Byeongseong Choi

PhD, Postdoctoral Fellow

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Education

2019-2022 **PhD, Carnegie Mellon University, Pittsburgh, PA**

Major concentration: Advanced Infrastructure Systems – GPA: 4.00/4.00
Title: Probabilistic risk assessment for heat-induced impact on urban energy system (tentative)
Thesis advisor: Prof. Matteo Pozzi & Prof. Mario Bergés

Main purpose of the thesis is to develop an integrated framework for risk assessment of extreme heat events and their impacts on building energy use in urban areas. The research covers the following topics:

- Development of probabilistic models which require reduced computational costs
- Extending the probabilistic models for analyzing heatwave risk
- Data collection using a numerical weather prediction model with high-performance computing
- Modeling building energy use under various weather conditions
- Assessing the propagating impacts from extreme temperature to building energy use

2015-2017 **M.S., Seoul National University, Seoul, Korea**

Major concentration: Structural reliability – GPA: 4.17/4.30
Title: Efficient simulation-based approaches for community-level probabilistic seismic risk assessment
Thesis advisor: Prof. Junho Song

Main purpose of the thesis is to develop computationally efficient algorithms to estimate regional losses caused by seismic hazards. The dissertation covers the following topics:

- Probabilistic seismic risk analysis
- Cross-entropy-based adaptive importance sampling
- Dimension reduction techniques:
  Principal component analysis and Central limit theorem
- Feature extraction and Clustering-based method in unsupervised learning

2009-2015 **B.S., Seoul National University, Seoul, Korea**

Major: Civil and environmental engineering – GPA: 3.52/4.3

Skills and Software

Modeling/ Analysis	Probabilistic modeling (spatio-temporal process), Probabilistic risk analysis (heatwave, earthquake), Uncertainty quantification, Value of Information analysis
Programming	MATLAB, Python, and R (compilation for high performance computing: Fortran, C++)
Software	Weather Research and Forecasting Model (WRF; numerical weather simulation), EnergyPlus (building energy simulation), Ergo (multi-hazard assessment), OPENQUAKE (seismic risk analysis), GeNIe (Bayesian network), QGIS (GIS tool), MIDAS (finite element analysis), Primavera P6 (project management)

Relevant Coursework

Urban System Modeling, Data Acquisition, Data Management, Structural reliability, Random vibrations, Structural dynamics, Structural analysis, Theories in elasticity, Finite element method, Advanced structural analysis, Advanced reinforced concrete design, Statistics for civil and environmental engineers.

Honors and Awards

- Bradford and Diane Smith Graduate Fellowship in Engineering, February 2022
- Awards for outstanding papers by Korean Society of Civil Engineers, KSCE 2016 CONVENTION, October 2016

Research and Professional Experience

2023- **Postdoctoral Researcher, The University of Texas at Arlington**

Project: SCC-IRG Track 1 - Enabling Smart Cities in Coastal Regions of Environmental and Industrial Change: Building Adaptive Capacity through Sociotechnical Networks on the Texas Gulf Coast (NSF # 2231557)
Duties include:

- Developing a modeling framework to optimally deploy a monitoring system for the coastal band region around Corpus Christi, Texas
- Developing a method to validate a monitoring system that captures spatiotemporal trends of hazard, related to air/water quality and increasing rate of floods

2019-2022 **Research Assistant, Carnegie Mellon University**

Project: SHADE - Surface Heat Assessment for Developed Environments (NSF #1664091)
Based on the academic background, duties include:

- Developing a probabilistic model to describe regional temperature fields.
- Identifying spatio-temporal patterns to forecast extreme heatwave in the city
- Modeling building energy use under various weather conditions
- Assessing the propagating impacts from extreme temperature to building energy use

2019-2021 **Teaching Assistant, Carnegie Mellon University**

- Fall 2019/2020/2021: worked as the teaching assistant for the course, Exploring CEE: Infrastructure and Environment in a Changing World (12100). Duties included guiding group projects (truss assembly), holding office hours, and grading homework.

2017-2018 **Associate Engineer, DAELIM industrial co., Seoul, Korea**

Project: West-coast Railroad (Construction Site #5)
Based on the educational background, duties included:

- Checking design safety of temporary structures according to Korean design codes.
- Manage project schedule and plan using Primavera P6

2016 **Teaching Assistant, Seoul National University**

- Fall 2016: worked as the teaching assistant for the course, Statistics for Civil and Environmental Engineers (457.212). Duties included reviewing class materials, grading homework/exams, and developing basic training lectures in R programming.
- Spring 2016: worked as the teaching assistant for the course, Topics in Structural Reliability (457.646). During the semester, I focused on supplementing class materials, especially illustrating graphics which are helpful to comprehend basic concepts in structural reliability. The role also covered developing examples for the course with MATLAB programming.

