Kevin Charles Kuei

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Objective / Specialist Skills

Objective: Staff/Intermediate Geotechnical Engineer Position

- Site characterization, field investigation and laboratory testing, analysis and design, CAD, geostatistical analysis, characterization of soil uncertainty effects, random field / stochastic simulations
- Numerical modelling, liquefaction potential assessment, site-response analysis, non-linear / stress-deformation analysis, limit equilibrium slope stability analysis, soil-structure interaction analysis, seismic hazard analysis
- Machine learning, response surface development, automation of analyses workflow, data extraction and reduction

Programming:	Python, C#, Matlab, R, JavaScript, CSS, HTML, SQL; Jupyter, numpy, pandas, scipy, sklearn; git
Geotechnical:	FLAC, PFC, Plaxis, DeepSoil, OpenQuake, SLIDE, GeoStudios, Settle3D, Leapfrog, AutoCAD, CLiq, Grapher, Surfer
Interests:	Computer Science, Climate Resiliency, Machine Learning, Seismic Hazard Analysis

Education

University of California, Davis

Mar 2020	Ph.D.	in Civil and Environmental Engineering {Geotechnical Eng., Minor: Structural Eng.}
Mar 2015	M.S.	in Civil and Environmental Engineering
Jun 2013	B.S.	in Civil Engineering

Professional Certification

Dec 2021	Professional Engineer, California (#Application Pending, Exam Passed)
Sep 2020	Engineer in Training, British Columbia (#223823)
Apr 2012	Engineer in Training, California (#145688)

Project Experience

Geotechnical Engineer, Golder Associates / WSP — Mar 2020 – Present

Tintaya Tailings Storage Facility Liquefaction Assessment Study, Peru (2021)

- Evaluate liquefaction susceptibility with Bray and Sancio (2009). Perform liquefaction potential assessment using simplified procedures and code-based amplification (ASCE 7-16).
- Evaluate pseudo-static stability to identify seismic yield coefficients and map critical hazard levels. Spectrally match hazard compatible earthquake time-series from NGA-Sub database with REQPy for Newmark block analysis, and comparison with empirical procedures.

Fraser Basin Council Seismic Vulnerability Assessment of High-Consequence Dikes in Lower Mainland, British Columbia (2020—2021)

- Support project team efforts to develop simulation dataset and response surface/model to perform first quantitative regional seismic assessment of high-consequence dikes in Lower Mainland, BC.
- Perform OpenQuake simulations with NRCAN 5th Generation Seismic Hazard model to develop spatial intensity measure maps for different hazard levels.
- Perform stress-deformation analyses with Python-PLAXIS 2D API. Modify code repository for improved performance. Perform data reduction, and database compilation for mapping input layers to response model output.
- Conduct literature reviews and data analyses in support of feature engineering efforts for selection / screening of key response surface input parameters.
- Develop ANN response surface model using supervised machine learning techniques with Python Scikit-Learn library. Create project pipeline, perform model evaluation, and hyperparameter tuning.
- Develop and implement an alternative gradient response model in collaboration with Redmond, WA office.
- Modified Python-PLAXIS scripts for arbitrary geometries and zone definition to emulate FLAC-functionality.

BHP / Jansen Project Westshore Terminal (2020—2021)

- In support of senior staff, perform geotechnical engineering analyses and assessment in support of SME review for geotechnical risks for proposed Westshore Terminal.
- Calibrate constituitive models, run FLAC NDA simulations, and conduct parametric analyses. Organize project files, and post-process results. Prepare client updates/presentations, report writing, and documentation as needed.
- Perform site characterization, and data review for developing cross-sections. Conduct geostatistical analysis to develop estimates of vertical/horizontal spatial correlation and variance in material properties. Develop independent 2D site-response FLAC models considering soil uncertainty effects using different interpretation techniques

including borehole interpolated, characteristic/homogenous, and random field-based models. Develop Python-R wrapper to perform 2D/3D conditional/unconditional simulations for integration with FLAC.
- Took initiative to explore AWS/Azure cloud compute options for running multiple FLAC models under time-constraints.

Esquimalt North Landing Wharf Expansion Proposal (2021)
- Support senior staff proposal efforts. Compile, review, and assign data quality indices to historic SI data. Identify data gaps. Assemble available data in Leapfrog model and estimate overburden sediment thicknesses from seabed and hard reflector contours for costing.

