报告时间：2023 年 5 月 26 日（星期五）下午 14:30-17:30

报告形式：信息楼 310 报告厅，腾讯会议（ID：901-832-446）

（一）

报告时间：15:00-15:15

报告人：韦鹏

报告题目：基于空间构建的分布式参数系统智能建模与异常诊断

主要内容：

Many thermal and fluid processes are distributed parameter systems (DPSs) described by partial differential equations (PDEs). The input, output, and process parameters of the DPS vary in space and time. Time-space separation-based methods have been widely used for modeling and diagnosis of DPSs. However, the exact governing PDEs and boundary conditions of DPSs are very difficult to obtain for many practical industrial processes, and existing data-based methods cannot achieve spatially continuous modeling and precise abnormality localization. In this report, a novel spatial construction method is proposed to preserve the spatial information between sensing locations for process modeling of unknown DPSs. In order to maintain the system dimension structure, the proposed spatial construction method is improved for the modeling of high-dimensional DPSs. Based on the proposed spatial construction method, the abnormalities can be detected in time and located accurately, which has been validated by the experiments on catalytic reaction processes, battery cells, and battery energy storage systems.

报告人简介：韦鹏，博士，毕业于香港城市大学系统工程系。其主要研究方向为电池储能系统的智能建模和故障诊断算法与应用研究。韦博士先后参与科研项目 2 项（香港研究资助局项目和广东省面上项目各 1 项）；以第一作者在 IEEE Transactions on Industrial

Informatics, IEEE Transactions on Industrial Electronics, Applied Energy 等国际期刊上发表 SCI 论文 6 篇，其中 5 篇中科院一区 Top；博士期间获得香港城市大学博士生全额奖学金和优秀研究生奖学金。

（二）

报告时间：15:15-15:30

报告人：王毅博

报告题目：广义时滞神经网络系统的稳定性研究

主要内容：

Generalized neural networks (GNNs) are composed of an enormous amount of connected units or nodes called artificial neurons, which are connected to simulate neurons in a biological brain. As we know, time-varying delays are an inevitable factor in GNNs because of the limited switching speed and communication bandwidth. Stability is a prerequisite for dynamic system analysis and application, but time delays may lead to unacceptable dynamic responses or instability. By considering a new matrix polynomial, the proposed novel reciprocally convex method leads to a tight bound for integral inequality combination and encompasses several existing approaches as special cases. The relaxed stability conditions with less conservatism are developed by employing the proposed reciprocally convex combination and the Lyapunov-Krasovskii(L-K) functional. Several numerical examples are conducted to show the superiorities of the stability conditions.

报告人简介：王毅博，博士后，2023 年博士毕业于燕山大学自动化系，2023 年 2 月至今，在香港理工大学计算机系开展博士后研究工作。主要研究领域为时滞系统的稳定性分析及控制、机器人实时调度与决策、模糊时滞系统等。发表 SCI 论文十余篇，主持河

北省研究生创新资助一项，2021 年获得国家公派联合培养项目资助。担任 IEEE Transactions on Cybernetics, Fuzzy systems，Circuits and Systems II: Express Briefs 等期刊审稿人。

（三）

报告时间：15:30-15:45

报告人：杨兴凯

报告题目：基于动力学指导振动分析的齿轮箱故障诊断

主要内容：

It is of vital significance to conduct fault diagnosis for gearboxes since it can prevent gearbox failures. Vibration signals have been commonly used for gearbox fault diagnosis since they contain abundant fault information. The core of vibration-based gearbox fault diagnosis is to extract signatures reflecting gearbox health conditions. In the industry, three major types of factors oftentimes affect gearbox health conditions, including gearbox operating conditions, gear tooth faults and tooth lubrication. These factors also make gearbox vibration signals more complex, which undermines the effectiveness of traditional vibration analysis for gearbox fault diagnosis. To overcome this deficiency, a novel methodology for gearbox fault diagnosis based on dynamics-guided vibration analysis is proposed, the core of which is to procure insights into how operating conditions, tooth faults and lubrication affect gearbox vibration characteristics via gearbox dynamic modelling. Afterwards, the obtained insights are employed to develop more effective vibration analysis methods which can accurately extract gear fault information, therefore increasing the accuracy of gearbox fault diagnosis.

