhou, L (Zhou, Liang); Wang, HW (Wang, Huawei)标题: Multi-task model of adaptive multi-scale feature fusion and adaptive mixture-of-experts for equipment remaining useful life prediction and fault diagnosis来源出版物: EXPERT SYSTEMS WITH APPLICATIONS卷: 272文献号: 126807DOI: 10.1016/j.eswa.2025.126807提前访问日期: FEB 2025文献类型: Article出版年: MAY 5 2025摘要: Remaining useful life (RUL) prediction and fault diagnosis are two major prognostic activities in industrial field. Existing works focus on RUL prediction without considering the inherent correlation between RUL and faults, which is not conducive to developing effective maintenance schedules, and reduces maintenance efficiency. To effectively manage maintenance schedules and spare parts, this work proposes a multi-task model of adaptive multi-scale feature fusion and adaptive mixture-of-experts for equipment RUL prediction and fault diagnosis. Specifically, an adaptive multi-scale feature fusion block is designed as the shared-bottom structure to extract multi-scale shared features for RUL prediction and fault diagnosis. Then, an adaptive mixture-of-experts block is developed to adaptively fuse expert features for specific tasks to improve the model's adaptability and generalization ability for different tasks. Furthermore, the homoscedastic uncertainty method is adopted to construct the joint loss function for multi-task adaptive balance training. Finally, experiments on engine degradation (CMAPSS) data provided by NASA Prognostic Database and tool wear monitoring (TWM) data collected by ourselves demonstrate that the proposed model outperforms state-of-the-art methods and has good joint learning performance of RUL prediction and fault diagnosis.入藏号: WOS:001427660900001Indexed Date: 2025-02-26
6. 作者: Li, X (Li, Xu); Xu, ZF (Xu, Zhuofei); Wang, YM (Wang, Yimin)标题: PSO-MCKD-MFFResnet based fault diagnosis algorithm for hydropower units来源出版物: MATHEMATICAL BIOSCIENCES AND ENGINEERING卷: 20期: 8页: 14117-14135DOI: 10.3934/mbe.2023631文献类型: Article出版年: 2023摘要: Due to the coupling effect of external environmental noise and vibration noise, the fea-ture rate of the original hydroelectric unit fault signal is not prominent, which will affect the per-formance of fault diagnosis algorithms. To solve the above problems, this paper proposes a PSO-MCKD-MFFResnet algorithm for fault diagnosis of hydropower units (Particle swarm optimization, PSO; Maximum correlation kurtosis deconvolution, MCKD; Multi-scale feature fusion residual net-work, MFFResnet). In practical applications, the selection of key parameters in the traditional MCKD method is heavily dependent on prior knowledge. First, this paper proposes a PSO-MCKD enhance-ment algorithm for fault features, which uses the PSO algorithm to search for the influencing parame-ters of MCKD to enhance the features from the original fault signal. Second, a fault feature diagnosis algorithm based on MFFResnet is proposed to improve the utilization of local features. The multi -scale residual module is used to extract features at different scales and then put the enhanced signal into MFFResnet for training and classification. The experimental results show that our approach can accurately and effectively classify the fault types of hydropower units, with an accuracy rate of 98.85%. It is superior to other representative algorithms in different indicators and has a good stability.入藏号: WOS:001023988900010PubMed ID: 37679128Indexed Date: 2023-07-31
7. 作者: Zhou, L (Zhou, Liang); Wang, HW (Wang, Huawei); Xu, SS (Xu, Shanshan)标题: Aero-engine prognosis strategy based on multi-scale feature fusion and multi-task parallel learning来源出版物: RELIABILITY ENGINEERING & SYSTEM SAFETY卷: 234文献号: 109182DOI: 10.1016/j.ress.2023.109182提前访问日期: FEB 2023文献类型: Article出版年: JUN 2023摘要: Aero-engine prognosis is helpful to ensure its safety and reliability, and effectively reduce the maintenance cost. However, the existing works only perform RUL prediction, ignoring the fault factors that lead to engine degradation. In addition, most prognosis methods can only extract single-scale features, ignoring the potential degradation features at other scales and layers. Therefore, this work proposes an aero-engine prognosis framework based on multi-scale feature fusion and multi-task parallel learning. In the proposed framework, multi-scale feature fusion blocks are designed to explore and fuse the potential degradation features of samples under different scales. And a layers concatenation block is constructed to integrate feature details from different layers and avoid losing useful information. Then a multi-task parallel learning block is constructed, and a joint loss function is developed for parallel learning of RUL prediction and fault diagnosis tasks. Meanwhile, a stacked image conversion method is proposed to integrate multi-sensor data with multiple cycles into image sample and make it contains more information beneficial to engine degradation. Finally, experimental results on CMAPSS and N-CMAPSS datasets show that the proposed framework exhibits superiority over other state-of-the-art methods and demonstrates good generalization and robustness.入藏号: WOS:000946733400001Indexed Date: 2023-03-27
8. 作者: Zhao, Y (Zhao, Yue); Bai, JJ (Bai, Jianjun); Zou, HB (Zou, Hongbo); Feng, J (Feng, Jing)标题: Multi-scale feature fusion network-based industrial process fault diagnosis method using space-time capsule and classifier optimization来源出版物: CANADIAN JOURNAL OF CHEMICAL ENGINEERINGDOI: 10.1002/cjce.25682提前访问日期: MAR 2025文献类型: Article; Early Access摘要: This paper introduces a multi-scale feature fusion deep learning network method for industrial process fault diagnosis based on spatio-temporal capsules and classifier optimization. In the feature extraction phase, a multi-scale residual convolution network is initially employed to extract multi-scale features. Subsequently, the identified fault features are forwarded to the spatio-temporal capsule network to further extract information related to time and space. After the feature extraction is completed, we replace the traditional softmax classifier with eXtreme Gradient Boosting (XGBoost) to make the final diagnosis more efficient and faster, avoiding the long diagnosis time caused by complex models. The proposed network fully takes into account the nonlinearity, timing, and high-dimensionality of the original data. The residual network structure can solve the problem of model degradation caused by the deepening of network layers. The LSTM and capsule network structures can minimize the loss of effective feature information for features extraction and the XGBoost algorithm achieves good classification. This 'offline training, online diagnosis' method can avoid lengthy training and effectively improve the fault diagnosis efficiency. Our experiments on chemical engineering processes, such as the Tennessee Eastman (TE) process and industrial coking furnace, show that the proposed method significantly improves fault diagnosis accuracy.入藏号: WOS:001450994900001Indexed Date: 2025-03-29
9. 作者: Song, YT (Song, Yutong); Du, JH (Du, Jinhua); Li, SX (Li, Shixiao); Long, Y (Long, Yun); Liang, DL (Liang, Deliang); Liu, YF (Liu, Yifeng); Wang, Y (Wang, Yao)标题: Multi-Scale Feature Fusion Convolutional Neural Networks for Fault Diagnosis of Electromechanical Actuator来源出版物: APPLIED SCIENCES-BASEL卷: 13期: 15文献号: 8689DOI: 10.3390/app13158689文献类型: Article出版年: AUG 2023摘要: Airborne electromechanical actuators (EMAs) play a key role in the flight control system, and their health condition has a considerable impact on the flight status and safety of aircraft. Considering the multi-scale feature of fault signals and the fault diagnosis reliability for EMAs under complex working conditions, a novel fault diagnosis method of multi-scale feature fusion convolutional neural network (MSFFCNN) is proposed. Leveraging the multiple different scales' learning structure and attention mechanism-based feature fusion, the fault-related information can be effectively captured and learned, thereby improving the recognition ability and diagnostic performance of the network. The proposed method was evaluated by experiments and compared with the other three fault-diagnosis algorithms. The results show that the proposed MSFFCNN approach has a better diagnostic performance compared with the state-of-the-art fault diagnosis methods, which demonstrates the effectiveness and superiority of the proposed method.入藏号: WOS:001045419300001Indexed Date: 2023-08-19
10. 作者: Ma, MH (Ma, Minghan); Hou, YJ (Hou, Yuejia); Li, YG (Li, Yonggang)标题: A multi-scale feature fusion network-based fault diagnosis method for wind turbine bearings来源出版物: WIND ENGINEERING卷: 47期: 1页: 3-15DOI: 10.1177/0309524X221114621提前访问日期: JUL 2022文献类型: Article出版年: FEB 2023摘要: A fault diagnosis method based on a multi-scale feature fusion network (MSFF-CNN) is proposed for the problem that the vibration signals of wind turbine bearings are easily disturbed by noise, and feature extraction is harrowing. Compared with the traditional diagnosis method, which has two stages of manual feature extraction and fault classification, this method combines the two into one. First, based on the characteristics of the bearing vibration signal, the multi-scale kernel algorithm is used to learn features in parallel at different scales. Then, the features extracted at different scales are fused to obtain complementary and rich diagnostic information. Finally, the Softmax classifier is used to output the fault diagnosis results. The simulation is carried out through the bearing vibration data of Case Western Reserve University. The results show that the accuracy of bearing fault diagnosis reaches 99.17%, proving the proposed method's high accuracy and effectiveness.入藏号: WOS:000829117100001Indexed Date: 2022-07-31
11. 作者: Zhang, JQ (Zhang, Jiqiang); Kong, XW (Kong, Xiangwei); Han, TR (Han, Taorui); Cheng, L (Cheng, Liu); Li, XY (Li, Xueyi); Liu, ZT (Liu, Zhitong)标题: Research on a Lightweight Multi-Scale Feature Fusion and its Fault Diagnosis Method for Rolling Bearing with Limited Labeled Samples来源出版物: EKSPLOATACJA I NIEZAWODNOSC-MAINTENANCE AND RELIABILITY卷: 27期: 1文献号: 192235DOI: 10.17531/ein/192235文献类型: Article出版年: 2025摘要: Convolutional neural networks(CNNs) show significant potential for bearing fault diagnosis. However, traditional CNNs face challenges such as poor noise resistance, high computational complexity, reliance on extensive samples, and limited generalizability. As a result, this paper proposes WDSC-Net, a lightweight, multiscale feature fusion method, focusing on limited labeled fault samples. Initially, a wide kernel convolutional is employed, aiming to reduce parameters and computational complexity. Next, features are fed into a 1x1 convolutional layer reduces feature dimensionality. Subsequently, leveraging the benefits of depth-separable convolution (DSC) allows the separation of spatial and channel features, constructing four convolutional layers of varying scales to amplify the nonlinear fault representation. Finally, an improved feature soft-threshold denoising module is introduced for global feature denoising. Validation on CWRU and MCDS datasets shows that the WDSC-Net method exhibits superior generalizability and noise resistance compared to typical deep-learning fault methods.入藏号: WOS:001392013900017Indexed Date: 2025-01-13
12. 作者: 王敏; 邓艾东; 马天霆; 张宇剑; 薛原作者: Wang Min; Deng Aidong; Ma Tianting; Zhang Yujian; Xue Yuan标题: Rolling bearing fault diagnosis method based on a multi-scale and improved gated recurrent neural network with dual attention标题: 基于双注意力机制的MSCN-BiGRU的滚动轴承故障诊断方法来源出版物: Journal of Vibration and Shock来源出版物: 振动与冲击卷: 43期: 6页: 84-92,103文献号: 1000-3835(2024)43:6<84:JYSZYL>2.0.TX;2-B文献类型: Article出版年: 2024摘要: Regarding the problem that the diagnosis accuracy of rolling bearing fault diagnosis models decreases under the variable working conditions and environmental noise interference,a rolling bearing fault diagnosis method(DAMSCN-BiGRU) composed of a multi-scale convolutional network based on dual attention mechanism (DAMSCN) and an improved bidirectional gated recurrent unit (BiGRU) was proposed.Firstly,using the multi-scale feature fusion module with different kernel sizes to obtain a variety of receptive fields and extract the multi-scale feature information of the original vibration signal of the bearing,which were fused adaptively according to their importance.And the multi-scale features were weighted and fused using a dual attention module composed of channel attention and spatial attentionto weaken the redundant features in the fused features.Then,the attention layer was added and the segmented activation was used to improve the BiGRU to mine the time-domain features of the signal to improve the performance of the bearing fault diagnosis.Finally,the classification of different faults was completed by the Softmax layer.The experimental results show that compared with other intelligent diagnosis models,DAMSCN-BiGRU can achieve an average diagnostic accuracy of 98.2% under variable working condition and still has an accuracy of 85.3% in the strong noise background,and the effect is better than other commonly used models under different levels of noise intensity,which is beneficial to promote the research and practical application in the intelligent fault diagnosis of rolling bearings.摘要: 针对滚动轴承故障诊断模型在变工况和环境噪声干扰下诊断精度降低的问题,提出一种基于双注意力机制的多尺度卷积网络(dual attention and multi-scale convolutional networks,DAMSCN)与改进的双向门控循环单元(bidirectional gated recurrent unit,BiGRU)组成的故障诊断模型DAMSCN-BiGRU。首先,多尺度特征融合模块使用不同大小的卷积核,获得多种感受野,从而提取到轴承原始振动信号的多尺度特征信息,并根据重要性对其进行自适应融合,然后利用通道注意力和空间注意力组成的双注意力模块(dual attention module,DAM)对多尺度特征进行重新标定,分配注意力权重,削弱融合特征中的冗余特征;然后,增加注意力层和利用分段激活改进BiGRU进而挖掘信号的时域特征,以提高轴承故障诊断的性能;最后,通过Softmax层完成对不同故障的分类。试验结果表明,与其他智能诊断模型相比,DAMSCN-BiGRU在变工况环境下,平均诊断精度达到98.2%,在强噪声背景下仍然有着85.3%的准确率,且在不同程度的噪声强度下效果均优于其他常用模型,有利于促进滚动轴承的智能故障诊断研究和实际应用。入藏号: CSCD:7716024Indexed Date: 2024-07-20