Golder Advanced Soil and Rock Laboratory (2021)
- Manage and document issues with large cyclic triaxial device, and communicate and troubleshoot issues with mfg.
- Support senior lab technicians with critical state line testing. Assist with rock specimen preparation and testing. Perform consolidation, direct shear, and triaxial tests. Perform triaxial, UCS, BTS, and PLT testing.

EGBC Guidelines (2020-2021)
- Assist senior staff with generating and preparing materials for EGBC seismic site-response analyses and seismic design of dike guidelines.
- Perform geostatistical analysis using Hunter et al. (1999) shear-wave velocity data to illustrate different approach for generated 1D realizations per methodologies of Toro and Vanmarcke.

Tintaya Tailings Storage Facilities Trade-Off Study, Peru (2020)
- Perform data review, strength re-interpretation, and stability analysis in support of tailings remediation / trade-off study for Golder Lima Peru office.
- Conduct limit equilibrium slope stability analysis with SLIDE for existing and remediated conditions including dam expansion and rigid inclusions. Perform analysis in accordance with CDA guidelines for static, dynamic, and post-liquefied conditions. Present results parametrically to convey uncertainty in design parameters. Perform seepage analysis with GeoStudios to independently verify phreatic level.
- Compile lithographic information and borehole data in Leapfrog model in support of proposed additional site characterization.

Serpentine Sea Dam (2020)
- Perform initial borehole data review, and settlement analysis with Settle3D. Parametrically evaluate wick-drains/pre-loading options on consolidation settlements. Perform preliminary pile capacity calculations.

Hellings Tank Water Storage Shoring Design (2020)
- Perform anchor design calculations and develop construction drawings and specifications considering existing buried infrastructure and site constraints. Coordinate with electrical, mechanical, and structural engineers of record.

Bunker Building Site-Response Analysis and Methodology, Victoria (2020)
- Perform 1D site-response analysis with DeepSoil with consideration of ground motion and soil uncertainty effects.
- Develop Python module with Jupyter notebook using object-oriented approach for externally generating and calibrating DeepSoil-compatible 1D realizations with GQH/MRDF constitutive model automatically. Develop supporting AHK scripts for batch DeepSoil simulations generated with module.
- Develop code for reading SQLite output from DEEPSOIL and post-processing batch results.
- Evaluate kinematic soil-structure-interaction effects following NEHRP (2012) guidelines.
- Develop non-linear site-response functions for non-ergodic applications per Stewart et al. (2017).

Consulting Engineer, California Push Technologies Sep 2017 – Feb 2018

- Refactor and optimize code components of Instrumented Becker Penetration Test (iBPT) post-processing software using an object-oriented framework for improved readability, maintainability, and speed. Develop a new GUI wrapper with added functionality and productivity features including automated signal processing (e.g., baselining, integration, filtering), file flagging, data reduction and output file generation, and batch processing.
- Support personnel training, field mobilization, data acquisition, equipment buildout efforts for two Conetec field projects. Compile iBPT analyzer software documentation and provided general software QAQC.

Geotechnical Intern, GEI Consultants Sep 2013 – Jan 2014

- Under oversight of the project engineer, assist with planning and developing construction documents for three small to medium-sized water resource projects located in California and New Mexico, including CAD work, estimation of earthwork quantities, site visits, reviewing specifications, and soliciting estimates for pipeline appurtenances.

Graduate Student Researcher, University of California, Davis Jan 2014 – Dec 2019

DEM Numerical Modelling

- Investigate particle size distribution effects on the fabric, state-dilatancy behavior, and liquefaction resistance of granular materials using the Discrete Element Method.
- Develop single-element drivers in Itasca PFC environment for simulating drained or undrained, monotonic, and cyclic CSR-controlled tests on periodic representative volume element specimens of differing particle size distribution, with batch-scripting functionality through integrated Python console.
- Devise semi-mechanistic approach coupling numerical simulation results with state- and index-property-based empirical correlations to study practical inference in strength response-penetration index space.

