Zhuoya Shi, PhD

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SUMMARY

Highly analytical and detail-oriented Data Analyst with a Ph.D. in Civil Engineering and expertise in Natural Language Processing(NLP), geo-spatial clustering, and data-driven urban façade safety solutions. Zhuoya Shi has a proven track record of developing innovative methods and delivering actionable insights and data-driven solutions. Proficient in Python, SQL, R, and advanced BIM software such as Civil 3D, AutoCAD, Revit, Navisworks, and BIM360. Skilled in developing and implementing BIM Implementation Plans, creating business intelligence solutions, sustainable design integration, building energy consumption analysis, and presenting BIM data through reports and dashboards. Proven ability to manage interdisciplinary projects combining civil engineering, machine learning, and data visualization, and collaborate effectively with cross-functional teams.

TECHNICAL SKILLS

BIM Software: AutoCAD, Revit, Navisworks, BIM360, Primavera P6, Solibri, Synchro 4D, Dynamo, Recap, Green Building Studio, CloudCompare, Pix4D, FARO SCENE.

Programming Languages: Proficient in Python, SQL, R; Familiar with Java, JavaScript, HTML, CSS.

Libraries & Tools: TensorFlow, Keras, PyTorch, Scikit-learn, NLTK, OpenCV, Pandas, NumPy, GeoPandas, Selenium, Matplotlib, Seaborn, Plotly, Git, Tableau, AWS, Microsoft Power BI, Tableau, JupyterLab, Google Colab.

Data Analysis: ETL, Data Mining, Statistical Analysis, Predictive Modeling, Data Visualization.

Certifications: Learning BIM 360 Field, Google Data Analytics Specialization, Generative Adversarial Networks Specialization, Fine Tune BERT for Text Classification with TensorFlow, Deep Learning Specialization, Python Data Structure

EXPERIENCE

Model-based and Data-driven Approach for Comprehensive Façade Inspection Guidance Sep. 2017—May.2024

Role: Graduate Researcher New York University

***Summary**: Developed advanced ML algorithms for façade condition data extraction and analysis, BIM-based approach to provide inspection guidance in neighborhood and building scale (published 10+ papers, achieving 130+ citations).*

- **Developed BIM Implementation Plans,** guiding the integration of BIM into projects to support efficient façade inspection.
- Collaborated with 10+ façade consulting teams and city agencies, leading focus groups to **define BIM requirements**.
- Analyzed façade condition data using **NLP**, achieved 93% accuracy in information extraction from large scale data.
- Conducted **city-scale geo-spatial clustering** analysis on NYC neighborhoods, identified building groups and defect patterns, providing data-driven insights for **city-scale guidance and decision-making**.
- Designed and implemented an object-oriented representation schemas and reasoning mechanisms for generation of **customized inspection checklists with BIM**, enhancing data accuracy and operational efficiency.
- Enhanced inspectors' assessment accuracy(15%) and efficiency (47.6%) with **BIM-based integrated visualization**.
- Developed and implemented advanced machine learning algorithms to **analyze building energy consumption patterns**, identifying key factors contributing to energy inefficiency.
- Leveraged **AR** to quantify architecture impact on humans through **hypothesis testing**, identifying 9 impactful features.

Digital Transformation Pilot Studies Sep. 2022—May. 2023

Role: VDC Engineer Intern DeSimone Consulting Engineering

***Summary**: Developed and implemented data extraction algorithms, conducted software evaluations, and optimized data workflows for digital transformation initiatives.*

- Conducted pilot studies and evaluated software tools for digital transformation, optimizing data workflows and supporting **BIM Integrated Project Delivery**.

- Designed and implemented algorithms for **data extraction**, converting unstructured data into structured formats for better project management and analysis.
- Ensured the **communication with stakeholders** of regular inspection findings through detailed reports

Proactive 2D model-based scan planning for existing buildings Sep. 2022—May. 2023
Role: Graduate Research Assistant University of Southern California

- Conducted data collection with **terrestrial laser scanner** and **drones**, generating point cloud data with images(**pix4D**).
- Processed and analyzed point cloud data using **point cloud library**, **Recap**, and **CloudCompare**.
- Collaborated with research groups on project reports and journal publications.