13. 作者: Li, XG (Li, Xianguo); Wu, DD (Wu, Dongdong); Liu, Y (Liu, Yi); Chen, Y (Chen, Ying)标题: Belt conveyor idler fault diagnosis method based on multi-scale feature fusion and residual mask convolution attention来源出版物: INSIGHT卷: 66期: 2页: 82-93DOI: 10.1784/insi.2024.66.2.82文献类型: Article出版年: FEB 2024摘要: Existing idler fault diagnosis methods have problems in failing to fully obtain global context information and providing poor diagnostic accuracy. To address these problems, this paper investigates a new method for diagnosing faults in belt conveyor idlers, based on analysis of their acoustic signals. The method is also applied to existing databases of bearing fault data. Firstly, an eight -element microphone array sound signal collector is designed to suppress environmental noise and raise the signal-to-noise ratio of the idler sound signal. Secondly, a multi -scale feature fusion (MSFF) module is constructed to learn complementary information between features at different scales. Then, a residual mask convolutional attention (MCA) module is designed to raise the modelling capability of local features and global contextual information. Finally, the structure of the ResNet-18 network is optimised to improve model fitting performance. Experimental results on self-made and public datasets show that the suggested method outperforms other comparative methods, real-time accurate detection and classification of belt idler faults and faults.入藏号: WOS:001240080600005Indexed Date: 2024-06-15
14. 作者: He, CF (He, Changfu); He, DQ (He, Deqiang); Wei, ZX (Wei, Zexian); Xu, K (Xu, Kai); Chen, YJ (Chen, Yanjun); Shan, S (Shan, Sheng)标题: A train bearing imbalanced fault diagnosis method based on extended CCR and multi-scale feature fusion network来源出版物: NONLINEAR DYNAMICS卷: 112期: 15页: 13147-13173DOI: 10.1007/s11071-024-09733-2提前访问日期: MAY 2024文献类型: Article出版年: AUG 2024摘要: The number of fault samples is much less than the normal samples in the actual operation of the train bearing, and the imbalanced characteristics of the fault data significantly decrease the performance of the diagnosis model. Therefore, a train bearing imbalanced fault diagnosis method (ECCR-MFFN) based on extended combined cleaning and resampling (ECCR) and the multi-scale feature fusion network (MFFN) is proposed. Firstly, the ECCR method is proposed, which adaptively determines the sampling area and provides rich fault information for the diagnostic model with high-quality synthesized samples. Then, MFFN is designed to obtain great feature extraction and classification results under imbalanced data conditions through feature extraction and fusion strategies of multi-branch different kernels. Finally, the superiority and effectiveness of the ECCR-MFFN under various data imbalance conditions are verified by comparative experiments on laboratory and public bearing datasets. The results demonstrate that the MFFN can effectively extract fault features under small imbalance rate (IBR) conditions and achieve ideal classification results. Compared with other data augmentation methods, the ECCR can synthesize samples with higher quality and has a more stable performance. Under the condition of IBR = 40:1, the accuracy of the ECCR-MFFN is 95.84% and 96.07%, which is significantly better than the comparison methods and offers a reliable method for dealing with data imbalance.入藏号: WOS:001231028000002Indexed Date: 2024-05-31
15. 作者: Bao, PF (Bao, Panfeng); Zhu, Y (Zhu, Yue); Shen, YF (Shen, Yufeng); Ou, JS (Ou, Jiashun); Hu, XN (Hu, Xuening)标题: Correlation-Enhanced Multi-Scale Residual Network for Bearing Fault Diagnosis in Noisy and Cross-Working Conditions来源出版物: INTERNATIONAL JOURNAL OF PROGNOSTICS AND HEALTH MANAGEMENT卷: 16期: 2文献号: 4302DOI: 10.36001/IJPHM.2025.v16i2.4302文献类型: Article出版年: 2025摘要: Bearing fault diagnosis under noisy and cross-working conditions remains a challenging task due to complex signal variations and interference. To address this challenge, this paper proposes a Correlation-Enhanced Multi-Scale Residual Network (CE-MSRN), which effectively captures multi-scale fault features while enhancing correlation across different bearing faults. Our model integrates a residual learning framework with a multi-scale feature fusion mechanism, improving robustness against noise and generalization across diverse working conditions. Experimental evaluations on benchmark datasets demonstrate that CE-MSRN achieves superior diagnostic accuracy compared to mainstream methods, exhibiting strong adaptability to unseen fault patterns. These results confirm the potential of our approach for real-time and reliable bearing fault diagnosis in aero-engines and transmission systems.入藏号: WOS:001546578100001Indexed Date: 2025-08-17
16. 作者: Luo, HL (Luo Honglin); Feng, L (Feng Li); Yang, R (Yang Rui); Xu, SQ (Xu Shuiqing); Du, KN (Du Kenan)编者: Cai, C (Cai, C); Qu X (Qu, X); Mai, R (Mai, R); Zhang, P (Zhang, P); Chai, W (Chai, W); Wu, S (Wu, S)标题: Inverter and Sensor Fault Diagnosis of PMSM Drive System based on Improved WOA-LSTM来源出版物: PROCEEDINGS OF 2023 INTERNATIONAL CONFERENCE ON WIRELESS POWER TRANSFER, VOL 4, ICWPT 2023丛书标题: Lecture Notes in Electrical Engineering卷: 1161页: 471-478DOI: 10.1007/978-981-97-0869-7\_51文献类型: Proceedings Paper出版年: 2024摘要: Aiming at the problems of low fault diagnosis accuracy and poor model generalization of permanent magnet synchronous motor (PMSM) drive system, a fault diagnosis model method combining Improved Whale Optimization Algorithm (IWOA) and Long Short Term Memory neural network (LSTM) was proposed. Firstly, the multi-dimensional features of motor signals are extracted by multi-scale feature fusion method, and the high-dimensional feature sample set is obtained. Secondly, the proposed Improved WOA is used to optimize the LSTM network model hyperparameters. Then, the improved WOA-LSTM model is used to realize the fault diagnosis of PMSM drive system inverter and sensor. Finally, the effectiveness of the proposed method is verified by comparing it with typical fault diagnosis methods.会议名称: International Conference on Wireless Power Transfer (ICWPT)会议日期: OCT 13-15, 2023会议地点: Weihai, PEOPLES R CHINA入藏号: WOS:001285140700051Indexed Date: 2024-09-06
17. 作者: Guan, Y (Guan, Yang); Meng, Z (Meng, Zong); Sun, DY (Sun, Dengyun); Liu, JB (Liu, Jingbo); Fan, FJ (Fan, Fengjie)标题: 2MNet: Multi-sensor and multi-scale model toward accurate fault diagnosis of rolling bearing来源出版物: RELIABILITY ENGINEERING & SYSTEM SAFETY卷: 216文献号: 108017DOI: 10.1016/j.ress.2021.108017提前访问日期: SEP 2021文献类型: Article出版年: DEC 2021摘要: Rolling bearing is an indispensable element of rotating machinery, timely and accurate fault diagnosis of rolling bearing plays an important role in the safe and reliable operation of modern industrial systems. Considering the bottleneck that the information collected by a single sensor and single scale features extracted by conventional networks are not comprehensive, a multi-sensor and multi-scale model (2MNet) is proposed to bring a new perspective to accurate fault diagnosis. Most notably, multi-sensor vibration signals in three directions can be fused by defining a novel correlation kurtosis weighted fusion rule. Furthermore, the implication of multi-scale is twofold: one is the multi-scale feature extraction by optimizing the conventional deep residual network and adding dilated convolution, and the other is to achieve multi-scale feature fusion by combining the pyramid principle which can connect deep and shallow features. The superiority and applicability of the model are confirmed by numerical simulation and rolling bearing data.入藏号: WOS:000702351700083Indexed Date: 2021-10-08
18. 作者: Tian, M (Tian, Miao); An, WJ (An, Wenjie); Sun, XM (Sun, Xianming); Wang, LP (Wang, Lipeng); Chen, CZ (Chen, Changzheng)标题: A non-contact fault diagnosis method based on multi information fusion networks for rolling bearings来源出版物: APPLIED ACOUSTICS卷: 237文献号: 110776DOI: 10.1016/j.apacoust.2025.110776提前访问日期: MAY 2025文献类型: Article出版年: JUL 5 2025摘要: Traditional fault diagnosis of rolling bearings primarily depends on vibration signal analysis, however, the physical contact requirement of vibration sensors significantly limits their practical application. To overcome this limitation, a novel non-contact diagnostic approach utilizing sound array technology, the Multi-Information Fusion Network (MIFNet) is proposed. Firstly, a multi-scale feature fusion module with information enhancement (IE-MSFFM) is developed, which adaptively enhances the sound signals of each channel to reduce signal noise and extract multi-scale characteristics for information fusion. Secondly, a multi-channel information selection fusion module (MCISFM) is developed to remove redundant information between multi-channel sound array signals and perform further information fusion to extract deep fault features of rolling bearings. Finally, the fault diagnosis module (FDM) is used to obtain the fault diagnosis results. The effectiveness of MIFNet is evaluated based on experimental data acquired by circular array sound sensors. The results show that MIFNet has excellent robustness and fault feature extraction performance in processing sound array signals. In addition, compared to existing advanced bearing fault diagnosis methods, MIFNet can faster and more accurate diagnose faults based on sound array signals. This study provides a new diagnostic method for non-contact fault diagnosis of rolling bearings.入藏号: WOS:001487698300001Indexed Date: 2025-05-18
19. 作者: 王妮妮; 马萍; 张宏立; 王聪作者: Wang Nini; Ma Ping; Zhang Hongli; Wang Cong标题: FAULT DIAGNOSIS OF ROLLING BEARING BASED ON FEATURE FUSION OF MULTI-SCALE DEEP CONVOLUTIONAL NETWORK标题: 基于多尺度深度卷积网络特征融合的滚动轴承故障诊断来源出版物: Acta Energiae Solaris Sinica来源出版物: 太阳能学报卷: 43期: 4页: 351-358文献号: 0254-0096(2022)43:4<351:JYDCDS>2.0.TX;2-5文献类型: Article出版年: 2022摘要: Aiming for the limitations of traditional fault diagnosis model,such as,strong dependence on engineering priori knowledge, incomplete feature extraction,difficulties in selection of classifiers,a fault diagnosis model of rolling bearing based on feature fusion of multi-scale deep convolutional neutral network is proposed. First,a convolutional neural network model that integrates feature extraction and pattern recognition is constructed,the vibration signals of rolling bearing are converted into two- dimensional images by wavelet transform and used as the input sample set. Second,a multi- scale feature fusion module is built up in the network structure for the purpose of adaptive extraction of features at different levels of fault samples,aiming to extract different- scale features completely. Finally,fault samples are input into the network to realize adaptive features extract of bearing signals and end- to- end diagnosis. According to the experimental analysis results,the proposed fault diagnosis model based on feature fusion of multi- scale deep convolutional network can extract features of the signal at all levels and achieves higher diagnosis accuracy and robustness under interferences of different noises. It provides a theoretical basis to realize fault diagnosis of rolling bearings.摘要: 针对传统滚动轴承故障诊断模型对工程先验知识依赖性强、提取特征不充分、分类器选取困难等问题,提出一种基于多尺度深度卷积网络特征融合的滚动轴承故障诊断模型。首先,建立集特征提取与模式识别于一体的卷积神经网络模型,利用小波变换将滚动轴承振动信号转换为二维图像作为输入样本集。然后,在网络结构中构建多尺度特征融合模块自适应提取故障样本不同层级特征,以实现样本不同尺度特征的充分提取。最后,将故障样本输入到网络中实现轴承信号特征自适应提取及端到端诊断。实验结果表明,所提基于多尺度深度卷积网络特征融合的故障诊断模型能充分提取信号各层级特征,在不同噪声干扰下具有较高的诊断精度和鲁棒性,可为滚动轴承故障诊断提供理论基础和实现途径。入藏号: CSCD:7199840Indexed Date: 2022-07-08
20. 作者: Xiao, ZG (Xiao, Zhiguo); Li, DN (Li, Dongni); Yang, CG (Yang, Chunguang); Chen, W (Chen, Wei)标题: Fault Diagnosis Method of Special Vehicle Bearing Based on Multi-Scale Feature Fusion and Transfer Adversarial Learning来源出版物: SENSORS卷: 24期: 16文献号: 5181DOI: 10.3390/s24165181文献类型: Article出版年: AUG 2024摘要: To address the issues of inadequate feature extraction for rolling bearings, inaccurate fault diagnosis, and overfitting in complex operating conditions, this paper proposes a rolling bearing diagnosis method based on multi-scale feature fusion and transfer adversarial learning. Firstly, a multi-scale convolutional fusion layer is designed to effectively extract fault features from the original vibration signals at multiple time scales. Through a feature encoding fusion module based on the multi-head attention mechanism, feature fusion extraction is performed, which can model long-distance contextual information and significantly improve diagnostic accuracy and anti-noise capability. Secondly, based on the domain adaptation (DA) cross-domain feature adversarial learning strategy of transfer learning methods, the extraction of optimal domain-invariant features is achieved by reducing the gap in data distribution between the target domain and the source domain, addressing the call for research on fault diagnosis across operating conditions, equipment, and virtual-real migrations. Finally, experiments were conducted to verify and optimize the effectiveness of the feature extraction and fusion network. A public bearing dataset was used as the source domain data, and special vehicle bearing data were selected as the target domain data for comparative experiments on the effect of network transfer learning. The experimental results demonstrate that the proposed method exhibits an exceptional performance in cross-domain and variable load environments. In multiple bearing cross-domain transfer learning tasks, the method achieves an average migration fault diagnosis accuracy rate of up to 98.65%. When compared with existing methods, the proposed method significantly enhances the ability of data feature extraction, thereby achieving a more robust diagnostic performance.入藏号: WOS:001305742600001PubMed ID: 39204877Indexed Date: 2024-09-15
