

Department of Civil Engineering eNews (April 2024)

Departmental Event

HKU signs MoU with Centre of Science and Technology Industrial Development of Ministry of Housing and Urban-Rural Development

The University of Hong Kong (HKU) and the Centre of Science and Technology Industrial Development (CSTID) of the Ministry of Housing and Urban-Rural Development (MOHURD) signed a Memorandum of Understanding (MoU) during the Mainland and Hong Kong Construction Forum 2024 on March 26, 2024. The MoU seeks to strengthen the University-Industry collaboration on exploring opportunities to promote the effective use of Modular Integrated Construction (MiC) for quality housing and to support the research and development of MiC in Hong Kong and the Mainland.

Prof. Wei Pan, Head of Department of Civil Engineering and Director of MiCLab, HKU and Mr. Feng Zhang, Chief Engineer of CSTID represented the two organisations in the MoU signing. The signing was witnessed by Mr. Xianxin Zeng, Director-General, Department of Construction Market Supervision of MOHURD, Ms. Bernadette Linn, Secretary for Development of the HKSAR Government, Mr. Yong Zhang, Director-General, Department of Housing and Urban-Rural Development of Guangdong Province, and Mr. Shuiqiu Ye, Deputy Director-General, Department of Educational, Scientific and Technological Affairs of the Liaison Office of the Central People's Government in the HKSAR.



Figure 1. A photo taken during the Forum.

Scholarship Presentation Ceremony 2023-2024

The Department of Civil Engineering held its highly anticipated Scholarship Presentation Ceremony for the 2023-2024 academic year on April 16, 2024 in the prestigious Convocation Room of the Main Building of HKU. This yearly event celebrated the outstanding achievements of deserving students and recognized the invaluable support of donors, scholarship representatives and distinguished guests.

Prof. Wei Pan, Head of Department of Civil Engineering, captivated the audience with his inspiring speech. He congratulated award recipients, expressed gratitude to all attendees and acknowledged the Department's rich history and remarkable success, *“HKU Civil Engineering is one of the oldest departments of our university. We have achieved a tremendous amount of success and glories, and you are part of that. HKU Civil Engineering is also a major driving force for not only creating new knowledge, but also serving the community in many areas including sustainable infrastructure, water and environment, and Modular Integrated Construction (MiC), to name a few. You will sustain that driving force.”*



Figure 1. Prof. Pan, Head of Department, giving his welcome speech.

The ceremony was graced by the presence of the esteemed Guest of Honour, Ir. Ricky Lau, JP, Permanent Secretary for Development (Works) of the Government of the HKSAR. Ir. Lau delivered a motivational speech, commending the MiC Lab of HKU for its groundbreaking research and innovation in MiC, *“In addition to the drive from the Government side, the development of MiC in the region does require dedicated support from our universities. On this, the MiC Lab of HKU is the best initiative of leading systematic and innovative research in MiC and its related technologies.”*



Figure 2. Ir. Ricky Lau, JP, giving his Guest of Honour speech.

In recognition of Ir. Lau's presence and support, he was presented with a Pewter Plate engraved with the HKU design, symbolizing appreciation for his commitment to education and his contribution to the ceremony.



Figure 3. Ir. Ricky Lau, JP (left), receiving a gift from Prof. Pan (right).

The Scholarship Presentation Ceremony also provided an opportunity to express gratitude to the generous donors whose support have made these scholarships possible. Their generosity has made a profound impact on the lives of the students. Their belief in students' potential and their investment in education have opened doors of opportunity for students, enabling them to pursue their dreams and aspirations, thus contributing to the advancement of civil engineering and the betterment of society.

To express appreciation for their presence and presenting Scholarship Certificates to the deserving award recipients, the donors and the Scholarship representatives were presented with a Certificate of Appreciation.

The Department of Civil Engineering extends its gratitude to Ir. Ricky Lau, JP, the generous donors, scholarship representatives, and all attendees for making the Scholarship Presentation Ceremony a resounding success.



Figure 4. Group photo taken at the end of ceremony.

For full details, please visit newspaper link by clicking here: [HKU Media](#)

[Seoul Metro Visit](#)

A strong delegation of 34 staff from Seoul Metro visited the Department of Civil Engineering and the Institute of Transport Studies on April 23, 2024. The delegates came from engineering, operation, planning, sales and safety divisions.

