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

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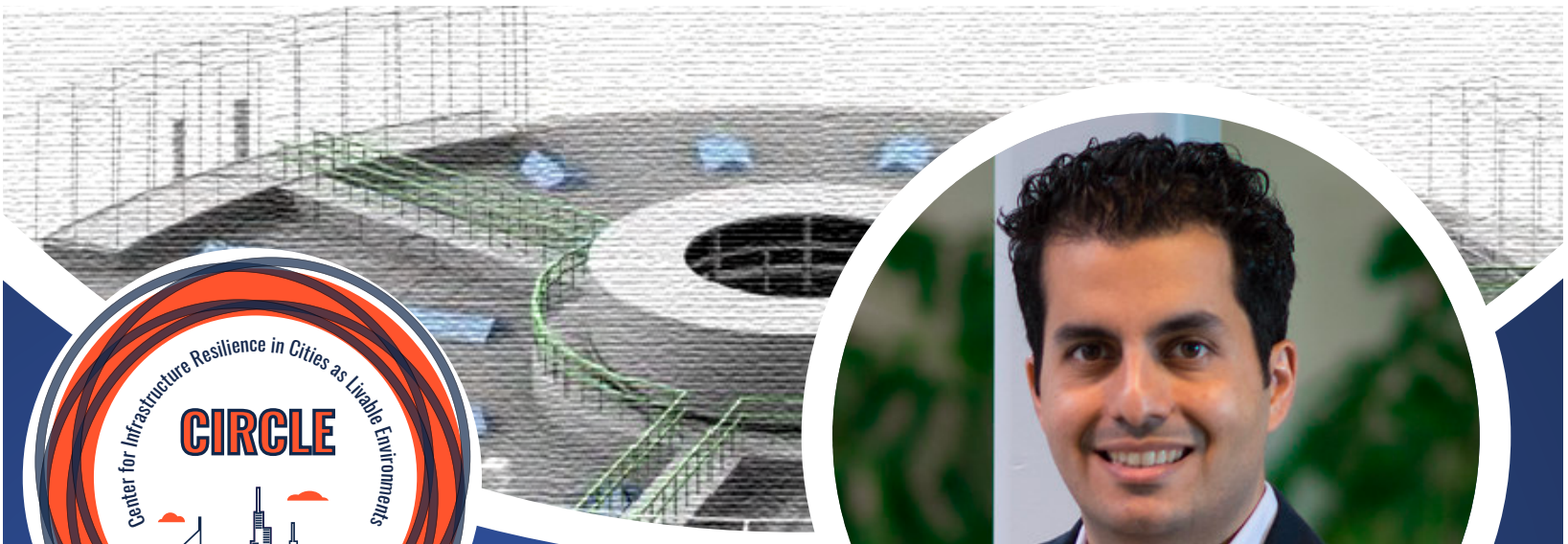

Center for Infrastructure Resilience in Cities as Livable Environments
CIRCLE

CIRCLE
Distinguished Lecture Series

Dr. Mani Golparvar

AI-powered Digital Twins for Spatio-Temporal Understanding of Physical Assets in Construction and Use Phases:
Where and When Computer Vision Meets BIM and Project Controls

ABSTRACT: Understanding the state of a project in space and through time is the foundation of many construction and operation workflows in the built environment. To do so, contractors and owners have tapped into the use of reality capture and BIM-enabled workflows. The exponential growth in the availability of reality and semantic-rich design data, paired with ever more aggressive delivery schedules on recent projects, has called for introduction of solutions that transcend the current capabilities and venture into bleeding-edge AI territory with the goals of (1) automatically identifying design and plan-related risks to improve decision-making, and (2) achieving better control and higher level of predictability through the real-time analysis of production, resources and jobsite conditions.

To address these needs, this talk will present the foundational and translational research efforts based on Computer Vision and Machine Learning that leverage this emerging data to automatically create spatio-temporal models that offer geometrical and semantic understanding of physical assets during construction and use phases. The talk will also describe how these semantic-rich reality models can be twinned against BIM and schedule data —in the form of AI-powered digital twins— such that actionable insights based on deviations between actual and expected performance can be generated so that project teams can take corrective actions. The theoretical foundation of these algorithms and systems will be presented during this talk. Lessons learned will be shared on how these solutions have scaled across 1000s of projects, and what their return on investment looks like, at both project and field personnel levels.