21. 作者: Ma, YD (Ma, Yidan); Song, ZX (Song, Zaixin); Liang, YT (Liang, Yongtao); Cao, JF (Cao, Jianfu)书籍团体作者: IEEE标题: Gear Fault Diagnosis in Geared Motors based on Frequency Adaptation Graph Prototype Network with Limited Data来源出版物: 2024 27TH INTERNATIONAL CONFERENCE ON ELECTRICAL MACHINES AND SYSTEMS, ICEMS丛书标题: International Conference on Electrical Machines and Systems ICEMS页: 3340-3345文献类型: Proceedings Paper出版年: 2024摘要: Detecting and classifying gear faults with limited labeled data is essential for effective fault diagnosis in electromechanical systems. This paper presents a novel Frequency Adaptation Graph Prototype Network (FAGPN) for classifying various gear faults in geared motors. FAGPN employs customized low-pass and high-pass filters, integrated with an attention mechanism, to enhance multi-scale feature fusion from vibration signals processed through various frequency-time methods. Additionally, FAGPN projects embeddings onto hyperspherical space with a consistency constraint to improve accuracy. Experimental results on real-world datasets involving multiple gear sets in different states demonstrate the superior performance of FAGPN. Remarkably, with a training ratio of 1%, FAGPN achieves over 99% accuracy.会议名称: 27th International Conference on Electrical Machines and Systems-ICEMS-Annual会议日期: DEC 26-29, 2024会议地点: Fukuoka, JAPAN入藏号: WOS:001492416500534Indexed Date: 2025-08-23
22. 作者: Wu, T (Wu, Tao); Guo, Y (Guo, Yu)书籍团体作者: IEEE标题: An End-to-end Fault Diagnosis Method: Dual-branch Network Feature Fusion Model Combined with MSACNN and Bi-LSTM来源出版物: 2024 IEEE INTERNATIONAL CONFERENCE ON AUTOMATIC CONTROL AND INTELLIGENT SYSTEMS, I2CACIS 2024丛书标题: IEEE International Conference on Automatic Control and Intelligent Systems页: 53-58DOI: 10.1109/I2CACIS61270.2024.10649851文献类型: Proceedings Paper出版年: 2024摘要: With the advancement of informatization and intelligent transformation in the manufacturing industry, the reliability and stability of manufacturing equipment have become crucial. Traditional equipment fault diagnosis methods only use single-branch convolutional neural networks (CNN) to extract vibration signal features, focusing on extracting local detailed features while lacking attention to the global features of the vibration signals. To address this issue, this paper proposes an end-to-end equipment fault diagnosis method based on a dual-branch feature fusion model, which combines the advantages of multi-scale attention convolutional neural networks (MSACNN) and Bidirectional Long Short-Term Memory (Bi-LSTM) in signal feature extraction. This approach focuses on calculating the global relationships of vibration signals while paying attention to local subtle feature information, and the two branches complement and fuse. Furthermore, to address the feature fusion problem of vibration signals, a multi-scale feature fusion module is designed to treat the global and local representations of vibration signals equally in the classifier, thereby avoiding the problem of gradient vanishing in subsequent fully connected layers. Experimental results show that compared to existing fault diagnosis methods, this method can adapt to variable noise interference and has higher accuracy.会议名称: IEEE International Conference on Automatic Control and Intelligent Systems (I2CACIS)会议日期: JUN 29, 2024会议地点: Shah Alam, MALAYSIA会议赞助商: IEEE; IEEE Malaysia Sect, Control Syst Chapter; Proc, Instrumentat & Control Res Interest Grp; Univ Teknologi MARA入藏号: WOS:001308267400010Indexed Date: 2024-12-09
23. 作者: Yang, S (Yang, Shuai); Liu, Y (Liu, Yan); Tian, XC (Tian, Xincheng); Ma, LX (Ma, Lixin)编者: Liu, XJ (Liu, XJ); Nie, Z (Nie, Z); Yu, J (Yu, J); Xie, F (Xie, F); Song, R (Song, R)标题: Bearing Fault Diagnosis Based on Attentional Multi-scale CNN来源出版物: INTELLIGENT ROBOTICS AND APPLICATIONS, ICIRA 2021, PT III丛书标题: Lecture Notes in Artificial Intelligence卷: 13015页: 25-36DOI: 10.1007/978-3-030-89134-3\_3文献类型: Proceedings Paper出版年: 2021摘要: Bearing is an indispensable component of industrial production equipment. The health status of bearing affects the production efficiency of equipment, so it is necessary to detect the health status of bearing in real time. In this paper, a multi-scale feature fusion convolutional neural network with attention mechanism (AMMNet) is proposed for bearing fault diagnosis. Firstly, different scale shallow features of the input signal are extracted by parallel convolutional layers with different kernel sizes. Then, the shallow features are sent to the feature fusion module based on channel attention mechanism. After that, the fused features are fed to the deep feature extractor. Finally, the bearing fault type is identified by the classifier. We introduce a novel dropout mechanism to the input signal to improve the generalization ability of the network. Experiments show that the proposed method has high stability and generalization ability. It can not only achieve high average accuracy in fixed load environment, but also has higher recognition accuracy and better stability than some intelligent algorithms in variable load conditions.会议名称: 14th International Conference on Intelligent Robotics and Applications (ICIRA)会议日期: OCT 22-25, 2021会议地点: Yantai, PEOPLES R CHINA会议赞助商: Tsinghua Univ; Beihang Univ; Shandong Univ; YEDA; Yantai Univ; IFToMM China; Springer入藏号: WOS:000725410600003Indexed Date: 2021-12-23
24. 作者: Huang, XH (Huang, Xinghua); Li, YY (Li, Yuanyuan); Chai, Y (Chai, Yi)标题: Intelligent Fault Diagnosis Method of Wind Turbines Planetary Gearboxes Based on a Multi-Scale Dense Fusion Network来源出版物: FRONTIERS IN ENERGY RESEARCH卷: 9文献号: 747622DOI: 10.3389/fenrg.2021.747622文献类型: Article出版年: NOV 29 2021摘要: Due to the powerful capability of feature extraction, convolutional neural network (CNN) is increasingly applied to the fault diagnosis of key components of rotating machineries. Due to the shortcomings of traditional CNN-based fault diagnosis methods, the continuous convolution and pooling operations result in the constant decrease of feature resolution, which may cause the loss of some subtle fault information in the samples. This paper proposes a CNN-based model with improved structure multi-scale dense fusion network (MSDFN) to realize the fault diagnosis of wind turbines planetary gearboxes under complicated working conditions. First, the continuous wavelet transform is applied to preprocess the vibration signals, and the two-dimensional wavelet time-frequency diagrams are used as the network input. Then, the multi-scale feature fusion (MSFF) module and a feature of maximum (FoM) module are used in the extraction and classification stages of fault features, respectively. Next, the multi-scale features of each network layer are fused to enhance the fault features. Finally, the high fault diagnosis accuracy is achieved by extracting the separable fusion result of fault features. The proposed method achieves more than 99% fault diagnosis average accuracy on a planetary gearbox dataset. The comparative experimental results verify the effectiveness of the proposed method and its superiority to some mainstream approaches. The ablation study further confirms that MSFF module and FoM module play the positive role in fault diagnosis.入藏号: WOS:000731702500001Indexed Date: 2021-12-27
25. 作者: Huang, Z (Huang, Zhe); Lan, Q (Lan, Qing); Li, MX (Li, Mingxuan); Wen, ZH (Wen, Zhihui); He, WP (He, Wangpeng)编者: Zhang, H (Zhang, H); Li X (Li, X); Hao, T (Hao, T); Meng, W (Meng, W); Wu, Z (Wu, Z); He, Q (He, Q)标题: A Multi-scale Feature Adaptation ConvNeXt for Cross-Domain Fault Diagnosis来源出版物: NEURAL COMPUTING FOR ADVANCED APPLICATIONS, NCAA 2024, PT III丛书标题: Communications in Computer and Information Science卷: 2183页: 339-353DOI: 10.1007/978-981-97-7007-6\_24文献类型: Proceedings Paper出版年: 2025摘要: Real-time monitoring of the operational status of mechanical equipment is crucial in industrial production. The scarcity of fault data, the predominance of unlabeled monitoring data, and the complex and variable operational conditions have gradually become prominent, which limit the accuracy of diagnostic models and affect their effectiveness in new operational conditions. To address these issues, a domain adaptation fault diagnosis method based on a multi-scale feature adaptive ConvNeXt is proposed in this paper. By integrating multi-scale feature fusion, multi-spectral attention mechanisms, and feature adaptive selection modules, the method enhances the ConvNeXt network's capability to capture fault characteristics. It combines conditional domain adversarial techniques to align the cross-domain feature marginal and conditional distributions. Comparative experiments conducted on two bearing datasets demonstrate the effectiveness of the proposed method in addressing the challenge of sparse labeling under target operating conditions, enabling accurate assessments of the health status of mechanical equipment in target conditions.会议名称: 5th International Conference on Neural Computing for Advanced Applications (NCAA)会议日期: JUL 05-07, 2024会议地点: Asia Pacific Assoc Cognit Intelligence, Guilin, PEOPLES R CHINA会议赞助商: Guangxi Normal Univ; Guilin Univ Elect Tech; Guilin Univ Tech; Shandong Jianzhu Univ会议主办方: Asia Pacific Assoc Cognit Intelligence入藏号: WOS:001343432300024Indexed Date: 2024-12-03
26. 作者: Lei, CL (Lei, Chunli); Wan, HY (Wan, Huiyuan); Yu, YQ (Yu, Yongqin); Miao, CX (Miao, Chengxiang); Feng, RC (Feng, Ruicheng)标题: Fault diagnosis method of rolling bearing under variable operating conditions based on MFCCNN来源出版物: PROCEEDINGS OF THE INSTITUTION OF MECHANICAL ENGINEERS PART C-JOURNAL OF MECHANICAL ENGINEERING SCIENCE卷: 239期: 7页: 2637-2648DOI: 10.1177/09544062241303382提前访问日期: DEC 2024文献类型: Article出版年: APR 2025摘要: A rolling bearing fault diagnosis method based on multi-scale feature fusion and cross-level connection convolutional neural network (MFCCNN) is proposed to address the issues of low accuracy and low generalization performance caused by the complex and variable actual working conditions of rolling bearings. Firstly, a Markov transition field (MTF) is used to convert a one-dimensional signal into a two-dimensional image with temporal correlation. Next, an improved channel attention mechanism is integrated into the multi-scale network to assign different weights to each channel information and extract initial features. Then, a position attention mechanism is created and incorporated into the cross-level connection to enhance the feature expression ability for deep feature extraction. The MFCCNN faults diagnosis model is developed based on the above module. Finally, the MTF images is input into the proposed model for training, and the Softmax classifier is utilized to achieve fault classification. To verify the effectiveness and superiority of the MFCCNN method, the CWRU and MFS rolling bearing dataset are selected for experimental verification. The results demonstrates that the MFCCNN model has higher diagnostic accuracy, stronger noise immunity, and generalization performance in varying operating conditions compared to other fault diagnosis methods.入藏号: WOS:001378815000001Indexed Date: 2024-12-21
27. 作者: Xie, GP (Xie, Guangpeng); Zhan, HF (Zhan, Hongfei); Yu, JH (Yu, Junhe); Wang, R (Wang, Rui); Cheng, YK (Cheng, Youkang)标题: Gearbox fault diagnosis based on RGT-MFFIN and multi-sensor fusion image generation来源出版物: ENGINEERING RESEARCH EXPRESS卷: 6期: 3文献号: 035577DOI: 10.1088/2631-8695/ad6f6c文献类型: Article出版年: SEP 1 2024摘要: In gearbox fault diagnosis based on vibration and torque state data, traditional one-dimensional time-frequency domain analysis methods often suffer from insufficient feature expression and mining, and require complex noise reduction and filtering preprocessing. To address this issue, this paper proposes a fusion image generation method that integrates the advantages of recurrence plot (RP) and Gramian angular summation field (GASF) to generate recurrence Gramian transformed (RGT) images. This approach integrates both global and local fault information, making the fault characteristics more intuitive and easier to analyze. Given that multi-sensor collaboration can enhance feature representation, feature-level fusion increases the computational burden, and decision-level fusion is prone to losing inter-sensor correlation information, this paper adopts data-level fusion for image sample enhancement. In the diagnostic method, the challenge of traditional convolutional neural networks (CNNs) in extracting diverse geometric linear structures from fused images is addressed by introducing deformable convolutional blocks for initial feature extraction. Additionally, a multi-scale feature fusion interaction network (MFFIN) is constructed. This network incorporates a channel-space interactive attention mechanism on top of multi-scale feature extraction, assigning weights to features according to their importance while facilitating the interaction of feature information. Finally, validation is carried out using public datasets, and the experimental results show that the proposed method demonstrates significant advantages in classification accuracy and robustness under variable operating conditions and noise, thereby proving its effectiveness and practicality.入藏号: WOS:001322178900001Indexed Date: 2024-10-05
28. 作者: Huang, ZW (Huang, Zhiwu); Zhao, XL (Zhao, Xinlong)标题: A novel multi-scale competitive network for fault diagnosis in rotating machinery来源出版物: ENGINEERING APPLICATIONS OF ARTIFICIAL INTELLIGENCE卷: 128文献号: 107441DOI: 10.1016/j.engappai.2023.107441提前访问日期: NOV 2023文献类型: Article出版年: FEB 2024摘要: Bearing fault diagnosis plays a vital role in ensuring the safe and reliable operation of rotating machinery. The diagnostic process is more difficult when the fault is in its early stages, as fewer fault components are contained in the vibration signal, making the diagnosis process more difficult. To improve the accuracy and efficiency of fault type identification, a novel multi-scale competitive network for fault diagnosis is proposed in this paper. First, to obtain multi-scale features and fully utilize the features in the intermediate layer, ensuring the completeness of fault information, a novel improved multi-scale feature fusion residual network (IMSFFRN) is proposed to exploit deep features for vibration signals. Specifically, multi-scale features are obtained by convolution with different dilation rates, and features from adjacent intermediate layers are selected for efficient fusion. Second, different features have varying importance in fault detection tasks. To make neurons more sensitive to specific faults, we propose a multiple-winning consciousness self-organizing map (MCSOM) competition layer, in which each neuron learns specific faults through competition, and the neuron that wins the competition updates its weights. This distinguishes the sensitivity of neurons to different faults. Finally, the generalizability of the network is improved by using support vector machines (SVMs) to classify fault classes. To affirm the efficacy of the proposed approach, a comprehensive evaluation is conducted on the CWRU, PU bearing dataset and SEU gear dataset. The results indicate that the accuracies achieved by the method proposed in this paper are 100%, 99.56% and 100%, respectively. It is superior to other methods proposed in this paper. Furthermore, it is observed that the proposed method exhibits high robustness in noisy environments.入藏号: WOS:001119054100001Indexed Date: 2023-12-21
