Minghao Chen

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OBJECTIVE

Dual MS student with strong drive and passion looking for a FA22 PhD opening in the field of smart city system, structural health monitoring, and control and optimization with reinforcement learning and deep learning.

EDUCATION

University of Michigan **Ann-Arbor, US**
M.S.E. in Industrial and Operations Engineering *Expected May 2022*
M.S.E. in Civil Engineering with Intelligent System *Expected May 2022*

- GPA: 3.84/4.0
- Core Courses: *Computational ML & DS, Dynamic Programming, Stochastic Process, Linear System Theory, Control System Design, Linear Programming, Infrastructure Sensing, Transportation System Optimization*

Shanghai Jiao Tong University **Shanghai, CN**
Exchange Student in Department of Electric and Computer Engineering *Sep 2020 - June 2021*

- GPA: 4.0/4.0

Southwest Jiaotong University **Chengdu, CN**
B.ENG. in Civil Engineering *June 2019*

RESEARCH EXPERIENCE

Bolt Loosening Monitoring with Integrated Vibro-Acoustic Modulation **Shanghai, CN**
Advisor: Dr. Yanfeng Shen (Shanghai Jiao Tong University) *Sep 2020 – Mar 2021*

- Integrated high frequency chirp signal and low frequency sine wave to optimize the traditional vibro-acoustic modulation and presented a comprehensive damage index (CDI) by extracting nonlinear sidebands and linear power information to sensitively track the entire life cycle of a loosened bolt
- Built a 3D ANSYS coupled field finite element model of a single bolted joint to simulate the dynamic response under three different preloads with above 90% accuracy compared to experiments
- Designed a piezoelectric sensor array with self-verification algorithm to precisely calculate CDI matrix and pinpoint loosened bolts and their loosening level in multi-bolted connections
- Presented in *ASME 2021 International Mechanical Engineering Congress and Exposition (IMECE)*. More detailed work has been submitted to *Journal of Sound and Vibration* for review

Online Damage Sensing Neural System for Wind Turbine Blades **Shanghai, CN**
Advisor: Dr. Yanfeng Shen (Shanghai Jiao Tong University) *June 2021 – Sep 2021*

- Created a brand-new soft piezoelectric sensor with flexible print circuit for detecting irregular structures
- Proposed a spectral density-based damage index (SDI) from time frequency analysis and wavelet analysis
- Combined sensors and SDI in an online sensing neural system (based on Lab View) and successfully located and quantified damages in the wind turbine blade

Centrifuge Modelling of Ground-borne Vibration from Twin-tunnel **Chengdu, CN**
Advisor: Dr. Wenbo Yang (Southwest Jiaotong University) *Sep 2019 – Feb 2020*

- Conducted a 1/50 centrifuge model experiment to simulate the dynamic response of four different underground structures: single tunnel, vertical spacing 60mm, horizontal spacing 60mm and 120mm
- Processed response data by extensive Kalman filtering to compute frequency response function (FRF), revealing twin tunnel interaction leads an amplification effect to the dynamic response of the original tunnel
- Orally reported our work in *the 5th China Civil Engineering Society Tunnel & Underground Engineering Branch (CCES-TUWB) Construction Management & Technology Youth Conference*

Optimization of Underground Delivery Tunnel Network **Chengdu, CN**
Advisor: Dr. Chuankun Liu (Tsinghua University) *Nov 2017 – May 2018*

- Developed a linear underground network model and designed a simulated annealing algorithm to get the optimal solution for delivery network arrangement
- Charted result and composed a paper to the *Journal of Highway and Transportation Research and Development* (doi:10. 3969/j.issn.1002—0268.2019.06.019)

PROJECTS

Accelerating Autonomous Vehicle Car-following Safety Testing **Ann-Arbor, US**

- Formulated Markov decision process (MDP) model based on importance sampling for the safety test of autonomous vehicle (AV) following a human-driving car with IDM model
- Adapted reinforcement learning (RL) on tabular temporal difference (TD) and natural driving data (NDD) in AV tests, finding proposed RL method is converged after 50 tests while the NDD requires 1.875×10^7 tests

