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ACADEMIC POSITIONS

PRINCETON UNIVERSITY

Distinguished Postdoctoral Fellow at Andlinger Center for Energy and the Environment & Civil and Environmental Engineering Department
Advisors: Ning Lin and Warren Powell

California, USA

2019 – Present

EDUCATION

STANFORD UNIVERSITY

PhD Structural Engineering and Geomechanics

Thesis project: “Effective emergency response policies for hospital systems in the wake of time-varying seismic hazard”

Advisors: A. Kiremidjian and G. Deierlein. *Committee:* J. Baker, J. Mitrani-Raiser, and W. Ellsworth

California, USA

2015 – 2019

STANFORD UNIVERSITY

MS Structural Engineering and Geomechanics

California, USA

2013 – 2014

UNIVERSIDAD NACIONAL DE INGENIERÍA

Professional Civil Engineer

Thesis project: “Evaluation of the effective flange width for low-ductility reinforced concrete (RC) walls through nonlinear Finite Element Modeling (FEM) verified by experimental tests”

Advisor: C. Zavala

Lima, Peru

2013

UNIVERSIDAD NACIONAL DE INGENIERÍA

Bachelor of Science in Civil Engineering

GPA: A+. Rank: #1/104

Lima, Peru

2007 – 2011

RESEARCH EXPERIENCE

PRINCETON UNIVERSITY

Resilience of Distributed Energy Resources to Hurricane Hazard and Climate Change

- Formulating framework to evaluate disaster resilience policies for distributed energy resources in urban areas exposed to high hurricane hazard and climate change impacts. Advisory team: Prof. Lin and Powell
 - Developing post-hurricane functionality models for solar panels, behind-the-meter storage units, and microgrids.
 - Building stochastic optimization model to design best strategies for deployment of resilient microgrids in cities along the East Coast in the United States.

New Jersey, USA

Aug. 2019 – Present

STANFORD UNIVERSITY

Main PhD Project: Earthquake resilience of hospital systems

- Developed a framework for quantifying the earthquake resilience of hospital systems, including the development of new probabilistic models for:
 - Regional post-earthquake patient redistribution across functional hospitals using convex optimization.

California, USA

Sep. 2015 – Jun. 2019

- Regional assessment of the functionality of beds and operating rooms in hospitals after an earthquake. Project in collaboration with Prof. Judith Mitrani-Reiser from John Hopkins University and the National Institute of Standards and Technology (NIST).
- Multi-severity casualty estimation after earthquakes due to regional infrastructure damage.

Computer vision applied to large-scale exposure recognition for disaster risk analysis Jan. 2019 – Present

- Using Convolutional Neural Network (CNN) and satellite imagery to predict building footprints and vulnerability-related attributes. In collaboration with Dr. Maryia Markhvida and Max Ferguson from Stanford University.
 - Developing a framework for full implementation of computer vision technology in seismic risk analysis assessment of portfolio annual average losses.
 - Testing accuracy of model for the 9 counties in the Bay Area in terms of regional average loss variations.
 - Led to writing a grant proposal for the “Computer Vision for Global Challenges” from Facebook for \$40k.

Disaster resilience performance of distributed energy resources (DERs) in power grids Jan. 2018 – Present

- Developed a model for quantifying power resilience gains in cities with rapid adoption of distributed power sources (e.g., photovoltaic panels) and storage units. Advisory team: Prof. Kiremidjian and Rajagopal.
 - Analyzed the seismic vulnerability of DERs’ supporting infrastructure.
 - Quantified multi-seasonal solar energy capacity and post-disaster distributed power storage needs.
 - Evaluated power microgrid performance in post-earthquake settings in the Bay Area.
 - Led the writing of an NSF grant proposal for \$ 500k in coordination with the advisory team.

Time and space dependent probabilistic model for earthquake rupture Sep. 2016 – Present

- Developed novel probabilistic model for time and space interactions of earthquake mainshock occurrences including formulation for parameter estimation using Bayesian and Markov Chain Monte Carlo techniques.
- Proposed a framework for incorporating both synthetic earthquake catalogs from physics-based rupture simulations and historic catalogs for time-dependent earthquake hazard estimation. Project in collaboration with Prof. Ampuero from the Seismology Department at Caltech University.