Prof. Reynold Cheng, Prof. Yong-Hong Kuo, Prof. Zhan Zhao, Prof. Jiangping Zhou and Dr. Jiali Zhou from HKU presented our latest metro-related research to them, including passenger analytics using smart card data; metro-related data science; operations of the railway system and metro development. There was good interaction and discussion.



Figure 1. A photo taken during the meeting.

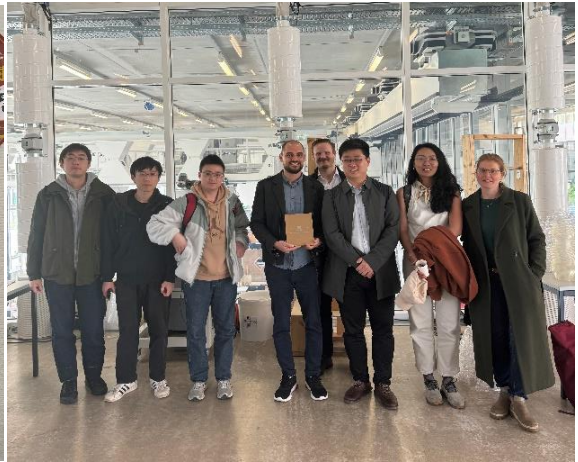
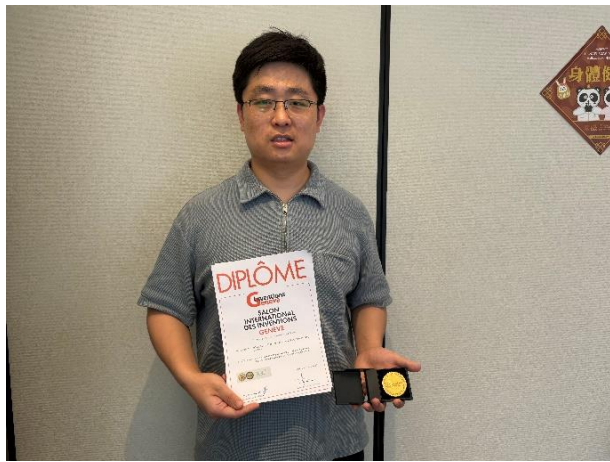
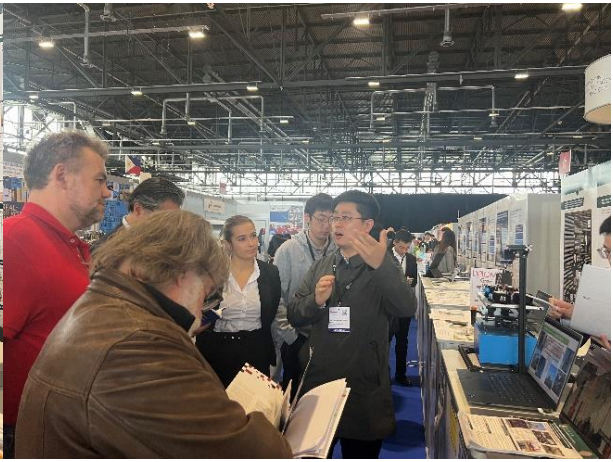
Staff Awards / Activities / News

Staff Awards

Dr. Xiao Li and his team won a Gold Medal at the 49th International Exhibition of Inventions Geneva

Dr. Xiao Li and his team won a Gold Medal at the 49th International Exhibition of Inventions Geneva with a project called “Hybrid Pose Adjustment (HyPA) Robot for Assembly Process in Modular Integrated Construction (MiC).” HyPA is tailored to automate the Modular Integrated Construction (MiC) assembly process, which aligns with the HK government’s initiative to deliver 430,000 new housing units efficiently over the next decade. This innovative technology proposes a novel robot configuration and integrates sensors and actuators to finely adjust the pose of MiC modules, effectively addressing pose adjustment challenges. Key components, including the horizontal steering system, cable control system, center of gravity (CoG) adjustment system, thruster array, and position and orientation sensing system, collaborate to ensure precise positioning and alignment of modules, thus optimizing the MiC assembly workflow to increase productivity and reduce labor and safety issues.

