Pavan Akula

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Appointments

12/2021	Assistant Professor, Oregon State University, OR, United States
07/2021-12/2021	Courtesy Faculty, Oregon State University, OR, United States
05/2020-12/2021	Post-Doc. Research Associate, Texas A&M University, College Station, TX, United States
01/2019-05/2019	Graduate Teaching Fellow, Texas A&M University, College Station, TX, United States
01/2016-05/2020	Research Assistant, Texas A&M University, College Station, TX, United States

Education

Ph.D. in Civil Engineering   Aug 2015 - May 2020
Texas A&M University, College Station, USA
Dissertation: "Thermodynamic Approach to Computational Modeling of Chemically Stabilized Soils"
Committee members: **Dallas N. Little (chair)**, James K. Mitchell, Paul Schwab, Robert Lytton, Anand Puppala, Charles Aubney

M.Sc. in Civil Engineering (Geotechnical Engineering)   Aug 2011 - Dec 2012
National University of Singapore, Singapore

B.Tech in Civil Engineering   Aug 2007 - May 2011
Pondicherry University, Pondicherry, India

Research Experience

Texas Engineering Experiment Station (TEES), Texas A&M University
Postdoctoral Research Associate   Jun 2020 - Present
- Project 1: Rapid chemical stabilization of expansive soils
  - Develop a novel chemical stabilizer for rapid stabilization of expansive clays
  - Investigate the stabilization methodology using mineralogical characterization and geochemical modeling
  - Determine the engineering and mechanical properties of the stabilized soil using conventional tests

- Project 2: Sustainable cementitious materials for non-structural applications
  - Investigate and develop sustainable cementitious materials for non-structural applications
  - Model the hydration reaction using geochemical modeling
  - Develop multi-scale models for predicting the performance of the material

- Project 3: Develop a hybrid data-driven and geochemical model to predict sulfate attack reliably
  - Evaluated data-efficient machine learning methods to predict ettringite formation in stabilized soils
  - Improved the accuracy in predicting ettringite by developing a geochemical model that utilized the predictions of the machine learning model

Zachry Department of Civil Engineering, Texas A&M University

Research Assistant   Jan 2016 - May 2020

- Project 1: Geochemical evaluation of smectite treated with an ionic stabilizer
  - Two geochemical equilibrium models (Visual MINTEQ and Geochemist's Workbench) based on Gibb's free energy minimization were used to model the interaction of an ionic stabilizer with smectite-rich soil.
  - The models simulated the release of Al^{3+} ions from the octahedral layer of smectite and molecular structural changes by dissolution.
  - The results were validated by relative humidity controlled XRD, and one dimensional swell test.

- Project 2: Optimizing calcium sulfoaluminate (CSA) cement for 3D printing
  - Optimized the properties of CSA cement for 3D printing using sustainable mineral admixtures
  - Characterized the mixture using analytical methods
  - Evaluated the durability of the mixture using geochemical modeling

- Project 3: Evaluate the durability of lime-treated slopes in hydraulic structures
  - Lime treated samples from Rouen canal (France) and Friant-Kern Canal (USA) were collected for the study
  - Durability was evaluated by studying the mineralogical, physical, and geochemical changes using X-Ray diffraction (XRD), X-Ray fluorescence (XRF), thermogravimetric analysis (TGA), pH, turbidity, particle size, unconfined compressive strength test, and Erosion-Function-Apparatus
  - Thermodynamic model was developed to evaluate the stability of hydration products at lime treated sections

Teaching Experience

Instructor, Texas A&M University   Jan 2019 - May 2019

- CVEN 302 - Computer applications in Engineering and Construction

Teaching Assistant, Texas A&M University   Jan 2017 - Dec 2018

- CVEN 306 - Materials Engineering for Civil Engineers

Professional Experience

AECOM, Geotechnical engineer   Jan 2013 - Jul 2015

- Designed the launch shaft (earth retaining structure) for the tunnel boring machine (TBM) using finite element models (Plaxis 2D, Plaxis 3D)
- Evaluated the stability of slopes and water drawdown potential for deep excavations using SLOPE/W and SEEP/W, respectively
- Investigated the effect of tunneling on nearby shallow and deep foundation using Plaxis
- Managed and reviewed geotechnical instrumentation data from piezometers, inclinometers, and settlement markers to ensure that the data were within the design safety limits
- Mentored interns and staff engineers

Publications (Peer reviewed)

- **Pavan Akula**, Dallas N. Little.*"Mineralogical Characterization and Thermodynamic Modeling of Synthesized Ettringite from Ca-Al-SO$_4$ Suspensions"*. Journal of Construction and Building Materials. 2021.
- **Pavan Akula**, Narain Hariharan, Dallas N. Little. *"Evaluating the Long-Term Durability of Lime Treatment in the Friant-Kern Canal: A Case Study"*. Transportation Research Record: Journal of the Transportation Research Board. 2020.
- **Pavan Akula**, Dallas N. Little.*" Methods to Detect Calcium Silicate Hydrates in lime stabilized soils"*. MethodsX. 2020.
- **Pavan Akula**, Dallas N. Little, Paul Schwab. *"Thermodynamic Evaluation of Smectite Treated with Hydrogen Ion Stabilizer"*. ASCE: Journal of Materials in Civil Engineering. 2020.