29. 作者: Li, ZN (Li, Zhenning); Jiang, HK (Jiang, Hongkai); Dong, YT (Dong, Yutong)标题: A convolutional-transformer reinforcement learning agent for rotating machinery fault diagnosis来源出版物: EXPERT SYSTEMS WITH APPLICATIONS卷: 271文献号: 126669DOI: 10.1016/j.eswa.2025.126669提前访问日期: FEB 2025文献类型: Article出版年: MAY 1 2025摘要: In the maintenance and management of rotating machinery, vibration signals during operation can reflect the health status of the system. Deep learning algorithms have enabled automatic feature extraction in vibration monitoring and diagnostic technologies, gaining widespread recognition in intelligent equipment management, though some limitations still exist. To improve model performance under limited sample scenarios and incorporate continuously optimizable strategies, this study introduces LiteDPER-CTQN (Lightweight Double Prioritized Experience Replay with Convolutional Transformer Q-Network), a novel fault diagnosis agent incorporating reinforcement learning. The agent demonstrates superior feature extraction and model adaptation through three key innovations: a lightweight reinforcement learning framework ensuring efficient and stable training, an enhanced Transformer-based architecture enabling multi-scale feature fusion, and an integrated intelligent diagnosis system. Experimental results on both bench tests and electric locomotive data demonstrate that our method achieves higher diagnosis accuracy, faster convergence, and lower computational resource consumption compared to state-of-the-art approaches, while the visualization of the Q-value function enhances the interpretability of the decision-making process.入藏号: WOS:001422909900001Indexed Date: 2025-02-23
30. 作者: Guan, Y (Guan, Yang); Meng, Z (Meng, Zong); Li, JM (Li, Jimeng); Cao, W (Cao, Wei); Sun, DY (Sun, Dengyun); Liu, JB (Liu, Jingbo); Fan, FJ (Fan, Fengjie)标题: A novel diagnostic framework based on vibration image encoding and multi-scale neural network来源出版物: EXPERT SYSTEMS WITH APPLICATIONS卷: 251文献号: 124054DOI: 10.1016/j.eswa.2024.124054提前访问日期: APR 2024文献类型: Article出版年: OCT 1 2024摘要: Intelligent fault diagnosis employing CNN-based techniques has demonstrated promising results in rotating machinery maintenance and management. However, most approaches that rely on time-series vibration signals fail to incorporate the physical knowledge of faults into feature learning, and are subject to obtaining the correlation between input and output characteristics. Furthermore, it is challenging for the neural network to improve feature extraction due to the rigid convolution kernel and the limited receptive field. To address these issues, an intelligent fault diagnosis framework is developed based on vibration image encoding and multi-scale neural networks. Firstly, a novel image encoding rule is designed to convert time-series signals into vibration images, which incorporate the impact characteristics of faults into the model inputs to enhance fault information. Secondly, a multi-scale feature fusion network with dilatated and irregular sampling convolution block is constructed for feature extraction and classification. In addition, a new regularization term is designed to avoid training overfitting. Finally, Grad-CAM is introduced to visualize the region of interest of the model. The proposed method is verified on the datasets with different fault types from our laboratory and DIRG bearing dataset with different fault severities from Politecnico di Torino. The experimental results demonstrate that our diagnostic framework exhibits good generalization and noise robustness, and can achieve high-precision fault diagnosis.入藏号: WOS:001232482800002Indexed Date: 2024-05-31
31. 作者: Wang, RH (Wang, Ronghua); Sun, SB (Sun, Shibao); Zhao, PC (Zhao, Pengcheng); Yang, XL (Yang, Xianglan); Wei, XJ (Wei, Xingjia); Hu, CY (Hu, Changyang)标题: Multi-Scale Fusion Network Using Time-Division Fourier Transform for Rolling Bearing Fault Diagnosis来源出版物: CMC-COMPUTERS MATERIALS & CONTINUA卷: 84期: 2页: 3519-3539DOI: 10.32604/cmc.2025.066212文献类型: Article出版年: 2025摘要: The capacity to diagnose faults in rolling bearings is of significant practical importance to ensure the normal operation of the equipment. Frequency-domain features can effectively enhance the identification of fault modes. However, existing methods often suffer from insufficient frequency-domain representation in practical applications, which greatly affects diagnostic performance. Therefore, this paper proposes a rolling bearing fault diagnosis method based on a Multi-Scale Fusion Network (MSFN) using the Time-Division Fourier Transform (TDFT). The method constructs multi-scale channels to extract time-domain and frequency-domain features of the signal in parallel. A multi-level, multi-scale filter-based approach is designed to extract frequency-domain features in a segmented manner. A cross-attention mechanism is introduced to facilitate the fusion of the extracted time-frequency domain features. The performance of the proposed method is validated using the CWRU and Ottawa datasets. The results show that the average accuracy of MSFN under complex noisy signals is 97.75% and 94.41%. The average accuracy under variable load conditions is 98.68%. This demonstrates its significant application potential compared to existing methods.入藏号: WOS:001529617800001Indexed Date: 2025-07-21
32. 作者: Zhong, QY (Zhong, Quanyu); Li, Q (Li, Qiang); Ren, JX (Ren, Junxiao); Chen, X (Chen, Xin); Liu, D (Liu, Dong); Yang, Q (Yang, Qiang)标题: A cross-domain multi-scale feature fusion network based on graph convolution for intelligent fault diagnosis来源出版物: ENGINEERING APPLICATIONS OF ARTIFICIAL INTELLIGENCE卷: 160文献号: 111900DOI: 10.1016/j.engappai.2025.111900子辑: B文献类型: Article出版年: NOV 23 2025摘要: Fault diagnosis of mechanical equipment plays a critical role in enhancing system stability and ensuring operational safety. Multi-modal monitoring data provides a more comprehensive view of the equipment's condition, enabling more precise state diagnosis through the processing of such data. A major challenge in contemporary multi-modal information fusion lies in the effective integration of cross-modal information. To overcome the inherent limitations of single-view approaches often found in existing multi-modal methods, this paper presents a multi-view, multi-modal information fusion approach based on graph convolutional networks. This method not only extracts key features from signals efficiently but also uncovers the interrelationships between different modal signals through a multi-view interaction mechanism, achieving more robust information fusion and enhanced fault diagnosis performance. This method consists of three core modules: feature extraction, information fusion, and classification. The feature extraction module utilizes a multi-level residual architecture, Mini-Long Short Term Memory, and self-attention mechanisms to capture both local and global signal features, model temporal dependencies, and refine feature selection. The information fusion module combines data and feature-level signal correlations using graph convolutional networks for cross-modal interaction. The classification module employs a two-layer fully connected network for fault diagnosis. This method quantitatively assesses the contribution of each modality, providing a theoretical basis for understanding their physical significance. Experimental results and ablation studies demonstrate its superior performance and enhanced accuracy in fault diagnosis, offering a novel approach for condition monitoring of complex equipment.入藏号: WOS:001555086600002Indexed Date: 2025-08-31
33. 作者: Wang, ZQ (Wang, Zhiqiang); Guan, C (Guan, Chao); Shi, SR (Shi, Shangru); Zhang, GZ (Zhang, Guozheng); Gu, X (Gu, Xin)标题: Motor Bearing Fault Diagnosis Based on Current Signal Using Time-Frequency Channel Attention来源出版物: WORLD ELECTRIC VEHICLE JOURNAL卷: 15期: 7文献号: 281DOI: 10.3390/wevj15070281文献类型: Article出版年: JUL 2024摘要: As they are the core components of the drive motor in electric vehicles, the accurate fault diagnosis of rolling bearings is the key to ensuring the safe operation of electric vehicles. At present, intelligent diagnostic methods based on current signals (CSs) are widely used owing to the advantages of the easy collection, low cost, and non-invasiveness of CSs. However, in practical applications, the fault characteristics of the CS are weak, resulting in diagnostic performance that fails to meet the expected standards. In this paper, a diagnosis method is proposed to address this problem and enhance the diagnosis accuracy. Firstly, CSs from two phases are processed by periodic resampling to enhance data features, which are then fused through splicing operations. Subsequently, a feature enhancement module is constructed using multi-scale feature fusion for decomposing the input. Finally, a diagnosis model is constructed by using an improved channel attention module (CAM) for enhancing the diagnosis performance. The results from experiments containing two different types of bearing datasets show that the proposed method can extract high-quality fault features and improve the diagnosis accuracy, presenting great potential in intelligent fault diagnosis and the maintenance of electric vehicles.入藏号: WOS:001277263900001Indexed Date: 2024-08-02
34. 作者: Shao, XR (Shao, Xiaorui); Kim, CS (Kim, Chang-Soo)标题: Adaptive multi-scale attention convolution neural network for cross-domain fault diagnosis来源出版物: EXPERT SYSTEMS WITH APPLICATIONS卷: 236文献号: 121216DOI: 10.1016/j.eswa.2023.121216提前访问日期: AUG 2023文献类型: Article出版年: FEB 2024摘要: This paper proposes a novel approach named adaptive multi-scale attention convolution neural network (AmaCNN) to accurately detect cross-domain faults with very few labelled data. In AmaCNN, multi-scale feature fusion CNN (MSFFCNN) with a multi-level attention scheme (MLAS) extracts multi-scale less-noise features from source and target domains. Considering the domain shift and semantic difference in the two domain features, a cross-domain adaption (CDA) scheme is applied. Significantly, the extracted domain features are measured with correlation alignment (CORAL) distance to minimize the domain shift first. Then, semantic alignment (SA) loss aligns and separates domain-invariant features point-by-point. Therefore, the proposed AmaCNN could learn rich multi-scale, less-noise, domain-invariant, and semantic-alignment features using limited training samples to detect cross-fault accurately. The experimental results on three real data sets confirmed its priority and reliability. Besides, the in-depth analysis has confirmed each component's effectiveness and CDA's good generality.入藏号: WOS:001070592200001Indexed Date: 2023-10-05
35. 作者: Xing, S (Xing, Shuo); Wang, JR (Wang, Jinrui); Han, BK (Han, Baokun); Zhang, ZZ (Zhang, Zongzhen); Bao, HQ (Bao, Huaiqian); Ma, H (Ma, Hao); Jiang, XW (Jiang, Xingwang)标题: A novel collaborative bearing fault diagnosis method based on multi-scale dynamic fusion network under speed fluctuating condition来源出版物: MEASUREMENT SCIENCE AND TECHNOLOGY卷: 35期: 1文献号: 015126DOI: 10.1088/1361-6501/ad00d4文献类型: Article出版年: JAN 1 2024摘要: Improving bearing fault diagnosis accuracy under speed fluctuation is a challenge in engineering applications. With the development of big data processing technology, a new solution, multi-sensor complementary information, has emerged. However, single-scale dimension compression, which is adopted in most multi-sensor data fusion methods, captures only a small amount of valuable information. To deal with this deficiency, a multi-scale dynamic fusion network (MSDFN) is proposed. First, considering the existence of non-stationary features in the fluctuating speed signal, the FReLU function is adopted to activate the features after considering contextual information. Then, multi-sensor features are fused by multiple scales to obtain richer feature information, and fusion features at different scales are weighted by using the attention mechanism. Finally, batch normalization is employed to standardize the variable speed feature distribution. The validity of the MSDFN is proved by conducting fault diagnosis experiments on two bearings under speed fluctuating conditions. Experimental results indicate that the MSDFN is not only effective in identifying various types of fault samples, but also shows higher stability in multiple trials when compared with other methods.入藏号: WOS:001085647100001Indexed Date: 2023-11-01
