



Stanford University

Vivian W. H. Wong

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October 30, 2023

Lyles School of Civil Engineering,
Delon and Elizabeth Hampton Hall of Civil Engineering,
550 Stadium Mall Drive,
West Lafayette, IN 47907-2051

Dear Members of the Search Committee,

I am pleased to submit an application for the Assistant Professor in the Lyles School of Civil Engineering. I am currently a Ph.D. candidate at Stanford University, working with Professor Kincho H. Law, with an anticipated graduation date of June 2024. My doctoral research lies in the intersection of urban mobility systems, smart manufacturing systems, and advanced machine learning and data analytics methods. I believe my interdisciplinary research background will allow me to develop and sustain innovative research on human-centric urban systems motivated by pressing societal challenges, while my teaching experiences will enable me to contribute to Purdue's broad Civil Engineering curriculum and deliver outstanding classroom instruction.

My doctoral research focuses on developing methodologies that combine spatiotemporal analytics with practical implementations to enhance safety and efficiency in two applications domains in **smart urban systems: pedestrian mobility and manufacturing operations**. In the domain of pedestrian mobility, I proposed a graph formulation that integrates spatial connectivity into the task of crowd flow forecasting with deep neural network models, and I collaborated with public security experts to validate the robustness and reliability of my solutions. Moreover, collaborating with industry professionals, I have successfully applied machine learning models and computer vision techniques to address challenges in manufacturing operations, such as real-time production scheduling and automated defect detection in additive manufacturing. These research endeavors have equipped me with a strong foundation in data-driven engineering and the ability to solve practical challenges faced in urban systems. Specifically, I will establish a research group to deepen our understanding of how data-driven methods can be applied to create a safe, human-centric, and sustainable smart city. My initial research will investigate ways to improve wheelchair navigation within our urban infrastructure to promote accessibility.

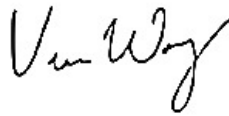
In terms of teaching, I believe in providing students with an adaptable, interdisciplinary skillset through problem-solving, quantitative understanding of engineering systems, and efficient data analysis. I have served as a teaching assistant for graduate-level courses and instructor for an undergraduate engineering orientation class and a seminar. I look forward to teaching across the core mechanics and engineering courses and have a strong interest in developing a special-topics course on data science for urban systems engineering that emphasizes hands-on learning and project-based assignments to reinforce concepts and foster practical skills.

In addition to my teaching philosophies, I am deeply committed to promoting a culture of diversity and inclusion both in my classroom and research laboratory. My personal journey as a woman in engineering, growing up in a family of Cambodian refugees who sought education even in challenging situations, serves

as a powerful motivation for me. I hope to be a role model and a source of encouragement for students from diverse backgrounds, inspiring them to excel as engineers, researchers, leaders, and innovators.

In support of my candidacy, I have provided a curriculum vitae, a research statement, a teaching statement, three peer-reviewed journal publications, and a supplementary material section, which includes a syllabus for the proposed new course I aim to create. I am extremely excited by the opportunity to visit West Lafayette to meet your faculties and students, to share my ideas, and to learn more about the exciting, highly interdisciplinary communities at Purdue. If you have any further questions or need additional materials, please do not hesitate to contact me. Thank you for your time and consideration.

Sincerely,

A handwritten signature in black ink, appearing to read "Vivian Wong". The signature is written in a cursive, flowing style.

Vivian W. H. Wong

Vivian W. H. Wong

Ph.D. Candidate
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Website: web.stanford.edu/~vw Wong3

Engineering Informatics Group
Civil and Environmental Engineering
Stanford University, Stanford, CA, USA

EDUCATION

Stanford University , Stanford, CA Ph.D. in Civil Engineering Advisor: Kincho H. Law Minor in Computer Science	Expected 06/2024
Stanford University , Stanford, CA Master of Science in Civil Engineering Emphasis in Structural Engineering & Mechanics	2019
University of Illinois at Urbana-Champaign , Champaign, IL Bachelor of Science in Civil Engineering	2017

RESEARCH APPOINTMENTS

Graduate Researcher, **Stanford Center at the Incheon Global Campus (SCIGC) & Engineering Informatics Group**, Stanford
Advisor: Kincho H. Law

Pedestrian Mobility (Ph.D. Dissertation Research): Applied machine learning on pedestrians for safer planning and management of the urban built environment under crowded scenarios

