

# Sabine Loos

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## Summary

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Ph.D. candidate and NSF Graduate Research Fellow researching how quantify the combined physical and social impacts of disasters rapidly after an event to inform recovery policies in data-poor regions

## Education

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### Stanford University

Stanford, CA

PH.D. IN STRUCTURAL ENGINEERING

2018-2021 (exp)

- Stanford Advisors: Dr. Jack Baker (Civil Engineering) & Dr. Anna Michalak (Carnegie Institute)
- External Advisors: Dr. David Lallemand (Earth Observatory of Singapore, Nanyang Technological University)

### Stanford University

Stanford, CA

M.S. IN SUSTAINABLE URBAN SYSTEMS

2016-2018

### Ohio State University

Columbus, OH

B.S. IN CIVIL ENGINEERING

2012-2016

## Disaster research experience

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### A data fusion framework to estimate post-disaster damage

Kathmandu, Nepal | Stanford, CA

DISCIPLINES: EARTHQUAKE ENGINEERING, REMOTE-SENSING, GEOSTATISTICS

2017 - Present

- Developing a geostatistical framework in R to more accurately estimate regional damages by integrating field surveys, earthquake engineering predictions, and inSAR-based damage data that are standardly available after a disaster
- Created pipeline to format and merge geospatial data and tested using preliminary case study of the 2015 Nepal earthquake
- Learning how to communicate remotely and across disciplines by working directly with field data collectors (Kathmandu Living Labs, Nepal) and remote-sensing developers (NASA-JPL/ARIA, Los Angeles)

### Relating disaster recovery to social and physical impact

Nepal | Stanford, CA

DISCIPLINES: SOCIAL SCIENCE, EARTHQUAKE ENGINEERING

2018 - Present

- Lead spatial analyst developing a new indicator for disaster impacts which not only encompasses physical impact (building damage) but also metrics of socioeconomic need (poverty, accessibility, etc.)
- Learning quantitative social science methods to assess household impacts and recovery by helping with the development of questionnaire and sampling strategy for large-scale survey to be carried out in over 800 homes in rural Nepal in Spring 2019
- Learning qualitative methods to assess the obstacles to recovery by carrying out four exploratory interviews with practitioners involved in reconstruction projects and policies in from nongovernmental organizations, multilateral agencies, and the national government of Nepal

### Validating inSAR-based damage proxy maps

Auckland, New Zealand

DISCIPLINES: DATA ANALYTICS, RADAR ENGINEERING

2017-2018

- Validated inSAR-based building damage proxy maps developed by NASA-JPL/ARIA with field survey dataset of 200 photos and 3000 data points for February 2011 Christchurch Earthquake
- Worked in-country with Tonkin & Taylor, the engineering firm who collected the surveys, to understand potential issues with the data and relevant contextual details about the earthquake
- Preparing documentation for the World Bank East Asia Pacific Team on the results of the validation to guide use after future earthquakes

### Crowdsourcing building damage using satellite imagery

Haiti | Stanford, CA

DISCIPLINES: EARTHQUAKE ENG., HUMAN COMPUTER INTERACTION, GEOGRAPHIC INFORMATION SYSTEMS

2016 - 2018

- Developed three approaches to crowdsourcing building damage information to compare two new "regional" methods rather than the traditional "building-by-building" approach
- Created training tutorial for remote volunteers using nadir satellite imagery from the 2010 Haiti earthquake
- Learned how to remotely collaborate on code to develop two online experiments in Pybossa and one in OpenStreetMap with GIS researchers at Heidelberg University
- Through a weighted least squares regression between true and crowdsourced damage data, found that weighting better performing volunteers improves the accuracy of crowdsourcing results

- Performed literature review of the interaction between chloride ingress and carbonation, two processes of deterioration which reduce the service life of concrete structures
- Developed probabilistic diffusion model using fick's law of diffusion and probability distributions defining concrete propoerties to determine the rate of deterioration and time to failure of a concrete marine pile

## Publications

### TECHNICAL REPORTS & JOURNALS

- **Loos, S,** Barns, K, Bhattacharjee, G, Soden, R, Herfort, B, Eckle, M, Giovando, C, Girardot, B, Deierlein, G, Kiremidjian, A, Baker, J & Lallemand, D. (2018). "The Development and Uses of Crowdsourced Building Damage Information based on Remote-Sensing". *Blume Earthquake Engineering Center Technical Report 197*. Stanford Digital Repository. Available at: <https://purl.stanford.edu/bj915mt6570>
- Schmuhl, D, **Loos, S,** Hur, J & Shafieezadeh, A (2018). "Time-dependent Probabilistic Capacity Degradation Assessment of Pre-stressed Concrete Piles in Marine Environment". *Structure and Infrastructure Engineering*, DOI: 10.1080/15732479.2018.1442483
- Lallemand, D., Soden, R., Rubinyi, S., **Loos, S.,** Barns, K., & Bhattacharjee, G. (2017). "Post-Disaster Damage Assessments as Catalysts for Recovery: A Look at Assessments Conducted in the Wake of the 2015 Gorkha, Nepal, Earthquake". *Earthquake Spectra*: December 2017, Vol. 33, No. S1, pp. S435-S451.

### CONFERENCE PROCEEDINGS

- **Loos, S.,** Barns, K., Bhattacharjee, G., Soden, R., Herfort, B., Eckle, M., Giovando, C., Girardot, B., Saito, K., Deierlein, G., Kiremidjian, A., Baker, J., Lallemand, D. "Crowd-sourced Remote Assessments of Regional-Scale Post-Disaster Damage". *Proceedings of the 11th U.S. National Conference on Earthquake Engineering*. June 25-29, 2018. Los Angeles, CA.
- Bhattacharjee G, Barns K, **Loos S,** Lallemand D, Deierlein G, Kiremidjian A, Soden R. Developing a user-centric understanding of post-disaster building damage information needs. *Proceedings of the 11th National Conference in Earthquake Engineering*, Earthquake Engineering Research Institute, Los Angeles, CA. 2018.