Stanford Resilience Framework Sep. 2016 – Sep. 2017

- Built and lead the development of a framework capable of quantifying resilience of large cities in the wake of increasing disasters.
 - Defined the research scope, manage a team of seven PhD students, and actively collected feedback from and coordinated with multiple faculty members. Advisory team: Prof. Kiremidjian, Deierlein, Baker, and Miranda from the Civil and Environmental Engineering Department at Stanford University.

Stanford Reconnaissance Mission after the 2016 Ecuador Earthquake Apr. 2016

- Assessed on-field damage of residential buildings, hospitals, roads, airports, ports and other infrastructure in several affected cities after the Mw 7.8 Earthquake in Ecuador. The team was led by Prof. Miranda from the Civil and Environmental Engineering at Stanford University.

Probabilistic modeling of regional earthquake ground motions Apr. 2016 – Dec. 2016

- Applied machine learning and Geostatistics to improve the efficiency and accuracy of simulated spatially cross-correlated ground motions compared to current methods. Project in collaboration with Prof. Caers from the School of Earth, Energy & Environmental Sciences at Stanford University.

Visualization and Evaluation of Soft-Story Building Vulnerability in Oakland Jan. 2015 – Apr. 2015

- Coordinated the project scope with the Oakland Chief Resilience Officer, the ABAG Resilience Program Coordinator, and the Oakland Building Inspector as part of the Mandatory Soft-story Building Retrofit Program.

- Evaluated structural vulnerability of 4 wooden soft-story buildings under the FEMA 807 Procedure.
- Analyzed demographic characteristics of soft-story buildings' tenants and owners.
- Created spatial visualizations of vulnerability indicators as a risk communication strategy for buildings' tenants and owners.

Incremental Construction Framework in Kathmandu, Nepal

Sep. 2014 – Mar. 2015

- Analyzed the seismic risk of non-engineered residential building expansions.
- Performed incremental dynamic analysis of a set of buildings representative of the structural typologies in Kathmandu, Nepal, during different stages of construction. Project in collaboration with Prof. Burton from the Civil and Environmental Engineering at UCLA.

UNIVERSITY OF PAVIA

Pavia, Italy

Visiting Researcher

Jun. 2016 – Jul. 2016

- Received training in OpenQuake software and algorithms at the Global Earthquake Model (GEM) Foundation.
- Processed databases for regional earthquake damage modeling.
- Calibrated earthquake casualty model targeted to regions in South America.

JAPAN-PERU CENTER FOR EARTHQUAKE ENGINEERING AND DISASTER MITIGATION (CISMID)

Lima, Peru

Structural Designer and Research Assistant

Aug. 2011 – Aug. 2013

Research:

- Performed FEM for reinforced concrete low-ductility walls using nonlinear smeared cracking models.
- Tested RC walls at natural and reduced scale under cyclic quasi-static and dynamic loads.
- Participated in an extensive field survey of building exposure and structural taxonomies in several regions in Peru.

Structural Design:

- Carried out structural analysis and design of multiple new RC buildings ranging from 5 to 9 stories, and designed retrofitting solution for an existing, pre-70s 3-story RC building.

JOURNAL PUBLICATIONS

- [J1] **Ceferino L.**, Mitrani-Reiser J., Kiremidjian A., and Deierlein G. (*In Review*). “Modeling patient transfers for optimized post-earthquake hospital system response”. *Nature Communications*.
- [J2] Patel S., **Ceferino L.**, Liu C., Kiremidjian A., & Rajagopal R. (*In Review*). “The Resilience Value of Rooftop Solar in Residential Communities”. *Nature Energy*.
- [J3] **Ceferino L.**, Galvez P., Ampuero J.-P., Kiremidjian A., & Deierlein G. (*In Review*). “Bayesian parameter estimation for space and time interacting earthquake rupture model using historical and physics-based simulated earthquake catalogs”. *Bulletin of Seismological Society of America*.
- [J4] **Ceferino, L.**, Kiremidjian, A., and Deierlein, G. (*In Review*). “Probabilistic space- and time-interaction modeling of main-shock earthquake rupture occurrence”. *Bulletin of Seismological Society of America*.
- [J5] **Ceferino L.**, Kiremidjian A., and Deierlein G. (2018). “Regional Multi-severity Casualty Estimation Due to Building Damage Following a Mw 8.8 Earthquake in Lima, Peru”. *Earthquake Spectra*, 4(3).
- [J6] **Ceferino L.**, Kiremidjian A., and Deierlein G. (2018). “Probabilistic Model for Regional Multi-severity Casualty Estimation due to Building Damage Following Earthquakes. *ASCE-ASME Journal of Risk and Uncertainty in Engineering Systems, Part A: Civil Engineering*, 4(3), 04018023.
- [J7] Markhvida M., **Ceferino L.**, and Baker J. (2017). “Modeling spatially correlated spectral accelerations at multiple periods using principal component analysis and geostatistics”. *Journal of Earthquake Engineering and Structural Dynamics* 47(5), 1107-1123.