- **Pavan Akula**, Dallas N. Little. *"Thermodynamic Approach to Evaluate Ettringite Formation in a Fluidized Bed Ash by-product Stabilized Soil: A case study"*. Transportation Geotechnics. 2020.
- **Pavan Akula**, Dallas N. Little, *"Thermodynamic Stability of Smectite Treated with Chemical Stabilizer"*. Advances in Material and Pavement Performance Predication. Doha, Qatar. 2018.
- **Pavan Akula**, Thiruvengadam Tamilmani, *"Numerical Analysis on the Effect of Jet Grout Piles on an Excavation Located in an Urban Area"*. International Conference and Journal of GEOMATE, Brisbane, Australia. 2015.
- **Pavan Akula**, Dallas N. Little. *" Evaluating Complementary Benefits of Machine Learning and Geochemical Modeling for Predicting Ettringite"*. (Under review).
- Umme Zakaira, **Pavan Akula**, Bjorn Birgisson. *"Towards Sustainable 3D Printing of Infrastructure Materials with Calcium-Sulfo-Aluminate Cement"*. (In preparation).

Posters

- **Pavan Akula**. *"Developing Resilient Stabilized Soil Materials using Geochemistry"*. Transportation Research Board". Transportation Research Board. 2022.
- **Pavan Akula**. *"Evaluating the Durability of Lime Stabilized Soil Mixtures: An Engineering, Mineralogical and Geochemical Approach"*. Transportation Research Board. 2021.
- **Pavan Akula**, Dallas N. Little. *"Thermodynamic Approach to Computational Modeling of Building Materials"*. TxDO T Workshop, College Station, Texas, USA. 2018.
- **Pavan Akula**. *"Use of Geochemical Modeling in Chemical Soil Stabilization"*. International PhD symposium, Urbana-Champaign, USA. 2017.

Presentations

- "Developing Resilience Infrastructure Materials using Computational Geochemistry". USACE Innovation Summit. 2021.
- "Development and Experimental Evaluation of a Novel Rapid-Strength Stabilizer for Expansive Clays". The International Airfield & Highway Pavements Conference (Pavements). 2021.
- "Application of Geochemistry and Mineralogy in Chemical Soil Stabilization", Transportation Research Board. 2021. (Webinar).
- "Evaluating Complementary Benefits of Machine Learning and Geochemical Modeling for Predicting Ettringite Formation in Chemically Stabilized Soils". Transportation Research Board. 2021.
- "Towards Resilient Infrastructure Materials: A Geochemical Approach". Materials Research Society Fall meeting. 2020.
- "Towards Resilient Infrastructure Materials: A Geochemical Approach". New Jersey Institute of Technology. 2020. (Invited talk).
- "Evaluating the Long-Term Durability of Lime Treatment in the Friant-Kern Canal: A Case Study". Transportation Research Board. 2020.
- "Thermodynamic Modeling of Civil Engineering Materials". Indian Institute of Technology-Madras. 2020. (Invited talk).
- "Geotechnical Instrumentation in Tunneling". ASCE: Geo-Institute. Texas A&M University. 2017.

Grants

- U.S. Army Corps of Engineers, Engineer Research and Development Center   2020-2023
  "Geochemical modeling of stabilized soil and aggregate systems"
  $300,000 for 3 years. (Shadow Wrote)
- Consortium for Education and Research in Geoengineering Practice   2020
  "Stabilizing high sulfate soils"
  $20,000 for 5 months. (Shadow Wrote)

Research Mentoring

- Saureen Naik, M.S. Student (M.S. project), Texas A&M University — 2019-Present
- Umme Zakaira, Ph.D. Student (Junior Ph.D. student), Texas A&M University — 2019-Present
- Leela Sushitha, M.S. Student (Independent study project), Texas A&M University — 2019

Honors and Awards

- Outstanding reviewer, ASCE: Journal of Materials in Civil Engineering — 2021
- Travel award, Zachry Department of Civil Engineering, Texas A&M University — 2020
- Zachry Department of Civil Engineering Excellence Fellowship, Texas A&M University — 2019
- Graduate Teaching Fellowship, Texas A&M University — 2019
- Associate Fellow, Academy of Future Faculty, Texas A&M University — 2017

Reviewer

- ASCE: Journal of Geotechnical and Geoenvironmental Engineering
- ASCE: Journal of Materials in Civil Engineering
- Journal of Transportation Geotechnics
- Transportation Research Board
- Journal of Powder Technology

Services

- Committee communication coordinator, Transportation Research Board, Stabilization of Geomaterials and Recycled Materials - AKG90 — Jan 2021-Present
- Committee member, Transportation Research Board, Stabilization of Geomaterials and Recycled Materials - AKG90 — Mar 2020 - Dec 2020
- President, Civil Materials Student Organization (CMSO) — Jul 2018 - Jul 2019