### BLOG POSTS

- **Loos, Sabine.** 2018. "Informing Equitable Disaster Recovery: More than Just Economic Losses." *Stanford Urban Resilience Initiative*. 2018. <http://urbanresilience.stanford.edu/nepal-recovery/>.

### REVIEWER

- Global Facility for Disaster Reduction and Recovery (GFDRR). 2018. "Machine Learning for Disaster Risk Management." Washington, DC.

## Presentations

- "Spatial integration of post-earthquake building damage data to support response and recovery decisions", Washington, DC, American Geophysics Union Fall Meeting, December 2018, Lightning Talk.
- "Rapid integration of post-disaster data: a basis to estimate impact for recovery planning", Berkeley, CA, Geospatial Analysis for International Development, November 2018, Oral Presentation.
- "Estimating regional damage to buildings: Integrating post-disaster data sources and field surveys", Stanford, CA, Blume Earthquake Engineering Center Affiliates Meeting, September 2018, Poster Presentation.
- "Crowdsourced Remote Assessments of Regional-Scale Post-Disaster Damage", Los Angeles, CA, 11th National Conference on Earthquake Engineering, June 2018, Oral Presentation.

## Grants & Awards

- 2018 **American Geophysical Union**, Fall Meeting Natural Hazards Section Student Travel Grant
- 2018 **Earthquake Engineering Research Institute**, 11th US National Conference Student Grant
- 2017 **Global Partnership for Sustainable Development Data**, Collaborative Data Innovations Grant
- 2016 **National Science Foundation**, Graduate Research Fellowship

## Skills

- Methods** Geostatistics, Spatial Analysis, Data Mining, Risk Analysis
- Programming & Software** R, Matlab, Python, LaTeX, ArcGIS
- Languages** English, French

## Relevant project experience

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### Honduras sustainable housing project

Honduras | Columbus, OH

POSITION: LEAD STRUCTURAL ENGINEER

2015 - 2016

- Led the structural design of a reinforced masonry single-family home which used local construction practices as part of an interdisciplinary team consisting of architecture, civil engineering, construction management, and business students
- Worked with local contractors to construct a three-room home for a family in Choluteca
- Structural designs are still being used today to construct new homes using seed fund initiated by project team

### Assessing coastal flood risk in the south bay

Stanford, CA

POSITION: SPATIAL ANALYST

Autumn 2017

- Performed semi-probabilistic assessment of direct economic losses due to sea level rise and coastal flooding for San Mateo and Burlingame, CA
- Presented results at San Mateo city council meeting to highlight the correlation between large economic losses and social vulnerability

## Professional & Teaching experience

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### Disaster Resilience Seminar

Stanford, CA

TEACHING ASSISTANT

Autumn 2018

- Led discussions between speakers from academia and industry and class of 25 graduate students surrounding the theme of decision support for disasters

### Turner Construction Company

Columbus, OH

FIELD ENGINEERING INTERN

2015 - 2016

- Supervised over 200 workers by communicating construction schedule, managing site safety, and leading daily huddles with subcontractors
- Documented close-out submittals and project turnover information for \$35 million renovation of the Columbus Metropolitan Library

### Introduction to Transportation Engineering

Columbus, OH

GRADER

Autumn 2015

- Graded weekly homework assignments, two midterms, and final exam for class of 150 undergraduates

### Jezerinac, Geers and Associates

Columbus, OH

STRUCTURAL ENGINEERING INTERN

Summer 2014

- Reviewed accuracy of designs in shop drawings from steel, concrete, and wood truss fabricators

## Leadership & Service

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### Stanford Urban Resilience Initiative (SURI)

Stanford, CA

GRADUATE STUDENT LEAD

2017 - Present

- Organizing SURI panel at the Natural Hazards workshop in July 2019
- Coordinate meetings with executive director to develop activities that promote graduate student involvement in SURI
- Organize SURI outreach, including weekly coffee hours, speakers, and recruitment
- Manage SURI website

### Earthquake Engineering Research Institute (EERI)

Stanford, CA

ACTIVITIES COORDINATOR

2017 - 2018

- Organized educational and social events, including bi-weekly graduate student research forums that normally had 20 attendees
- Partnered with professional chapter of Structural Engineers Association of Northern California to provide post-earthquake safety assessment training to EERI students

## **Leaders of the Built Environment**

*Stanford, CA*

PHILANTHROPY CHAIR

*2016 - 2017*

- Promoted culture of service outside of the classroom by planning group volunteer events and reflection activities for Sustainable Design and Construction Program Graduate students (80 total)
- Developed teaching curriculum for class about environmental sustainability for 7th-12th graders as part of Stanford's splash program

## **Engineers Without Borders**

*Columbus, OH*

FUNDRAISING CHAIR

*2013 - 2016*

- Completed semi-annual grant applications, delegated weekly committee meetings of 20 people, and increased member retention by 30 %
- Raised over \$9000 for international project trips in one year

## **Structural Engineers Association of Ohio**

*Columbus, OH*

PRESIDENT

*2013 - 2015*

- Implemented multiple student/professional events, including job shadows and mentoring nights

## **Esperanza International**

*Tijuana, MX*

CONSTRUCTION VOLUNTEER

*May 2015*

- Constructed concrete masonry unit modular homes on an international worksite with fewer machinery

## **Habitat for Humanity**

*Immokalee, FL*

TRIP LEADER

*Winter 2014, 2015*

- Led a service learning trip of 10 civil engineers to construct multiple single family timber houses