- [J8] Noh H.Y., Kiremidjian A., **Ceferino L.**, and So E. (2017). “Bayesian Updating of Earthquake Vulnerability Functions with Application to Mortality Rates”. *Earthquake Spectra*, Vol. 33, No. 3, pp. 1173-1189.
- [J9] Lallemand D., Burton H., **Ceferino L.**, Bullock Z., and Kiremidjian A. (2017). “A Framework and Case Study for Earthquake Vulnerability Assessment of Incrementally Expanding Buildings”. *Earthquake Spectra*, 33(4).
- [J10] Zavala C., Gibu P., Lavado L., Taira J., Cárdenas L., and **Ceferino L.** (2012). “Cyclic Behavior of Low Ductility Walls Considering Perpendicular Action”. *Journal of Disaster Research*, 8(2), 313.

CONFERENCE PRESENTATIONS

- [C1] **Ceferino L.**, Mitrani-Reiser J., Kiremidjian A., and Deierlein G. (2018). “Computing Hospital System Resilience: A Supply-Demand Perspective”. In 11th National Conference in Earthquake Engineering, Earthquake Engineering Research Institute, Los Angeles, CA.
- [C2] **Ceferino L.**, Kiremidjian A., and Deierlein G. (2018). “Parameter Estimation Methods for Modeling of Time and Space Interactions of Earthquake Rupture”. In 16th European Conference in Earthquake Engineering, Thessaloniki, Greece.
- [C3] **Ceferino L.**, Kiremidjian A., and Deierlein G. (2017). “Space and time interaction modeling of earthquake rupture occurrence”. In 12th International Conference on Structural Safety & Reliability, Vienna, Austria.
- [C4] **Ceferino L.**, Kiremidjian A., and Deierlein G. (2017). “Framework of the estimation of the health status of the population during an earthquake emergency”. In 16th World Conference on Earthquake Engineering, Santiago de Chile, Chile.
- [C5] Markhvida M., **Ceferino L.**, and Baker J. (2017). “Effect of ground motion correlation on regional seismic loss estimation: application to Lima, Peru using a cross-correlated principal component analysis model”. In 12th International Conference on Structural Safety & Reliability, Vienna, Austria.
- [C6] Zavala C., Gibu P., Lavado L., Taira J., Cardenas L., and **Ceferino L.** (2013). “Low Ductility Concrete Wall Test Considering Perpendicular Wall Action”. In 10th International Conference on Urban Earthquake Engineering, Center for Urban Earthquake Engineering, Tokyo Institute of Technology, pp.599-602, 2013.

POSTER PRESENTATIONS

- [P1] **Ceferino L.**, Markhvida M., Cremen G., Heresi P., Hulsey A., Balbi M., Kiremidjian A., Baker J., Deierlein G. (2017). “Integrating PBEE and Network Analysis to Measure Resilience Performance Objectives”. QuakeCore 2017 Annual Meeting, Taupo, New Zealand.
- [P2] Bindal A., Li J., Markhvida M., **Ceferino L.** (2017). “Earthquake Resilience of Hospital Systems”. 2017 Artificial Intelligence (CS221) Poster Presentation, Stanford University, California.

