

2018-2019 ANNUAL REPORT

Stanford University Student Chapter of the Earthquake Engineering Research Institute



Report Date: July 5, 2019

This report summarizes the membership and activities conducted by the Stanford University Student Chapter of the Earthquake Engineering Research Institute during the 2018-2019 academic year.

MISSION & GOALS

The purpose of the EERI Stanford Chapter is to advance Earthquake Engineering research, advance understanding of earthquakes and their consequences, and promote measures to mitigate their harmful effects. The EERI Stanford Chapter organizes various events for professional development, education and outreach, and networking. These activities include technical seminars, student seminars, SPLASH, School Earthquake Safety Initiative (SESI), a post-earthquake building evaluation workshop, happy hours and others.

MEMBERSHIP

The Stanford University Student Chapter had a total of 26 members in 2018-2019.

OFFICERS

The initial Board for the 2018-2019 Academic year was elected in June 2018. At the end of the Spring quarter the President stepped from the position and the new board was elected in June 2018 to lead the chapter for the following academic year. The Board consisted of the following members:

| Role | Name | EERI Member Number | Email | Student Status |
|---------------------------|--------------------|--------------------|-----------------------|------------------|
| President | Andres Acosta | 29875 | aacostav@stanford.edu | Graduate student |
| Vice-President | Rodrigo Silva | NA | rsilval@stanford.edu | Graduate student |
| Treasurer | Francisco Galvis | 23568 | galvisf@stanford.edu | Graduate student |
| Secretary | Nick Burton | NA | ngburton@stanford.edu | Graduate student |
| Geophysics Representative | Jackson MacFarlane | NA | jmacfarl@stanford.edu | Graduate student |
| SLC Representative | Shannon Spiers | 16655 | sspiers@stanford.edu | Graduate Student |
| SDC Graduate Advisor | Andy Zicarelly | NA | azicare@stanford.edu | Graduate Student |

Board meetings were held on a regular basis to support chapter activities and track their progress throughout the academic year.

FACULTY & INDUSTRY ADVISORS

The chapter advisors are:

| | Name | Email | Affiliation |
|-------------------------|-------------------|-----------------------|---------------------|
| Faculty Advisor | Gregory Deierlein | ggd@stanford.edu | Stanford University |
| Industry Advisor | John Osteraas | osteraas@exponent.com | Exponent |

MEMBERS

A complete list of student members is shown below.

| Name | | EERI ID | Email | Student status |
|-------------|---------------|----------------|-------------------------|-----------------------|
| Andres | Acosta | 29875 | aacostav@stanford.edu | Active |
| Anne | Hulsey | 16179 | ahulsey@stanford.edu | Active |
| Luis | Ceferino | 16644 | ceferino@stanford.edu | Active |
| Shannon | Spiers | 16655 | sspiers@stanford.edu | Active |
| Kuanshi | Zhong | 18166 | kuanshi@stanford.edu | Active |
| Jose Ramon | Silos de Alba | 18269 | josilos@stanford.edu | Active |
| Tim | Ngo | 18768 | ngotm@stanford.edu | Active |
| Sabine | Loos | 18993 | sloos@stanford.edu | Active |
| Nikhil | Chaudhuri | 19203 | nikhilc@stanford.edu | Active |
| Evelyn | Li | 19212 | evelynli@stanford.edu | Active |
| Daphne | Basangwa | 19499 | daphneb@stanford.edu | Active |
| Gitanjali | Bhattacharjee | 19550 | gjee@stanford.edu | Active |
| Shannon | Spiers | 19606 | duplicate@duplicate.com | Active |

| | | | | |
|----------------|---------------------|-------|------------------------|--------|
| Ziyang | Jiang | 19633 | zij004@stanford.edu | Active |
| Addison | Bliss | 19635 | alb041@stanford.edu | Active |
| Prajwal | Kammardi Arunachala | 19657 | prajwalka995@gmail.com | Active |
| Corinna | Slater | 19699 | cslater@stanford.edu | Active |
| Asherin George | Anto George | 19722 | asherin@stanford.edu | Active |
| Maryia | Markhvida | 19758 | markhvid@stanford.edu | Active |
| Karen | Barns | 19768 | kbarns@stanford.edu | Active |
| Yilin | Chen | 19899 | yilinc2@stanford.edu | Active |
| Joel | White | 20028 | jwhite56@stanford.edu | Active |
| Gabriela | Palavecino | 20344 | glps@stanford.edu | Active |
| Francisco | Galvis | 23568 | galvisf@stanford.edu | Active |
| Aubrey | Kingston | 19327 | aubreyk1@stanford.edu | Active |
| Paul | Calderon | 20892 | pfc@stanford.edu | Active |

BUDGET & FINANCIALS

This year, most events that included a budget were supported by the John A. Blume Earthquake Engineering Center. Due to this generous support, the student chapter's financial balance remained at \$2057.62.

