

Watcharapong Wongkaew

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PROFESSIONAL SUMMARY

I am currently student in Department of Civil Engineering, The University of Tokyo, I am now working on the **Generative Urban Foundation Model** in Sekimoto Lab [IIS, CSIS] which generates realistic trajectories of people mobility across cities around the world from real data. I have three years of experience in research primarily in Transportation Science, Travel Behavior, Geography, and Artificial intelligence.

RESEARCH INTERESTS

Transportation Science, Travel Behavior, Geography, Urban Big Data, Transport Spatial Planning, and Artificial intelligence

- Predicting Changes in Travel Behavior Following Urban Development Projects Using Machine Learning
- Analyzing the Impact of Real-Time Transit Information on Individual Mode Choice Decisions
- Modeling the Relationship Between Land Use Diversity and Travel Behavior within Neighborhoods

CURRENT WORKS

- **Railway Track Management Exposed to Extreme Events Using Machine Learning: A Case Study in Tropical Climate Regions of Thailand:** author of a book Chapter in Elsevier's "**Artificial Intelligence for Railway Infrastructure**"
- Land use and public transportation ridership analysis combining traditional models and machine learning [Current Work]
- Designed and implemented a business vehicles agent-based simulation system generating 4.5M daily trips for 1.5M+ truck and taxi agents across 106 zones nationwide
- Investigator on **Generative Urban Foundation Model** in Sekimoto Lab [IIS, CSIS] which generates realistic trajectories of people mobility using decoder-only transformer, and explore on more world models and other diffusion methods

EDUCATION

Master's degree in civil engineering, Geospatial Engineering

October/2027

Center for Spatial Information Science (CSIS), Department of Civil Engineering

The University of Tokyo, Tokyo, Japan

- Work on **Pseudo-PFLOW: Synthetic Mobility Simulation for Nationwide Transportation Analysis**
- Authored technical documentation for the truck ABM and taxi ABM detailing calibration methodology, data provenance, and cross-verification against source statistics
- Investigator on **Generative Urban Foundation Model** in Sekimoto Lab [IIS, CSIS] which generates realistic trajectories of people mobility using decoder-only transformer, and explore on more world models and other diffusion methods

Bachelor's Degree in Civil Engineering, Transportation Engineering

June/2023

Chulalongkorn University, Bangkok, Thailand

- **Finished as a first-class honors graduate**
- Acquired research apprenticeship at Chulalongkorn University Transportation Institute between 2021 - 2023
- Received University Fund on AI On-demand Transportation: researching on-demand transportation at the university
- Served Engineering Student Committee between 2020 – 2021 (ESC)
- Head of RTUS Ideathon Bangkok Transportation team: EU-led youth incubation program in urban development
- Dissertation on Contemporary Time-specific 4-Step-Transportation-Modeling of public transportation in Nakhon

Ratchasima

12th Grade, STEM Concentration

March/2019

Mahidol Wittayanusorn School, Salaya, Nakhon Pathom

- Study on applying GIS in evaluating and surveying areas that are at risk of flood in Nakhon Pathom, Thailand
- Bronze medalist in the International Geography Olympiad

PUBLICATIONS

- Wongkaew, W., Wanichjaroenporn, K., Bunditsakulchai, P. (2026). **Spatiotemporal Dynamics of Land Use and Ridership: A Geographically Weighted Regression Analysis of Bangkok's MRT Blue Line.** 16th International Conference on Advanced Systems in Public Transport (CASPT2025). Article published in special issue in *Public Transport*

