# Richard J. Clancy

www.rjclancy.com

#### EDUCATION

**Ph.D. in Applied Mathematics** University of Colorado

M.S. in Applied Mathematics Texas State University

**B.A. in Physics** University of Colorado Aug 2017 – May 2022 (expected) Boulder, CO

 $\begin{array}{c} Aug~2015-May~2017\\ San~Marcos,~TX \end{array}$ 

Aug 2003 – May 2007 Boulder, CO

### PAPERS AND MANUSCRIPTS

- Clancy, R.J., Menickelly, M., Hückelheim, J., Hovland, P., Nalluri, P., Gjini, R., 2022. "TRO-PHY: trust region optimization using a precision hierarchy". arXiv:2202.08387. (submitted to *ICCS 2022*).
- Clancy, R.J., Becker, S., 2021. "Approximate maximum likelihood estimators for linear regression with design matrix uncertainty". arXiv preprint arXiv:2104.03307. (submitted to *IEEE Transactions on Signal Processing*).
- Clancy, R.J., Gerginov, V., Alem, O., Becker, S. and Knappe, S., 2021. "A study of scalar optically-pumped magnetometers for use in magnetoencephalography without shield-ing". *Physics in Medicine & Biology*, 66(17), p.175030.
- Becker, S. and Clancy, R.J., 2020. "Robust least squares for quantized data matrices". Signal Processing, 176, p.107711.
- Clancy, R.J., 2017. "Numerical solutions to Poisson's Equation over non-uniform discretizations with associated fast solvers". *M.S. Thesis.*

#### PRESENTATIONS

- "Assorted topics in applied mathematics", *Institute for Human Neuroscience Seminar*, Boys Town Research Hospital, Dec 2021, Omaha, NE.
- "TROPHY: A variable precision trust region method", *SASSY Seminar*, Argonne National Laboratory, Jul 2021, Lemont, IL (remote).
- "Design matrix uncertainty: robust optimization and approximate MLE approaches" *SIAM Conference in Optimization*, Jul 2021, Spokane, WA (remote).
- "Approximate maximum likelihood estimators for regression with design matrix uncertainty" *SIAM FRAMSC*, Mar 2021, Denver, CO (remote).
- "Optimal convergence of the Shortley-Weller Formula for Poisson's Equation over an interior non-uniform grid". *Differential Equation and Applied Math Seminar*, May 2017, Texas State University, San Marcos, TX.

#### **Research** Assistant

University of Colorado

Aug 2017 – Present Boulder, CO

- Numerical Optimization: Designed an interpolation based trust region algorithm for numerical optimization that employs function and derivative information to accelerate convergence.
- **Robust Optimization**: Formulated and solved min/max optimization problems ensuring solutions to least squares problem were robust to noise.
- Maximum Likelihood Estimation for Regression: Devised an approximation method using probability theory and complex analysis to solve otherwise intractable linear regression problems when the data in design matrix is uncertain.
- Inverse Problems and Signal Processing: Developed algorithms to solve inverse problems for localizing regions of brain activity. Wrote software to extract signals of interest using Fourier transforms, independent component analysis, principal component analysis, etc.
- **Teaching**: Linear Algebra, Differential Equations, Markov Processes, Multivariate Calculus.

#### **Research** Intern

Los Alamos National Laboratory

• High Performance Computing: Investigated likelihood of (and remedial actions for) catastrophic rounding error in scientific computing pipelines. Discovered that 20% of computations in a partial differential equation simulation were ignored due to limited dynamic range of floating point arithmetic when using single precision.

#### Givens Research Associate

Argonne National Laboratory

• **Optimization for Big Data**: Implemented and analyzed trust region algorithm that used different floating precision levels to reduce computational load.

• Numerical Linear Algebra: Employed limited memory linear algebra routines allowing for the solution of massive climate modeling problems with millions of variables.

#### **Research Intern**

FieldLine. Inc

- Physics Based Modeling: Wrote code to model physical phenomena used in the solution of inverse problems for border security applications.
- **Simulations**: Simulated different sensor array geometries to determine optimal configurations for counter-tunneling applications eliminating need for costly physical experiments.

#### **Research Intern**

Sensory, Inc

- **Computer Vision**: Investigated methods for estimating facial pose angle and absolute distance from camera for facial authentication and user engagement.
- Data Visualization: Wrote software to parse, analyze, and visualize large messy data sets.

May 2021 – Jul 2021

Lemont, IL (remote)

May 2020 – Aug 2020 Boulder, CO

May 2019 – Aug 2019

Boulder, CO

Jul 2021 – Sep 2021 Los Alamos, NM (remote)

#### Research/Teaching Assistant

Texas State University

- **Numerical Partial Differential Equations and Fast Solvers**: Studied numerical methods for solving partial differential equations with a focus on error analysis. Developed and implemented multi-grid solvers.
- **Teaching**: Calculus and Developmental Mathematics.

# Quantitative Analyst / Natural Gas Options TraderJul 2007 - Sep 2014AAA Capital Management Advisors, LTDHouston/Austin, TX

- **Research and Trading**: Conducted fundamental and quantitative research at energy focused commodity trading advisor. Managed \$25 million option portfolio.
- **Software**: Assisted in the development of a proprietary risk-management system that evaluated derivative option risks in real-time.
- **Monte Carlo Simulations**: Built economic models and ran Monte Carlo simulations to stress test option exposure.

# Computational Skills

- Programming languages: Python, MATLAB, C++, Visual Basic for Applications, R.
- Libraries:: NumPy, SciPy, Pandas, JAX, Scikit-learn, and Matplotlib, OpenCV.
- Other technologies: Linux/Unix Command Line, Parallel Computing, Git, SQL, Microsoft Office.
- **Relevant courses**: Machine learning, Numerical linear algebra, Numerical analysis/methods, Algorithms, Convex optimization, Mathematical statistics, Regression analysis, Scientific computing.

## SERVICE

- President: SIAM Graduate Student Chapter at CU-Boulder, May 2020 Aug 2021.
- Organizer: SIAM Front Range Student Conference, Mar 2021.
- Reviewer: ICML 2021, NeurIPS 2021, ICLR 2022.
- Mentor: First year Graduate School Mentorship Program, CU-Boulder, Aug 2018 Present.
- Volunteer Teacher: Summer STEM Camp for Machine Learning, Jul 2018 and Jul 2019