2015-2016 **Graduate Student Researcher, Seoul National University**

As a graduate student researcher, I participated in the following projects:

- Preliminary Study to Develop Cyclic Disaster Framework Based on Quantified Risk of Urban Earthquakes (15RDPP-C102128-01):
  - Mar 2016 - Feb 2017, supported by Ministry of Land, Infrastructure, and Transport
- Convergence Research Center for Disaster-Hazard Resilience (2015R1A5A7037372):
  - Aug 2015 - Feb 2016, supported by National Research Foundation of Korea
- Development of Seismic Hazard Risk Management Model for Korea Using Open Access Software (400-20150011):
  - May 2016 - Feb 2017, supported by Seoul National University

List of Publications

Journal papers

B. Choi, M. Bergés, E. Bou-Zeid, and M. Pozzi, (2021). Short-term probabilistic forecasting of meso-scale near-surface urban temperature fields. *Environmental Modelling & Software*, 145, p.105189.

Conferences & workshops

B. Choi, M. Bergés, and M. Pozzi, (2022). Spatio-temporal modelling for meso-scale surface temperature, *ICOSSAR 2021-2022,13th International Conference on Structural Safety & Reliability*, 13-17 September 2022, Shanghai, China (virtual oral presentation)

B. Choi, M. Bergés, and M. Pozzi, (2022). Short-term probabilistic heat-induced risk assessment on urban scale energy system, *Engineering Mechanics Institute Conference*, Johns Hopkins University, Baltimore, MD, May 31-June 3, 2022

B. Choi, M. Pozzi, M. Bergés, and E. Bou-Zeid, (2021). Data-driven short-term prediction of meso-scale surface temperature, *Engineering Mechanics Institute Conference and Probabilistic Mechanics & Reliability Conference*, Virtual, May 25-28, 2021

B. Choi, M. Bergés, E. Bou-Zeid, and M. Pozzi, (2020). Probabilistic approaches for surrogate modeling with high-dimensional data to predict short-term meso-scale Surface temperature. *American Geophysical Union Fall Meeting 2020*. Virtual, December 15, 2020

B. Choi, M. Pozzi, and M. Bergés, (2020). Heat risk assessment using surrogate model for meso-scale surface temperature, *Machine Learning for Engineering Modeling, Simulation, and Design Workshop at Neural Information Processing System 2020*, Virtual, December 12, 2020

B. Choi, M. Pozzi, M. Bergés, and E. Bou-Zeid, (2020). Developing time-variant filter for meso-scale surface temperature prediction, *International Association for Bridge and Structural Engineering (IABSE) Conference 2020*, Seoul (remote), November 9-10, 2020

B. Choi, M. Bergés, E. Bou-Zeid, and M. Pozzi, (2019). A non-stationary surrogate model for meso-scale surface temperature with extracted diurnal spatial patterns. *American Geophysical Union Fall Meeting 2019*. San Francisco, December 10, 2019

B.-S. Choi, J. Byun, and J. Song (2017), Efficient earthquake loss estimation by cross-entropy-based adaptive importance sampling, *12th International Conference on Structural Safety and Reliability (ICOSSAR2017)*, August 6-10, Vienna, Austria.

B.-S. Choi, and J. Song (2017), Novel sampling methods for seismic impact analysis of urban communities and complex infrastructure systems, *IFAT 2017 Third International Forum on Advanced Technologies*, March 9-11, Hualien, Taiwan

B.-S. Choi, and J. Song (2016), Cross-entropy-based adaptive importance sampling for probabilistic seismic risk assessment of lifeline networks considering spatial correlation, *Urban Transitions Global Summit 2016*, September 5-9, Shanghai,

B.-S. Choi, and J. Song (2016), Dimension reduction techniques and efficient sampling method for regional seismic loss assessment, *Korean Society of Civil Engineers 2016 Convention*, October 19-21, Jeju, Korea

B.-S. Choi, J. Song, and S. Chi (2016), Probabilistic seismic risk assessment of lifeline networks using cross-entropy-based adaptive importance sampling, *Probabilistic Safety Assessment and Management 13*, October 2-7, Seoul, Korea

J. Song, and B.-S. Choi (2016), Reliability analysis of complex infrastructure systems using cross-entropy-based adaptive importance sampling, *Workshop on Resilience of Urban Infrastructure*, April 24-26, Toronto, Canada

B.-S. Choi, and J. Song (2016), Seismic risk assessment for traffic network using adaptive sampling, *2016 Conference of the Earthquake Engineering Society of Korea*, March 18, Suwon, Korea

E. Choi, B.-S. Choi, J. Song (2015), Probabilistic loss assessment of earthquakes in Korea using open-source software platforms, *2015 Autumn Conference of the Earthquake Engineering Society of Korea*, September 10-12