AWARDS & HONORS

Grant Applications:

- “Computer Vision for Global Challenges” from Facebook (\$40k, results pending) 2019
- NSF “Humans, Disasters, and the Built Environment” (\$500k, in resubmission process) 2019
- “World Bank-GFDRR Challenge Fund Round 3” (\$200k, shortlisted 6 out of 150) 2019
- “Innovate Perú” from Ministry of Production in Perú (\$50k) 2017

Scholarships:

- Distinguished Fellowship at Andlinger Center (\$130k), Princeton University 2019 – 2021
- “John A. Blume” Fellowship, Stanford University 2017 – 2018
- “Shah Family” Fellowship, Stanford University 2015 – 2016
- “Andrés del Castillo” Scholarship (\$20k), Universidad Nacional de Ingeniería 2013

- PRONABEC Scholarship (\$90k) 2013
- Fulbright Scholarship in 2012 2012
- “Marfa Foundation” Fellowship for full undergrad funding 2008 – 2011

Awards:

- EERI Student Grant for the National Conference on Earthquake Engineering (NCEE) 2018
- 2nd place in contest of undergraduate research presentations in National Congress of Civil Engineering Students (CONEIC) in Peru 2013
- 1st place in contest of knowledge on Civil Engineering in CONEIC 2011 in Peru.
- Prize “Manuel Pardo y Lavalle” in 2010.
- 8th place out of 4277 in National University of Engineering’s admission contest in 2007.

TEACHING EXPERIENCE AND MENTORSHIP

STANFORD UNIVERSITY

California, USA

Undergraduate Student Mentor: Emily Alcazar, Arizona State University

Jun. – Aug. 2018

- Provided research guidance as part of the Stanford Undergraduate Research Fellowship (SURF) program.
- Developed a research plan for the student to perform quick estimations of power outages after earthquakes and to visualize results for a journal paper. The student’s outputs were incorporated into the paper.

Graduate Student Mentor: Chenying Liu, Stanford University

Jan. – Dec. 2018

- Mentored an incoming PhD student to use state-of-the-art earthquake tools and databases to perform high-resolution earthquake risk analysis for power system resilience.
- Set up the initial scope and objectives of the student’ research projects.

Substitute Instructor for graduate-level class

Mar. – Jun. 2017 & 2018

- Led five regular lectures and helped prepare class material on earthquake risk analysis as part of the class “Introduction to Performance-based Earthquake Engineering”.

Teaching Assistantship for graduate-level class

Mar. – Jun. 2016

- Held weekly office hours for consultation for “Introduction to Performance-based Earthquake Engineering”.
- Developed problem sets and documented the solutions for the class.
- Elaborated the class project objectives, scope, and description to perform regional earthquake risk analysis.

Graduate Student Mentor: Sam Adiputra, Stanford University

Mar. – Jun. 2015

- Provided research guidance for a three-month credit-based independent study.
- Developed the research plan to study masonry infill modeling using diagonal struts. The results helped improve existing models for masonry infills in non-ductile concrete frames.

UNIVERSITY OF PAVIA

Pavia, Italy

Training Instructor

Jun. 2016 – Jul. 2016

- Compiled and summarized background material on the analytics of earthquake risk assessments aiming to communicate foundational risk techniques to engineers in developing countries.

RENDEL Inc. & MADOX Inc.

Lima, Peru

Lecturer

Dec. 2015

- Led training directed to professional civil engineers on ASCE-41 methods for seismic evaluation and retrofit of existing buildings using linear and non-linear structural analysis.

- Developed material and held the 10-hour training.

INDEPENDENT PRIVATE TUTOR

Lima, Peru

Tutor for Undergraduate Classes

Jan. 2008 – Dec. 2011

- Tutored multiple undergraduate classes in Civil Engineering for students in different universities.

Tutor for Peruvian College Admission

Jan. 2006 – Dec. 2008

- Prepared students for Math, Physics, and Chemistry undergraduate university admission exams.

CONSULTING EXPERIENCE AND ENTREPRENEURSHIP

WORLD BANK

Washington D.C., USA

Earthquake Risk Consultant

Jan. 2017 – Present

- Developed the objectives, scope, and description of a seismic risk project for Central Asia. This regional-scale project will help identify vulnerable, key infrastructure in the region and develop a retrofit program.