36. 作者: Guo, YM (Guo, Youming); Wu, QM (Wu, Qinmu)标题: Visualization for Explanation of Deep Learning-Based Fault Diagnosis Model Using Class Activation Map来源出版物: CMC-COMPUTERS MATERIALS & CONTINUA卷: 77期: 2页: 1489-1514DOI: 10.32604/cmc.2023.042313文献类型: Article出版年: 2023摘要: Permanent magnet synchronous motor (PMSM) is widely used in various production processes because of its high efficiency, fast reaction time, and high power density. With the continuous promotion of new energy vehicles, timely detection of PMSM faults can significantly reduce the accident rate of new energy vehicles, further enhance consumers' trust in their safety, and thus promote their popularity. Existing fault diagnosis methods based on deep learning can only distinguish different PMSM faults and cannot interpret and analyze them. Convolutional neural networks (CNN) show remarkable accuracy in image data analysis. However, due to the "black box" problem in deep learning models, the diagnostic results regarding providing accurate information to the user are uncertain. This paper proposes a motor fault diagnosis method based on improved deep residual network (ResNet) and gradient-weighted class activation mapping (Grad-CAM) to analyze demagnetization and eccentricity faults of permanent magnet synchronous motors, and the uncertainty limitation of fault diagnosis based on the convolutional neural network is overcome by the visual interpretation method. The improved ResNet is formed by using ResNet9 as the backbone network, replacing the last convolution layer with a atrous spatial pyramid pooling (ASPP), and adding a multi-scale feature fusion module and attention channel mechanism (CAM). The proposed model not only retains the effective extraction of image features by ResNet9 but also enhances the sensitivity field of the network through the hollow convolution pyramid and realizes the feature fusion of the web on different scales through the multi-scale feature fusion module (MSFFM), further improving the diagnostic accuracy of the network on different types of fault features. The diagnostic effect of the network is verified on the selfmade data set, which mainly includes five states: normal (He), 25% demagnetization (De25), 50% demagnetization (De50), 10% static eccentricity (Se10), and 20% static eccentricity (Se20). The number of pictures in the training set is 6000, and the number in the test set is 1500. The average diagnostic accuracy of the improved ResNet on this dataset is 99.00%, which is 1.04%, 8.89%, 4.58%, and 7.22% higher than that of the multi-column convolutional neural network (MCNN), Bi-directional long short-term memory (Bi-LSTM), deep belief network (DBN), and recurrent neural network (RNN) models, respectively. Finally, gradient activation heat maps were used to globally average pool the final output feature map of the network to obtain feature weights. They were superimposed with the original image to get gradient activation heat maps of different grayscale images. The warmer the tone of the heat map, the greater the impact on the network diagnosis results, and then the demagnetization and eccentricity fault characteristics of the permanent magnet synchronous motor were determined-visual characterization of quantitative analysis.入藏号: WOS:001126979000026Indexed Date: 2024-01-11
37. 作者: Deng, FY (Deng, Feiyue); Ding, H (Ding, Hao); Yang, SP (Yang, Shaopu); Hao, RJ (Hao, Rujiang)标题: An improved deep residual network with multiscale feature fusion for rotating machinery fault diagnosis来源出版物: MEASUREMENT SCIENCE AND TECHNOLOGY卷: 32期: 2文献号: 024002DOI: 10.1088/1361-6501/abb917文献类型: Article出版年: FEB 2021摘要: Intelligent mechanical fault diagnosis algorithms based on deep learning have achieved considerable success in recent years. However, degradation of the diagnostic accuracy and operational speed has been significant due to unfavorable working conditions and increasing network depth. An improved version of ResNets is proposed in this paper to address these issues. The advantages of the proposed network are presented as follows. Firstly, a multi-scale feature fusion block was designed, to extract multi-scale fault feature information. Secondly, an improved residual block based on depthwise separable convolution was used to improve the operational speed and alleviate the computational burden of the network. The effectiveness of the proposed network was validated by discriminating between diverse health states in a gearbox under normal and noisy conditions. The experimental results show that the proposed network model has a higher classification accuracy than the classical convolutional neural networks, LeNet-5, AlexNet and ResNets and a faster calculation speed than the classical deep neural networks. Furthermore, a visual study of the different stages of the network model was conducted, to effectively comprehend the operational processes of the proposed model.入藏号: WOS:000595757300001Indexed Date: 2020-12-18
38. 作者: Tang, H (Tang, Heng); Xia, JZ (Xia, Junzhong); Bai, YC (Bai, Yunchuan); Chen, CF (Chen, Chengfa); Leng, YG (Leng, Yonggang)标题: EFLightCaps: an efficient feature-focused lightweight capsule network with frequency-domain regularization for rotating machinery fault diagnosis来源出版物: MEASUREMENT SCIENCE AND TECHNOLOGY卷: 36期: 3文献号: 036130DOI: 10.1088/1361-6501/adb50d文献类型: Article出版年: MAR 31 2025摘要: The prevalent issues of small samples and heavy noise in industrial settings have severely limited the application effectiveness of intelligent diagnostic methods. To address these challenges, an efficient feature-focused lightweight capsule network is proposed. Firstly, a plug-and-play lightweight Ghost multiscale convolution block is designed to integrate multiscale convolution with gating mechanisms through a multi-branch architecture, enabling multi-scale feature fusion and enhancing the model's noise robustness. Secondly, an efficient feature-focused routing mechanism is proposed to optimize information transfer between capsules through multi-step feature reconstruction and feature focusing strategies, which substantially enhances generalization capabilities in small-sample scenarios. Finally, a dual-norm frequency-domain regularization loss function is designed to leverage the complementary advantages of first-order and second-order norms, enhancing both feature extraction capability and reconstruction quality. Extensive experiments on two distinct datasets demonstrate that EFLightCaps achieves superior diagnostic performance and computational efficiency in scenarios with small samples and heavy noise.入藏号: WOS:001427554400001Indexed Date: 2025-02-26
39. 作者: Ni, PH (Ni, Peihao); Zhang, YY (Zhang, Yuanyuan); Xiong, XY (Xiong, Xiaoyun); Wang, JL (Wang, Jinlong); Ji, AG (Ji, Aiguo); Dong, LC (Dong, Liangcheng)标题: MSGAFN: Multi-scale graph attention fusion network for machine fault diagnosis来源出版物: PROCEEDINGS OF THE INSTITUTION OF MECHANICAL ENGINEERS PART C-JOURNAL OF MECHANICAL ENGINEERING SCIENCE卷: 238期: 15页: 7894-7907DOI: 10.1177/09544062241230217提前访问日期: FEB 2024文献类型: Article出版年: AUG 2024摘要: Fault diagnosis is essential in various fields, such as industrial manufacturing and engineering maintenance. Graph neural networks that take graph data as input can explore the relationships between data, which has strong feature expression capabilities. Currently, traditional fault diagnostic methods based on graph neural networks (GNN) are challenging to capture local and global feature information of data effectively. Most GNN models fail to consider the inherent differences between adjacent nodes, and they perform poorly in processing vibration signals in real-world industrial scenarios that commonly have strong noise. To resolve these concerns, this paper proposes a method for fault diagnosis based on a multi-scale graph attention fusion network (MSGAFN). In MSGAFN, data samples are constructed as clan graphs with multiple information scales to effectively represent local and global information of the graph structure data. Additionally, MSGAFN designed a new multi-scale feature fusion layer (MSFFL) to automatically learn the weights of adjacent nodes to represent their importance to the central node and reflect the differences between different adjacent nodes. This method is fully validated on bearing and gear datasets. The experimental results demonstrate that the proposed method exhibits excellent performance under conditions of imbalanced datasets and strong noise, providing a promising approach for bearings and gears fault diagnosis in real-world industrial scenarios with strong noise.入藏号: WOS:001174651600001Indexed Date: 2024-03-09
40. 作者: Wang, ZK (Wang, Zekun); Xu, ZF (Xu, Zifei); Cai, C (Cai, Chang); Wang, XD (Wang, Xiaodong); Xu, JZ (Xu, Jianzhong); Shi, KZ (Shi, Kezhong); Zhong, XH (Zhong, Xiaohui); Liao, ZQ (Liao, Zhiqiang); Li, Q' (Li, Qing 'an)标题: Rolling bearing fault diagnosis method using time-frequency information integration and multi-scale TransFusion network来源出版物: KNOWLEDGE-BASED SYSTEMS卷: 284文献号: 111344DOI: 10.1016/j.knosys.2023.111344提前访问日期: JAN 2024文献类型: Article出版年: JAN 25 2024摘要: Advances in deep learning methods have demonstrated remarkable development in diagnosing faults of rotating machinery. The currently popular deep neural networks suffer from design flaws in their network structure, leading to issues of long-term dependencies in fault diagnosis models built upon conventional deep neural networks. Consequently, such models exhibit insufficient global perceptual capabilities towards fault features. Furthermore, how accurately pre-trained models can diagnose faults is hugely impacted by changes in bearings' working conditions. To tackle the aforementioned issues, this study puts forth a multi-scale TransFusion (MSTF) model for diagnosing faults in rolling bearings under multiple operating conditions. Firstly, a time-frequency symmetric dot pattern transformation technique is designed to transform the original vibration signals into two-dimensional representations. This method can effectively highlight the distinctions between different fault types. Secondly, a multi-scale feature fusion module is established, which fully extracts low-level features from the time-frequency signals and reduces the complexity of the subsequent attention calculations. Meanwhile, relying on the advantages of the Transformer model in capturing global dependencies, the long-range periodic fault information is deeply mined. Finally, multi-head and multi-layer attention are visualized to enhance the interpretability of the model. After analyzing two case studies with both public and experimental datasets, the examination demonstrated that the developed model outperformed other state-of-the-art models. The diagnostic model developed in this study exhibits the ability to accurately diagnose bearing faults across multiple operating conditions while maintaining high robustness to signals contaminated with noise.入藏号: WOS:001156312500001Indexed Date: 2024-02-10
41. 作者: Ding, SS (Ding, Shanshan); Wu, WB (Wu, Weibing); Ma, XL (Ma, Xiaolu); Liu, F (Liu, Fei); Chen, RW (Chen, Renwen)标题: CMFE-PVT: a lightweight fault diagnosis framework for rolling bearings using compact multi-scale feature extraction and a pruned-restructured vision transformer来源出版物: MEASUREMENT SCIENCE AND TECHNOLOGY卷: 36期: 2文献号: 025015DOI: 10.1088/1361-6501/ada3ee文献类型: Article出版年: FEB 28 2025摘要: The intelligent fault diagnosis method based on transformer and convolutional neural network (CNN) has achieved good global and local feature extraction results. However, the multi-head self-attention mechanism adopted by the transformer and the cross-channel convolution operation in CNN increases the complexity of the model, thereby increasing the demand for hardware resources, which to some extent, limits its broad applicability in industrial applications. Therefore, this paper proposes a lightweight fault diagnosis framework based on compact multi-scale feature extraction and pruned-restructured vision transformer (ViT) to address the above challenges. Firstly, a compact multi-scale feature extraction module is designed to efficiently capture complex features in rolling bearing vibration signals through parallel multi-scale convolution kernels, combined with channel reduction strategies to significantly reduce computational complexity while maintaining feature richness. Next, short-time Fourier transform and pseudo-color processing techniques are used to obtain time-frequency images. Then, a dual optimization of matrix sparsity and structural reorganization is implemented for Self-attention in ViT to ensure model performance and significantly reduce computational overhead. Finally, the time-frequency images are segmented and rearranged before being fed into the improved lightweight ViT for global feature extraction and fault recognition of rolling bearings. The experimental results show that the proposed fault diagnosis method has the advantages of lightweight (Params:4.27 K, floating point operations per seconds:0.1 M, multiplication and accumulation operations per seconds:51.07 K) and robustness compared to mainstream algorithms.入藏号: WOS:001395522400001Indexed Date: 2025-01-19
42. 作者: 黄志鸿; 杜瑞; 张辉作者: Huang Zhihong; Du Rui; Zhang Hui标题: Feature-level fusion method of visible and infrared images for scene understanding in complex power environments标题: 面向复杂电力环境场景理解的可见光和红外图像特征级融合方法来源出版物: CAAI Transactions on Intelligent Systems来源出版物: 智能系统学报卷: 20期: 3页: 631-640文献号: 1673-4785(2025)20:3<631:MXFZDL>2.0.TX;2-6文献类型: Article出版年: 2025摘要: With the continuous increase in the automation and intelligence levels of power systems,the effective monitoring and fault diagnosis of substation and distribution network equipment have become crucial to ensuring stable grid operation.To address the challenges faced by traditional single-modal image processing methods in complex power environments,a scene understanding method based on the feature-level fusion of visible and infrared images is proposed here.By deeply analyzing the complementary characteristics of visible and infrared images,a dual-branch symmetric fusion network framework is designed,and it effectively integrates the high-resolution texture information of visible images with the temperature information of infrared images.Furthermore,multi-scale feature fusion layers and multi-scale attention decoders are introduced to enhance the segmentation precision and detail recovery capabilities of the model.The experimental results reveal that this method performs excellently in substation equipment monitoring,particularly demonstrating good robustness in processing images under insufficient lighting and occlusion conditions.This research presents an effective technical approach for monitoring complex power environments and offers significant theoretical and practical implications for advancing intelligent management in power systems.摘要: 随着电力系统自动化和智能化程度的不断提高,变电站和配电网设备的有效监测与故障诊断成为保证电网稳定运行的重要手段。针对传统单模态图像处理方法在复杂电力环境中面临的挑战,本文提出了一种基于可见光和红外图像特征级融合的场景理解方法。通过深入分析可见光图像和红外图像的互补特性,设计了一个双分支的对称融合网络框架,有效结合了可见光图像的高分辨率纹理信息和红外图像的温度信息。此外,引入多尺度特征融合层和多尺度注意力解码器,以提高模型的分割精度和细节恢复能力。实验结果表明,该方法在变电站设备监测中取得了优异的性能,尤其是在处理光照不足和遮挡情况下的图像时,展现出了较好的鲁棒性。该研究不仅为复杂电力环境的监测提供了一种有效的技术手段,而且对于推动电力系统智能化管理具有重要的理论和实践意义。入藏号: CSCD:8003879Indexed Date: 2025-09-13