- Tracking, modeling and predicting crowd flow with CCTV videos and building floor plans
- Spatiotemporal pedestrian data acquisition and label generation

Smart Manufacturing Systems: Automated part quality control; adaptive production scheduling

- Defect localization, segmentation, classification in 3D printing parts
- Learning dispatching rules for the job shop scheduling problem to handle unexpected interruptions

Methodology: Deep learning (e.g. graph neural networks, convolutional neural networks), tracking algorithms, spatiotemporal data analysis, image and video analysis

Undergraduate Research Assistant **Smart Structures Technology
Laboratory**, University of Illinois at Urbana-Champaign
Advisor: Billie F. Spencer

2015 - 2017

PUBLICATIONS

Under Preparation

- J5 **V. W. H. Wong** and K. H. Law, "CMGraphs: Dynamic Graphs Constructed with Spatial Prior to Enable Spatiotemporal Crowd Flow Forecasting in Complex Built Environments".
- J4 M. Sato, **V. W. H. Wong**, H. Yeung, P. Witherell and K. H. Law, "Identification and Interpretation of Melt Pool Shapes in Laser Powder Bed Fusion with Machine Learning", Submitted to *Smart and Sustainable Manufacturing Systems*.

Peer-Reviewed Journal Articles

- J3 **V. W. H. Wong**, S. H. Kim, J. Park, J. Park and K. H. Law, "Generating Dispatching Rules for the Interrupting Swap-Allowed Blocking Job Shop Problem Using Graph Neural Network and Reinforcement Learning", *ASME Journal of Manufacturing Science and Engineering*, Jan 2024; 146(1): 011009.
<https://doi.org/10.1115/1.4063652>
- J2 **V. W. H. Wong** and K. H. Law, "Fusion of CCTV Video and Spatial Information for Automated Crowd Congestion Monitoring in Public Urban Spaces". *Algorithms*, Mar 2023; 16(3):154.
<https://doi.org/10.3390/a16030154>
- J1 **V. W. H. Wong**, M. Ferguson, K. H. Law, Y. T. Lee and P. Witherell, "Segmentation of Additive Manufacturing Defects Using U-Net". *ASME Journal of Computing and Information Science in Engineering*, June 2022; 22(3):031005.
<https://doi.org/10.1115/1.4053078>

Peer-Reviewed Conference Proceedings

- C7 M. Sato, **V. W. H. Wong**, K. H. Law, H. Yeung and P. Witherell, "Explainability of Laser Powder Bed Fusion Melt Pool Classification Using Deep Learning", *ASME Computers and Information in Engineering Conference (CIE)*. Aug. 20-23, 2023.
- C6 **V. W. H. Wong** and K. H. Law, "Modeling Crowd Data and Spatial Connectivity as Graphs for Crowd Flow Forecasting in Public Urban Space", ASCE International Conference on Computing in Civil Engineering, Corvallis, OR, Jun. 25-28, 2023.
- C5 **V. W. H. Wong**, S. H. Kim, J. Park, J. Park and K. H. Law, "Generating Dispatching Rules for the Interrupting Swap-Allowed Blocking Job Shop Problem

Using Graph Neural Network and Reinforcement Learning", ASME Manufacturing Science and Engineering Conference (MSEC), New Brunswick, NJ, Jun. 12-16, 2023.

- C4 M. Sato, **V. W. H. Wong**, K. H. Law, H. Yeung, Z. Yang, B. Lane and P. Witherell, "Anomaly Detection of Laser Powder Bed Fusion Melt Pool Images", International Design Engineering Technical Conferences and Computers and Information in Engineering Conference, St. Louis, MO, Aug. 14-17, 2022.
- C3 **V. W. H. Wong**, M. Ferguson, K. H. Law, Y. T. Lee and P. Witherell, "Segmentation of Additive Manufacturing Defects Using U-Net", *ASME Computers and Information in Engineering Conference (CIE)*. Aug. 17-20, 2021.
- C2 **V. W. H. Wong**, M. Ferguson, K. H. Law, Y. T. Lee and P. Witherell, "Automatic Volumetric Segmentation of Additive Manufacturing Defects with 3D U-Net", *AAAI 2020 Spring Symposia*, Stanford, CA, USA, Mar. 23-25, 2020.
- C1 **V. W. H. Wong**, M. Ferguson, K. H. Law and Y. T. Lee, "An Assistive Learning Workflow on Annotating Images for Object Detection", *2019 IEEE International Conference on Big Data*, Los Angeles, CA, USA, Dec. 9-12, 2019.
Acceptance rate = 18.7%

