

Alexander Kelly

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Education

The University of Texas at Austin

May 2024

Bachelor of Science in Geological Sciences (Option III: Hydrogeology)

Certificates in the Elements of Computing and Computational Science & Engineering

Minor in the Foundations of Business

Overall GPA: 3.65/4.0

Honors & Awards

2023 Awards

Carroll C. Miller Endowed Presidential Scholarship

Kent Bob & Suzie Hydrogeology Field Endowment

Groundwater Field Methods Award

2022 Awards

Joseph S. Cullinan Memorial Scholarship in Geological Sciences

Udden Memorial Scholarship Fund

Research Experience

The University of Texas, Hildebrand Department of Petroleum and Geosystems Engineering

Summer Undergraduate Research Intern

June – August 2024

Advisor: Dr. Maša Prodanović

- Incorporated the Fast Fourier Transform (FFT) into a machine learning framework to enhance accuracy of rock property estimations for 3D pore-scale rock samples
- Improved model performance by increasing accuracy and reducing computational error, allowing for better digital image restoration and subsurface representation
- Designed and created an open-source model, hosted on the Digital Rocks Portal, utilizing the Texas Advanced Computing Center (TACC) supercomputer system
- Created poster to present findings at the conclusion of the research program under the supervision of Dr. Maša Prodanović, demonstrating advancements in machine learning and subsurface analysis

The University of Texas, Department of Earth and Planetary Science

Undergraduate Researcher

May – December 2023

Advisors: Dr. M. Bayani Cardenas, Dr. Daniella Rempe

- Gathered field data from a barrier island along the Yucatan Peninsula, allowing for the comparison between the anticipated and the actual subsurface freshwater/saltwater interface
- Computed tidal effects on groundwater assessing the vulnerability and accessibility fresh groundwater
- Constructed a detailed map of the field site using ArcGIS to enhance understanding of the island's features
- Presented at American Geophysical Union (AGU) 2023 Meeting, San Francisco, CA

Presentations

Summer Undergraduate Research Poster Session, Austin, TX, August 2024. Kelly, A; Cheng, B; Prodanović, P. “Incorporating the Fast Fourier Transform into a Deep Learning Algorithm” (poster)

Longhorn Research Poster Session, Austin, TX, April 2024. Kelly, A; Nguyen, A; Sananda, J; Nguyen, W; Cardenas, B; Rempe, D. “Physical Hydrogeology of a Barrier Island in the Yucatan Peninsula” (poster)

The Jackson School of Geosciences Symposium, Austin, TX, February 2024. Kelly, A; Nguyen, A; Sananda, J; Nguyen, W; Cardenas, B; Rempe, D. “Physical Hydrogeology of a Barrier Island in the Yucatan Peninsula” (poster)

American Geophysical Union (AGU) 2023 Meeting, San Francisco, CA, December 2023. Kelly, A; Nguyen, A; Sananda, J; Nguyen, W; Cardenas, B; Rempe, D. “Physical and Chemical Hydrogeology of a Barrier Island in the Yucatan Peninsula” (poster)

Work Experience

Groundwater Modeler INTERA Inc. September 2024 – Present

- Compile, synthesize, and analyze data to develop conceptual site and numerical models for groundwater flow and transport projects
- Perform numerical flow and transport modeling of subsurface systems under the direction of senior staff
- Create inputs and post-process results from groundwater models, evaluating for accuracy and reliability
- Support in the preparation of technical reports and presentations for clients, regulators, and stakeholders

Undergraduate Research Assistant The University of Texas at Austin January 2024 – June 2024

- Collected bi-weekly field measurements including e-line, neutron probe, and soil gas measurement collection to develop understanding of the vadose zone on the White Ranch property
- Maintained and contributed to database of critical zone research data to ensure accuracy and prepare data
- Aided in procurement of materials and coordination of installation of VMS apparatus for monitoring critical zone gas readings

Project Management Intern Davenport Builders September 2022 – June 2024

- Integrated Excel and third-party software programs to enhance communication and efficiency
- Coordinated movement of materials, personnel, and equipment to 22 job sites to ensure project success
- Worked with clients to build cost-benefit models to ensure maximum return on investment for projects
- Developed tools in Microsoft Excel, Google Sheets, and PlanSwift to decrease project bid time by 60%
- Created a pricing database accounting for material and labor costs to increase the efficiency and accuracy of project estimates

Earth Science Learning Assistant The University of Texas at Austin January 2023 – May 2023

- Communicated various aspects of geoscience and sustainability, including feedback loops and hydrogeology to a group of 59 students from a variety of technical and non-technical unrelated to geoscience backgrounds
- Evaluated students understanding of the material through a variety of metrics, including clarity, correctness, and thoughtfulness

Academic Projects

Geophysical Survey of Edwards Aquifer Authority Field Research Park, Bexar County, TX Final Paper
Applied Karst Hydrogeology Student August – December 2023
Professor: Dr. Marcus Gary

- Water resource management in Central Texas is crucial due to population growth and recurring droughts. Groundwater recharge, especially in karst systems like the Edwards aquifer, is pivotal for evaluating water sustainability. The Edwards Aquifer Authority's Field Research Park aims to quantify infiltration and recharge rates, with data collected by University of Texas students indicating variable conductivity and moisture levels, informing future land management practices to mitigate runoff and enhance recharge effectiveness.