During this trip to Europe, Dr. Li and his team also held the HK/Germany joint research project meeting with Prof. Frank Petzold, Prof. André Borrmann, and their teams at TUM, Munich, Germany. They also had a workshop on digital collaboration with Prof. Philippe Block’s team and visited NCCR digital fabrication at ETH, Zurich, Switzerland.



Figures 1. – 6. Photos taken during Europe trip.

For full story, please access newspaper articles by clicking here:
[HKU Media;](#)

Staff Activities

Keynote on MiC

Prof Wei Pan, Head of Department, delivered an invited Keynote Speech titled “Modular Integrated Construction (MiC)” at the Mainland and Hong Kong Construction Forum 2024 in Guangzhou on March 26, 2024.



Figure 1. Prof Pan’s Keynote Speech at the Forum.

Dr. Jiayi Wang was invited to present an online Keynote Speech at 2024 Engineering Structures (Asia-Pacific): Young Scientists Forum - AI in Civil Engineering

On April 10, 2024, Dr. Jiayi Wang presented an online Keynote Speech at 2024 Engineering Structures (Asia-Pacific): Young Scientists Forum- AI in Civil Engineering. The Speech is titled “AI accelerated Computational Mechanics and Structural Health Monitoring: Exact Displacement boundary physics-informed neural network (EPINN)”. The forum had six presentations in total and attracted more than 14,000 online views from the civil engineering community. Dr. Wang presented the recent progress of AI for civil engineering, including the AI solver for solid mechanics and digital twin for structural health monitoring of bridges under traffic loads. The Speech also presented future development trend of latest neural operators to solve structural design optimization problems and inverse problems.

人工智能加速计算力学与结构健康监测：精确位移边界条件的物理驱动神经网络EPINN



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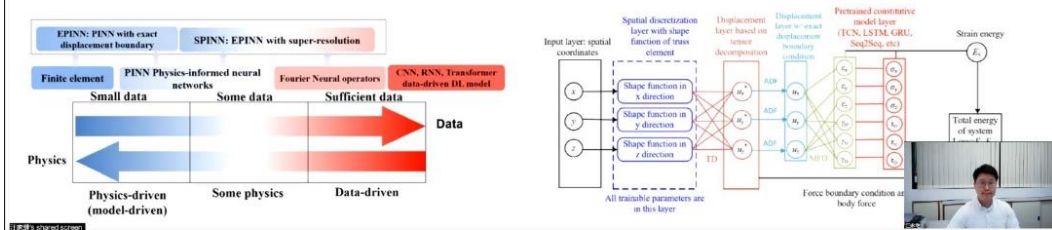


Figure 1. Cover page of the Keynote Speech.

题目: 人工智能加速计算力学与结构健康监测：精确位移边界的物理驱动神经网络(EPINN)
报告人: 汪家继 助理教授
香港大学 土木工程系
时间: 2024年4月10日 (周三) 19:05-19:35
腾讯会议: 247 361 895 (密码: 67983) + 爱思唯尔同步直播

报告简介:
近年来, 人工智能算法的快速发展为结构力学性能仿真模拟和结构健康监测提供了新思路与新技术。其中, 物理驱动机器学习算法通过融合物理方程和数据集, 针对大量计算力学反问题取得了较好的拟合结果。迄今为止, 物理驱动机器学习模型往往难以作为求解器直接求解固体力学正问题, 其效率与精度难以达到有限元求解器。此外, 物理驱动机器学习用于真实复杂结构的模拟仍处于起步阶段。本报告着重介绍一种精确位移边界条件的物理驱动神经网络 (EPINN), 该模型使用最小势能原理作为损失函数, 使用卷积神经网络精确重构了有限单元法的形函数, 使用张量分解构建高维位移函数, 并针对位移场施加了精确位移边界条件, 从而显著提升了物理驱动神经网络的计算效率。初步研究表明该方法针对典型三维问题, 与传统物理驱动神经网络相比实现了100倍以上的加速比。探讨该模型应用于复杂工程结构力学响应模拟的未来发展方向, 包括基于时序卷积网络的材料与结构模拟代理模型和时程分析等。此外, 针对桥梁健康监测的广泛需求, 本报告也进一步介绍了一种用于桥梁健康监测的数字孪生模型, 可基于位移或加速度传感器实现端到端的桥梁损伤分布场预测, 实现了基于健康监测设备的车桥耦合系统实时精准损伤识别。

