

Siddharth Bhat

Education

Master by **International Institute of Information Technology Hyderabad India.**
Research (Expected graduation: December 2020)

Undergraduate **International Institute of Information Technology Hyderabad India.**
Completing: May, 2020

Publications

Optimizing Geometric Multigrid Computation using a DSL Approach: Vinay Vasista, Kumudha KN, **Siddharth Bhat**, Uday Bondhugula. Supercomputing (SC), Nov 2017

Word Embeddings as Tuples of Feature Probabilities: **Siddharth Bhat**, Alok Debnath, Souvik Banerjee, Manish Shrivastava Representation Learning for NLP, 2020

Work Experience

Winter 2019 **Teaching Assistant for Natural Language: Applications, IIIT-H.**

Monitored projects, took sessions on word embeddings, involving word2vec, GloVe, fasttext.

Summer 2019 **Intern at Tweag.io, Paris, France.**

Re-implemented portions of GHC (Glasgow Haskell Compiler) runtime for **Asterius (link)**, a Haskell to WebAssembly compiler. Involved Haskell, C, and WebAssembly.

Winter 2018 **Teaching Assistant for Principles of Programming Languages, IIIT-H.**

Course covers the book "Essentials of Programming Languages" by Dan Friedman. Helped write lecture notes, set assignments, graded assignments and exams.

Summer 2018 **Visiting research intern at ETH Zurich, Zurich, Switzerland.**

Investigating formal verification of polyhedral compilation. **PolyIR (Link)** is a formal specification of polyhedral programs.

Summer 2018 **GSoC mentor, Polly Labs.**

Mentoring a project to enable Polly's loop optimisations into Chapel.

Mar-Dec '17 **ETH Zurich, Research Intern at SPCL, Zurich, Switzerland.**

Worked on Polly, a polyhedral loop optimizer for LLVM.

Jan-Mar '17 **Course content contributor, IIIT-H.**

Wrote lecture notes for the **Intro to programming course (link)**

Summer 2016 **Research Intern, IISc Bangalore, Bangalore.**

Worked on PolyMage, DSL compiler for optimising loop transforms. Contributed to ISL and PLUTO. Implemented tiling patterns, optimised PolyMage for stencils.

Summer 2016 **Selected for GSoC 2016, Google.**

Binding SymEngine, a symbolic math library to Haskell. Had to drop this to intern at IISc, Bangalore. Still maintain the library (symengine.hs)

Summer 2015 **GSoC 2015, Google.**

Worked on VisPy, a pure Python graphics library which uses OpenGL internally for performance. Successfully completed.

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Open Source Contributions

- Coq** Submitted issues, bug-fixes, helped improve developer documentation.
- VE-LLVM** Collaboration with VE-LLVM, a formal semantics of the LLVM compiler toolchain in Coq
- Polly** Implementing support for Fortran, added unified memory abilities to the CUDA backend within Polly, a polyhedral loop optimiser for LLVM. ([Link to commits](#))
- Symengine.hs** GSoC 2016. Haskell bindings to SymEngine, a C++ symbolic manipulation library.
- VisPy** GSoC 2015. Rewrote scene graph for performance. Added visuals, high level API for easy use of plotting. Implemented auto-resizing with **Cassowary**, a linear optimisation library.
- Rust** Contributed to the Rust compiler and ecosystem. Found compiler errors, fixed libraries. Was part of **Piston**, group of Rust programmers that experimented with writing game engines.
- Haskell** Contributed to the Haskell ecosystem. Reported and fixed bugs in *stack*, *stackage*, *diagrams*, *GHC*, etc. ([Link to GHC commits](#)).
- PLUTO** Source to Source C optimiser for loop nests. Improved the PLUTO API that had gone out of sync with master. Discovered bugs in PLUTO for diamond tiling transforms
- PolyMage** DSL Compiler than generates C code. Uses **Polyhedral Compilation** Extended the compiler to add stencils, time iterated-stencils.
- PPSSPP** PPSSPP is a C++ open source PSP emulator. Wrote most of the touch handling code. Implemented atomic locks for audio performance.

My Projects

- Tiny-optimising-compiler** An experiment in re-writing LLVM in Haskell. The goal is to have a minimal optimising compiler framework. Has **137** stars on github
- Simplexhc** A custom compiler for a subset of Haskell. The goal is to try and apply *polyhedral compilation* ideas to compile a lazy, pure, functional programming language. with LLVM as a backend. Has **64 stars** on github.
- Sublime Bookmarks** A plugin for sublime text to quickly jump between pieces of your codebase. **26k downloads** and counting.
- Cellular Automata** A collection of Cellular Automata written in Haskell. Uses **Comonads** for abstraction. **130 stars** on Github.
- Teleport** A simple tool to switch between projects written in Haskell. Shows how to write "real world Haskell". Published as a **Literal Haskell tutorial**. **90 stars** on github
- TIMi** A visual interpreter of the **template instantiation machine** to understand evaluation of lazy functional languages. **51** stars on github.

Miscellaneous

- Barvinok** Talk at ETH Zurich: Slides describing the barvnok algorithm to count lattice points in polyhedra
- FunctionalConf '19** Talk on implementing embedded probabilistic programming languages in Haskell ([Slides](#))
- Haskell Exchange 2020** Talk on optimizing `smallpt-hs` (a port of a raytracer to haskell) to beat C++ performance ([Slides](#))
- FPIndia** Talk explaining the paper egg: fast and extensible equality saturation. ([Slides](#))
- Theory seminar, winter '19** Talk on impossibility of compass-straightedge constructions using field theory.

[math.se](#) Answer on **math.stackexchange**. **4724 reputation, top 2% this year**. General interest in algebra and geometry.