Optimization of Stochastic Medical Home Care Delivery **Ann-Arbor, US**

- Constructed a mixed integer programming model to minimize the total travel cost while meeting patients service requirements within their window time and improve Ann arbor COVID medical home care delivery
- Analyzed the optimal routing solved by simulated annealing and greedy algorithms and found simulated annealing algorithm produced a six times faster route than the greedy algorithm

PUBLICATIONS

- **Chen, M.**, & Shen, Y. (2021). Multi-Bolt Loosening Monitoring Using an Integrated Vibro-Acoustic Modulation Technique. *ASME 2021 International Mechanical Engineering Congress and Exposition*.
- Liu, C., **Chen, M.**, et al. (2019). Network Design of Underground Logistics Channel Based on Simulated Annealing. *Journal of Highway and Transportation Research and Development*, 36(06), 151-158. doi:10.3969/j.issn.1002－0268.2019.06.019.

CONFERENCE PRESENTATIONS

- **Chen, M.**, & Shen, Y. Multi-bolt loosening monitoring using an integrated vibro-acoustic modulation technique. *2021 ASME International Mechanical Engineering Congress & Exposition,* November 2021, virtual.
- **Chen, M**. & Yang, W. An experiment study of dynamic response of shield tunnel under long-term loads induced by trains. *The 5th China Civil Engineering Society Tunnel and Underground Engineering Branch (CCES-TUWB) Construction Management and Technology Youth Conference*, October 2019, Ermei, China.
- **Chen, M**. Analysis of urban flood-waterlogging and design of road drainage system based on low-impact development. *ASCE Mid-Pacific Conference Water Research Paper Competition*, April 2018, Sacramento, CA.

PATENTS

- Multifunctional bicycle power generation device. P.R.China Patent, CN108539922A, 2018
- Real-time haze monitoring system based on thing networking. P.R.China Patent, CN207396274U, 2018

SCHOLARSHIPS AND AWARDS

SWJTU First Class Scholarship	*2015, 2017-2019*
SWJTU Innovation Scholarship	*Oct 2016*
SWJTU Excellent Degree Thesis	*2019*
The ASCE MIDPAC 2018 Steel Bridge Competition | First Prize in Display	*Apr 2018*
The ASCE MIDPAC 2018 Water Research Paper Competition | Third Place	*Apr 2018*
The Mathematical Contest in Modeling | Meritorious Winner	*Apr 2017*
China Undergraduate Mathematical Contest in Modeling | First Prize	*Sep 2016*

PUBLIC AND UNIVERSITY SERVICE

American Society of Civil Engineers UM Student Chapter - *SE Branch Representative*	*May 2021– Present*
CEE 514 Prestress Concrete Design – *Graduate Student Instructor*	*Sep 2021– Dec 2021*
UM CEE Graduate Student Advisory Council	*Sep 2020 – May 2021*
SJTU International Program Office – *Student Assistant*	*Jan 2021 – July 2021*
SWJTU Mathematical Modeling Association - *Honorable Academic Advisor*	*Sep 2017 – July 2019*
Chi Epsilon American Honor Society of Civil Engineers - *Global Specialist*	*May 2018 – May 2019*
American Society of Civil Engineers SWJTU Student Chapter - *Steel Bridge Leader*	*May 2017 – May 2018*

SKILLS

Programming	MATLAB (Simulink, Optimization, RL, ML), Python (Pytorch), Julia (ML, DL), Arduino
Software	ANSYS, LabView, Simulink, Flac3D, AutoCAD, Origin, Sketch up, SPSS statistics
Laboratory	Circuit Design, Oscilloscope, Manufacture, Electrical and Mechanical Tests, General Machining

REFERENCES

- **Dr. Branko Kerkez**, Arthur F. Thurnau Associate Professor of Civil and Environmental Engineering, University of Michigan, (1)7346470727, bkerkez@umich.edu
- **Dr. Yanfeng Shen**, Associate Professor of Mechanical Engineering, Shanghai Jiao Tong University, (86)2134206765, yanfeng.shen@sjtu.edu.cn
- **Dr. Wenbo Yang**, Professor of Civil Engineering, Southwest Jiaotong University, (86)13258289231, wenbo.yang@swjtu.edu.cn