YANAPAY Inc.

Lima, Peru

Co-founder/CTO

Jan. 2017 – Jun. 2019

- Built start-up focused on raising awareness of earthquake losses, fatalities, and tsunami risk for all residential building owners and tenants in Lima, Peru, using earthquake risk tools, machine learning, and computer visualization (<https://pe.yanapay.net/>). The Ministry of Production of Peru provided \$50k to support the project.

RENDEL Inc.

Lima, Peru

Co-founder and Structural Engineering Consultant

Jan. 2015 – Present

- Performed structural analysis and design of anchored walls for slope stability in mines, elevated water reservoirs for multiple residential complexes, and special components for industrial plants.

RIVERA CONSULTING GROUP INC.

San Francisco, USA

Staff Structural Engineer

Jun. – Aug. 2014

- Performed structural evaluation and designed retrofitting solution for pre-70s reinforced concrete and wooden buildings.

CESEL Inc.

Lima, Peru

Internship

Jan. – Mar. 2011

- Evaluated cost estimates and carried out structural analysis of reinforced concrete buildings.

ACADEMIC SERVICE AND OUTREACH

JOURNAL REVIEWER

Earthquake Spectra

2017 – 2019

Computers and Structures

2017 – 2019

International Journal of Disaster Risk Reduction

2018 – 2019

SCIENTIFIC CONFERENCE SUPPORT

Coordinated and co-moderated two sessions on “Post-Earthquake Response, Emergency Management, And Recovery” and “Risk and Resilience of Distributed Infrastructure and Lifelines” at NCEE in Los Angeles 2018

Moderated session on “Seismic Analysis” at the ICOSSAR in Vienna, Austria 2017

Fund-raised and co-organized Techsuyo, the annual meeting for the Peruvian professional community in USA in the areas of science, technology, and innovation, at Stanford University 2017

COMMUNITY OUTREACH

- Developed material and taught a three-session interactive lecture on earthquake fundamentals at the Sequoia High School in Redwood City, California 2017
- Conducted a community session on earthquake vulnerability of soft-story houses for critical neighborhoods in Oakland, California, in coordination with the Oakland Chief Resilience Officer 2015

LEADERSHIP POSITIONS

- President, Peruvian Student Association, Stanford University 2016-2018
- Board Member, EERI Student Chapter, Stanford University 2016
- Vice-President, Peruvian Student Association, Stanford University 2015
- Student Representative, Board of the Civil Engineering Department, Universidad Nacional de Ingeniería in Peru 2009 – 2010

OTHER TALKS AND MEDIA COVERAGE

- “Effective Policies for Hospital System Emergency Response”, at Princeton University & University of Delaware. May. 2019
- “Seismic Resilience of Urban Systems to Earthquakes”, at Universidad Nacional de Ingeniería in Lima, Peru. Dic. 2018
- “Seismic Resilience of Urban Systems to Earthquakes”, at Universidad Nacional de Ingeniería in Lima, Peru. Dic. 2018
- “Probabilistic Modeling and Parameter Estimation for Earthquake Ruptures with Application to the Subduction Zone in Peru”, at the Instituto Geofísico del Perú, Lima. Aug. 2018
- “Risk Analysis beyond Insurance. Where the Disaster Risk Technologies are Taking us?” at the Understanding Risk Forum organized by the World Bank in Mexico City, Mexico. Jun. 2018
- Featured in the CEO Update Newsletter of the Canterbury District Health Board for research on “Seismic Resilience of Hospital Systems” in New Zealand Sep. 2017
- “April 16, 2016 Mw 7.8 Ecuador Earthquake” at Pacific Earthquake Engineering Research Center at University of California, Berkeley Jul. 2016
- Interviewed by Radio San Borja, in Lima, about seismic risk analysis and performance-based earthquake engineering. Dec. 2014
- Interviewed by the Peruvian Association of Civil Engineers about state-of-the-art research on earthquake engineering in USA. Aug. 2014
- “Experiences about the admission process at North American Universities” at the National University of Engineering in Lima, Peru. Mar. 2013, Aug. & Dec 2014

LANGUAGES

- Spanish (native language)
- English (second language, TOEFL iBT: 103)

REFERENCES

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