个人简介:
汪家继, 香港大学土木工程系助理教授, 博士生导师。于2014年和2019年获清华大学本科及博士学位, 从事钢-混凝土组合结构、物理驱动机器学习、结构数字孪生模型、非线性本构模型等方面的研究工作。发表SCI论文46篇, 以第一作者或通讯作者发表国际知名期刊论文36篇, 授权国家发明专利2项。曾获中国钢结构协会科学技术奖特等奖, 汶川地震工程奖奖学金, 清华大学未来学者博士生奖学金等。担任美国土木工程学会大中华分会理事, 参与北京市新首钢大桥、银川绿地中心、深圳东宝河新安大桥等多个项目的科学研究。主持香港大学启动经费, 日本学术振兴会特别研究员项目及多个超级计算机应用项目。

Figure 2. Abstract of the Keynote Speech.

Distinguished Speech on MiC

Invited by the Institution of Civil Engineers (ICE) Hong Kong Association, Prof. Wei Pan, Fellow of ICE, delivered a Distinguished Speech titled “Revolution of Civil Engineering through MiC Innovations” at the ICE Hong Kong Association 25th Anniversary Conference on April 18, 2024. ICE was established in 1818 and now has 97,000 members globally, with its mission to improve lives by ensuring the world has the engineering capacity and infrastructure systems it needs to enable our planet and our people to thrive.



Figure 1. Prof. Pan’s speech during the conference.

Staff News

Prof. Sze Chun Wong was appointed as an external member of the Project Board and co-convenor of the Independent Railway Expert Advisory Committee, The Government of HKSAR, for two years with effect from November 1, 2023.

Prof. Sze Chun Wong was appointed as a member of the Lantau Development Advisory Committee, The Government of HKSAR, for two years with effect from February 1, 2024.

Department of Civil Engineering eNews (March 2024)

Staff Award

Clarivate Highly Cited Researchers 2023

Prof. Chuyang Y. Tang and Prof. Tong Zhang, listed in alphabetical order, were two of the University's fifty-one scholars recognized in Clarivate's list of Highly Cited Researchers for 2023.

On March 14, 2024, an award ceremony took place in Loke Yew Hall to celebrate their remarkable research achievements. Both professors have consistently produced multiple Highly Cited Papers™, which rank in the top 1% by citations within their field and publication year in the Web of Science™ over the past decade. Their work has garnered significant attention from international peers, showcasing their ground breaking research and their considerable academic influence.

HKU acknowledges the significance of this achievement, as it boasts the highest number of HKU scholars, 51 in total, to be featured on the list. Furthermore, HKU's notable improvement in rankings has also contributed to Hong Kong's inclusion among the top 10 regions and nations for 2023, according to Clarivate Analytics.



Figure 1. Group photo taken in the Awards Ceremony.

For full story, please access newspaper articles by clicking here:

[HKU Media 1](#); [HKU Media 2](#) and [HKU Media 3](#)

[Dr. Xiao LI awarded Environment and Conservation Fund as PI with the title of “CarbonGuard: A Blockchain-enabled IoT-BIM Platform for Automated Estimation, Reliable Monitoring, and Proactive Reduction of Carbon Emissions in Modular Integrated Construction \(MiC\)”](#)

Buildings account for 90% of electricity consumption and over 60% of the city's carbon emissions in Hong Kong. Beyond building operation, the construction stage releases significant carbon emissions in a short period. Modular integrated construction (MiC) has

been extensively promoted as an innovative construction approach and is expected to be used to deliver massive public housing in the next decade. However, monitoring MiC's carbon emissions has been a labor-intensive, unreliable, and passive process, typically conducted after construction activities have concluded. Such a post-estimation approach is impractical as it comes too late to act and only provides retrospective data for future projects.

This project aims to develop a blockchain-enabled IoT-BIM (BIBP) platform designed for estimating, monitoring, and reducing carbon emissions in MiC.