From: Susan Benton <sbenton@sse.stanford.edu>
Sent: Monday, June 24, 2019 12:42 PM
To: Francisco Galvis
Cc: Rodrigo Ivan Silva Lopez; Andres Antonio Acosta Vera
Subject: Re: EERI Student Chapter balance

Hi, your account balance is \$2,057.62.

Best,

Susan Benton
She/Her
Accounting Manager
ASSU/SSE
Stanford University

CHAPTER ACTIVITIES

The EERI Stanford Student Chapter was involved in a variety of activities over the year. Activities included organization of research forums, presentations and workshops as well as outreach events to other schools and industry professionals.

REGULAR CHAPTER MEETINGS

Board meetings were held on regular basis. Meetings covered chapter logistics and planning of events. In addition, follow-ups and additional planning details were done via email. Following is the summary of the meetings:

Meeting #1 Date: 10/10/2018 Duration: 1h Attendance: 4

We discussed the activities that the chapter was going to develop throughout the year, and planned the Welcome Back happy hour that was happening that Friday

Meeting #2 Date: 11/29/2019 Duration: 1h Attendance: 3

Discussed the Splash class and analyzed the results of the activities that happened during the quarter, planning the ones for the Winter quarter.

Meeting #3 Date: 03/03/2018 Duration: 1h Attendance: 3

Planned activities for the spring quarter.

Meeting #4 Date: 05/17/2019 Duration 1h Attendance: 6

SESI preparation. We went through the class that was going to be presented to the students and the construction guidelines of the project.

Meeting #5 Date: 04/06/2019 Duration 1h Attendance: 4

Elaboration of final report and election of new EERI board

*Note: this is not a complete list of meetings.

PHD SEMINARS – SUMMER QUARTER ON THURSDAYS

PhD and masters' students presented their research every Thursday afternoon of the Summer Quarter. The seminar gave the opportunity to students to present their current projects in a non-pressured environment. In addition, presenters were exposed to constructive feedback from their peers. The seminars involved refreshments and gave students the chance to interact.

| | Day | Presenter 1 | Topic 1 | Presenter 2 | Topic 2 |
|---|----------|----------------|--|-----------------|--|
| 1 | 07/12/18 | Kuanshi Zhong | Cumulative Damage in Reinforcing Steel and Impacts on Collapse under Long Duration Motions | Yilin Chen | Spatial correlations in CyberShake physics-based ground motion simulations |
| 2 | 07/19/18 | Alomir Favero | Continuum Finite Deformation Hydrodynamics of Granular Flows | | |
| 3 | 07/26/18 | Luis Ceferino | Earthquake resilience for hospital systems | Selim Gunay | Deep Residual Network with Transfer Learning for Image-based Structural Damage Recognition |
| 4 | 08/02/18 | Kentaro Minowa | Recent Developments and Applications of Seismic Dampers in Japan | Chao Chen | Parallel linear solvers for elliptic partial differential equations |
| 5 | 08/09/18 | Chao Liang | Gravity-driven oscillation in a volcanic conduit, one mechanism for very long period (VLP) seismicity at Kilauea volcano | Amory Martin | Dynamic Topology Optimization of Elastic Rocking Spines |
| 6 | 08/16/18 | Yifan Wang | Spherical Harmonics Method for Linear Elasticity: Applications to Dislocation-Void Interaction and Hydrogel Deformation by Cell-Intaking | Andy Ziccarelli | Simulating Ductile Crack Propagation and Brittle Fracture in Steel Structures |
| 7 | 08/23/18 | Yi Shao | Improving the ductility and design method of steel reinforced damage-tolerant concrete | Yixiao Sheng | Application of Seismic Interferometry |
| 8 | 08/30/18 | Isa Rosa | Multiscale Modeling and Testing of Biopolymer bound Soils | Mia Allende | |

SPLASH – INTRODUCTION TO EARTHQUAKE ENGINEERING

The EERI Stanford Student Chapter taught Intro to Earthquake Engineering to students from 7th – 12th grade on November 11, 2018 and again on December 2nd 2018. The lecture was divided into four main sections: (1) what causes earthquakes? (2) how do earthquakes affect buildings? and (3) how do engineers design buildings to

withstand shaking? These topics were complimented with videos, animations, hands-on activities and interactive exercises. Approximately 30 students participated.

