Shashi Gowda

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Experience

SEP 2018 - PRESENT

Massachusetts Institute of Technology, Cambridge - *Graduate Research Assistant*

Research question: Scientific and engineering problems require domain-specific languages. How can we make it so that scientists don't have to write a compiler for every problem, reducing the time and cost to solutions?

- Authored a fast symbolic manipulation and code-generation library, Symbolics, that is currently used by **56 engineering simulation projects** with 217 indirect dependents. Including: ModelingToolkit (paper) (differential equation-based modeling), Catalyst (chemical reaction networks).
- Research in automatic performance improvements in automatic differentiation through program analysis. Our technique results in asymptotic improvements in AD performance on real-world numerical code.
- Developed a distributed-memory file-processing toolkit called FileTrees. Used by researchers for lazy-loading and parallel processing experimental data organized in directory trees. Also used to generate directories of synthetic data in parallel.

SEP 2016 - AUG 2018

Julia Computing, Bangalore - *Principal Software Engineer*

- Built and shipped JuliaDB, a high-performance distributed analytical database competitive with spark, kdb and pandas (Abstract: PyData NYC 2017).
- Deployed JuliaDB to replace Postgres in machine-learning workloads at Trinity Health and NPCI (India's largest payment gateway) saving hardware costs and reducing latency.
- Open Source projects I created and owned: JuliaDB; IndexedTables; Dagger (distributed task scheduler); TextParse (a best in class parser-compiler).

SEP 2014 - AUG 2016

CSAIL, MIT, (Remote) - *Software Engineer*

- Authored project Escher: Functional Reactive Web UI. Used for dashboards entirely in Julia, no JS needed. One of the first projects to employ server-sided DOM, later widely adapted.
- Developed Interact – a package that adds interactivity to IPython notebooks, allowed UI components within interactive notebooks.
- Developed Dagger a distributed, out-of-core task scheduler and a distributed array library. Experimented with many schedulers and memory formats, benchmarking the same.
- Developed interactive course material for 18.06 MIT's undergrad Linear Algebra class and 18.337 Parallel Computing.

Education

SEP 2018 - PRESENT

Massachusetts Institute of Technology, Cambridge - *Ph.D.*
Ph.D. in Mathematics and Computational Science. Research fields: computer algebra, programming language design, and staged compilation in scientific software.

SEP 2010 - MAY 2014

National Institute of Technology Surathkal, India - *B.Tech.*
B.Tech. in Information Technology. **4 time Google Summer of Code** (2010,2011,2012,2014), President of the institute chapter of Institute of Engineers (India).

Publications

- **High-performance symbolic-numerics via multiple dispatch (2021)**
  S. Gowda, Y. Ma, A. Cheli, M. Gwozdz, V.B. Shah, A. Edelman, C. Rackauckas.
  ACM Communications in Computer Algebra Vol. 55 (dl.acm.org)
- **ModelingToolkit: A Composable Graph Transformation System For Equation-Based Modeling** *Y. Ma, S. Gowda, R. Anantharaman, C. Laughman, V. Shah, C. Rackauckas.*
  (arXiv:2103.05244)
- **Automated Sparsity-Aware Optimizations in Differentiable Programming (2017)**
  S. Gowda, Y. Ma, V. Churavy, A. Edelman, C. Rackauckas.
  NeurIPS 2017 Program Transformations for Machine Learning Workshop. (pdf)

Notable Talks

- 2022 *Strange Loop, St Louis.* "Symbolic-numeric programming in Julia"
- 2022 *SciMLCon, Boston, MA* "Symbolic arrays: past, present and future"
- 2018 *JuliaCon, London, UK* "How JuliaDB works"
- 2017 *PyData NYC, NYC* "JuliaDB: A data system for Julia" (with Jeff Bezanson and Josh Day)
- 2016 *Microsoft, Bangalore, Data-art gallery Keynote* "A Functional Algebra of UIs"
- 2016 *JuliaCon, Boston, MA* "Dagger.jl - A framework and scheduler for Parallel computing"
- 2015 *JuliaCon, Boston, MA* "Escher.jl-a new way to make and deploy UIs"

Skills

Software Engineering, Algorithms, Algorithmic analysis, Web development, Parallel computing, Systems Programming, Numerical Computing, System Administration, Programming Languages – design and implementation, Compilers, Scripting, Front-end development, Backend development, Database Management Systems, Data Visualizations, User Interface Design, Operating Systems

Julia, Python, C, C++, Scheme, Lisp, JavaScript, CSS, PHP, Typescript, Python, Matlab, SQL, MySQL, Postgres, Pandas, dplyr; Linux/Unix, Git, Vim, Tmux