TAKAHIRO (TAKA) YABE

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Education

Purdue University *West Lafayette, IN*
PhD student in Civil Engineering 8/2017-Present
"Data-Driven Methods for Predicting Post-Disaster Population Displacement and Recovery"
Advisors: Professor Satish Ukkusuri, Professor Seungyoon Lee

University of Tokyo *Tokyo, Japan*
Masters in Civil Engineering 4/2015-3/2017
"Modelling Evacuation Behavior after Various Disasters using Mobile Phone GPS Dataset"
Advisors: Professor Yoshihide Sekimoto, Professor Muneo Hori
Bachelors in Civil Engineering 4/2011-3/2015
"Real-Time Urban Scale Mobility Predictions after Disasters using Mobile Phone Data"
Advisor: Professor Yoshihide Sekimoto

Research Interests

Modeling the resilience of cities using big mobility datasets
- How can we characterize and optimize the recovery process of cities after large scale disasters?
- Data driven modeling of population dynamics on a network of connected cities.
- Deep learning models to better understand urban functions from human mobility patterns.

Predicting post-disaster behavior of individuals
- Analysis of population displacement and recovery after disasters using mobile phone datasets.
- Cross-city, cross-disaster prediction of post-disaster behavior in future disasters.

Research and Internship Experience

Purdue University *West Lafayette, IN*
Purdue Systems Collaboratory Doctoral Fellow 8/2018-Present
Graduate Research Assistant 7/2017-Present
- Working as the student lead in the NSF Project "*CRISP Type 2/Collaborative Research: Critical Transitions in the Resilience and Recovery of Interdependent Social and Physical Networks* (#1638311)" under the supervision of Professor Satish V. Ukkusuri.
- Developing statistical methods to infer the recovery of communities after severe disasters using large scale mobility datasets (mobile phone CDR, GPS, social media data).

University of Tokyo *Tokyo, Japan*
Graduate Research Assistant 4/2014-3/2017
- Developed data assimilation framework to integrate multi-agent simulations and real time observation data to predict city-scale human mobility.
- Delivered evacuation mobility analysis results to local governments right after Kumamoto earthquake (4/2016) to assist developing shelter allocation strategies.

Yahoo! Japan Research *Tokyo, Japan*
Research Intern 8/2015-Present
- Developed methods to measure the fragility of city transportation using large scale mobility dataset.
- Collaborated with researchers in private firms and local government officials

Japan International Cooperation Agency *Manila, the Philippines*
Research Intern 7-9/2016

- Conducted interviews and surveys to local government agencies to investigate disaster preparedness of people living in vulnerable areas.
- Inspected disaster risk analysis of informal residential areas near Manila using GIS software.

Awards

EISG Student Merit Award Finalist 12/2019
Engineering and Infrastructure Specialty Group, Society for Risk Analysis

Travel Award 12/2019
Society for Risk Analysis, for the 2019 Annual Meeting

Student Travel Award 11/2019
ACM SIGSPATIAL International Conference on Advances in GIS 2019

Poster Competition 2nd Prize 7/2019
The main conference on the scientific analysis of mobile phone datasets (NetMob 2019)

Outstanding Speaker Award 4/2019
Purdue Institute of Transportation Engineers (ITE)

Best Presentation Award 9/2016
Annual Conference of GIS Association of Japan

Grants & Fellowships

Doctoral "Systems" Fellowship 8/2018
Purdue Systems Collaboratory, Purdue University

Research Fellowship for Young Scientists (JSPS DC1) 4/2017
Japan Society for the Promotion of Science, total of $72,000 over 3 years

Doctoral Student Research Fellowship 9/2016
Department of Engineering, University of Tokyo, $3,000

Student Travel Grant for Overseas Study 3/2016
Department of Engineering, University of Tokyo, $4,000

Publications

Articles under review:

[R3] Modeling the Dynamics of Spatial Segregation after Disasters using Mobile Phone Data
Yabe, T., Ukkusuri, S. V.
Under review in *Transportation Research Part D: Transport and Environment*

[R2] Development of a people mass movement simulation framework based on reinforcement learning
Pang, Y., **Yabe, T.**, Sekimoto, Y., Kashiyama, T., Tsubouchi, K.
Under review in *Transportation Research Part C: Emerging Technologies*