43. 作者: Shi, WC (Shi, Weicheng); Lyu, XQ (Lyu, Xiaoqin); Han, L (Han, Lei)编者: Xie, W (Xie, W); Gao, S (Gao, S); He X (He, X); Zhu X (Zhu, X); Huang, J (Huang, J); Chen, W (Chen, W); Ma, L (Ma, L); Shu, H (Shu, H); Cao, W (Cao, W); Jiang, L (Jiang, L); Shu, Z (Shu, Z)标题: An Insulator Detection Model Using Bidirectional Feature Fusion Structure Based On YOLO X来源出版物: 2022 IEEE 17TH CONFERENCE ON INDUSTRIAL ELECTRONICS AND APPLICATIONS (ICIEA)丛书标题: IEEE Conference on Industrial Electronics and Applications页: 881-886DOI: 10.1109/ICIEA54703.2022.10006264文献类型: Proceedings Paper出版年: 2022摘要: d Abstract Transmission line detection is the key to ensure the safe operation of the power system. How to identify the power equipment and further detect the faults is an important topic. Firstly, based on the You Only Look Once X(YOLO X), the Bidirectional Feature Fusion(BFF) structure is proposed to replace the Feature Pyramid Networks(FPN) and Path Aggregation Network(PAN) of the model, making multi-scale feature fusion more effective. Then, a transmission line insulator fault dataset is used to verify the effectiveness and accuracy of the proposed model. The results show that the mean average precision(mnAP) of this model reaches 96.56% (compared to Y01,0 X increased by 0.54%), and the detection speed reaches 17 FPS on NVIDIA GeForce RTX 3080 laptop.会议名称: 17th Conference on Industrial Electronics and Applications (ICIEA)会议日期: DEC 16-19, 2022会议地点: Chengdu, PEOPLES R CHINA入藏号: WOS:000947797800152Indexed Date: 2023-04-07
44. 作者: Kim, D (Kim, Donghyun); Hwang, H (Hwang, Hoseong); Kim, H (Kim, Hochul)标题: CECvT: Initial Diagnosis of Anomalies in Thermal Images来源出版物: IEEE ACCESS卷: 11页: 108068-108079DOI: 10.1109/ACCESS.2023.3319670文献类型: Article出版年: 2023摘要: Given the global competitive landscape, it is imperative that businesses maintain and manage their facilities continuously to enhance efficiency and productivity for sustaining competitiveness. Hence, a new hybrid model called contrast enhancement convolutional vision transformer (CECvT) was developed in this study that enables fault diagnosis without physical contact with factory equipment to ensure accurate initial fault detection without the risk of machine damage or interference. This model leverages thermal imaging as an apt source for early anomaly detection in equipment. A new contrast enhancement module employing contrast enhancement techniques was integrated to address the edge information loss when utilizing thermal images. Moreover, the network performance was enhanced by fusing the advantages of convolutional neural network (CNN) and Transformer models. Notably, the model design allows deriving detailed feature information necessary for the initial diagnostics by harnessing multiscale information to extract and concatenate features. The proposed method's performance was evaluated using the thermal imaging dataset provided by AI Hub. When juxtaposed with CNN, Transformer, and hybrid CNN-Transformer models, the proposed model demonstrated a superior accuracy of 96.17%. Furthermore, it achieved the most accurate diagnosis at the inception of abnormalities than the other networks. The proposed model thus has potential and is preferrable for various thermal-imaging-based fault diagnosis applications owing to its excellent performance and precision during initial diagnosis.入藏号: WOS:001083308200001Indexed Date: 2023-10-28
45. 作者: Wang, DX (Wang, Dexian); Xu, XY (Xu, Xingye); Yang, JH (Yang, Jinghui); Liu, QL (Liu, Qilong); Huang, DL (Huang, Delin)标题: Fault diagnosis of planetary gears in noisy environments using a VMTransformer model来源出版物: MEASUREMENT SCIENCE AND TECHNOLOGY卷: 36期: 3文献号: 036209DOI: 10.1088/1361-6501/adb2b0文献类型: Article出版年: MAR 31 2025摘要: As a green and renewable energy source, wind energy experienced considerable growth, offshore wind power technology is increasingly valued by nations worldwide. Planetary gearboxes are critical but failure-prone components in wind turbines, which present a significant risk to the operational stability of the entire system. To address the issue of noise interference in the vibration signals of gearboxes under extreme conditions, this paper proposes the VMTransformer model, which integrates, variational mode decomposition (VMD) and the multichannel transformer for the fault diagnosis of planetary gear in wind turbine generators. The noise in the vibration signal is decomposed and reconstructed in the frequency domain using the VMD, and the significant frequency information is retained for signal noise reduction. The results of the decomposition are subjected to multi-scale feature fusion over multiple channels, which can maximize the frequency domain information provided by the VMD to further refine and enhance the model's ability to extract important features in the signal. Efficient channel attention is incorporated into the transformer model to suppress redundant information, enhancing the extraction of relevant information from each channel, and improving both the model's stability. The experimental results demonstrate that the model proposed in this paper obtains an accuracy of 98.62%, which is a significant improvement over other models, and the model also performs well in noisy environment.入藏号: WOS:001434655800001Indexed Date: 2025-03-08
46. 作者: Chen, ZH (Chen Zhihao); Xiao, YW (Xiao Yewei); Li, ZQ (Li Zhiqiang); Liu, Y (Liu Yang)标题: Insulators Identification for Overhead Transmission Lines in Distribution Networks Based on Multi-Scale Dense Network来源出版物: LASER & OPTOELECTRONICS PROGRESS卷: 58期: 8文献号: 0815003DOI: 10.3788/LOP202158.0815003文献类型: Article出版年: APR 2021摘要: Insulators are an essential part of overhead transmission lines in distribution networks. Accurate identification of insulator images by drone aerial photography is an important prerequisite for defect detection and fault diagnosis. Aiming at the problem of small insulator targets and complex backgrounds in images, an algorithm for insulators identification on overhead transmission lines in distribution networks based on multi-scale dense networks is proposed in this paper. First, use the K-means algorithm to analyze the target frame of the dataset to obtain a suitable anchor frame. Second, replace the residual module in the basic network with a dense connection module to enhance the multiplexing and fusion of network feature information. At the same time, add a spatial pyramid pooling module and optimize multi -scale feature fusion to predict insulators. Finally, replace the original loss function with a loss function that combines the cross-entropy function and the Focal loss function to construct an aerial inspection image data set and perform experiments. The experimental results showed that the algorithm accuracy is improved by about 12 percentage points and has a stronger robustness than the original algorithm, which meets the requirements of the grid inspection for insulator identification.入藏号: WOS:000686485400036Indexed Date: 2021-04-01
47. 作者: 陈志豪; 肖业伟; 李志强; 刘洋作者: Chen Zhihao; Xiao Yewei; Li Zhiqiang; Liu Yang标题: Insulators Identification for Overhead Transmission Lines in Distribution Networks Based on Multi-Scale Dense Network标题: 基于多尺度密集网络的配网架空输电线路绝缘子识别来源出版物: Laser & Optoelectronics Progress来源出版物: 激光与光电子学进展卷: 58期: 8文献号: 1006-4125(2021)58:8<JYDCDM>2.0.TX;2-6文献类型: Article出版年: 2021摘要: Insulators are an essential part of overhead transmission lines in distribution networks. Accurate identification of insulator images by drone aerial photography is an important prerequisite for defect detection and fault diagnosis. Aiming at the problem of small insulator targets and complex backgrounds in images, an algorithm for insulators identification on overhead transmission lines in distribution networks based on multi-scale dense networks is proposed in this paper. First, use the K-means algorithm to analyze the target frame of the dataset to obtain a suitable anchor frame. Second, replace the residual module in the basic network with a dense connection module to enhance the multiplexing and fusion of network feature information. At the same time, add a spatial pyramid pooling module and optimize multi-scale feature fusion to predict insulators. Finally, replace the original loss function with a loss function that combines the cross-entropy function and the Focal loss function to construct an aerial inspection image data set and perform experiments. The experimental results showed that the algorithm accuracy is improved by about 12 percentage points and has a stronger robustness than the original algorithm, which meets the requirements of the grid inspection for insulator identification.摘要: 绝缘子为配网架空输电线路的重要组成部分,对无人机航拍的绝缘子图像进行精准识别是实现其缺陷检测和故障诊断的重要前提。针对图像中绝缘子目标小、背景复杂的问题,提出了一种基于多尺度密集网络的配网架空输电线路绝缘子识别算法。首先,利用K-means算法对数据集的目标框进行分析,获取合适的锚框;然后,将基础网络中的残差模块替换为密集连接模块,以增强网络特征信息的复用与融合,同时添加空间金字塔池化模块、优化多尺度特征融合,以对绝缘子进行预测;最后,用融合交叉熵函数和Focal损失函数的损失函数替换原始损失函数,构建航拍巡检图像数据集并进行实验。实验结果表明,相比原始算法,本算法的准确率提高了约12个百分点,且鲁棒性更强,基本满足电网巡检对绝缘子识别的要求。入藏号: CSCD:6973657Indexed Date: 2021-08-13
48. 作者: Zhang, XL (Zhang, Xinliang); Kong, JW (Kong, Junwei); Zhao, YJ (Zhao, Yunji); Qian, W (Qian, Wei); Xu, XZ (Xu, Xiaozhuo)标题: A deep-learning model with improved capsule networks and LSTM filters for bearing fault diagnosis来源出版物: SIGNAL IMAGE AND VIDEO PROCESSING卷: 17期: 4页: 1325-1333DOI: 10.1007/s11760-022-02340-x提前访问日期: AUG 2022文献类型: Article出版年: JUN 2023摘要: The deep-learning networks for bearing fault diagnosis may encounter ambient noise interference. The inherently feedforward serial structure lacks the suppression of the ambient noise involved in bearing data. Moreover, the accuracy of the diagnosis model relies on training a large amount of labeled data, thus resulting in a significant amount of time consumption. To combat these two challenges, an improved capsule network diagnosis model with a long short-term memory filter (LF-iCapsNet) is proposed. First, the LSTM network is used to filter out the noise interference in the time domain through a nonlinear moving-average mechanism. At the same time, a subsequent feature-extraction convolution with large kernels is employed to specifically suppress the noise in the frequency domain, where a dilated convolution is adopted to achieve multi-scale feature extraction. Second, to obtain the distance-dependent relations of low-level features, an inner dependence operator is introduced into the primary capsule. Thus, a richer and more complete feature description of the bearing fault is guaranteed. And so, the derived digital capsule gives a geometrical constraint representation among the pixels in the feature maps and a rather high-speed training process because of its one-stage detection mode. Finally, the proposed LF-iCapsNet model is validated on the dataset from Case Western Reserve University (CWRU). The experimental results show that the diagnosis model provides a considerable improvement in the classification accuracy of bearing faults under the noise condition.入藏号: WOS:000846669600001Indexed Date: 2022-09-03
49. 作者: Kim, J (Kim, Junho); Lim, DG (Lim, Dae-Guen); Jung, W (Jung, Wonho); Lee, H (Lee, Hojong); Park, YH (Park, Yong-Hwa)编者: Su, Z (Su, Z); Peters, KJ (Peters, KJ); Ricci, F (Ricci, F); Rizzo, P (Rizzo, P)标题: Condition Monitoring of Intelligent Tires Utilizing 1D CNN and Vibration Measurement来源出版物: HEALTH MONITORING OF STRUCTURAL AND BIOLOGICAL SYSTEMS XVIII丛书标题: Proceedings of SPIE卷: 12951文献号: 129511HDOI: 10.1117/12.3026906文献类型: Proceedings Paper出版年: 2024摘要: Tire maintenance plays a crucial role in vehicle performance, with the tire being identified as the most important factor. In this study, we introduce an intelligent tire system equipped with composite sensors to enhance driving safety and vehicle management. Analysis of actual traffic accident data reveals that approximately 10% of accidents are attributed to tire-related issues, emphasizing the significance of tire maintenance. However, our investigation suggests that while conventional time and frequency domain techniques are available for fault detection in intelligent tires, they tend to exhibit slightly lower performance compared to those utilizing artificial intelligence. To address this limitation, we propose a deep learning-based diagnosis method. By attaching a 3-axis accelerometer sensor to the tire tread and simulating various failure modes, including Belt/ Bead separation, comprehensive data for analysis were collected. We develop a novel approach using multi-scale feature fusion with adaptive weight calculation using 1-D convolution principles, which significantly improves fault detection accuracy. Experimental results demonstrate the effectiveness of our proposed method, achieving a 100% F1 Score in the classification of Tire Separation faults. Visualization using Uniform Manifold Approximation and Projection (UMAP) further confirms distinct clustering for each fault state. Overall, our study offers valuable insights into tire fault diagnosis and management, contributing to enhanced vehicle safety and performance.会议名称: Conference on Health Monitoring of Structural and Biological Systems XVIII会议日期: MAR 25-28, 2024会议地点: Long Beach, CA会议赞助商: SPIE; RDI Technologies Inc入藏号: WOS:001235352400039Indexed Date: 2024-07-02
