# Arvind S. Rao, PhD


**Contact Information**

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Website: **rao.im**
GitHub: **github.com/arvsrao**

Citizenship: *United States of America*
Aufenthaltstitel/Visa: *Niederlassungserlaubnis*
Deutschkenntnisse: Goethe Niveau B1


**Education**

*Sensor Fusion Nanodegree*, Udacity — August 2022

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

**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 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 monix/futures, Scala, Java, Spark, Protocol Buffers; Pandas, BASH, and Python

*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 worked 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

*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*
Philadelphia, PA

**University of Pennsylvania**
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*
Iowa City, IA

**University of Iowa**
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.

## 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

## 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.