

# Akarsh Simha

✉ akarsh@utexas.edu • 🌐 asimha.net • 🗣️ kstar • Work Authorization: U.S. Green Card

## Education

### The University of Texas at Austin

*Ph.D. in Physics, 3.87/4*

**Austin, TX, USA**

2010 – 2017

### Indian Institute of Technology Madras

*B.Tech. in Engineering Physics, 8.52/10*

**Chennai, India**

2006 – 2010

Minor: Theoretical Computer Science.

## Relevant Experience

### Apple Inc.

*Senior Machine Learning Research Engineer*

**Cupertino, CA**

October 2022 – November 2023

- Led efforts on a framework to deploy machine learning models on mobile devices.
- Optimized memory, compute and storage efficiency of model metadata and post-processing pipelines

*Machine Learning Research Engineer*

September 2019 – October 2022

- Major contributions to cutting-edge user experiences in iOS and macOS powered by machine learning technologies
- Developed a neural-network classifier model for the subject lifting flagship feature in iOS 16 premiered in WWDC 2022
- Developed a convolutional neural-network image classifier to weed-out utility content for the iOS 15 “Shared With You” feature premiered in WWDC 2021
- Developed data pipelines, performed robustness/failure analysis to prepare models for the real world
- A 3-month rotation in a team working on optimization passes for an LLVM-based GPU driver, with positive impact on real-world shader performance on Apple GPUs.

*Machine Learning Compilers and Systems Engineer*

October 2017 – September 2019

- Key contributor to a deterministic ML compiler system for rapid prototyping of ML models.
- Conceived and developed a model-in-the-loop annotation tool for a complex annotation problem

### The KDE Project

*Solving problems of scale in open-source astronomy*

Ongoing Involvement

Contributor to KStars, cross-platform open-source astronomy software written using C++ and Qt.

- Reduced the time taken to compute celestial object positions by 45% by caching expensive computations.
- Improved the performance and accuracy of core positional-astronomy routines and introduced rigorous tests against IAU standards.
- Derived and implemented a novel mathematical formula to correctly match the orientation of the sky as seen in a telescope, and designed a convenient UI to use the feature.
- Currently working on cross-matching, ingesting and rendering a 300 million star database without compromising performance

### Google Summer of Code

*Mentor for The KDE Project*

**Remote**  
Summers of 2009 – 2013, 2015 – 2016

Mentored/Co-mentored many students working on GSoC projects with KStars, an open-source astronomy software under KDE.

- Laid out project ideas for students, provided software design guidance and performed code reviews.
- Projects supervised include: an improved GUI for astronomical observation planning, a relational database for storing astronomical data, using OpenGL for drawing, and optimization of the computation pipeline in KStars.

*Student Developer for The KDE Project*

June – August 2008

- Used a space-partitioning tree and LRU cache to render a 100 million star catalog in the astronomy software KStars using less than 200MB of total memory at any given time.
- Implemented an optimized binary data format for fast lookup of stars in a spatial region compressing the whole catalog into 1.4GB.

### The University of Texas at Austin

*Graduate Student Researcher*

**Austin, TX**

June 2011 – August 2017

Key part of a team that succeeded in making a measurement of Brownian motion with unprecedented temporal and spatial resolution.

- Used optical tweezers to track a few-micron-sized particle in liquid to verify the tenets of statistical physics by directly measuring the particle’s microscopic motion. The results were published in the prestigious *Science* journal.
- Developed a software system to aid with alignment of crucial optical elements, and for characterizing the frequency response of photodetectors, thus enabling removal of detector artifacts from the data signal

- Developed a new mathematical framework to approximate solutions to the equations of fluid mechanics in various geometries, thereby bringing rigorous mathematical footing to a previously ad-hoc approximation method. Applied our method to the theory of Brownian motion in liquids.
- Skills acquired include optics, interfacing with hardware, software engineering, design and development of electronics, mathematical modeling.

## Selected Publications

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- Observation of Brownian Motion in Liquids at Short Times: Instantaneous Velocity and Memory Loss  
S. Kheifets, A. Simha, K. Melin, T. Li, M. G. Raizen; **Science** 28, Vol. 343 No. 6178 pp. 1493-1496 (2014)
- Unsteady Stokes flow near boundaries: the point-particle approximation and the method of reflections  
A. Simha, J. Mo, P. J. Morrison; **J. Fluid Mech.**, Vol. 841, pp. 883–924 (2018)
- An algebra and trigonometry–based proof of Kepler’s First Law  
A. Simha; **Am. J. Phys.**, Vol. 89, Issue 11, pp. 1009-1011 (2021)

## Relevant Skills

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*Proficient:* C++17, Python (numpy, Flask, tensorflow), Qt, Linux, git, Objective-C, Deep Learning, Computer Vision  
*Working Knowledge:* LLVM, bash scripting, CMake, CUDA, HTML/CSS/JavaScript

## Selected Coursework

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**Undergraduate:** Algorithmic Graph Theory, Quantum Information and Computing, Formal Logic, Formal Language Theory

**Graduate:** Quantum Mechanics, Nonlinear Optics and Lasers, Nonlinear Dynamics, Quantum Optics, Complex Analysis, PDEs