# JINPU CAO

*Stanford University*

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## EDUCATION

2020 - 2022 **M.S. in Sustainable Design and Construction Program** (GPA: 3.9/4.3)

*Civil and Environmental Engineering Department, Stanford University*

2019 - 2020 **Exchange Student in GeoSystems Program** (GPA: 4.0/4.0)

*Civil and Environmental Engineering Department, University of California, Berkeley*

2016 – 2019 **B.E. in Geotechnical Engineering Department** (GPA: 4.7/5.0)

*Civil Engineering College, Tongji University*

## RESEARCH INTERESTS

AI and Data Science Applications in Architectural Engineering and Construction

Smart and Sustainable System

## PROFESSIONAL APPOINTMENTS

**Department of Strategic Innovation, WSP USA** *March 2022 - Now*

*Research Assistant,* and advised by *Pooja Jain (V.P. Strategic Innovation in WSP)*

*Dr. Martin Fischer (Professor at Stanford)*

This is a significant exploration of developing the practical workflow of an end-to-end vision-based automatic pavement distress detection system. Also, I am responsible for figuring out its potential business value.

***Achievements:*** Based on the deep learning framework, I have realized the construction and practical deployment of the distress detection system. More importantly, this experience has brought me more growth to master the skills of applying artificial intelligence to the AEC industry and analyzing its business value.

**CEE, Stanford University** *March 2022 - Now*

*Research Assistant,* and advised by *Derek Ouyang (Research Manager at the RegLab)*

This community-engaged pilot study aims to improve adaptation to wildfire smoke and extreme heat in vulnerable communities. I am responsible for characterizing these communities' air quality and exploring their human-induced and environment-induced influence.

***Achievements:*** Our team characterized the relationship between indoor and outdoor air quality with a "spike lag" model and verified it with actual monitoring data. The discovery will be a vital contribution to our new journal paper. I also made significant progress in research project management and communication skills in this community-engaged research.

**CEE, Stanford University** *Jan 2022 - Sept 2022*

*Research Volunteer*, and advised by *Dr. Haeyoung Noh (Professor at Stanford)*

The project introduced the first system-PigSense to use structural vibration to track animals. The system uses physical knowledge of the structural vibration characteristics caused by pig-activity-induced load changes to recognize different behaviors of the sow and piglets.

***Achievements:*** I am responsible for applying machine learning to automate the characterization of the piglet group activities, including nursing, sleeping, and being active base on vibration data. Our work is under review by the *ACM journal*. I also strengthened my ability to cooperate with others and find my niche in a big research team.

## HONORS AWARDS

CEE, Stanford University

*2021-2022 Outstanding Project of SFBI*

Tongji University

*2017-2020 Outstanding Graduates in Shanghai (Top 5% of 220,000 students)*

*Shanghai Scholarship (Top 5% of 220,000 students)*

*Excellent Students of Tongji University (Top 3% of 4000 students)*

*The First Prize Merit-Scholarship of Tongji University (Top 5% of 400 Students)*

*The Second Prize of Structure Design and Model Competition*

National College Students' Mathematics Competition

*2016-2017 The Second Prize in Shanghai Division*

National College Students' Mathematical Modeling Competition

*2016-2017 The Third Prize in Shanghai Division*

## PUBLICATIONS

1. An LSTM-based model for TBM performance prediction and the effect of rock mass grade on prediction accuracy (*China Civil Engineering Journal*, first author, accepted)

2. PigSense: Vibration-based Activity and Health Monitoring System for Pigs (*ACM Journals*, co-author, in review)

3. Improving adaptation to wildfire smoke and extreme heat in vulnerable communities: Evidence from a pilot study in the San Francisco Bay Area (*Environmental Research Letters*, contributor, ready to submit)

## COMPLETED PROJECTS

**CEE, Stanford University**

*Course Projects*

**1. Sustainable Urban System Projects** *Sept 2021 - June 2022*

*advised by Derek Ouyang (Research Manager at the RegLab, Stanford)*

The Sustainable Urban System projects' emphasis merges traditional data analytics with complex systems analysis to better inform decisions around the wicked problems of urban development like urban land use, hazard analysis, amenity accessibility, equity implications of air quality, and emission analysis.

**2. Fortuna Cools Life Cycle Assessment** *Sept 2020 – Jan 2021*

*advised by Dr. Michael Lepech (Professor at Stanford University)*

Our team conducted a formal life cycle assessment of Fortuna coolers made in large parts of coconut husk. We determined that the Fortuna cooler life cycle is associated with drastically lower greenhouse gas emissions and is comparable to or has slightly higher emissions than EPS coolers in several impact categories.

3. **Battery Lifetime Prediction with Limited Cycle Data** *Sept 2021 – Jan 2022*
   *advised by Dr. Mu Li (Senior Principal Scientist in Amazon Web Services)*
   We applied machine-learning models to predict the health status of batteries based on their fast charging and discharging data. Our best model achieves more than 90% prediction accuracy given the data of only five charging and discharging cycles.

**CEE, Tongji University**

*Research Assistant, advised by Dr. Fang Liu (Professor at Tongji University)*

4. **Intelligent Water Platform** *Oct 2020 - Aug 2021*
   This was a practical and valuable project to build an intelligent diagnosis, risk reasoning, and decision support system for municipal facilities. I independently developed a water consumption probabilistic prediction model based on the deep autoregressive (DeepAR) algorithm. The model has been integrated into the Shanghai Smart Intelligent Platform to predict daily water consumption and provide plumbing burst alarming services.
5. **TBM Operation Parameters Prediction** *Nov 2018 - Aug 2019*
   In this project, I independently developed TBM parameters and a geological prediction model based on deep learning networks, and won the National Third Place in the data mining competition organized by the Chinese Society of Rock Mechanics and Engineering.

**PRESENTATIONS CONFERENCES**

1. The 4th International Conference on Information Technology in Geo-Engineering (4ICITG)
   **Speaker** for "A Long-term Probabilistic Forecasting Approach of TBM Operating Parameters based on Deep Learning." *Online, Aug 2022*
2. The II International Geo-science Machine Learning Big Data Seminar
   **Speaker** for "Predicting TBM Performance using Machine Learning: is Surrounding Rock Information Important." *Shanghai, Aug 2019*

**INTERNSHIPS**

**Shanghai Shentong Metro Group** *Shanghai, June 2019 - Aug 2019*
*Subway Monitoring Intern*
This was an interesting practical expedition to assist in monitoring and analyzing the subway deformation and settlement near an ultra-deep foundation pit (Xuhui Center, Shanghai). I processed and visualized the subway deformation monitoring data based on python and proposed corresponding corrective measures to the construction unit.

**LEADERSHIPS MEMBERSHIPS**

*Former Co-President*
Tongji University Branch of American Society of Civil Engineers *Jan 2017 - Aug 2019*
*Co-organizer of Structural Design Competition of Tongji University*

**PROFESSIONAL SKILLS**

Programming: Python, MATLAB, R, C#, SQL
Machine Learning and Deep Learning: Keras, TensorFlow, PyTorch
Software: Microsoft Office, AutoCAD, Revit, Dynamo, Rhino, SimaPro (Life Cycle Assessment)