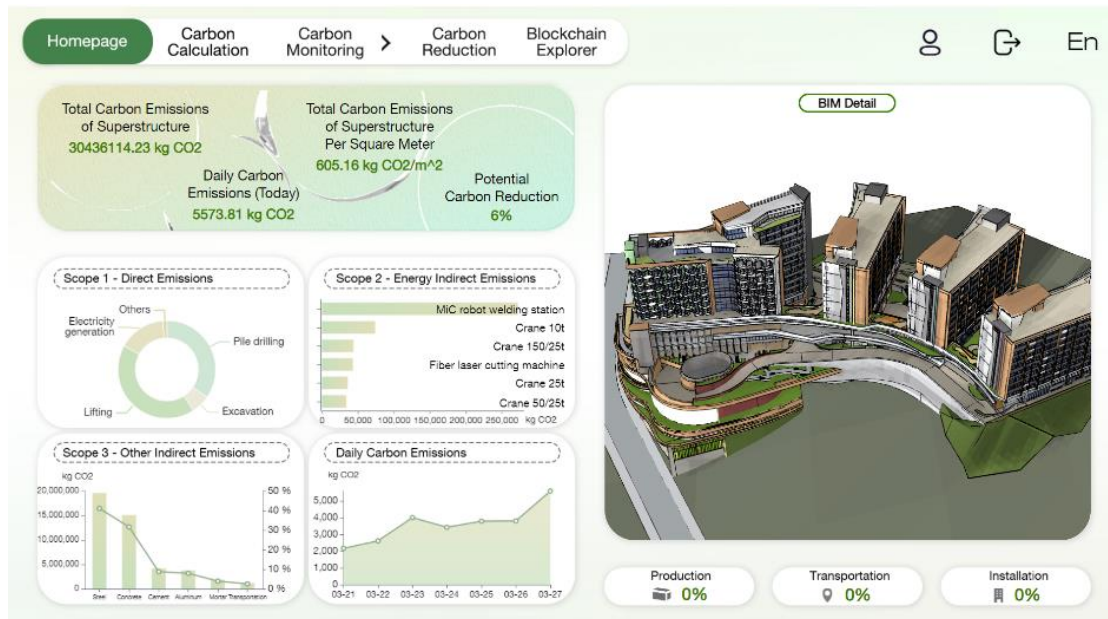


Figure 1. Blockchain-enabled IoT-BIM (BIBP) platform for carbon.

For full story, please access newspaper articles by clicking here: [ECF GovHK](#)

[Dr. Xiao LI awarded NSFC/RGC CRS as Co-PI \(1 million HKD\) with the title of “The mechanism and policy optimization of multi-stakeholder cross-regional collaboration in the construction industry of the GBA”](#)

In this project, HKU collaborates with Tsinghua University, HKPolyU, Central University of Finance and Economics, and Xiamen University. Our HKU team takes the role of establishing an intelligent platform for simulating stakeholders' interactions, collaboration behaviour, and collaboration performance that underpins collaboration policies.



Figure 1. Policy simulation platform for construction industry collaboration.

For full story, please access newspaper articles by clicking here: [HKU Scholars Hub](#)

Project Mingde

The Shaking Table Competition 2024

The Shaking Table Competition 2024, organized by our Department and Project Mingde Student Association (PMSA), was held on March 7, 2024. This exciting competition served both educational and entertainment purposes, aimed at encouraging students to apply their engineering knowledge and creativity to design and construct a small-scale physical model. The models were tested under an earthquake load applied through the shaking table. Each team was given limited materials, mainly balsa wooden sticks and super glue, and a fixed amount of time to construct a model according to the pre-announced specifications. They were also required to present their engineering justifications to the esteemed judge, Prof. Francis Au, the former Head of Department.

This year's competition was attended by five teams, and we are pleased to announce the winning was team A, comprised of Lau Tak San, Wong Pak Hei, Hung Chi Yung, and Chan Long Ching, who are all fourth-year civil engineering students. The team received a cash prize of HK\$1000 and a Certificate of Champion. We extend our congratulations to the winners on their impressive victory, and we commend all participants for their hard work and dedication to the competition.



Figure 1. Group photo of the winning team with the judge.



Figure 2. Models built by Team A to E (from left to right).