- Wongkaew, W., Muanyoksakul, W., Ngamkhanong, C. et al. **Data driven machine learning prognostics of buckling failure modes in ballasted railway track**. Discov Appl Sci 6, 212 (2024). <https://doi.org/10.1007/s42452-024-05885-3>
- Wongkaew, W., Phunjanna, K., Muanyoksakul, W., Ngamkhanong, C. **Integrating Digital Surface Model for Flood Risk Assessment of Railway Networks in Thailand**. International Conference of Rail Transportation (ICRT 2024). Article published in proceedings
- W. Wongkaew, W. Muanyoksakul, K. Manachamni, T. Tangjarusritaratorn, and C. Ngamkhanong. **Risk Assessment of Railway Tracks in Floodplain Area using Digital Surface Model**. International Conference on Civil and Building Engineering Informatics 2023. Article published in proceedings
- Wongkaew, W., Wanichjaroenporn, K., Bunditsakulchai, P. **Spatiotemporal Dynamics of Land Use and Ridership: A Geographically Weighted Regression Analysis of Bangkok's MRT Blue Line**. 3rd International Workshop on Geographic Modelling and Simulation (IWGMS 2024). Abstract published in proceedings.

EXPERIENCE

Research Associate

July/2021 – October/2025

Chulalongkorn University Transportation Institute, Bangkok

- Support in analyzing motorcycle self-reported accident surveys: Chulalongkorn University | May 2022
- Coordinate workshops on the topic of congestion charge: Thailand Clean Mobility Program | GIZ | August 2022
- Research and report in transportation policy and planning areas with logistics and railway engineering focus: Strategic Agenda Team, Thailand Science Research and Innovation (TSRI) | 2022 – 2024
- Survey Don Mueang airport and review data on airport access and egress data collection. Also, analyze and supervise those collected airport egress data. Write and report the results in academic articles: Airports of Thailand | 2023
- Research and review law and strategic urban plans for climate-sensitive transportation planning in Thailand and work as a researcher in Chiang Mai and Khon Kaen, Report on results of surveys from the researchers, Cooperate with German (GIZ) team and review data sources and law for the team: UrbanAct Project, GIZ | 2023
 - Public transportation governance review in local area
 - Infrastructure planning and operation in local area
- Review laws and safety statistics, conduct focus groups, and analyze collected data about the motor-tricycle (Tuk-tuk) safety program. Write and report the results to the agency: Department of Land Transportation, DOT | 2023 – 2024
- Supervise garbage collection program and analyze garbage collection logistics data, environment-sensitive areas: Bangkok Garbage Improvement Project, Bangkok Metropolitan Administration | 2023

Researcher

April/2024 – April/2025

Academic Division, Pheu Thai Party, Bangkok

- Analyze transportation data from the Household Travel Survey 2022, Ministry of Transport, generate insights and reports from the data, and design public transportation policy for the government of Thailand
- Congestion Charge Policy Planning within Bangkok Metropolitan Area (BMA)
- Plan bus routes and incentives for public transport mode shifting in Lad Krabang, Bangkok
- Work on the data and policy infrastructures in the party using data from the government

Researcher

July/2023 – October/2024

Advanced Railway Infrastructure, Innovation and Systems Engineering (ARIISE) Research Unit, Bangkok

Transportation Behavior Research Group, Chulalongkorn University

- Work on track geometry data, and analyze buckling modes of railway tracks from FEM data, and visualize the data
- Work on sustainable transportation, railway infrastructure resilient, and climate change adaptation
- Lead and ideate the independent project on public transportation cost and navigating public transportation in Thailand: No grant, Chulalongkorn University | 2024
- Review and model travel time/ delay on national highway using data from highway department: Highway Traffic Operation Center | 2023 – 2024
- Working on land use induced demand on public transportation in Bangkok: No grant, Chulalongkorn University | 2024

Operations Intern

May/2022 – August/2022

Toshiba Infrastructure Systems & Solutions Corporation, Tokyo (Online training)

- Model urban railway line operations in crew/ train scheduling with a real-world example, and results compared to operation are at 80% accuracy in BTS Monorail Yellow Line and BTS APM Gold line
- Run operation plans and create new operation curves in planned railway projects.

