Bruno Jacob

Goleta, CA, USA | (805) 617-6974 | bruno@engineering.ucsb.edu | github.com/brunopjacob | US Permanent Resident

Technical Skills

PROGRAMMING LANGUAGES: Python | Fortran | Julia | SQL | MATLAB | C++ | Unix/Linux environment | R | Scala

DATA SCIENCE: NumPy | Scikit-Learn | Imaging Processing | Data Visualization (Matplotlib) | Pandas | Spark

MACHINE LEARNING: TensorFlow | Keras | NLP | Deep Learning | Random Forest | K-means | SVM | Gradient Descent | Naive Bayes | PyTorch

PARALLEL COMPUTING: MPI, OpenMP, Cilk+, OpenACC, CUDA.

LANGUAGES: English, Portuguese (native speaker)

Education

PhD in Mechanical Engineering, Emphasis in Computational Science and Engineering | University of California, Santa Barbara | Aug 2021

MSc in Mechanical Engineering | Universidade Federal de Uberlandia, Brazil | Aug 2015

BSc in Mechanical Engineering | University of Illinois at Urbana-Champaign & Universidade Federal de Uberlandia, Brazil | Aug 2014

Experience

CARPE DATA **Mar 2021 – Present**

Software Engineer

- Developed and maintained a Scala/Spark big data pipeline using the best data practices (Git, Jenkins, CI/CD).
- Analyzed large datasets to identify, parse and extract structured and unstructured data.
- Ran and modified big data pipelines using AWS S3 and ElasticMapReduce (EMS).

UNIVERSITY OF CALIFORNIA, SANTA BARBARA **Sep 2018 – Present**

Graduate Research Assistant (Advisor: Linda Petzold)

- Developed a parallel MPI C++ software to investigate the effects of stochastic dynamics in biophysical systems subject to multiple chemical reactions and fluid flows using coarse-grained physics (DPD, SPH, SDPD) with traditional and high order methods (compact finite differences, spectral methods).
- Developed computational models to investigate the effects of sodium diffusion in the brain in the onset of migraine.
- Helped in the development of supervised machine learning models (logistic regression, SVM, decision trees, and random forests) to optimize chemical reactions and accelerate the fabrication of quantum materials.

UNIVERSITY OF CALIFORNIA, SANTA BARBARA **Jan 2016 – Jun 2019**

Graduate Teaching Assistant

- Led lab sections and lectures (10 quarters) for undergraduate-level Engineering, Computer Science, Mathematics and Physics courses.
- Courses: Fluid Mechanics 2 (Winter 2016, Winter 2019), Thermosciences 3 (Spring 2016), Introduction to Programming (Fall 2016, 2017; Spring 2017, 2019, 2020), Strength of Materials (Winter 2017), Mathematics of Engineering (Spring 2018), Numerical Analysis (Fall 2018).

ARGONNE NATIONAL LABORATORY **May 2017 – Sep 2017**
Associate Researcher

- Developed software in Julia/Python that predicts power line overload, desynchronization and blackouts; performed statistical analysis on 10's of GBs of data.
- Effectively presented results to a non-scientific audience of stakeholders.

RELEVANT COURSEWORK (COURSERA/ STANFORD / UPENN)
Machine Learning Specialization | Neural Networks & Deep Learning | Natural Language Processing with Classification and Vector Spaces | Structuring Machine Learning Projects | Improving Deep Neural Networks: Hyperparameter tuning, Regularization and Optimization | Fundamentals of Quantitative Modeling.

Publications (peer-reviewed journals)

Jacob, B., Drawert, B., Li, Z., Yi, T.M. and Petzold, L., 2019. "A hybrid smoothed dissipative particle dynamics (SDPD) spatial stochastic simulation algorithm (sSSA) for advection–diffusion–reaction problems". *Journal of computational physics*, *378*, pp.1-17.

Jacob, B., Drawert, B., Li, Z., Yi, T.M. and Petzold, L., 2019. "Validation data for a hybrid smoothed dissipative particle dynamics (SDPD) spatial stochastic simulation algorithm (sSSA) method". *Data in brief*, *22*, pp.11-15.

Jacob, B., Duarte, L.E.R., Andrade, J.R. and Duarte, C.A.R., 2020. "Effects of random disturbances on the stability of a temporally evolving incompressible plane wake". *Mechanics Research Communications*, *103*, p.103475.

Jiang, R., Jacob, B., Geiger, M., Matthew, S., Rumsey, B., Singh, P., Wrede, F., Yi, T.M., Drawert, B., Hellander, A. and Petzold, L., 2021. "Epidemiological modeling in StochSS Live!". *Bioinformatics*.

Jacob, Bruno, Drawert, B. Yi, T.M, Petzold, L., 2021. "An arbitrary Lagrangian Eulerian smoothed particle hydrodynamics (ALE-SPH) method with a boundary volume fraction formulation for fluid-structure interaction". *Engineering Analysis with Boundary Elements*.

Presentations in conferences

Jacob, B., Drawert, B., Kolko, A., Petzold, L., Harrington, M., 2021. "A Computational Model Explores the Regulation of Cerebrospinal Fluid and Brain Tissue Sodium Levels During Migraine". *AHS 63rd Annual Scientific Meeting*, July 5th, 2021 (Poster presentation).

Jacob, B., Drawert, A., Yi, T.M., Petzold, L., Harrington, M., 2021. "Simulating Growth of the Yeast Mating Projection by Coupling Spatial Stochastic Biochemical Simulation with Particle-Based Fluid Dynamics". *Gordon Research Conference on Stochastic Physics in Biology*, January 6th-11th 2019 (Poster presentation).