TEACHING APPOINTMENTS

Teaching Assistant - Graduate-level

Finite Element Methods in Structural Dynamics (CEE 284)	Autumn 2019, 2021, 2022
Structural Dynamics (CEE 283)	Winter 2020, 2022

Co-Instructor - Undergraduate-level

Engineering Orientation (UIUC ENG 100)	Fall 2016
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Teaching Assistant - Undergraduate-level

Engineering First-Year Experience Seminars (UIUC ENG 177)	Fall 2016
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ACADEMIC SERVICE

Paper Reviewer

IEEE Transactions on Neural Networks and Learning System	2023
Optimization Letters	2022
Automation in Construction	2022
IEEE Big Data Conference	2019

Affiliations

Society of Women Engineers (SWE)
 Women in Science and Engineering (WISE) Group
 Someone Like Me (SLM) Mentorship Program
 Womens Community Center (WCC) STEM Mentorship Program

BROADENING PARTICIPATION ACTIVITIES

Mentor	2023
Stanford Womens Community Center (WCC) STEM mentorship program Mentees: Lauren Williams, Jayna Huang	
Coordinator	2023
Stanford Someone Like Me (SLM) mentorship program	
Residence Community Associate	2018-2019
Stanford Kennedy Graduate Residence / Graduate Life Office	
Always Connecting Representative	2017
Society of Women Engineers annual conference [link to media coverage]	
Volunteer Instructor	2017
Shakes and Quakes outreach at Sangamon Elementary School	
Co-Founder, President and Project Manager	2016 - 2017
Engineers In Action (EIA) UIUC for suspension bridge construction in underdeveloped communities in Guatemala and Panama	
Field Representative	2016
Saha Global for delivering electricity and entrepreneurial opportunities for women in Ghana	
Officer and Nominating Committee	2015 - 2017
Society of Women Engineers at UIUC	

AWARDS & HONORS

Blume Fellowship, Stanford University	2019
James Scholar, UIUC	2014 - 2017
Earle J. Wheeler Scholarship, UIUC	2016
Fred S. Bailey International Service Scholarship for Cause-Driven Leaders, UIUC	2016
International Engineering Fellowship, UIUC	2016
Wayne C. Teng Scholarship, UIUC	2015

INDUSTRY APPOINTMENTS

Amazon , Seattle, WA	Summer 2022
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Applied Scientist Summer Intern, Amazon Softlines Discovery
Mentor & Manager: Michael Matheny

Alibaba Cloud, Hangzhou, China Summer 2018
Summer Research Intern, City Brain project
Host: Liang Yu

PRESENTATIONS

Conference Presentations

Modeling Crowd Data and Spatial Connectivity as Graphs for Crowd Flow Forecasting in Public Urban Space 06/2023
ASCE International Conference on Computing in Civil Engineering (I3CE 2023), Corvallis, OR, USA

Generating Dispatching Rules for the Interrupting Swap-Allowed Blocking Job Shop Problem Using Graph Neural Network and Reinforcement Learning 06/2023
ASME International Manufacturing Science and Engineering Conference (MSEC 2023), New Brunswick, NJ, USA

Segmentation of Additive Manufacturing Defects Using U-Net 08/2021
ASME International Design Engineering Technical Conferences & Computers and Information in Engineering Conference (IDETC-CIE 2021), Online

Automatic Volumetric Segmentation of Additive Manufacturing Defects with 3D U-Net 03/2020
AAAI 2020 Spring Symposia, Stanford, CA, USA

An Assistive Learning Workflow on Annotating Images for Object Detection 12/2019
IEEE Big Data 2019, Los Angeles, CA, USA

Invited Talks

Spatiotemporal Data to Understand Human Behavior and Mobility in Urban Systems 05/2023
TU Delft–Stanford: Designing for Future Mobility Workshop, Stanford, CA

Understanding Human Behaviors in Smart Building and Urban Environments 06/2021
Stanford Center at the Incheon Global Campus First International Symposium, Online

MISCELLANEOUS

Player on Stanford Table Tennis Team 2022 - Present

REFERENCES

Kincho H. Law

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Stanford University
Stanford, CA, USA
Email Address: law@stanford.edu

Michael D. Lepech

Professor of Civil and Environmental Engineering
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Jerome P. Lynch

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Renate Fruchter

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