Advanced architecture design with BIM Jan. 2016—May. 2016
Role: Architecture Designer University of Southern California

Summary: *Developed a 3D visitor center model using Revit, incorporating sustainable design and schedule optimization.*

- Created a 3D model of a visitor center using **Revit**, incorporating **3D parametric models** and **adaptive components**
- Implemented sustainable design integration practices using **Green Building Studio**
- Applied programming modeling with **Dynamo,** optimizing component schedules with **BIMLink**

EDUCATION

New York University *Sep. 2017—May.2024*
Doctor of Philosophy in Civil Engineering New York, NY
Thesis: A BIM-based and data-driven approach for comprehensive façade inspection guidance in cities

University of Southern California *Sep. 2015—May. 2017*
Master of Science in Construction Engineering Los Angeles, CA

Chang'an University *Sep. 2010—May. 2014*
Bachelor of Science in Construction Cost Xi'an, Shaanxi, China

PUBLICATIONS

Journal Papers

Shi, Z. Ergan, S. (2024). Comprehensive and Consistent Inspection of Urban Façades: A Model-Based and Ontology-Driven Approach. *Journal of Computing in Civil Engineering*(In Submission)

Shi, Z. Ergan, S. (2024). Spatial Clustering and NLP-Based Analysis of Defect Patterns and Frequencies in NYC Façades. *Computers, Environment and Urban Systems* (In Submission).

Shi, Z. Ergan, S. (2024). Impact of integrated visualization in improving urban façade safety condition assessment. *Journal of Buildings* (In Submission)

Shi, Z., Park, K., Ergan, S (2024). Towards a comprehensive and consistent urban façade inspection process: Data-driven analysis of façade inspection reports for capturing inspection requirements. *Journal of Construction Engineering and Management* (In submission).

Ergan, S., **Shi, Z.**, Yu, X. (2018). Towards quantifying human experience in the built environment: A crowdsourcing-based experiment to identify influential architectural design features. *Journal of Building Engineering*, 20, 51-59.

Chen, M., Koc, E., **Shi, Z.**, and Soibelman, L. (2018). Proactive 2D model-based scan planning for existing buildings. *Automation in Construction*, 93, 165-177.

Conference Proceedings

Shi, Z. Ergan, S. (2024) "A model-based approach for flexible façade inspection data visualization of urban buildings" in i3CE 2024, Conference Proceedings, July 28-31, Pittsburgh, PA.

Shi, Z. Ergan, S. (2023) "Model-based Checklist Generation for Façade Safety Inspection Guidance" in i3CE, June 25-28, Corvallis, OR.

Shi, Z. Ergan, S (2021). An ontology towards BIM-based guidance of building façade maintenance. Proceedings of the 38th ISARC, November 2-3, Dubai, UAE.

Shi, Z., Park, K., Ergan, S (2020). Towards a comprehensive façade inspection process: An NLP-based analysis of historical façade inspection reports for knowledge discovery. Proceedings of the 37th ISARC, October 27-28, Kitakyushu, Japan.

Shi, Z., Ergan, S. (2020). Towards Point Cloud and Model-Based Urban Façade Inspection: Challenges in the Urban Façade Inspection Process. In Construction Research Congress 2020: Safety, Workforce, and Education (pp. 385-394). Reston, VA: American Society of Civil Engineers.

Shi, Z., Ergan, S. (2018). Leveraging point cloud data for detecting building façade deteriorations caused by neighboring construction. Tamap Journal of Engineering, 2018.

TEACHING EXPERIENCE

CE-GY 8383 Building information modeling (BIM) and its application in AEC/FM (4 semesters)

– Taught creating, implementing, and maintaining BIM with Autodesk software (i.e., Revit, Navisworks), point cloud processing with Autodesk Recap and project 4D simulation with Synchro.

CE-UY 3513 Construction scheduling (2 semesters)

– Taught critical path method, cost allocation, manpower leveling and distribution, etc. using Primavera P6 and Microsoft Project.

PROJECT MENTOR

ARISE Program (3 sessions), *NYU, Brooklyn, NY*

– Mentored minority high school students on research projects.

Tandon Undergraduate Summer Research Program (3 sessions), *NYU, Brooklyn, NY*

– Led Python and Machine Learning Bootcamp for the students with hands-on practical approaches.

– Held brainstorm workshops to troubleshoot research bottlenecks and track research progresses.

Summer Program's Discover Engineering, *USC, Los Angeles, CA*

– Led engineering labs across multiple disciplines for 20+ high school students.

PROFESIONAL AFFLIACTION/MEMBERSHIP

American Society of Civil Engineers (ASCE), member

Structural Engineers Association of New York (SEAoNY), member

SERVICE TO PROFESSION

Served as reviewer for ISARC 2024, ISARC 2023, ISARC 2021 and CRC 2020

AWARDS AND HONORS

Provost TA's Scholarship, Civil and Urban Engineering Department, New York University	***2020***
Institute of Design & Construction Innovation Hub (IDC) Foundation Scholarship, New York University	***2018***
First-class Scholarship, School of Civil Engineering, Chang'an University	***2011--2014***
Merit Student Cadre of Chang'an University	***2013***
Summer Social Practice Advanced Individual	***2011***