

RUPANSHU SOI

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EDUCATION

Birla Institute of Technology and Science, Pilani

Bachelor of Engineering in Computer Science

2018–2022

CGPA: 8.99

Thesis: Scaling Implicit Parallelism with Index Launches

RESEARCH EXPERIENCE

Exploring LLVM using Software Engineering Techniques

Summer 2021

MITACS Globalink Research Intern

- Explored the feasibility of using the Anaximander approach, a general technique for microservice exploration, to understand a compiler’s architecture.
- Developed modular probes to extract information about LLVM’s internal architecture, and techniques to recursively compose this information to construct *maps* about LLVM.
- Advised by [Prof. Sébastien Mosser](#) and [Prof. Jean Privat](#).

Hybrid Analysis for Index Launches

Fall 2020–Spring 2021

Remote Collaboration

- Implemented a hybrid (static + dynamic) program analysis in the Regent compiler. [\[PRs\]](#)
- Greatly increased the scope of the index launch optimization by providing safety guarantees in cases unsusceptible to static analysis.
- Advised by [Dr. Elliott Slaughter](#). Collaborated with [Legion](#) contributors.

Development of an Implicitly Parallel Meshfree Solver in Regent

Spring 2020

BITS Pilani

- Wrote a high-performance CFD solver in Regent’s implicitly parallel programming model. [\[Code\]](#)
- Achieved higher performance than corresponding Fortran and Julia implementations.
- Advised by [Dr. Anil Nemili](#).

REFEREED PUBLICATIONS

R. Soi, M. Bauer, S. Treichler, M. Papadakis, W. Lee, P. McCormick, A. Aiken, and E. Slaughter.
Index Launches: Scalable, Flexible Representation of Parallel Task Groups. [\[Abstract\]](#)[\[Paper\]](#)[\[Slides\]](#)[\[Talk\]](#)
In *High Performance Computing, Networking, Storage and Analysis* (**SC ’21**), November 2021.

R. Soi, N. R. Mamidi, E. Slaughter, K. Prasun, A. Nemili, and S. M. Deshpande.
An Implicitly Parallel Meshfree Solver in Regent. [\[Abstract\]](#)[\[Paper\]](#)[\[Slides\]](#)
In *Parallel Applications Workshop: Alternatives to MPI+X (PAW-ATM)*, November 2020.
In conjunction with *High Performance Computing, Networking, Storage and Analysis* (**SC ’20**).

SUMMER SCHOOLS

Programming Language Implementation Summer School (PLISS)

Summer 2021

Programming Language Analysis and Optimizations

Summer 2021

Hosted online by IIT Hyderabad

SELECTED PROJECTS

Open-Source Contributions to the Regent Compiler

2020–2021

- Added the `__import_cross_product` and `__future` keywords, support for some bitwise operators, and reported several bugs. [\[PRs\]](#)[\[Bug Reports\]](#)

Misty: A Scheme Interpreter in Lua*Spring 2021*

- Implemented lexical scoping, HOFs, and tail-call optimization. [[Code](#)]

Selective Repeat Inspired File Transfer Protocol in Racket*Spring 2021*

- Built reliability against packet loss, corruption, reordering, and delays over UDP sockets. [[Code](#)]

Runi: Handwritten Lexer and Parser in Go*Spring 2021*

- Wrote a CFG, lexer, and predictive recursive descent parser for a C-like language. [[Code](#)]
- Visualized the parse tree using Graphviz.

TEACHING ASSISTANTSHIPS

Theory of Computation*Fall 2021***Operating Systems***Spring 2021***Differential Equations (Math III)***Fall 2020***Mechanics, Oscillations and Waves (Physics I)***Spring, Fall 2019***SCHOLASTIC ACHIEVEMENTS**

MITACS Globalink Research Internship*Summer 2021*

- A competitive 12-week undergraduate research internship in Canada. [[Website](#)]

BITS Pilani Merit Scholarship*Spring, Fall 2019*

- Top 1-3% of the batch.

Sir CV Raman Prize*Spring 2019*

- Awarded to the top performer in Physics I.

10/10 Semester GPA*Fall 2018*

- Top 5 in 1100 students.

PROGRAMMING SKILLS

Languages	C, Python, Lua, Go, Racket, Regent
Systems	LLVM, Flex, Bison, Linux, MERN stack, L ^A T _E X

LEADERSHIP & MANAGEMENT EXPERIENCE

Joint Secretary, Ad Astra (Astronomy and Science Club)*Fall 2019–Spring 2020*

- Managed and organized club activities including discussions, talks, quizzes and star-gazing sessions.
- Responsible for club events during our annual technical fest, ATMOS.