50. 作者: Zhang, LX (Zhang, Longxin); Zhou, P (Zhou, Peng); Wang, M (Wang, Miao); Weng, CK (Weng, Chengkang); Deng, XJ (Deng, Xiaojun)标题: FCAODNet: a fast freight train image detection model based on embedded FCA来源出版物: INTERNATIONAL JOURNAL OF COMPUTATIONAL SCIENCE AND ENGINEERING卷: 26期: 5页: 579-590DOI: 10.1504/IJCSE.2023.133692文献类型: Article出版年: 2023摘要: The fault detection of freight train image has some problems, such as low detection accuracy and slow detection speed. Aiming at the problem of slow detection speed in the process of train image fault detection, a lightweight object detection model fast channel attention network (FCAODNet) is proposed in this study. FCAODNet consists of four modules, including feature extraction network (FEN), lightweight multi-scale feature fusion (LMFF), prediction across scales (PAS), and decoding modules. FEN extracts image features, LMFF fuses features, PAS predicts the location of the target object, and the decoding module obtains the final prediction result. FCAODNet's FEN adopts CSPDarknet53tiny. The designed LMFF is embedded with two FCA modules to improve the detection accuracy. Experiments on train datasets and public datasets show that FCAODNet outperforms other state-of-the-art models in detection speed and has good detection accuracy and robustness.入藏号: WOS:001079832000009Indexed Date: 2023-10-26
51. 作者: Gong, B (Gong, Bin); An, AM (An, Aimin); Shi, YK (Shi, Yaoke); Zhang, XM (Zhang, Xuemin)标题: Fast fault detection method for photovoltaic arrays with adaptive deep multiscale feature enhancement来源出版物: APPLIED ENERGY卷: 353文献号: 122071DOI: 10.1016/j.apenergy.2023.122071提前访问日期: OCT 2023子辑: A文献类型: Article出版年: JAN 1 2024摘要: Photovoltaic (PV) arrays have output characteristics such as randomness and intermittency, and faults can seriously affect the safe operation of the power system. In order to improve the comprehensive performance of the PV array fault diagnosis model, a new intelligent online fault monitoring method for PV arrays is proposed in this paper. (1) a three-dimensional channel feature map based on I, V, and P features is constructed because the IV and P curves of the PV array have significantly different effects under different fault conditions. (2) The PV array fault diagnosis model based on a multi-source information fusion network (MIFNet) is proposed, and Channel Mixing Convolution (CMC) module, three-dimensional feature attention enhancement (TDFAE) module, and Channel normalized scaling (CNS) module are designed to improve the comprehensive performance of the model. (3) An adaptive nonlinear mutual sparrow search algorithm (ANMSSA) is proposed to optimize the hyperparameter configuration of the MIFNet network. The experimental results show that the average recognition accuracy, prediction accuracy, and sensitivity of the ANMSSA-MIFNet network proposed in this paper are 99.64%, 99.64%, and 99.71% respectively. When facing single-component faults and multi-component faults, the model has stronger diagnostic accuracy, robustness, anti-noise ability, and stability, and can efficiently diagnose different faults of PV arrays, providing the scientific basis and theoretical support for the operation of PV systems.入藏号: WOS:001092910200001Indexed Date: 2023-11-10
52. 作者: Li, ZL (Li, Zhenling); Gao, YK (Gao, Yukun)标题: Research on Wind Turbine Unbalance Fault Diagnosis Based on Wavelet Transform and Convolutional Neural Network来源出版物: IEEE ACCESS卷: 12页: 176259-176269DOI: 10.1109/ACCESS.2024.3496921文献类型: Article出版年: 2024摘要: Rotor imbalance in wind turbines presents a serious problem. Particularly for offshore wind turbines, aerodynamic imbalance could have a severe impact because of the large size of the rotor. A diagnosis method based on a parallel convolutional neural network with multi-scale feature fusion is proposed to diagnose rotor imbalance. It consists of two feature extractors of different scales, which are combined in the fully connected layer. Firstly, a model of a 3MW wind turbine is built and the mass imbalance and aerodynamic imbalance are added to the simulation. The signal is collected and the effects of rotor imbalance on the nacelle vibration in wind turbines are investigated and described. Secondly, the nacelle vibration is selected as the target signal. Wavelet transform is performed on the collected signals, and the 2-dimensional time-frequency map is obtained as the object dataset for the classification. Thirdly, a convolutional neural network is used to classify rotor imbalances of different magnitudes, and different convolution kernels and activation functions are tested. Finally, a new data set is built in the highly fidelity simulation model, and the trained model is loaded for test and verification. The experiments show that the proposed diagnosis model based on the time-frequency map of nacelle vibrations and a convolutional neural network can identify rotor imbalance effectively, and the accuracy is greater than 98%. The results demonstrate the satisfactory performance of the proposed method. It can diagnose rotor imbalance effectively without additional sensors.入藏号: WOS:001370660700036Indexed Date: 2024-12-19
53. 作者: 蔡舒妤; 闫子砚作者: Cai Shuyu; Yan Ziyan标题: Research on small target damage detection of aero-engine based on improved YOLOv4标题: 基于改进YOLOv4的航空发动机小目标损伤检测研究来源出版物: Journal of Aerospace Power来源出版物: 航空动力学报卷: 38期: 2页: 445-452文献号: 1000-8055(2023)38:2<445:JYGJYD>2.0.TX;2-B文献类型: Article出版年: 2023摘要: Intelligent aero-engines damage detection is an important research direction in aircraft fault diagnosis.An improved multi-scale target detection method based on You Only Look Once version 4(YOLOv4) was proposed for the problem that existing target detection model has a poor effect on the detection of small target damage of aero-engine.A new shallow feature fusion layer was constructed in path aggregation network (PANet),which fused shallower features with deep features to improve the network detection performance for small target damage.In order to reduce redundant parameters in the network,depthwise separable convolution was introduced in neck and the standard convolution was reconstructed into the form of depthwise separable convolution.Experiments showed that the improved YOLOv4 improved the detection accuracy of small target damage by 3.43%,reduced the model size by 54.06 MB,and increased the detection speed of the model by 31.03%.The results of the study indicated that the improved YOLOv4 model had better detection performance for small target damage.摘要: 智能化的航空发动机损伤检测是飞机故障诊断重要的研究方向,针对现有目标检测模型对航空发动机的小目标损伤检测效果差的问题,提出了一种改进的基于You Only Look Once version 4(YOLOv4)的多尺度目标检测方法。在路径聚合网络(PANet)中构建低层次的特征融合层,将更浅层的特征与深层特征融合,提高网络对小目标损伤的检测性能。为减少网络中的冗余参数,在颈部结构中引入了深度可分离卷积,将标准卷积重构为深度可分离卷积的形式。实验表明:改进后的YOLOv4对小目标损伤的检测精度提升了3.43%,模型大小降低了54.06 MB,同时检测速度提高了31.03%。研究结果表明改进的YOLOv4模型对小目标损伤具有更好的检测性能。入藏号: CSCD:7435113Indexed Date: 2023-07-07
54. 作者: Li, H (Li, Hang); Li, L (Li, Li); Wang, HB (Wang, Hongbing)标题: Defect Detection for Wear Debris Based on Few-Shot Contrastive Learning来源出版物: APPLIED SCIENCES-BASEL卷: 12期: 23文献号: 11893DOI: 10.3390/app122311893文献类型: Article出版年: DEC 2022摘要: In industrial defect detection tasks, the low probability of occurrence of severe industrial defects under normal production conditions has brought a great challenge for data-driven deep learning models that have just a few samples. Contrastive learning based on a sample pair makes it possible to obtain a great number of training samples and learn effective features quickly. In the field of industrial defect detection, the features of some defect instances have small category variance, and the scale of some defect instances has a great diversity. We propose a few-shot object detection network based on contrastive learning and multi-scale feature fusion. Aligned contrastive loss is adopted to increase the instance-level intra-class compactness and inter-class variance, and the misalignment problem is alleviated to a certain extent. A multi-scale fusion module is designed to recognize multi-scale defects by adaptively fusing features from different resolutions with the idea of exploiting the support branch's information. The robustness and efficiency of the proposed method were evaluated on an industrial wear debris defect dataset and the MS COCO dataset.入藏号: WOS:000910811200001Indexed Date: 2023-01-27
55. 作者: Jin, YL (Jin, Yulin); Hao, L (Hao, Liang); He, XH (He, Xinghua); Liu, ZW (Liu, Zhiwen)标题: A multi-scale temporal convolutional capsule network with parameter-free attention module-dynamic routing for intelligent diagnosis of rolling bearing来源出版物: MEASUREMENT SCIENCE AND TECHNOLOGY卷: 36期: 1文献号: 016151DOI: 10.1088/1361-6501/ad8add文献类型: Article出版年: JAN 31 2025摘要: We proposed a multi-scale temporal convolutional capsule network model coupled with a parameter-free attention module and dynamic routing mechanism to analyze complex vibration signals for diagnosing the health of bearings. The proposed method utilizes a capsule network as the fundamental architecture. Instead of a convolutional neural network, a temporal convolutional network is employed. Additionally, a multi-scale feature fusion module is integrated into the capsule network structure to dynamically extract various layers of features from fault samples, enhancing the discriminatory capability of abnormal data. Subsequently, the parameter-free attention module and dynamic routing mechanism are employed to construct digital capsules. This allows the smallest unit capsule in a single layer to carry more information, enhance the similarity between the instance primary capsule and the fault capsule, reduce the interference of irrelevant features to the model, and improve the accuracy of fault type recognition. Finally, a multi-scale temporal convolutional capsule network model that integrates feature extraction and pattern recognition is established to perform end-to-end diagnosis of the bearing. Experimental findings suggest that the proposed method outperforms other deep learning methods in terms of accuracy and robustness. It can provide a theoretical basis and implementation path for the detection and diagnosis of train wheelset bearing time series abnormal data.入藏号: WOS:001360103300001Indexed Date: 2024-11-28
56. 作者: Zhou, GY (Zhou, Guangyue); Li, KW (Li, Kewen); Zhu, XY (Zhu, Xinyuan)标题: An intelligent three-dimensional fault detection method based on multitask learning and multi-scale feature fusion来源出版物: ENGINEERING APPLICATIONS OF ARTIFICIAL INTELLIGENCE卷: 156文献号: 111059DOI: 10.1016/j.engappai.2025.111059子辑: A文献类型: Article出版年: SEP 15 2025摘要: Faults, as critical controlling factors in the formation and distribution of oil and gas resources, play a vital role in seismic data analysis. Deep learning, in three-dimensional (3D) fault detection, has made significant strides in recent years. However, current research relies primarily on synthetic seismic data, limiting model generalization across diverse geological conditions. Furthermore, the diversity and scale differences in fault morphology challenge traditional encoder-decoder detection networks. To overcome these challenges, we propose an intelligent three-dimensional fault detection method based on multitask learning and multi-scale feature fusion, named MTL-MSF-Fault3D, aiming to improve fault detection accuracy and generalization. The multitask learning (MTL) network processes fault detection as the primary task and edge detection as an auxiliary task, promoting feature sharing and improving model performance on field data. The multi scale fusion (MSF) module dynamically integrates multi-scale features by dual-channel attention gates, preserving fault edge information and enhancing detection detail. The fault detection method proposed in this paper leverages artificial intelligence (AI) technology to optimize the feature extraction and decision-making processes for faults. By automatically adjusting network parameters, it ensures a significant improvement in the model's adaptability across different geological environments. Experiments show MTL-MSF-Fault3D excels on synthetic data and provides reliable fault interpretation on complex field seismic data, all while maintaining low computational cost. This research introduces new techniques for fault detection, with significant practical value. It demonstrates the effectiveness, scalability, and robustness of artificial intelligence in fault detection within the oil and gas exploration field.入藏号: WOS:001497548700001Indexed Date: 2025-06-01
57. 作者: Chen, YY (Chen, Yongyi); Zhang, D (Zhang, Dan); Zhang, WA (Zhang, Wen-an)标题: MSWR-LRCN: A new deep learning approach to remaining useful life estimation of bearings来源出版物: CONTROL ENGINEERING PRACTICE卷: 118文献号: 104969DOI: 10.1016/j.conengprac.2021.104969提前访问日期: NOV 2021文献类型: Article出版年: JAN 2022摘要: Rolling bearings are important components of industrial rotating machinery and equipment. The prediction of the remaining useful life (RUL) of rolling bearings is of great significance for improving the safety of the machine, reducing the economic and property losses caused by the failure of the bearings. However, for the task of predicting the RUL of rolling bearings, the information of the past time and the future time are as important as the information of the current time. In order to make better use of the extracted features for RUL prediction of rolling bearings, this paper has proposed a novel deep learning framework of multi-scale long-term recurrent convolutional network with wide first layer kernels and residual shrinkage building unit (MSWR-LRCN). The major difference from the previous deep neural network is that our new network organically combines the attention mechanism with multi-scale feature fusion strategy, and improves the anti-noise ability of the entire network. In addition, moving average (MA) method and a polynomial fitting model are also used, which help predict the RUL of rolling bearings effectively. The results show that this method has improved the prediction accuracy compared with the existing methods.入藏号: WOS:000744233200004Indexed Date: 2022-02-01