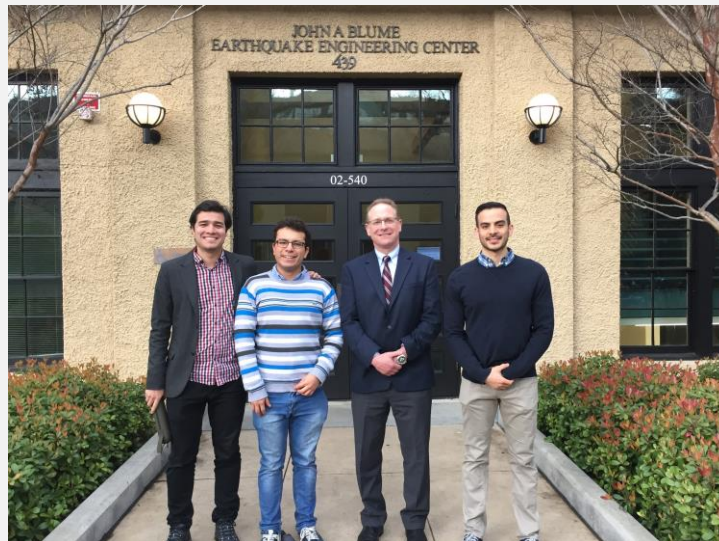
Participants: Rodrigo Silva Lopez and Francisco Galvis



FRIEDMAN FAMILY VISITING PROFESSIONAL - MARCH 5th, 2019

This year we were awarded the Friedman Family Visiting professional grant. We were fortunate to host Nathan Gould, Chief of Technology for the ABS Consulting Advanced Engineering Division, at Stanford University on March 5, 2019. Nathan shared a whole day of activities with students, faculty, and postdocs of the Structural Engineering and Geomechanics program at Stanford University. Activities included lunch, dinner, round table discussion, tour around campus, and of course, his lecture.

During his lecture, Nathan talked about Multi-Hazard design, which incorporates both natural and manmade hazards, has become a popular design requirement for critical structures. While many Owners and various project team members anticipate a relatively easy integration of the respective hazards based on their understanding of the loads generated by the hazards, numerous complexities arise during the actual integration of a multi-hazard design approach into construction documents.



Nathan Gould with EERI Stanford Student chapter board members

From left to right: Francisco Galvis (Financial Officer EERI Stanford Student Chapter), Rodrigo Silva (Vice-president EERI Stanford Student Chapter), Nathan Gould (Friedman Family Visiting Professional), Andres Acosta (President EERI Stanford Student Chapter)

TECHNICAL SEMINARS BY ARUP AND DEGENKOLB

Arup leaders Rob Smith and John Worley came to campus to talk about Arup's work on earthquake engineering from Manila to Mexico, emphasizing seismic engineering innovations around the world. On their presentation, they provided case studies of how local conditions change the way that seismic resilience is addressed in engineering solutions. From Manila to Mexico, via the San Francisco Bay Area and the Netherlands, the speakers provided examples of how different constraints and conditions alter how buildings are designed, built and retrofitted. They touched on topics such as supplementary damping, tall buildings, induced seismicity, soil structure interaction, retrofitting and base isolation.

Rob Smith leads Arup's Advanced Technology and Research team in San Francisco. A native of the UK, Rob has worked for Arup for 20 years and has spent time in London, the Philippines, Los Angeles and San Francisco. His projects are to be found on six continents, and in many areas of structural engineering, including high-rise buildings, long span bridges and special structures, such as the Vegas High Roller and the Beijing National Stadium. John Worley leads Arup's Oakland office and the Structural-Buildings team in both San Francisco and Oakland. He has over 30 years of experience in structural engineering design and projects including hospitals, schools, laboratories, airports, theatrical facilities, office buildings, and industrial facilities. He typically is involved in projects from conception through final construction making him well versed in the creative part of design as well as the nuts & bolts side of design.



Left: Rob Smith; Right: John Worley

The second technical seminar was offered by Degenkolb. Senior principal James Malley came to campus to talk about the Use of PEER Tall Buildings Initiative Guidelines for Peer Review of Tall and Unique Structures. In this presentation, Jim summarized some of the key elements of the PEER tall building Guidelines and discuss their application on a number of interesting peer review projects.