报告人简介：杨兴凯，博士后，2022 年 8 月博士毕业于加拿大阿尔伯塔大学机械系。2022 年 9 月至今，在阿尔伯塔大学机械系任职博士后研究员，合作导师是加拿大工程院

院士 Ming J. Zuo 教授和国际工程资产管理学会会士 Zhigang Tian 教授。主要从事数字孪生驱动的机械装备智能诊断与健康管理、齿轮传动装置摩擦动力学建模和信号处理等方面的研究。在 Mechanical Systems and Signal Processing 和 Tribology International 等国际权威期刊上发表 SCI 论文十余篇。作为核心成员参与加拿大国家重点研发计划项目和 Mitacs Accelerate 基金项目等多个科研项目。担任 Sensors 等多个 SCI 期刊特刊客座编辑，担任期刊 International Journal of Hydromechatronics 青年编委，担任 Mechanical Systems and Signal Processing 和 Reliability Engineering and System Safety 等 SCI 期刊审稿人。

（四）

报告时间：15:45-16:00

报告人：吕菲

报告题目：合成数据辅助医学图像分割的标注高效学习

主要内容：

Collecting pixel-level annotation is an expensive process and has been one of the key challenges in developing deep learning-based image segmentation methods. The problem is even more challenging for medical images because medical professional is required for annotation and normally abnormal regions in medical images are relatively small. Existing research works have been conducted from different angles for annotation-efficient deep learning, and we mainly investigate the approach based on synthetic data. Synthetic data is cheap to collect without requiring human labelling, and it is fully controllable. In this talk, I will share three recent research works by leveraging synthetic data, including: 1) Pseudo-Healthy Synthesis for Weakly Supervised Liver Tumor Segmentation; 2) Synthetic-to-Real Unsupervised Domain

Adaptation for Liver Tumor Segmentation; and 3) Synthetic Data Augmentation for Semi-Supervised COVID-19 Pneumonia Infection Segmentation.

报告人简介：吕菲，博士，将于 2023 年 8 月份毕业。主要研究方向是医学人工智能，特别关注于数据与标签高效学习，弱监督学习和半监督学习等。在医学图像领域的顶级期刊及会议发表了多篇文章，如 IEEE TMI, MICCAI 等。在攻读博士学位之前，在阿里巴巴担任高级工程师，拥有丰富的行业实践经验。

（五）

报告时间：16:00-16:15

报告人：刁晓光

报告题目：面向中压直流的光伏汇集与故障保护方法研究

主要内容：

Distributed Photovoltaic Access to DC Distribution Systems is an important form of future renewable energy grid integration. This new form of grid integration requires photovoltaic DC converters to have high efficiency, high voltage conversion ratio, high reliability, and the ability to operate in multiple modes. To meet the requirements of distributed photovoltaic access at medium and low voltages with multiple ports, research is being conducted on the differentiated topology architecture of distributed photovoltaic DC converters based on modular combination and reuse. Additionally, research is being conducted on redundant configuration techniques for series/parallel module operation to achieve high reliability and port fault self-isolation techniques. Other areas of research include photovoltaic plant protection techniques, cooperative control, and fault diagnosis techniques based on spiking neural networks.

报告人简介：刁晓光，博士，武汉大学 2021 级博士研究生，2022 年 12 月至今，在丹麦奥尔堡大学能源系进行联合培养。主要研究方向包含模块化级联变换器拓扑设计、控制

与保护，构网型光伏逆变器控制以及神经网络在微电网控制中的应用等。以第一作者发表 SCI 论文 7 篇，中国电机工程学报 1 篇。获得全国研究生电子设计竞赛一等奖 2 次，国家奖学金 2 次。担任 IEEE Transactions on Power Electronics, IEEE Transactions on Industrial Electronics 与 IEEE Transactions on Transportation Electrification 等期刊审稿人。

（六）

报告时间：16:15-16:30

报告人：吴宇轩

报告题目：面向色散介质的探地雷达三维逆时偏移成像方法研究

主要内容：

Nowadays, benefiting from its strong capability of nondestructive detection, the ground-penetrating radar (GPR) has been applied to detect and reconstruct underground targets and has drawn lots of attention both in military and civilian fields. However, in the processing of GPR imaging, due to the dispersion errors caused by random distribution of various particles in soil, conventional imaging methods have disadvantages of low signal-noise ratio (SNR), low resolution, and unbalanced amplitude. In this work, to achieve high resolution and high veracity on underground targets' 3-D reconstruction, we improved the conventional reverse time migration (RTM) algorithm in perspective of medium constitutive relationship. Besides, we extended the improved RTM method in 3-D environments and reconstructed the 3-D structure of several underground targets. To make the RTM algorithm suitable for stepped frequency continuous wave (SFCW) GPR system, we generated three excitation signal models and analyzed the effect of different excitation signals on imaging performance. Finally, through the quantitative analysis of simulation and on-vehicle experimental results, we found that the 3-D

images generated by improved RTM method had higher resolution, smaller measurement error, and higher veracity than those of conventional RTM method.