[R1] Understanding post-disaster population recovery patterns
Yabe, T., Tsubouchi, K., Fujiwara, N., Sekimoto, Y., Ukkusuri, S. V.
Under review in *Journal of Royal Society Interface*

Articles in Peer Reviewed Journals:

[J6] Mobile Phone Data Reveals the Importance of Inter-City Social Connectivity for Recovery after Hurricane Maria
Yabe, T., Ukkusuri, S. V., Rao, P.S.C.
Applied Network Science, Vol. 4, Issue 1, 98. (2019)

[J5] Integrating Information from Heterogeneous Networks on Social Media to Predict Post-Disaster Returning Behavior
Yabe, T., Ukkusuri, S. V.
Journal of Computational Science, Vol. 32, pp. 12-20. (2019)

[J4] Cross-comparative analysis of evacuation behavior after earthquakes using mobile phone data
Yabe, T., Sekimoto, Y., Tsubouchi, K., Ikemoto, S.
PLoS ONE, Vol. 14, Issue 2, e0211375 (2019)

[J3] CityFlowFragility: Measuring the Fragility of People Flow in Cities to Disasters using GPS Data Collected from Smartphones.
Yabe, T., Tsubouchi, K., Sekimoto, Y.
Interactive, Mobile, Wearable and Ubiquitous Technologies (IMWUT), Vol. 1, Issue 3, 117. (2017)

[J2] Predicting Delay of Commuting Activities Following Frequently Occurring Disasters Using Location Data from Smartphones.
Yabe, T., Tsubouchi, K., Sudo, A., Sekimoto, Y.
Journal of Disaster Research, Vol. 12, No.2, pp. 287-295. (2017)

[J1] Real time movement prediction after natural disasters using data assimilation. (in Japanese)
Yabe, T., Sekimoto, Y., Kashiyama, T., Kanasugi, H., Sudo, A.
Journal of the Japanese Society for Transportation Engineering, Vol. 2 No. 2, pp. 19-27. (2016)

Articles in Peer Reviewed Conference Proceedings:

[C10] City2City: Translating Place Representations across Cities
Yabe, T., Tsubouchi, K., Shimizu, T., Sekimoto, Y., Ukkusuri, S. V.
Proceedings of the 27th ACM SIGSPATIAL International Conference on Advances in Geographic Information Systems. (2019)

[C9] Predicting Evacuation Decisions using Representations of Individuals' Pre-Disaster Web Search Behavior.
Yabe, T., Tsubouchi, K., Shimizu, T., Sekimoto, Y., Ukkusuri, S. V.
Proceedings of the 25th ACM SIGKDD International Conference on Knowledge Discovery & Data Mining. ACM. (2019)

[C8] Fusion of Terrain Information and Mobile Phone Location Data for Flood Area Detection in Rural Areas.
Yabe, T., Tsubouchi, K., Sekimoto, Y.
Proceedings of the 2018 IEEE International Conference on Big Data. IEEE. (2018)

[C7] Social-Media aided Hyperlocal Help-Network Matching & Routing during Emergencies.
Kumar, D., **Yabe, T.**, Ukkusuri, S.V.
Proceedings of the 2018 IEEE International Conference on Big Data. IEEE. (2018)

[C6] Replicating Urban Dynamics by Generating Human-like Agents from Smartphone GPS Data.
Pang, Y., Tsubouchi, K., **Yabe, T.**, Sekimoto, Y.
Proceedings of the 26th ACM SIGSPATIAL International Conference on Advances in Geographic Information Systems. (2018)

[C5] Modeling and reproducing human daily travel behavior from GPS data: A Markov Decision Process approach.

Pang, Y., Tsubouchi, K., **Yabe, T.**, Sekimoto, Y.
Proceedings of the 1st Workshop on Prediction of Human Mobility in conjunction with the 23rd ACM SIGSPATIAL International Conference on Advances in Geographic Information Systems. (2017)

[C4] A Framework for Evacuation Hotspot Detection after Large Scale Disasters using Location Data from Smartphones: Case Study of Kumamoto Earthquake.
Yabe, T., Tsubouchi, K., Sudo, A., Sekimoto, Y.
Proceedings of the 24th ACM SIGSPATIAL International Conference on Advances in Geographic Information Systems. (2016)

[C3] Predicting Irregular Individual Movement following Frequent Mid-Level Disasters using Location Data from Smartphones.
Yabe, T., Tsubouchi, K., Sudo, A., Sekimoto, Y.
Proceedings of the 24th ACM SIGSPATIAL International Conference on Advances in Geographic Information Systems. (2016)

