Jack Sheehan

jts11@rice.edu | (650) 483-8531 | 1601 Rice Blvd Houston, TX 77005

EDUCATION

Rice University, Houston, TX — May 2022

Bachelor of Science: **Earth, Environmental, & Planetary Sciences, conc. Geophysics**

Honors Thesis: "Machine Learning Detection of P-Waves in Laboratory Acoustic Emission Events"

Bachelor of Arts: **German Studies**

Cum. GPA: 3.23/4.00

RELEVANT COURSEWORK AND SKILLS

Courses

- **General:** Dynamic Mathematical Modeling, Engineering Computation, Differential Equations, Multivariable Calculus
- **Major:** Computation in Planetary Science; Physics: Mechanics, Physics: Waves & Heat, Seismology, Planetary Chemistry, Geology, Earth Systems and Cycles

Skills

- **Programming:** Unix/Linux-based operating systems, Python, MATLAB, PRo3D, SAC, SOLIDWORKS, HTML
- **Competencies:** computational seismology, n-body simulation, orbital dynamics, deep-learning network architecture, GNSS displacement modeling
- **Certifications:** Goethe C1 German Language Certificate, IRIS Seismology Skill Building Workshop, GAGE/SAGE Noisy Data Short Course, SDSM&T Geologic Field Camp

RESEARCH EXPERIENCE

Incorporated Research Institute for Seismology (IRIS) Intern — April 2021 – Present

Dr. Zhigang Peng at the Georgia Tech Geophysics Lab

- Apply deep-learning filter techniques to detect Acoustic Emission (AE) Events in simulated deep-focus earthquake, create event-trigger and continuous metadata to fit model requirements
- Utilize deep-learning package EQTransformer (EQT, Mousavi et al., 2020) to detect and pick P-waves in microseismic data by removing S-wave component
- Analyze EQT's performance on event-trigger and continuous data using signal-to-noise ratios, event probabilities, and human analyst comparisons
- Continuing Honors Thesis:
    - Create catalog of events and design fracture audiovisual model for display in FRES Collaboration 2022 Product
    - Train new EQT model using laboratory picks to enhance generic AE P-wave detection and picking AI for future projects

Southern California Earthquake Center (SCEC) SOURCES Intern — June 2021 – September 2021

Dr. Valerie Sahakian at the University of Oregon Earthquake Hazards Lab

- Evaluated station biases for Peak Ground Displacement (PGD) Ground Motion Modeling (GMM)
- Compared PGD results to saturated strong-motion accelerometer models using residuals as calculated by Ruhl et al., 2018 and variance with time as calculated by Crowell et al., 2013.

- Tested potential model biases, including crustal effects, earthquake mechanisms, and hypocenter location estimations
- Proposed potential application of PGD GMM in earthquake hazard products like ShakeAlert

Course Literature Review October 2020 – December 2020

Analysis of Research *Onset of 'Hudson Strait' Heinrich events in the eastern North Atlantic at the end of the middle Pleistocene transition* (Hodell, et al., 2008)

- Investigated HEs in thermohaline circulation and discussed implications of the researcher's use of Cibicidoides wuellerstorfi for IRMS
- In order to better understand the research: visited the IODP Gulf Coast Repository to learn about cores, visited Dr. Cin-Ty Lee's lab to observe a spectrometer

Student Researcher August 2020 – May 2021

Dr. Mark Torres at the Rice University Biogeochemistry Lab

- Identified knickpoints in Icelandic river basins using MATLAB Topotoolbox and drone elevation data to predict bedrock erosion and deposition
- Used MATLAB GIS to create digital elevation plots of current and past environments to evaluate rock/water interaction and knickpoint propagation

---

PRESENTATIONS

Posters

- **Sheehan J.**, Zhai Q., Chuang Y., Peng Z., Officer T., Wang Y. "Machine Learning Detection of P-Waves in Laboratory Acoustic Emission Events to Understand the Mechanics of Deep-Focus Earthquakes." Accepted for upcoming presentation at: AGU Fall Meeting 2021.
- **Sheehan J.**, Sahakian V.J. "Evaluating Source and Site Effects in Peak Ground Displacement Models for Earthquake Magnitude Calculation." Presented at: 2021 Southern California Earthquake Center Annual Meeting.
- **Sheehan, J.** "Using Machine Learning to Automatically Detect P-Waves." Presented at: Rice Natural Sciences Research Fair 2021.

Oral

- Zhai Q., **Sheehan J.** "Preliminary Results of Systematic Detections of Intermediate-Depth Earthquakes." Presented at: Frontier Research in Earth Sciences Annual Workshop 2021.

LEADERSHIP AND VOLUNTEER INVOLVEMENTS

Rice Students for the Exploration and Development of Space (SEDS) Officer August 2019 – Present

Rice Lunabotics Committee for NASA's 2022 Robotics Mining Competition

- Outreach Officer: represent Rice SEDS recruit companies for networking events and Owls in Space Symposium; contribute to over $20,000 in funds raised for CubeSat and Rover projects
- Lunabotics Designer: lead development of rover's code to automatically identify minerals and potential mining sites in contest; work with engineering team to design rover's camera and shovel

IMPACT Rice Coordinator, Staffer, Participant January 2019 – May 2021

Student Activities Center, Rice University, Houston, TX

- Lead 50+ leadership retreat, researched and booked campsite, selected staff and participants from 150+ applicants
- Facilitated weekly staff meetings, designed workshop events including resume-building, career goals, and leadership identity

Owl Edge Extern January 2021

Franklin Bay, Blackbrush Oil & Gas, LP

- Shadowed contract geologist evaluating potential drill site acquisitions in the North Louisiana Salt Basin
- Observed GIS mapping technology involved in seismic interpretation, exploitation, and development

Tour Guide Department Chair, Recruitment Liaison February 2019 – May 2020

Rice University Admissions Office, Student Admissions Council Executive Board, Houston, TX

- Revamped and oversaw tour guide hiring and training; introduced continuing review, mentorship program
- Scheduled 70+ tour guides for weekly tours and planned student panels and club expos for large admissions events

---

HONORS

Houston Geological Society Undergraduate Scholarship: Nominated by Rice DEEPS. Currently applying
Honors Research Thesis: Accepted to the honors program by Rice DEEPS and the honors thesis committee
Honorable Mention for Student Elevator Pitch: Houston Geological Society Student Expo 2020
Rice Leipzig Fellowship: Awarded funding for 3-month research project at the Universität Leipzig

---

REFERENCES

Dr. Zhigang Peng, Professor**,** Department of Earth and Atmospheric Sciences at Georgia Tech

- Relationship: IRIS internship mentor, primary Honors Thesis mentor
- Contact: (404) 894-0231, zpeng@gatech.edu

Dr. Adrian Lenardic, Professor**,** Department of Earth, Environmental, and Planetary Sciences at Rice University

- Relationship: Honors Thesis co-mentor
- Contact: (713) 348-4883, ajns@rice.edu

Caity Hoover, Assistant Director, Student Activities Center at Rice University

- Relationship: Staff liaison for Impact Rice retreat
- Contact: (713) 348-3064, ch65@rice.edu