James Malley, Senior principal at Degenkolb Engineers

WINTER STRUCTURAL ENGINEERING, SUSTAINABLE DESIGN, & CONSTRUCTION CAREER FAIR – FEBRUARY 12th, 2019

Stanford EERI Chapter helped BEAM, Stanford Career Education promote a successful career fair in the Winter quarter for the Structural Engineering and Geomechanics (SEG) and Sustainable Design and Construction (SDC) programs. A large representation of more than 30 companies in the field of structural engineering and construction attended.



STUDENT RESEARCH SEMINARS – WINTER 2019 and SPRING 2019

The EERI Stanford Student Chapter, in collaboration with the Stanford Geosciences Department, hosted a bi-weekly student research forum during lunch in the winter and spring quarters. Students had the opportunity to

present their latest research to fellow students in a non-pressure environment with constructive feedback. It also served as a platform to discuss new developments in the field and topics of common interest. In addition, the forum gave the opportunity to new students to present their undergraduate research related to earthquake engineering. Each forum featured two 15-minute presentations with 10 minutes for questions each and lunch for all attendees.

Winter Student Seminar:

| | Date | Presenter 1 | Topic 1 | Presenter 2 | Topic 2 |
|---|----------|--|--|---|--|
| 1 | 02/06/18 | Luca Capacci (Politecnico di Milano) | Seismic Resilience of Aging Bridge Networks | Sergio Reyes (Pontificia Universidad Católica de Chile) | Three-dimensional seismic isolation system for low-mass structures and equipments using simply supported devices |
| 2 | 02/16/18 | Amory Martin | Optimization of Rocking Systems for Nonlinear Earthquake Response | Pablo Heresi | Uncertainty in spatial correlation models for intensity measures |
| 3 | 03/02/18 | Stephen Porter | Development, history, use and all the advantages of Instructional Shake Table Model EE-ST-2 | | |
| 4 | 03/09/18 | Luis Ceferino | Bayesian parameter estimation for space and time interacting earthquake rupture model using historical and physics-based simulated earthquake catalogs | | |

Spring Student Seminar:

| | Date | Presenter 1 | Topic 1 | Presenter 2 | Topic 2 |
|---|----------|------------------------|--|-----------------------|--|
| 1 | 04/13/18 | Reza Rastak | Systematic design of stretchable electronics | | |
| 2 | 04/27/18 | Sabine Loos | Data fusion to rapidly estimate post-earthquake damage | Sabine Loos | Quantifying the Downtime Induced by Cordons around Damaged, Tall Buildings |
| 3 | 05/11/18 | Paul Mayencourt | Structural Optimization and Digital Fabrication of Timber Structures | Amory Martin | Comparison of Different Objectives for Dynamic Topology Optimization |
| 4 | 05/25/18 | Armando Messina | Testing and Modeling Friction for Seismic Isolation Applications | Andy Zicarelli | Simulating Ductile Crack Propagation in Steel Structures Due to Earthquake Loading |

EERI - Seismic Design Happy Hour – April 12th

The EERI Stanford Student Chapter held a happy hour to celebrate the First Place achieved by the Seismic Design Team. The happy hour provided the opportunity for students of the SEG program to know the SDC team and the winning tower, besides allowing students to inquire about the whole experience of the competition and design.



EERI - WELCOME BACK HAPPY HOUR – OCTOBER 12th

The EERI Stanford Student Chapter held a happy hour to encourage students to get engaged in activities that EERI would be holding throughout that year. We got an attendance of about 40 students and different faculty members.

SESI HIGH SCHOOL LECTURES – MAY 22st, 24th, & 29th, 2019

In May of 2019, the Earthquake Engineering Research Institute (EERI) Stanford Chapter had its third School Earthquake Safety Initiative (SESI) program at the local Sequoia High School. Over the course of three visits, Stanford graduate students taught the IB Physics class of Allison Honold about earthquake safety and current engineering research. Lectures focused on physical principles, seismology and engineering featuring demonstrations, videos and current Stanford research. The 30 students then participated in a group exercise to build a two-story wood house and retrofit it using earthquake-resistant systems. On the final day, the buildings from all six teams were tested on a shake-table simulating a wide range of earthquakes. Winners were announced at the end along with closing thoughts about civil engineering.