iBPT and RTP Research and Fieldwork

- Support iBPT and reusable test pile (RTP) research and field-testing efforts on 13 projects in California, Washington, Colorado, and British Colombia including equipment preparation, personnel training, data collection and processing, site characterization, and report writing.
- Develop in-house computer programs for performing forward- and inverse-method wave equation analyses in conjunction with direct measurements from the iBPT and RTP systems. Devise a multistage signal matching approach to incorporate any number of iBPT/RTP measurement locations and static or dynamic measurements.
- Investigate performance, aspects of non-uniqueness, and potential improvements to procedures for estimating static pile capacity reliant on dynamic load testing and signal matching techniques based on analysis of iBPT and RTP measurements from an element- and systems-level perspective.
- For select iBPT projects, perform signal matching analysis of iBPT head measurements to facilitate estimation of equivalent N_{60} values in accordance with Sy and Campanella (1994) for liquefaction potential assessment.
- Parametrically evaluate the energy normalization performance of the iBPT under different driving conditions using forward-methods of wave equation analysis.
- Prepare a thermal correction study of the iBPT system evaluating performance of the temperature correction scheme. Propose a modified methodology based on back-analysis of field data by comparing differential changes in measured baseline forces with differential thermal corrections during driving breaks.

Selected Development

MOOC

Introduction to Computer Science [Harvard], Deep Learning Specialization [DeepLearning.AI], Stanford: Machine Learning [Stanford], Introduction to Data Science in Python [U.Mich.], Applied Machine Learning in Python [U.Mich.]

University of California, Davis

Life Cycle Assessment for Sustainable Engineering, Theoretical Geomechanics, Geotechnical Earthquake Engineering, Probabilistic Seismic Hazard Analysis, Finite Element Procedures in Applied Mechanics, Professional Practice in Geotechnical Engineering, Earth and Rockfill Dams, Advanced Foundation Design

Selected Publications

Journals

Kuei, K., DeJong, J.T., Alejandro, M. (2021) "Particle Size Distribution Effects on the Strength and Fabric evolution of Granular Media." *Canadian Geotechnical Journal.* In review.

Kuei, K., Ghafghazi, M., DeJong, J.T. (2020). "Prediction, Performance, and Uncertainty in Dynamic Pile Load Testing as Informed by Direct Measurements form an Instrumented Becker Penetration Test." *Journal of Geotechnical and Geoenvironmental Engineering,* doi: 10.1061/(ASCE)GT.1943-5606.0002290.

Kuei, K., Ghafghazi, M., DeJong, J.T. (2017a). "Pile Driving Mechanics at the Base as Informed by Direct Measurements." *Journal of Geotechnical and Geoenvironmental Engineering,* doi: 10.1061/(ASCE)GT.1943-5606.0001746.

Conference

Kuei, K., DeJong, J.T., Alejandro, M. (2020). "Particle Size Effects on the Strength and Fabric of Granular Media." *Geo-Congress 2020*, Minneapolis, MN.

Kuei, K., DeJong, J.T., Ghafghazi, M. (2018). "A Multistage Signal Matching Approach for Pile Capacity Estimation Using the Instrumented Becker Penetration Test." *International Foundations Congress and Equipment Expo*, March 5-10, Orlando, Florida.

Kuei, K., Rossiter, A., Sturm, A., DeJong, J.T., Ghafghazi, M. (2017b). "An Instrumented Becker Penetration Test for Estimation of Penetration Resistance and Prototype Pile Capacity in Gravelly Soils." *Geotechnical Frontiers 2017 Conference*, March 12-15, Orlando, Florida.

Sturm, A., Kuei, K., DeJong, J., Thurairajah, A., Olivera, R., Ghafghazi, M. (2017). "Comparison of Becker Penetration Test Interpretation Methods in Characterization of Gravelly Soil Deposits." *3rd International Conference on Performance-based Design in Earthquake Geotechnical Engineering (PBD-III)*, July 16-19, Vancouver, British Colombia.

Sturm, A., Kuei, K., Rossiter, M., DeJong, J., Thurairajah, A., Olivera, R. (2016). "Characterization of Gravelly Soils in Vancouver B.C. Using the instrumented Becker Penetration Test". *69th Canadian Geotechnical Conference (Geo Vancouver 2016),* Oct 2-16, Vancouver, British Colombia.