Lecturer / Faculty advisor

July/2020 – April/2026 (Current)

Mahidol Wittayanusorn School, Nakhon Pathom

- Create a syllabus and curriculum for the National Geography Olympiad
- Help the Department of Social Science with classwork, exam reader, and fieldwork
- Train students in Geography Olympiad courses: Geography Fieldwork and Human Geography

SKILLS

Transportation Engineering: Four-step sequential modeling/ Modal split modeling/ Discrete Choice Modeling/ Travel behavior survey and analysis/ Data Collection Skills

Transportation Planning: Urban Planning/ Policy Planning/ Equity Analysis

Railway Engineering: Detection of railway defect/ Infrastructure management and life cycle design

Data analysis and statistics: Forecasting and time series analysis/ Statistical modeling and simulations

R and Python Programming

Machine Learning & AI: Traditional statistical modeling / Deep Learning and Neural Networks

Geographical skills: Qualitative fieldwork / Human Geography

Project Management: Stakeholder Engagement/ Coordination and project planning

CERTIFICATIONS

- Sustainable Transportation Networks and Streetscapes, Johns Hopkins University – 2023
- Transportation, Sustainable Buildings, Green Construction, Johns Hopkins University – 2023
- Sustainable Regional Principles, Planning and Transportation, Johns Hopkins University – 2023
- Sustainable Neighborhoods, Johns Hopkins University – 2023
- Technology and Innovative Entrepreneurship, Stanford University – 2023
- The Data Scientist's Toolbox, Johns Hopkins University – 2023
- Geographical Information Systems, École Polytechnique Fédérale de Lausanne – 2023
- Management of Urban Infrastructures, École Polytechnique Fédérale de Lausanne – 2024
- Introducing Cellular Automata, Coursera – 2023
- Summer Course: Future's City System for Resilient and Healthy City, TU Delft – 2023
- Bayesian Statistics Specialization - Inference, Time Series, Hierarchical Model, UC Santa Cruz – 2024
- Human Mobility in Future Cities Specialization, University of Amsterdam and EIT Mobility – 2024
- Qualitative Research Methods, University of Amsterdam – 2024
- Causal Inference, Columbia University – 2024
- Mathematics for Machine Learning, Imperial College – 2024
- Supervised Machine Learning: Regression, IBM – 2024
- Neural Networks and Deep Learning, DeepLearning.AI – 2024

AWARDS/RECOGNITIONS/VOLUNTEER WORK

- Volunteer as an academic tutor at Police Border School in Chumpon
- Volunteer in Environmental Conservation camp at the University Anurak CU club
- Finalist in Thailand Innovation Awards 2021: On-demand ride application in urban area
- Honorable mentions at GPSC Greenovation Startup Sandbox on the topic of **hydrogen buses**
- Honorable mentions at AWS Build on ASEAN on the topic of **tracking low CO2 emissions from delivery users**
- Honorable mentions at the German Embassy EV Hackathon on the topic of **Superblock problems**
- Honorable mentions at Last Mile Hackathon by EIT on the topic of **first-last mile problems** in Bangkok
- Honorable mentions and popular votes of Falling Walls Lab on the topic of **on-demand transportation**
- Third place at Environhack by the Ministry of Natural Resources and Environment on **motorcycle EV conversion**

COURSEWORK: RESEARCH/TERM PAPER/TERM PROJECT

- **Prediction and validation of motorcycle drivers' behavior:** report on the motorcycle self-reported accident survey by running the LOGIT and PROBIT models. Statistics Method for Transportation Analysis | May 2022
- **Operation and Infrastructure of SRTET Red commuter railway:** report on surveys and additional operation information. Railway Transportation System | December 2022
- **Mumbai Urban Transportation Plan:** report on research of Mumbai urban transportation infrastructure. Urban Transportation Planning | December 2022
- **Impact of social media news on the usage and attitudes towards various public transportation modes:** conduct a survey and analysis within the university area and write a report. Travel Behavior Survey and Analysis | May 2023
- **Neural Networks Model to detect the defects on railway tracks:** AI for Engineering | December 2022

ACADEMIC RESEARCH EXPERIENCE: ARTICLES/PRESENTATIONS/CONFERENCES

- **Challenges in Climate Action Planning and Implementation in Developing Countries: A Case Study of Low Carbon Urban Mobility Governance in Thailand:** Co-Author in Transportation Research Board Annual Meeting 2025.
- **Public Transport Accessibility Index for Bangkok and Its Application:** First Author in Transportation Research Board Annual Meeting 2025. The article is accepted in Transportation Research Record.

