UNIVERSITY OF ILLINOIS URBANA-CHAMPAIGN

DREMES

The Dynamic Research Enterprise for Multidisciplinary Engineering Sciences
ZJU-UIUC Joint Research Center

ZHEJIANG UNIVERSITY

Center for Infrastructure Resilience in Cities as Livable Environments
CIRCLE

CIRCLE
Distinguished Lecture Series

Dr. Hui Li

A Roadmap for Physical Artificial Intelligence in Civil Engineering

ABSTRACT: Civil engineering deals with all aspects of design, construction, and maintenance of the physical and natural built environment. The discipline has a long history and is often viewed as relatively traditional. The concept of intelligent civil engineering systems was first introduced at the end of 1970s, associated with structural vibration control. In the early 1990s, smart sensing and health monitoring technologies as well as smart material-based control strategies emerged, becoming known as the second stage of intelligence in civil engineering. In more recent years, artificial intelligence (AI) has emerged from the field of computer science to become a focus of research and development in many fields, including civil engineering. In contrast with AI focusing only on data analysis, the application of AI in the natural sciences and engineering must also respect intrinsic physical laws, which is termed "Physical Artificial Intelligence (PAI)", though some scholars prefer "AI for science". In this lecture, the basic concepts underlying PAI in civil engineering are introduced. Then, the revolutionary changes catalyzed by PAI in the theory and technology of civil engineering are discussed, covering issues such as architectural design, structural and material design, structural analysis and mechanics, solution of the complex governing equations, construction, maintenance and operation, and disaster risk management. Finally, the presentation looks toward the future of civil engineering research and applications in an intelligent societal setting.

BIO: Dr. Hui Li is a Changjiang Scholarship Professor in Civil Engineering and Mechanics at the Harbin Institute of Technology. Her research interests focus on Intelligent Science and Technology for Civil Engineering. She has made pioneering research contributions in Data Science and Engineering in Structural Health Monitoring, Intelligence Wind Engineering, Fusion Design of Architecture and Topology, and Negative Stiffness Damping Control. She is the author over 200 Journal papers, including one paper in Science. She was awarded the China National Science and Technology Prize (2006, 2007, 2013, 2018), the Structural Health Monitoring Person of the (2015), and the ASCE Housner Medal (2021). She has also led numerous engineering field applications, including monitoring of the Xihoumen Bridge, Hu-Su-Tong Bridge, etc. She is the current president of both the International Association for Structural Control and Monitoring and the Asian Pacific Network of Centers for Research in Smart Structure Technology.

CIRCLE: The Center for Infrastructure Resilience in Cities as Livable Environments is one of three research themes supported by the joint Dynamic Research Enterprise for Multidisciplinary Engineering Sciences (DREMES), established between the University of Illinois at Urbana-Champaign (UIUC) and Zhejiang University (ZJU). The CIRCLE Distinguished Lecture Series is intended to provide opportunities for faculty and students to meet and interact with internationally renowned experts in the field.

To register send an email to circle@intl.zju.edu.cn or scan the QR code. Registration is free.

14 FEB 2022 on zoom | **at 8AM CDT - 10PM Beijing Time**

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Dr. Hui Li

土木工程物理人工智能的发展路径展望

摘要：土木工程全过程包括设计、建造、维护等。土木工程学科是一门拥有悠久历史的传统学科。智能土木工程是土木工程与计算机学科、电子工程等的新兴交叉领域。最早于70年代末提出，主要指结构振动控制。上世纪90年代初期，智能感知、健康监测技术和基于智能材料的智能控制可以视为智能土木工程的第二阶段。近年来，人工智能在计算机科学领域取得了巨大成功，也已经成为纯数学、应用数学、其它自然科学和工程科学研究的热点。计算机科学领域主要依赖纯数据，但包括土木工程在内的数学、其它自然科学和工程科学领域服从物理定律和定理。因此，人工智能在这些领域的应用应满足物理定律和定理，因此，作者将其称为“物理人工智能”，也有学者称为“AI for science”。 在该报告中，首先介绍土木工程物理人工智能的概念；其次，讨论物理人工智能可能对土木工程科学与技术的变革，包括智能建筑艺术设计、结构设计和材料设计，智能结构分析与力学，复杂控制方程的智能求解方法，智能建造、智慧维护和智慧灾害风险管理；最后，展望在未来智能社会中土木工程的形态和相关科学研究。

简介：李惠　国家基金委创新群体负责人、国家杰出青年科学基金获得者、长江学者特聘教授，哈尔滨工业大学土木工程学院/人工智能研究院教授。长期从事土木工程智能科学与技术研究，尤其在健康监测数据科学与工程、智能桥梁风工程、建筑艺术与结构融合智能设计、智能负刚度阻尼控制领域进行了开创性研究。已经发表论文200余篇（包括SCIENCE一篇），获国家科技进步二等奖多项，国际结构健康监测年度人物奖（2015年）和ASCE HOUSNER奖章（2021年）。成果广泛应用于西堠门大桥、沪苏通大桥等。现任国际结构控制与监测学会理事长、亚太智能结构技术学会理事长。

CIRCLE：宜居城市基础设施韧性中心是伊利诺伊大学厄巴纳–香槟分校（UIUC）格兰杰工程学院和浙江大学 (ZJU) 建立的三个联合研究中心之一。 CIRCLE 杰出讲座系列旨在为教师和学生提供与该领域国际知名专家会面和互动的机会。

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2022年02月14日 zoom | 北京时间：晚上10点

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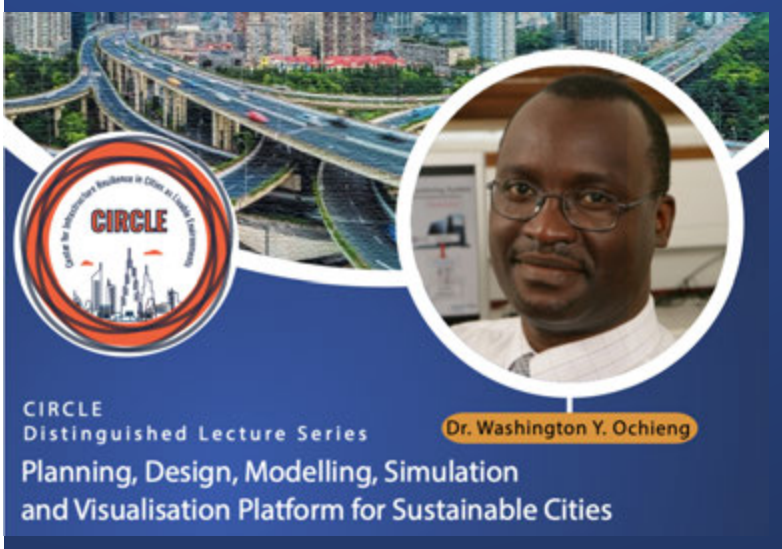

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