报告人简介：吴宇轩，哈尔滨工业大学 2019 级博士研究生。主要研究方向为基于步进频雷达的地下空间目标探测技术研究。作为核心研究成员参与了“某环境感知技术”“天馈一体化技术研究”“超宽带精确测距测向技术”等一系列国防创新项目，重点围绕色散介质中微弱信号提取及三维特征重建等难题开展了技术攻关，相关研究成果在 IEEE 遥感领域汇刊 IEEE Transaction on Geoscience and Remote Sensing，传感器领域期刊 IEEE Sensors Journal，仪器测量领域顶级会议 I2MTC 等国际知名高水平期刊及会议上发表，其中以第一作者或学生第一作者发表 SCI 论文 4 篇，EI 会议论文 2 篇，申请 2 项国家发明专利并获得授权 1 项，获得中国（国际）传感器创新创业大赛二等奖 1 次，博士研究生国家奖学金 1 次，担任 International Journal of Advanced Robotic Systems 等期刊审稿人。

（七）

报告时间：16:30-16:45

报告人：闫宇晴

报告题目：基于神经网络的分数阶模糊系统的自适应滑模控制

主要内容：

This report concentrates on the neural network(NN) based adaptive sliding mode control(SMC) for fuzzy fractional order system(FOSs) , $\alpha \in (0, 1)$. First of all, a novel method of optimal SMC approach is developed for fuzzy FOSs by using adaptive dynamic program(ADP), integral sliding mode and NN with unmatched disturbances and time-varying delays. Next, to weaken the influence of the nonlinearities, SMC strategy is proposed for the specific system, which is established on the corresponding SMD to ensure that the FOS

reach the SMS in a finite time. Moreover, it shows that the matrix of SMS can be described by the linear matrix inequality(LMI). Furthermore, the Hamilton-Jacobi-Bell man(HJB) equation can be approximated by a single NN method, and Lyapunov stability principle proves that the weight errors are convergent, further guaranteeing the asymptotically stability of the fuzzy FOS.

报告人简介：闫宇晴，博士，就读于东北大学信息与工程学院，主要研究领域为分数阶系统的故障诊断与容错控制、分数阶多智能体的协同控制、分数阶系统的滑模控制等。就读期间发表 SCI 论文十余篇，其中本人一作发表 IEEE Trans 系列论文四篇。

（八）

报告时间：16:45-17:00

报告人：张二川

报告题目：测地线跳蛙算法的收敛性分析

主要内容：

Geodesics are of fundamental interest in mathematics, physics, computer science, engineering and many other subjects. The so-called Leapfrog Algorithm was proposed in Noakes 1998 (but not named there as such) to find geodesics joining two given points x_0 and x_1 on a path-connected complete Riemannian manifold. The basic idea is to choose some junctions between x_0 and x_1 that can be joined by geodesics locally and then adjust these junctions. It was proved that the sequence of piecewise geodesics $\{\gamma^k\}_{k\geq 1}$ generated by this algorithm converges to a geodesic joining x_0 and x_1. In this talk, we will discuss Leapfrog's convergence rate $\tau_{i,n}$ of i-th junction depending on the manifold M. A relationship is found with the maximal root λ_n of a polynomial of degree $n-3$, where $n(n>3)$ is the number of geodesic segments. This talk is based on joint work with Prof. Lyle Noakes (UWA).

报告人简介：张二川，博士后，北京理工大学数学与应用数学专业学士，数学专业硕士，澳大利亚西澳大学(The University of Western Australia)哲学博士，伊迪斯科文大学(Edith Cowan University)博士后，现任伊迪斯科文大学研究员(计算机视觉方向)和西澳大学兼职研究员(几何和优化方向)。

（九）

报告时间：17:00-17:15

报告人：宾俊驰

报告题目：多模态动态信息感知的乙烷泄漏检测

主要内容：

A leak detection is an essential procedure to guarantee reliable functioning during ethane production and transportation with infrared imaging. However, infrared imaging can't perceive semantic information about objects, such as colors and textures. Visible imaging can provide such information but lacks reliability against bad weather. Multi-modal imaging that utilizes visible and infrared information can be the ultimate solution to compensate for their properties. Thus, this study proposed an innovative motion-aware multi-modal framework to effectively and efficiently fuse visible and infrared video frames to detect ethane leaks. Extensive experiments demonstrate the significant improvement brought by the proposed framework over detection's accuracy and robustness. Hence, the proposed framework enables reliable ethane monitoring with multi-modal imaging.

报告人简介：宾俊驰，博士，加拿大英属哥伦比亚大学博士候选人，师从国际光学工程学会（SPIE）Zheng Liu 会士，研究方向为数据融合与工业视觉监测方法，预期 2023 年 9 月份毕业。近五年时间中以第一作者或共同第一作者发表 SCI 收录论文 8 篇，EI 会议论文 4 篇，参与加拿大政府支持的科研项目 3 个，获得科研经费共 57 万元，相关研究

曾被加拿大广播公司（CBC）报道；曾兼职于加拿大各类本土企业，协助开展软件和算法研究工作；在 2020-2022 连续三年被国际知名期刊《IEEE Transactions on Instrument and Measurement》评为杰出审稿人，曾担任国际知名会议 NeurIPS 2022 自动驾驶研讨会的技术委员会成员；曾获得由美国空军实验室与威斯康辛大学举办的智能遥感灾害监测大赛冠军。