SAMPLE WRITINGS

Abstract: Data-Driven Machine Learning Prognostics of Buckling Failure Modes in Ballasted Railway Track

This study explores the development and application of a machine learning (ML) approach to predict buckling failure modes in ballasted railway tracks. With the growing demand for safer and more reliable railway systems, the ability to foresee and mitigate track failures is paramount. Our study focuses on harnessing advanced ML algorithms to analyze and interpret complex data sets, aiming to identify potential buckling failures before they occur. The methodology employed involves collecting extensive data from previous advanced numerical studies. Faced with the inadequacy of field data collection on track buckling and the limited availability of data related to track conditions, our study has relied on simulation data for insight and analysis. This data is then processed and analyzed using sophisticated ML models trained to recognize patterns and anomalies indicative of potential buckling failures. A novel aspect of our approach is the integration of environmental factors, acknowledging their significant influence on the likelihood of both snap-through and progressive buckling in railway tracks. We compare the effectiveness of various ML algorithms in accurately predicting these failure modes and evaluating their performance in simulated and real-world scenarios. The findings demonstrate the models' proficiency in identifying early signs of both snap-through and progressive buckling, leading to timely interventions. This capability not only improves railway safety but also aids in efficient maintenance scheduling and asset management. Additionally, a case study in Thailand's railway system demonstrates the model's effectiveness in predicting buckling failures under tropical environmental conditions. This paper contributes a novel perspective to the field of railway infrastructure maintenance. By providing a reliable method for predicting specific buckling failure modes, it paves the way for enhanced operational safety and efficiency in railway networks, particularly in the face of dynamic environmental conditions.

Abstract: Using Travel Demand Survey Data to Predict Mode Shift and Identify Potential Transportation Hub by Machine Learning Techniques; Case Study: Bangkok

Identifying potential hubs in transportation networks is crucial for understanding structure, dynamics, and efficient management. This study explores machine learning techniques such as decision trees, random forests, and neural networks to predict mode shift patterns and identify potential transportation hubs using travel demand survey data in Bangkok. The research comprises two parts: first, a comprehensive machine learning model is employed to analyze the data and develop predictive models for mode shift behavior by dataset obtained from travel demand surveys conducted by the Office of Transport and Traffic Policy and Planning in Bangkok Metropolitan Region. The results of the mode shift factor are transit availability, land use, age, and travel distance. Secondly, the study identifies demographics and compares potential locations for transportation hubs based on projected mode shift patterns predicted by those models. The most prominent demographic to shift is working-age females who live in a small household in non-house accommodation and who are still a student or work outside of the home. The study found some hidden transportation hubs from the new transportation line; by planning, the city can better accommodate its inhabitants' changing travel preferences and future population growth. Overall, this research demonstrates the potential of machine learning techniques in harnessing and diversifying travel demand survey data to predict mode shift behavior and identify optimal locations for transportation hubs. The findings provide guidance for policymakers in Bangkok and other cities striving to build sustainable efficient transportation networks.

Abstract: Public Transport Accessibility Index for Bangkok and Its Application

Traffic congestion in Bangkok is partly due to inadequate public transport planning. This study analyzes the public transport accessibility index (PTAI) for Bangkok's inner core, considering total travel time, value of time, and number of trips. The factors used to calculate were total travel time, the value of time, and the number of trips. To depict the spatial inequality, the accessibility index color map showed that areas with a high index concentrated in the city center and tended to decrease when away from these areas. This index ranged from 0.77 to 5.45, with an average of 1.90. Comparing the current index, the results came to the following conclusions: The general trend is that the accessibility index gradually decreases as it gets further from the central area of Inner Bangkok in the east of the Chao Phraya River, signifying the inequality in accessibility between the central area and the surrounding area. Therefore, improving accessibility in the west of the Chao Phraya River with effective public transportation would lessen the inequality.

References & Articles upon request: Asst. Prof. Dr. Pongsun Bunditsakulchai