BIO: Mani Golparvar is Professor of Civil Engineering, Computer Science, and Technology Entrepreneurship at University of Illinois at Urbana-Champaign. His work in the area of computer vision, machine learning, and BIM has been the recipient of 2018 Walter Huber Research Prize from ASCE, 2017 National Top 20 Under 40 from ENR; 2016 Dan Halpin Award for Scholarship in Construction and 2013 James Croes Medal for innovation in Civil Eng. from ASCE; among other best journal and conference paper awards. Dr. Golparvar is also the CSO and co-founder of Reconstruct, a spin-off Software-as-a-Service company from UIUC. With $28M+ venture capital backing, most recently led by the Nemetschek Group, along with EquipmentShare/Romulus Capital, STO Building Group, ThorntonTomasetti, SHoP Architects, Syska Hennessy, and Asia Pacific Land, Reconstruct Visual Command Center solution creates reality models from photos and 360 videos and integrates them with BIM and project scheduling to visually track progress, analyze productivity, and proactively detect potential delays using predictive analytics; in turn empowering construction companies to keep their projects on schedule and on budget. Reconstruct has been recognized with awards such as the World Economic Forum construction technology innovation award in 2016.

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.

31 May 2023 on zoom | at 8AM CDT - 9PM Beijing Time

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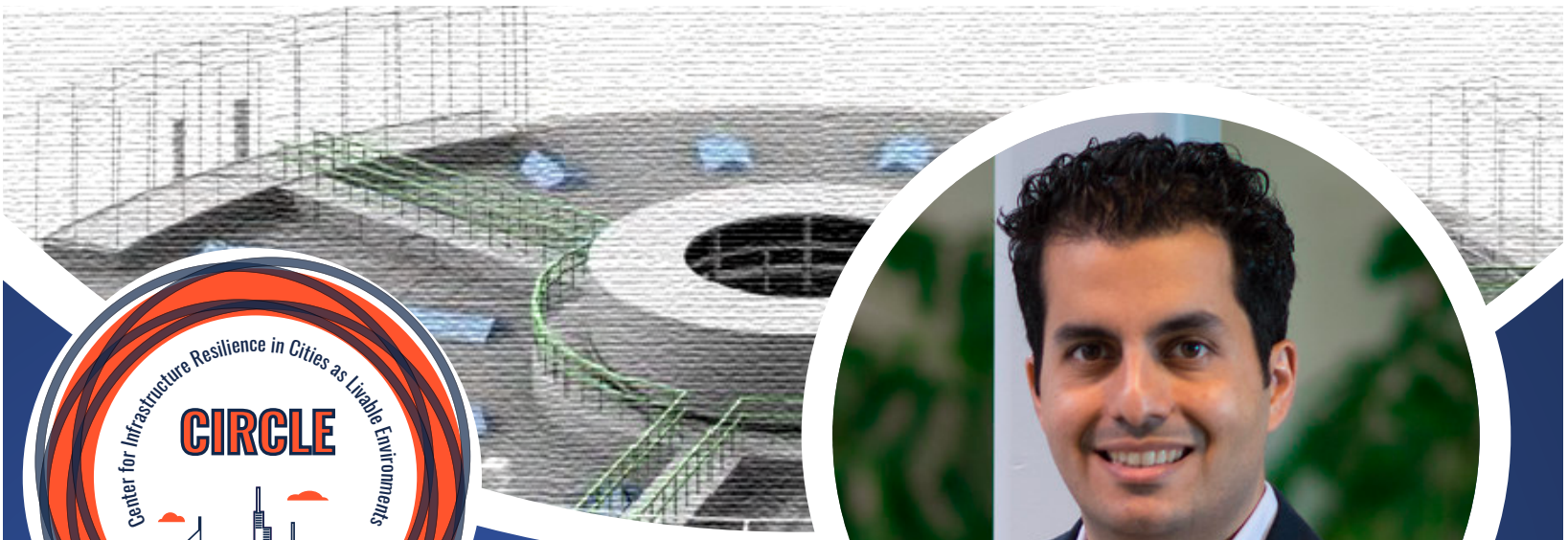