Application of Geostatistical Methods in Estimating Precipitation Final Paper
Physical Hydrology Student August – December 2023
Professor: Dr. Ashley Matheny

- Explored polygonal declustering and radial basis function techniques for estimating precipitation values from sparse, randomly distributed in-situ measurements, addressing the challenge of accurately modeling precipitation due to its complex spatial and temporal scales. Through analysis of randomly generated data, it reveals insights into the strengths and limitations of each method, underscoring the importance of method selection and scale based on dataset characteristics.

Affects Different Single-Porosity Models on Solute Flow Final Paper
Vadose Zone Hydrology Student January – May 2023
Professor: Dr. Daniella Rempe

- This paper evaluates three commonly used models—Brooks-Corey, Kosugi, and van Genuchten-Mualem—for simulating solute flow in the vadose zone. While all models share fundamental principles, they differ in assumptions regarding pore size distribution and soil water content versus soil suction relationship. Through solute transport simulations and comparison with experimental data, the study highlights the significant impact of model choice on prediction accuracy.

Leadership Experience

KBH Energy Center Student Advisory Council Member 2022 – May 2024

- Represent the KBH Energy Center as an ambassador, embodying its values and mission regarding the importance of the energy sector
- Engaged in KBH Energy Center events, treks, and conferences, fostering networking and learning opportunities

Jackson Scholars Member, Peer Mentor 2022 – May 2024

- Engaged in geoscience-related scholarship, outreach, and service activities to enhance learning beyond traditional academic settings
- Developed skills related to leadership, professionalism, and community service skills through active participation in the program
- Participated in leadership initiatives, study abroad programs, and research projects as part of the program's curriculum

- Served as a peer mentor, assisting underclassmen in navigating academic and professional opportunities to fulfill their requirements
- Demonstrated commitment to supporting academic and professional growth through mentorship

Energy AI Hackathon Team Captain January 2024

- Led a five-person team to develop a machine learning model to solve a petroleum engineering data science problem
- Performed data analysis on a sparsely populated data set and performed feature elimination to prioritize important factors

American Academy of Environmental Engineers and Scientists Vice-President 2022 – January 2024

- Coordinated activities and presentations with companies and researchers dedicated to environmental concerns
- Aid in organizing and managing a community with over 50 students

Geoscience Ambassadors Ambassador 2023 – January 2024

- Empowered geoscience students to share personal journeys and experiences to inspire others to pursue paths in geoscience
- Engaged in reflection and storytelling to communicate the importance and relevance of geosciences to diverse audiences
- Actively participated in brainstorming sessions to develop innovative outreach ideas aimed at effectively communicating geoscience goals and activities
- Contributed to initiatives aimed at increasing awareness and accessibility of geoscience disciplines among individuals and communities lacking exposure to the field
- Demonstrated commitment to promoting diversity and inclusivity within the geoscience community through active involvement in outreach activities

Professional Affiliations

Member, American Geophysical Union (AGU)

Technical Skills

Computational Skills: Python, SQL, Java, MATLAB, PHREEQC, Hydrus-2D, Data Analytics, Microsoft Office Suite, Google Suite, ArcGIS Pro, QGIS, TensorFlow, PyTorch, Git/GitHub, Pandas, Unix

Field Skills: Transducer data collection, Critical Zone Gas Sampling (Quantek), Critical Zone Gas Flux Sampling (PP Systems), Neutron Probe, Chemical Sampling

Certifications

Google Data Analytics (In-progress)
Foundations of Project Management (2021)
Network Dynamics of Social Behavior (2021)
Renewable Energy and Green Building Entrepreneurship (2021)

Seismic Tomography (2021)
Microsoft Office Suite (2016)

References

Dr. M. Bayani Cardenas | cardenas@jsg.utexas.edu

Professor, Department of Earth and Planetary Sciences, Jackson School of Geosciences

Relationship: Professor, (Former) Research Advisor

Dr. Daniella M. Rempe | rempe@jsg.utexas.edu

Associate Professor, Department of Earth and Planetary Sciences, Jackson School of Geosciences

Relationship: Professor, (Former) Research Advisor

Dr. Maša Prodanović | masha@utexas.edu

Professor and Associate Department Chair, Hildebrand Department of Petroleum and Geosystems Engineering, Cockrell School of Engineering

Relationship: Professor, (Former) Research Advisor