[C2] Particle Filter for Real-time Human Mobility Prediction following Unprecedented Disaster.
Sudo, A., Kashiyama, T., **Yabe, T.**, Kanasugi, H., Song, X., Higuchi, T., Nakano, S., Saito, M., Sekimoto, Y.
Proceedings of the 24th ACM SIGSPATIAL International Conference on Advances in Geographic Information Systems. (2016)

[C1] Making Real-Time Predictions of People's Irregular Movement in a Metropolitan Scale under Disaster Situations.
Yabe, T., Sekimoto, Y., Kanasugi, Y., Kashiyama, T.
14th International Conference on Computers in Urban Planning and Urban Management (CUPUM). (2015)

Other Conference Presentations:

[P10] "Modeling the Dynamics of Spatial Segregation after Disasters using Mobile Phone Data"
Transportation Research Board Annual Meeting, Washington D.C., USA. January 12th-16th, 2020.

[P9] "Modeling the Influence of Online Social Media Information on Post-Disaster Mobility Decisions" (poster presentation)
Transportation Research Board Annual Meeting, Washington D.C., USA. January 12th-16th, 2020.

[P8] "Understanding Population Recovery Patterns after Disasters from Mobile Phone Data"
Society for Risk Analysis Annual Meeting 2019, Arlington, Virginia, USA. December 9th-12th, 2019.

[P7] "Critical Transitions in the Resilience and Recovery of Interdependent Social and Physical Networks"
44th Annual Natural Hazards Workshop, Denver, Colorado, USA. July 17th-18th, 2019. (Plenary talk)

[P6] "Understanding Post-Disaster Population Recovery Patterns"
The main conference on the scientific analysis of mobile phone datasets (NetMob), Oxford, UK. July 8th-10th, 2019.

[P5] "Mobile phone data reveals the importance of inter-city social connectivity for recovery after Hurricane Maria"
Complex Systems Conference, Purdue University, Indiana, USA. May 13th-17th, 2019.

[P4] "Population Recovery Modeling with Mobile Phones"
NSF CRISP Grantees Meeting, George Mason University, Virginia, USA. December 5th-6th, 2018.

[P3] "CityFlowFragility: Measuring the Fragility of People Flow in Cities to Disasters using GPS Data Collected from Smartphones"
2017 ACM International Joint Conference on Pervasive and Ubiquitous Computing (Ubicomp 2017), Maui, Hawaii, USA. September 11th-15th, 2017.

[P2] "A Framework for Evacuation Hotspot Detection after Large Scale Disasters using Mobile Phone Location Data"
The main conference on the scientific analysis of mobile phone datasets (NetMob), Milan, Italy. April 5th-7th, 2017.

[P1] "Estimating Evacuation Hotspots using GPS data: What happened after the large earthquakes in Kumamoto, Japan?"
5th International Workshop on Urban Computing (UrbComp), held in conjunction with ACM KDD, San Francisco, CA, USA. August 14th, 2016.

Services

Organizing Conferences/Workshops

- **Steering Committee** of *International Workshop on Prediction of Human Mobility (PredictGIS)*, held in conjunction with ACM SIGSPATIAL conference
  - 2017 version held at Los Angeles, CA, USA (November 7th, 2017)
  - 2018 version held at Seattle, WA, USA (November 6th, 2018)
  - 2019 version held at Chicago, IL, USA (November 5th, 2019)

Peer Reviewer

PLoS ONE, International Journal of Disaster Risk Reduction

Student Organizations

- **Event Coordinator** of *Purdue Institute of Transportation Engineers (ITE) Student Chapter* (2018)

Expertise

Computational Expertise

- Large scale (network) data analysis and machine learning methods using Python, R.
- Multi agent simulation for urban-scale mobility using Java.
- Visualization of networks using Gephi, NetworkX, iGraph; geospatial data using QGIS, ArcGIS.

Work Experience with Heterogeneous Data

- Twitter data, GPS trajectory data, mobile phone call detail records, GIS data (vector, raster).

Languages and Overseas Experience

- English (TOEFL 113/120, IELTS 8.5/9.0), Japanese (native language)
- Lived in Great Britain (1998-2001), Canada (2005-2008), US (2017-Present)