58. 作者: He, M (He, Min); Qin, L (Qin, Liang); Deng, XL (Deng, Xinlan); Liu, KP (Liu, Kaipei)标题: MFI-YOLO: Multi-Fault Insulator Detection Based on an Improved YOLOv8来源出版物: IEEE TRANSACTIONS ON POWER DELIVERY卷: 39期: 1页: 168-179DOI: 10.1109/TPWRD.2023.3328178文献类型: Article出版年: FEB 2024摘要: Insulators are essential components in power transmission lines. Due to the harsh variations in bad environments, insulators may experience faults. Detecting these insulator faults promptly and effectively is an urgent issue. To rapidly and accurately locate insulators and their faulty regions in aerial images of insulators with complex backgrounds and varying fault sizes, this paper proposes an improved YOLOv8 algorithm for the detection of multiple insulator fault types (MFI-YOLO). This algorithm achieved target feature extraction in complex background images by replacing the C2F network constructed by fusing the GhostNet and multi-scale asymmetric convolution (MSA-GhostBlock). Furthermore, in the feature fusion stage, a multi-scale feature fusion structure called ResPANet, based on residual skip connections, was constructed to replace the PANet. This enhancement aims to improve the network detection accuracy in multi-target scenarios. Finally, to evaluate the algorithm's performance, this study constructed a target detection dataset containing four types of insulators: normal, self-explosive, damaged, and flashover. Experimental results indicate that, compared to the original model, the improved model has increased mean accuracy from 89.2% to 93.9%. The designed model exhibits high detection accuracy in the insulator and its three fault categories, especially for some hard-to-detect fitting.入藏号: WOS:001173317300047Indexed Date: 2024-04-26
59. 作者: Chen, W (Chen, Wei); Lu, JY (Lu, Jinyu); Pei, TT (Pei, Tingting); Yuan, GJ (Yuan, Guojing)标题: YOLOv8-AFA: A photovoltaic module fault detection method based on multi-scale feature fusion来源出版物: ENERGY SOURCES PART A-RECOVERY UTILIZATION AND ENVIRONMENTAL EFFECTS卷: 47期: 1页: 657-676DOI: 10.1080/15567036.2024.2443948文献类型: Article出版年: DEC 31 2025摘要: To tackle the issues of false positives and missed detections arising from inconsistent defect scales and complex, variable background textures in photovoltaic module fault detection, we propose a novel defect detection algorithm based on YOLOv8-AFA. Firstly, an adaptive bottleneck attention mechanism is introduced, which integrates convolutional operations with adaptive average pooling, effectively mitigating the interference caused by complex background textures in photovoltaic modules. Secondly, a multi-scale adaptive fusion mechanism is developed, combining adaptive average pooling, convolution, upsampling, and feature fusion to overcome the challenge of missed detections due to varying defect scales in photovoltaic module fault detection. Finally, an adaptive pooling fusion module is constructed, leveraging both adaptive max pooling and adaptive average pooling to enhance the model's detection capabilities across diverse environments. Experimental results demonstrate that the proposed YOLOv8-AFA algorithm achieves a mean average precision (mAP) of 91.5% in photovoltaic module fault detection tasks, representing a 2.2% improvement over the original YOLOv8 model. Moreover, the generalization capability of the algorithm was rigorously validated on the PASCAL VOC dataset, achieving a mean accuracy of 90.5%, surpassing other methods. This result demonstrates the improved algorithm's generalization performance, providing robust technical support for intelligent fault diagnosis in photovoltaic modules.入藏号: WOS:001380698000001Indexed Date: 2024-12-25
60. 作者: Li, JJ (Li, Junjie); Cheng, MX (Cheng, Mingxia)标题: FBS-YOLO: an improved lightweight bearing defect detection algorithm based on YOLOv8来源出版物: PHYSICA SCRIPTA卷: 100期: 2文献号: 025016DOI: 10.1088/1402-4896/ad9ef1文献类型: Article出版年: FEB 1 2025摘要: Aiming at the existing bearing defect detection algorithms with low accuracy, large number of parameters and computation, this paper proposes an efficient and lightweight bearing surface defect detection algorithm FBS-YOLO based on YOLOv8. Firstly, FasterNet replaces the original feature extraction network of YOLOv8, and uses Partial Convolution (PConv) to reduce redundant computation and memory access. Secondly, the fusion of weighted Bidirectional Feature Pyramid Network (BiFPN) in Neck network, which removes less efficient feature transmission nodes in the process of multi-scale feature fusion to achieve a higher level of fusion, improves the fusion efficiency of features at different scales. Finally, the advantages of Switchable Atrous Convolution (SAConv) are introduced to innovate the CSP Bottleneck with the two convolutions (C2f) module in the original model Neck network, and SAConv is combined with C2f (C2f\_SAConv) to from a more flexible module adapted to the features of different scales is proposed to enhance the feature extraction and processing capability of the model. The experimental results show that the algorithm FBS-YOLO proposed in this paper achieves a mAP of 91.4% in the bearing defect detection task, which is 2.8% higher than that of the original YOLO8 model, and the number of parameters and computation volume are reduced by 39.8% and 41.9%, respectively, and the model inference speed can be up to 161 fps. The algorithm meets the light-weight requirements of industrial detection deployment while maintaining high accuracy, effectively achieving a balance between model lightweight and performance, and providing new ideas for end-to-end industrial deployment.入藏号: WOS:001399201800001Indexed Date: 2025-01-24
61. 作者: Liu, XY (Liu, Xiaoyi); Zhu, JY (Zhu, Jianyu); Zhu, ZY (Zhu, Zhanyu); Zhu, HQ (Zhu, Hongqiu)标题: CBS-YOLOv5: fault detection algorithm of electrolyzer plate with low-resolution infrared images based on improved YOLOv5来源出版物: MEASUREMENT SCIENCE AND TECHNOLOGY卷: 36期: 1文献号: 016202DOI: 10.1088/1361-6501/ad8254文献类型: Article出版年: JAN 31 2025摘要: In the process of copper electrorefining, accurate detection of electrode plate faults is extremely challenging due to the low resolution of captured infrared images, significant noise interference, and dense electrode plate arrangements. To address these challenges, this paper proposes an improved YOLOv5-based electrode plate fault detection algorithm called CBS-YOLOv5. This algorithm introduces several innovations over the original YOLOv5, including: the incorporation of coordinate attention to enhance the ability of the feature extraction network to separate target information from noise; the construction of a small object detection module to improve the detection of dense small objects by increasing the resolution of the feature map; the replacement of the traditional path aggregation network with a Bi-directional Feature Pyramid Network (BiFPN) for more flexible multi-scale feature fusion; and the integration of the swin transformer to optimize the cross-stage partial bottleneck structure, significantly enhancing the model's ability to detect densely packed small objects. Experimental results show that the proposed CBS-YOLOv5 model achieves an accuracy of 88.1%, which is an improvement of 5.7% over the base model. Furthermore, this algorithm demonstrates exceptional detection capabilities for dense small objects in low-resolution infrared images while maintaining real-time detection speed, making it suitable for various complex industrial scenarios, including fault detection in non-ferrous metal electrolysis processes. CBS-YOLOv5 not only improves detection accuracy and robustness but also has broad application prospects, offering a new solution for intelligent manufacturing and industrial inspection.入藏号: WOS:001335507000001Indexed Date: 2024-10-25
62. 作者: Li, X (Li, Xiao); Li, KW (Li, Kewen); Xu, ZF (Xu, Zhifeng); Huang, ZC (Huang, Zongchao); Dou, YM (Dou, Yimin)标题: Fault-Seg-Net: A method for seismic fault segmentation based on multi-scale feature fusion with imbalanced classification来源出版物: COMPUTERS AND GEOTECHNICS卷: 158文献号: e105412DOI: 10.1016/j.compgeo.2023.105412提前访问日期: MAR 2023文献类型: Article出版年: JUN 2023摘要: Fault identification has important geological significance and practical production value. Due to the effects of earth filtering and environmental noise, it is difficult to identify minor faults, and manual fault identification is inefficient. In this study, an end-to-end deep learning semantic segmentation network Fault-Seg-Net is proposed to identify fault on seismic images, which simultaneously learns global semantic features and local detailed features. In Fault-Seg-Net, a multi-scale residual module is designed to expand the receptive field to mine fine-grained fault features from the low-dimensional feature space. Fault-Seg-Attention module is designed to model long-distance dependencies of pixel spatial location to compensate for the spatial continuity loss. In addition, a compound loss is used to guide the model training to handle imbalanced seismic image segmentation tasks. Experimental results on synthetic datasets have verified that Fault-Seg-Net can achieve high Precision (88.6%), Recall (89.2%), Dice (88.8%) and mIoU (81.5%) simultaneously, which is significantly better than traditional image processing methods and deep learning semantic segmentation networks. Experimental results on real large-scale field datasets have verified that Fault-Seg-Net has important practical value and strong robustness. This study provides an effective solution for intelligent seismic fault identification under complex geological environment.入藏号: WOS:000959588500001Indexed Date: 2023-04-22
63. 作者: Zhang, XL (Zhang, Xiaoli); Zhao, CC (Zhao, Congcong); Lu, WJ (Lu, Wenjie); Liang, K (Liang, Kun)标题: Load Equipment Segmentation and Assessment Method Based on Multi-Source Tensor Feature Fusion来源出版物: ELECTRONICS卷: 14期: 5文献号: 1040DOI: 10.3390/electronics14051040文献类型: Article出版年: MAR 2025摘要: The state monitoring of power load equipment plays a crucial role in ensuring its normal operation. However, in densely deployed environments, the target equipment often exhibits low clarity, making real-time warnings challenging. In this study, a load equipment segmentation and assessment method based on multi-source tensor feature fusion (LSA-MT) is proposed. First, a lightweight residual block based on the attention mechanism is introduced into the backbone network to emphasize key features of load devices and enhance target segmentation efficiency. Second, a 3D edge detail feature perception module is designed to facilitate multi-scale feature fusion while preserving boundary detail features of different devices, thereby improving local recognition accuracy. Finally, tensor decomposition and reorganization are employed to guide visual feature reconstruction in conjunction with equipment monitoring images, while tensor mapping of equipment monitoring data is utilized for automated fault classification. The experimental results demonstrate that LSE-MT produces visually clearer segmentations compared to models such as the classic UNet++ and the more recent EGE-UNet when segmenting multiple load devices, achieving Dice and mIoU scores of 92.48 and 92.90, respectively. Regarding classification across the four datasets, the average accuracy can reach 92.92%. These findings fully demonstrate the effectiveness of the LSA-MT method in load equipment fault alarms and grid operation and maintenance.入藏号: WOS:001443474800001Indexed Date: 2025-03-18
64. 作者: 郝帅; 杨磊; 马旭; 马瑞泽; 文虎作者: Hao Shuai; Yang Lei; Ma Xu; Ma Ruize; Wen Hu标题: YOLOv5 Transmission Line Fault Detection Based on Attention Mechanism and Cross-scale Feature Fusion标题: 基于注意力机制与跨尺度特征融合的YOLOv5输电线路故障检测来源出版物: Proceedings of the Chinese Society of Electrical Engineering来源出版物: 中国电机工程学报卷: 43期: 6页: 2319-2330文献号: 0258-8013(2023)43:6<2319:JYZYLJ>2.0.TX;2-2文献类型: Article出版年: 2023摘要: It is an important research direction and a challenging topic in the field of transmission line detection to use UAV for detecting high-voltage transmission lines and automatically and accurately detecting fault targets in the detection data based on computer vision technology. In order to solve the problem that the target to be detected has multi-scale characteristics and partial occlusion in complex inspection environment, a fault detection algorithm of YOLOv5 transmission line based on attention mechanism and cross-scale feature fusion is proposed. First, the YOLOv5 detection network is built. Based on the YOLOv5 detection network, the spatial and channel convolution attention model is introduced to suppress the complex background interference and enhance the significance of the target to be detected. Secondly, the FPN+PAN structure in the original YOLOv5 detection framework Neck is changed to BiFPN structure, so that the multi-scale features of the target can be fused effectively. Thirdly, to address the problems of missing and false detection caused by the insufficient feature expression ability of detection network, we design an adaptive weighted fusion module with multi-scale and same-scale features, which can enhance the detection accuracy of detection network to occluded fault targets. Finally, to verify the effectiveness of the proposed algorithm, the inspection data obtained by an inspection department using UAV in recent four years are used. The results show that the proposed method can accurately detect transmission line faults in complex environment, and the average accuracy of detection can reach 96.8%.摘要: 利用无人机对高压输电线路巡检,并基于计算机视觉技术对巡检数据中的故障目标进行自动、准确检测是输电线路巡检领域中的重要研究方向,同时也是一个极具挑战性的课题。针对复杂巡检环境中待检测目标存在多尺度特性以及部分遮挡造成传统算法难以准确检测问题,提出一种基于注意力机制与跨尺度特征融合的YOLOv5输电线路故障检测算法。首先,搭建YOLOv5检测网络,为了抑制复杂背景干扰,在其基础上引入空间与通道卷积注意力模型,以增强待检测故障目标的显著度;然后,将原始YOLOv5检测框架Neck中的FPN+PAN结构改为BiFPN结构,从而使目标多尺度特征能够有效融合;其次,为了解决待检测目标特征表达能力不足造成漏检和误检的问题,设计多尺度与同尺度特征的自适应加权融合模块,以增强检测网络对遮挡情况下故障目标的检测能力。最后,为了验证提出算法的有效性,利用某巡检部门近4年无人机巡检数据对算法进行验证。结果表明,提出的算法能够对复杂环境中输电线路上的多尺度故障目标实现精确检测,其平均检测精度可达96.8%。入藏号: CSCD:7434090Indexed Date: 2023-07-07