

Zhuoxinran(Zoe) Li

514-814-3577 | zoezxrli.github.io | zhuoxinran.li@mail.utoronto.ca | Toronto, ON

EDUCATION

University of Toronto, St. George Toronto, ON
BA, Major in Human Geography, Minor in Geographic Information Systems Sep 2023 – May 2025 (exp)

Concordia University Montréal, QC
Coursework in Urban Studies (Transferred to the University of Toronto) Jan 2021 – May 2023

Courses: Advanced Geographic Information Systems; Geovisualization; Introduction to Programming in GIS; Introduction to Urban Data Analytics; Social Research Methods; Multidisciplinary Urban Capstone Project: Toronto Senior Housing Corporation; Urban Sustainability; Environmental Ethics; Ecological Worldview

SKILLS

Techs: ArcGIS Pro, Python (*pandas, GeoPandas, NumPy, Matplotlib, Folium, scikit-learn*), QGIS, SQL, AutoCAD, SketchUp, Adobe Illustrator, Adobe Photoshop, Microsoft Office

Languages: Mandarin, English, French

Interests: Gerontology, Disability, Health Geography, Transportation, Visualization Design, Art History

PROJECTS

Urban Analytics with Python - Livability Index Sep - Oct, 2024

- Utilized OSMNx to extract data for 10 urban features (roads, public transport, parks, recreation, emergency services, street lighting, commerce, and employment centers) across 23 districts in Budapest.
- Normalized urban feature densities (scored 1–10) with MinMaxScaler, then assigned weights, and calculated total scores for all districts. Given the 5th district had the highest livability score, and the 23rd the lowest.

Data Visualization for Potential Prediction May - Jun 2024

- Trained a XGBoost to predict energy, with test performance of 0.112 mean squared error and 0.992 R^2 .
- Visualized 14 feature importances from a trained XGBoost using a Matplotlib scatter plot.
- Calculated Pearson correlation among 14 features and visualized it using Heatmap in Matplotlib.
- Submitted manuscript "Identification of Cu-N₂ Sites for Zn-Air Batteries in Harsh Electrolytes: Computer Virtual Screening, Machine Learning, and Practical Application" to Energy and Environmental Science.

Clustering Geolocation Data Intelligently in Python Apr - May 2024

- Clustered 837 taxi rank geolocation entries into 70 groups using KMeans, achieving a silhouette score of 0.64 and uncovering urban mobility patterns.
- Improved clustering quality by applying DBSCAN to filter out outliers, resulting in 51 clusters with an enhanced silhouette score of 0.92. However, DBSCAN is biased for uniform density within clusters.
- Refined clustering performance with HDBSCAN to address varying cluster densities, yielding 61 clusters with a silhouette score of 0.77.
- Finalized the clustering process by using K-Nearest Neighbors to analyze the proximity of each point to its cluster, ensuring proper classification and enhancing data integrity.

Geospatial Data Visualization using Python and Folium Mar - Apr 2024

- Categorized 10,001 taxi trip start points into clustered, widespread, and scattered patterns to visualize spatial distribution and identify key areas of taxi demand using Folium.
- Extracted Monday data (6-9 AM) using a lambda function to visualize start and end locations in Folium.
- Visualized traffic volumes at the 9 AM peak hour and mapped frequently used routes using Matplotlib.

Analyzing Neighbourhood Quality of Life with GIS Oct - Dec 2023

- Utilized ArcGIS Pro to map and analyze 77 Chicago neighborhoods with specific socioeconomic factors (health, culture, education, green space, and crime).
- Normalized each socioeconomic factor using the Max-Min in the Field Calculator to ensure comparability across different metrics and facilitate accurate livability scoring.
- Finalized livability score for each neighborhood using the Weighted Sum Model in ArcGIS Pro, with scores ranging from 15.6 to 79.7.
- Created a map of overall livability in Chicago neighborhoods, highlighting five communities with the highest scores (70-80), primarily in the northern region.