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Dr. Mani Golparvar

基于AI驱动的数字孪生技术在建筑施工和使用阶段物理资产的时空理解中的应用：

计算机视觉技术如何与BIM和项目控制结合

摘要：在建筑环境中，对项目的时空状态进行全面的理解是众多施工和运营工作流程的基础。为此，承包商和业主已经开始利用现实捕捉技术和基于BIM（建筑信息模型）的工作流程。然而，近年来现实数据和语义丰富的设计数据的可获得性呈指数级增长，再加上近期项目中日益紧迫的交付计划，这促使引入超越当前能力的、涉足尖端AI领域的解决方案，旨在实现以下目标：（1）自动识别设计和规划中的相关风险，以提高决策效率；（2）通过实时分析生产、资源和工作场地条件，实现更好的控制和更高水平的预测性。为满足这些需求，本次演讲将介绍基于计算机视觉和机器学习的基础和应用研究工作，以利用这些新兴数据自动创建时空模型，从而在建筑施工和使用阶段对物理资产进行几何和语义理解。本次演讲还将描述如何以AI驱动的数字孪生的形式将这些富含语义信息的现实模型与BIM和进度数据相结合，以生成基于实际与预期性能之间差异的可操作的洞察，使项目团队能够采取纠正措施。本次演讲将介绍这些算法和系统的理论基础，并分享这些解决方案在数千个项目中的推广应用经验以及在项目和现场人员层面的投资回报情况。

简介：Mani Golparvar是伊利诺伊大学香槟分校的土木工程、计算机科学和技术创业教授。他在计算机视、机器学习和BIM领域的工作曾获得多项殊荣，其中包括2018年美国土木工程师协会（ASCE）的Walter Huber Research Prize、2017年工程新闻记录（ENR）评选的全国40岁以下杰出人物前20名、2016年Dan Halpin Award和2013年美国土木工程师协会（ASCE）的James Croes Medal，以及多个期刊和会议颁发的优秀论文奖项。同时，Golparvar博士也是Reconstruct公司（一家来自伊利诺伊大学香槟分校的软件即服务公司）的首席科学官和联合创始人。近期，Reconstruct公司获得超过2800万美元的风险资本支持，其中包括Nemetschek集团的领投，以及EquipmentShare/Romulus Capital、STO Building Group、Thornton Tomasetti、SHoP Architects、Syska Hennessy和Asia Pacific Land等跟投。Reconstruct的Visual Command Center解决方案利用照片和360°视频创建真实模型，并将其与BIM和项目计划集成，以实时跟踪工程进展、分析生产效率，并通过预测分析技术主动识别潜在延误，从而使建筑公司能够按计划和预算进行项目管理。目前，Reconstruct公司还被授予了包括2016年世界经济论坛建筑技术创新奖在内的多个奖项。

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。

发送邮件至circle@intl.zju.edu.cn或扫描二维码报名，免费注册。

2023年5月31日 zoom | 北京时间：晚上9点

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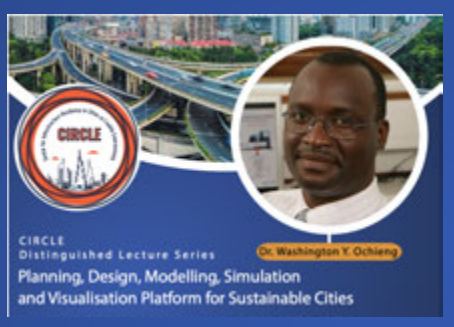

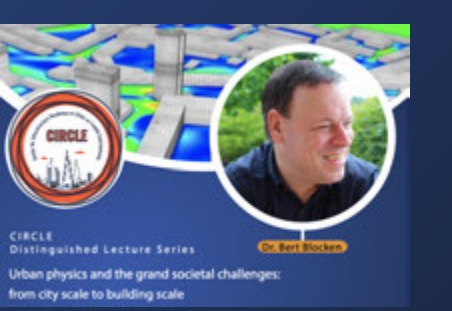

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