Arvind S. Rao, PhD

Contact Information

Mainz, Germany
{first name} at {last name}.im

Citizenship: *United States of America*
Deutschkenntnisse: Goethe Niveau B1
Website: **www.rao.im**

Education

The University of Iowa, Iowa City, IA — May 2010
Ph.D. in Mathematics
Dissertation: "Weak solutions to a Monge-Ampère type equation on Kähler surfaces"
Research Area: Geometric Analysis, Differential Geometry

Georgia Institute of Technology, Atlanta, GA — May 2002
B.S. in Electrical Engineering

Projects

I actively develop myself professionally through project based learning and even online courses. Most of my coding side projects are publicly viewable on GitHub. In April 2021 I enrolled in the Udacity Sensor Fusion Engineer Nanodegree. The Lidar portion of the course culminates in a coding project. My submission detects road obstacles (cars, street signs, etc.) in a sequence of Lidar acquired point clouds.

Software

I have a lot of experience developing software in Linux and macOS environments, and some familiarity developing software in Windows.

- CLion, Intellij, Sublime, Git, RubyMine, LaTeX, and Microsoft Office Suite.
- GitLab, Gerrit, GitHub, Jenkins, Jira

Industrial Positions

Lead Software Engineer — **HERE Technologies**
Schwalbach am Taunus, Germany — February 2016 – Present

Within the HERE Geocoding & Search product, I mainly contribute to the development of a map data compilers–distributed applications that run in cluster environments. I also have had the opportunity to do some research and prototyping. For instance, I developed Apache Spark implementations of known image processing methods for very large sparse global (as in the earth) heat maps. I reported on this work at Spark Summit Europe 2017.

Technical Skills Practiced: functional programming, concurrency with futures, Scala, Java, Spark, google protocol-buffers; Pandas, BASH and Python scripting

Data Scientist — **Riviera Partners**
San Francisco, CA — February 2013 – September 2015

At Riviera I was charged with implementing a candidate to job matching system. To further evolve the matching system, I applied statistical machine learning techniques to understand its performance. I was also responsible for the development of candidate scoring and matching methodologies. I completely refactored the existing candidate scoring service, leading to a 20 fold speed up. Additionally, I was completely embedded in the software engineering team, working directly on the main application, implementing the matching feature, maintaining and extending the search function (elasticsearch), as well as bug fixing.

Technical Skills Practiced: Javascript, Angular, Ruby, Python, NumpPy/Pandas, SQL (PostgresSQL, Microsoft SQL, etc.), BASH & Python scripting; data cleaning, normalization, and modeling

Industrial Positions

Software Engineering Contractor — **ark.com**
San Francisco, CA — October 2012 – January 2013

Ark.com was a YC alumnus, and I worked on a research project regarding social network entity resolution. We were specifically interested in applying techinques from computer vision to this problem. I wrote scripts for image histogram comparison (used pyOpenCV), and I curated a set of images for testing/exploration. Additionally, I wrote web crawlers to acquire data from social networks. While doing so, I learned about web architectures, and how to use proxies to crawl the social web fast.

Research and Teaching Experiences

Postdoctoral Researcher — **University of Pennsylvania**
Philadelphia, PA — Section of Biomedical Image Analysis
March 2010 – July 2012

I developed a suite of mathematical contrast measures for 3D diffusion MRI to better classify pathologies of neurodegenerative diseases. Statistical analysis was done with these measure to find significantly different brain regions within a population of patients and normal subjects. These measures are clinically relevant and outperform comparator measures. Additionally, I used machine learning techniques to aid assessment of group difference within a population represented by brain connectivity graphs.

- Implemented experiments and methods in C++, Matlab, Maple, and Python.
- Developed image filters with C++ library ITK. Some experience with Boost (only spherical harmonic functions).
- Wrote BASH and Python scripts to batch process 3D diffusion images on a compute cluster.

Graduate Teaching Assistant — **University of Iowa**
Iowa City, IA — August 2003 – December 2009 (most fall & winter semesters)

- Course instructor for Algebra II, during fall semester of 2006.
- Led two discussion sections, and each met biweekly. Wrote and graded quizzes. Also graded homework assignments.
- Assisted students of Engineering Calculus II with Mathematica assignments.
- Provided one-on-one tutoring for students enrolled in University of Iowa mathematics courses ranging from Algebra I to Multivariate Calculus.
- Wrote solutions to homework assignments for Differential Geometry of Curves and Surfaces (Fall 2006, Spring 2008) and Real & Complex Analysis II (Spring 2008).

Publications

1. Arvind Rao, "Weak Solutions to a Monge-Ampère Type Equation on Kähler Surfaces." PhD Dissertation, University of Iowa, 2010.

2. Arvind Rao, Alex R. Smith, Robert Schultz, Timothy P.L. Roberts, and Ragini Verma, "Peak Geodesic Concentration: A Measure of WM Complexity", Proceedings of MMBIA 2012.

Selected Conferences and Presentations

Spark Summit Europe 2017 — November 2017
Dublin, Ireland

- Presentation of work done at HERE Technologies titled, "Histogram Equalized Heat Maps from Log Data via Apache Spark".

IEEE Workshop on Mathematical Methods in Biomedical Image Analysis — January 2012
Breckenridge, CO

- Poster presentation of, "Peak Geodesic Concentration: A Measure of WM Complexity".

Geometric Partial Differential Equations — February 2009 – May 2009
Institute for Advanced Study, Princeton, NJ

- While in residence, I wrote my dissertation, presented a paper in an advanced topics PDE course, and attended seminars.

Differential Geometry Seminar — September 2006 and 2007
University of Iowa, Iowa City, IA

- Two presentations on global estimates for a Monge-Ampère type equation, my dissertation research project.
- Three presentations about the Calabi Conjecture based on lectures notes by Yum-Tong Sui.
- Four presentations based on the John Lee and Thomas Parker exposition of the Yamabe Problem.

Fellowships and Service

- Member of the University of Pennsylvania Biomedical Postdoc Community Service Committee, May 2011 - April 2012.
- NSF−VIGRE Traineeship, Spring Semester 2009.
- University of Iowa Graduate College Summer Fellowship, Summer Semester 2008.
- Volunteered at Iowa high school mathematics competition, hosted by the University of Iowa Mathematics Department, during the spring of 2006 and 2007.