PUBLICATIONS

- **A Multi-Grained Symmetric Differential Equation Model for Learning Protein-Ligand Binding Dynamics.** Liu, S., Du, W., Li, Y., **Li, Z.**, Bhethanabotla, V., Rampal, N., Yaghi, O., Borgs, C., Anandkumar, A., Guo, H., & Chayes, J. [[In Submission to Nature Communication](#)]
- **Manifold-Constrained Nucleus-Level Denoising Diffusion Model for Structure-Based Drug Design.** Liu, S., Yan, D., Du, W., Liu, W., **Li, Z.**, Guo, H., Borgs, C., Chayes, J., & Anandkumar, A. [[In Submission to Proceedings of the National Academy of Sciences of the United States of America \(PNAS\)](#)]
- **Identification of Cu-N₂ Sites for Zn-Air Batteries in Harsh Electrolytes: Computer Virtual Screening, Machine Learning, and Practical Application.** Xu, C., Li, K., Liu, S., Xu, J., Sharma, S., Zhang, J., Mao, B., Chen, H., Zhang, H., Xu, H., Luo, B., Zhao, H., **Li, Z.**, Huang, Z., Wang, J., Xi, K., Fu, C., Zhao, Y., Chai, G., He, G., & Parkin, I. [[In Submission to Energy and Environmental Science](#)]
- **A Text-guided Protein Design Framework.** Liu, S., Li, Y., **Li, Z.**, Gitter, A., Zhu, Y., Lu, J., Xu, Z., Nie, W., Ramanathan, A., Xiao, C., Tang, J., & Anandkumar, A. [[In Submission to Nature Machine Intelligence \(Second-round Revision\)](#)]
- **Unsupervised Discovery of Steerable Factors When Graph Deep Generative Models Are Entangled.** Liu, S., Wang, C., Lu, J., Nie, W., Wang, H., **Li, Z.**, Zhou, B., & Tang, J. [[Transactions on Machine Learning Research 2024](#)]
- **Symmetry-Informed Geometric Representation for Molecules, Proteins, and Crystalline Materials.** Liu, S., Du, W., Li, Y., **Li, Z.**, Zheng, Z., Duan, C., Ma, Z., Yaghi, O., Anandkumar, A., Borgs, C., Chayes, J., Guo, H., & Tang, J. [[NeurIPS 2023](#)]

EXPERIENCE

- Esri Canada GIS Centres of Excellence (ECCE) Student Associate** Oct, 2024 - Oct, 2025 (exp)
- Contributing to the ECCE blog with two or more posts per term, sharing GIS-related work and experiences using Esri software, while competing for the ECCE Blog Awards.
 - Preparing to participate in the annual ECCE App Challenge, developing innovative geospatial apps in teams using Esri technology and open data.
- Capstone Project Consultant, Toronto Senior Housing Corporation** Sep, 2024 - Apr, 2025 (exp)
- Designing a volunteer program for the Toronto Seniors Housing Corporation (TSHC) to effectively mobilize over 400 senior tenant volunteers to engage in tenant-led activities and events.
 - Collaborating with TSHC staff to align the program with the Community Connect+ model, enhancing tenant engagement and community well-being.
- Graphic Designer & Certified Travel Consultant, Voyages Mei Mei Inc.** Apr, 2019 - Apr, 2021
- Achieved a 90% approval rating from the company manager and a 95% client satisfaction rate for the quality and impact of trips plans, reflecting consistent high performance and customer contentment.
 - Designed trip posters for both domestic (Canada) and international trips using Adobe Illustrator and Adobe Photoshop to attract target audience and sell products.
- Art Teaching Assistant, Mont-Royal Academy of Fine Arts** Jan, 2019 - Dec, 2019
- Instructed five students aged 6-12 in self-expression, creativity, and critical thinking about their artwork.
 - Assisted in organizing and setting up art exhibitions to showcase students' work, thereby enhancing their confidence, public presentation skills, and appreciation for art.

CERTIFICATIONS

- Data Scientist in Python Certificate — DataCamp** Dec, 2024 (exp)
- Advanced coursework in data engineering, covering data modeling, ETL, and relational databases, building foundational skills in data analysis and management applicable to urban data systems, GIS, and urban analytics.
- Sustainable Cities and Communities Specialization — Coursera** Jul, 2023
- A comprehensive study on sustainable urban development, focusing on optimizing land use, resources, and socio-economic factors for resilient cities, enhancing knowledge in urban sustainability and smart city planning for graduate research.
- Psychology of Older Age/Gerontology — Udemy** Jul, 2022
- An in-depth exploration of aging's psychological aspects, including cognitive decline and social implications, providing a strong foundation for applying spatial analysis to improve elderly populations' quality of life.