

# Arvind S. Rao, PhD

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## Contact Information

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

Citizenship: *United States of America*  
Deutschkenntnisse: Goethe Niveau B1  
Website: [www.rao.im](http://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, L<sup>A</sup>T<sub>E</sub>X, and Microsoft Office Suite.

## Industrial Positions

*Lead Software Engineer*  
Schwalbach am Taunus, Germany

**HERE Technologies**  
February 2016 – Present

Within the HERE Geocoding & Search product, I mainly contribute to the development of a map data compiler—a distributed application. 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:* Scala, Java, Spark, google protocol-buffers; Pandas, BASH and python scripting

*Data Scientist*  
San Francisco, CA

**Riviera Partners**  
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, NumPy/Pandas, SQL (PostgreSQL, Microsoft SQL, etc.), BASH & Python scripting; data cleaning, normalization, and modeling

**Industrial Positions**

*Software Engineering Contractor*  
San Francisco, CA

[ark.com](http://ark.com)

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 techniques 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.
- Experienced with C++ libraries ITK and VTK. 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.
3. Arvind Rao, Alex Smith, Robert Schultz, Timothy Roberts, and Ragini Verma, "Geodesic Concentration: A Measure of Diffusion Concentration", (submitted to Computers in Biomedicine)

Selected Conferences and Presentations	<a href="#">Spark Summit Europe 2017</a> Dublin, Ireland	November 2017
	<ul style="list-style-type: none"><li>• Presentation of work done at HERE Technologies titled, “<a href="#">Histogram Equalized Heat Maps from Log Data via Apache Spark</a>”.</li></ul>	
	<a href="#">IEEE Workshop on Mathematical Methods in Biomedical Image Analysis</a> Breckenridge, CO	January 2012
	<ul style="list-style-type: none"><li>• Poster presentation of, “<a href="#">Peak Geodesic Concentration: A Measure of WM Complexity</a>”.</li></ul>	
	<a href="#">Geometric Partial Differential Equations</a> Institute for Advanced Study, Princeton, NJ	February 2009 – May 2009
	<ul style="list-style-type: none"><li>• While in residence, I wrote my dissertation, presented a paper in an advanced topics PDE course, and attended seminars.</li></ul>	
	Differential Geometry Seminar University of Iowa, Iowa City, IA	September 2006 and 2007
	<ul style="list-style-type: none"><li>• Two presentations on global estimates for a Monge-Ampère type equation, my dissertation research project.</li><li>• Three presentations about the Calabi Conjecture based on lectures notes by Yum-Tong Sui.</li><li>• Four presentations based on the John Lee and Thomas Parker exposition of the Yamabe Problem.</li></ul>	
Fellowships and Service	<ul style="list-style-type: none"><li>• Member of the University of Pennsylvania Biomedical Postdoc Community Service Committee, May 2011 - April 2012.</li><li>• NSF–VIGRE Traineeship, Spring Semester 2009.</li><li>• University of Iowa Graduate College Summer Fellowship, Summer Semester 2008.</li><li>• Volunteered at Iowa high school mathematics competition, hosted by the University of Iowa Mathematics Department, during the spring of 2006 and 2007.</li></ul>	