Participants: Rodrigo Silva, Francisco Galvis, Andres Acosta, Corinne Bowers, Andy Zicarelli, Chittayong (Jao) Surakitbanharn and Kelsie McKenna.



SEISMIC DESIGN COMPETITION TEAM

The Stanford Seismic Design team is a student organized group dedicated to promoting interest in structural and earthquake engineering on campus. They are a small team that designs, builds and tests full scale balsa wood towers. Stanford students have been participating in the annual Seismic Design Competition for the past 9 years.

The 16th annual EERI Undergraduate Seismic Design Competition took place March 5-8, 2019 in Vancouver, British Columbia, held in conjunction with the EERI Annual Meeting. Forty-four teams, both national and international, were invited to participate.



The design prompt was to design and model a new iconic structure that would be a celebrated addition to the Vancouver skyline. The design challenges included a double-height first floor and a T-shaped building footprint. The teams constructed 5-ft tall model towers out of balsa wood, seeking to produce the most efficient, seismically sound, and architecturally appealing designs. During the competition, teams gave presentations describing their towers' key structural features and integration into the Vancouver cityscape, displayed posters promoting the tower, and--the main event--tested the structures. After being loaded with about 25 lbs of dead load, the towers were put on a shake table and subjected to two simulated earthquakes of increasing intensity, prepared by the EERI SLC. Tower performance during the ground motions was judged based on peak roof acceleration and drift.

SDC Team Members

A complete list of members is shown below.

| Name | EERI Member Number | Email | Role |
|--------------------|--------------------|--------------------------|---------|
| Nikhil Chaudhuri | 19203 | nikhilc@stanford.edu | Captain |
| Joel White | 20028 | jwhite56@stanford.edu | Captain |
| Tim Ngo | 18768 | ngotm@stanford.edu | Member |
| Paul Calderon | 20892 | pfc@stanford.edu | Member |
| Junha Hwang | NA | junha@stanford.edu | Member |
| Jeffrey Valdespino | NA | jvaldespino@stanford.edu | Member |
| Emma Bowers | NA | esbowers@stanford.edu | Member |

SDC Team Financial Sponsors

A list of financial sponsors for the SDC team:

| Name | Email | Amount | Note |
|---|------------------|---------|------|
| John A. Blume Earthquake Engineering Center | ggd@stanford.edu | 5000,00 | |

Team's lessons learned



SDC Team members at the competition

The Stanford Seismic Design team continues to grow, and the processes which have been developed over the years contributed directly to this year's success. This year, team members each developed structural concepts and modeled their ideas in ETABS. This was an important step, given the unique constraints on the building footprint, which could have led to a tower susceptible to torsional effects if not properly addressed. After the initial design phase, we selected one tower design to build as a prototype, and we then tested it on the Blume Center shake table. The shake test results then informed a final round of optimization before we constructed our final tower.

At the competition, our tower survived both ground motions. In fact, our tower performed so well that it received the Best Seismic Performance Award from the judges. This performance, combined with the other aspects of our presentation, led to our team winning first place in the competition for the first time!

ELECTION & ELECTION RESULTS

An election for officers for the 2019-2020 academic year was held in June 2019. The table below shows the new officers appointed to the Chapter board who will take office in July 2019.

| Role | Name | EERI Member Number | Email | Student Status |
|---------------------------------|--------------------|---------------------------|-----------------------|-----------------------|
| President | Corinne Bowers | NA | cbowers@stanford.edu | Graduate student |
| Vice-President | Armando Messina | NA | messina3@stanford.edu | Graduate student |
| Treasurer | Joanna Jiaqi Zou | NA | zouj@stanford.edu | Graduate student |
| SDC graduate mentor | Andy Ziccarelli | NA | aziccare@stanford.edu | Graduate student |
| SLC Representative | Yijie Gao | NA | yijiegao@stanford.edu | Graduate Student |
| Geophysics Group Representative | Jackson MacFarlane | NA | jmacfarl@stanford.edu | Graduate student |

ACKNOWLEDGMENTS

The EERI Stanford Student Chapter would like to thank its advisers Prof. Gregory Deierlein and John Oстераas, the John A. Blume Earthquake Engineering Center, Exponent, and its undergraduate and graduate members for their support and dedication to the chapter. Also, the Chapter would like to specially thank Racquel Hagen for her help coordinating events throughout the year and Kyle Douglas for helping with the shake table tests for the Seismic Design Competition.