Soumik Kumar Basu

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Education

- **IIT Hyderabad** — Kandi, Telengana
  *PhD in Computer Science and Engineering; CGPA: **9**/10* — *Aug 2021 - Present*
- **West Bengal University of Technology** — Kolkata, West Bengal
  *Bachelor of Technology in Computer Science and Engineering; CGPA: **9.2**/10* — *Aug 2017 - July 2021*
- **Sinthi Ramkrishna Sangha Vidyamandir** — Kolkata, West Bengal
  *Higher Secondary Examination; Percentage: **85.8**%* — *Aug 2015 - July 2017*
- **Sinthi Ramkrishna Sangha Vidyamandir** — Kolkata, West Bengal
  *Secondary Examination; Percentage: **91.9**%* — *Aug 2014 - July 2015*

Research Interests

Compilers, Program Analysis and Optimization, High-Performance Computing, Heterogeneous Computing

Publications

- **Soumik Kr. Basu**, Jyothi Vedurada, Method and System for Automatic CUDA Stream Allocation using Static Analysis, Patent(IN) '25
- **Soumik Kr. Basu**, Jyothi Vedurada, GSOHC: Global Synchronization Optimization for Heterogeneous Computing, ECOOP '25
- Sayak Das, Nirvik Ranjan Das, **Soumik Kr. Basu**, Hriddhi Mondal, Avijit Bose, Page Replacement Technique on the basis of Frequency of Occurrence of Pages, COMSYS '20

Research Focus

My PhD work encompasses three distinct projects that primarily focus on compiler optimization opportunities on the host side of heterogeneous CPU-GPU programs to reduce execution time while minimizing manual programming effort.

Teaching Experience

- **Computer Architecture(CS2323)**: Teaching Assistant to Dr. Praveen Tammana (October '21 - Dec '21)
- **Operating Systems(CS3523)**: Teaching Assistant to Dr. Sathya Peri (Jan '22 - Jun '22)
- **Software Engineering(CS4443)**: Teaching Assistant to Dr. M.V. Panduranga Rao and Dr. Jyothi Vedurada (Jan '23 - Jun '23)
- **Compilers II(CS3423)**: Teaching Assistant to Dr. Jyothi Vedurada (Aug '23 - Dec '23)
- **Introduction to Program Analysis and Optimization (CS5863)**: Teaching Assistant to Dr. Jyothi Vedurada (Jan '24 - Jun '24)
- **Introduction to Programming (ID1063)**: Teaching Assistant to Dr. Jyothi Vedurada, Dr. J. Saketha Nath, and Dr. Saurabh Kumar (Aug '24 - Dec '24)

Services

- Served as a Program Committee member for PPOPP '23 (CORE Rank A) Artifact Evaluation Committee
- Served as a Moderator for Computer Systems in ACM IIT Hyderabad Student Chapter
- Served as a member of the Organizing Committee for CSI Regional Student Convention for Region - II '19
- Served as a Teaching Assistant for ACM Summer School on Compilers for AI / ML Programs, 2024

Honors and Awards

- Winner of Mathmania '18, an inter-college mathematics competition (Winner among 180 teams)
- Won Intra-School Science Acharya Medal for highest marks in Mathematics in Higher Secondary Exam
- Received "Certificate of Merit-2015" for "Excellent" performance in science subjects (99%) in Secondary Exam
- Received "Certificate of Merit-2017" for "Excellent" performance in Higher Secondary Exam

Relevant Academic Course works

- **Introduction to Compiler Optimization, IIT Hyderabad, Grade - 10/10 (A), Instructor: Dr. Jyothi Vedurada, Dr. Ramakrishna Upadrasta**: (Jan '22 - Jul '22)
- **Parallel and Concurrent Programming, IIT Hyderabad, Grade - 9/10 (A-), Instructor: Dr. Sathya Peri**: (Jan '22 - Jul '22)
- **Parallel Computing, IIT Hyderabad, Grade - 9/10 (A-), Instructor: Prof. C Siva Ram Murthy**: (Aug '22 - Nov '22)
- **Topics in Compiler Optimization, IIT Hyderabad, Grade - 10/10 (A), Instructor: Dr. Jyothi Vedurada and Dr. Ramakrishna Upadrasta**: (Aug '22 - Nov '22)

Skills

Languages/ APIs Known: CUDA, OpenCL, Java, C++, Python, C, SQL, Unix scripting, POSIX Threads, **Technical Tools:** LLVM, Clang, Postgres, GDB, NVIDIA Nsight, **IDEs:** Visual Studio Code, Atom, Vim, **Other Tools:** Latex, Git, Gnuplot, DOT, Docker

Invited Talks

- **Title:** Understanding GPU Architectures and Programming, **Venue:** ACM IIT Hyderabad Student Chapter Talk, 2023
- **Title:** Recent Optimization in GPU Architecture and Compilers, **Venue:** IIT Hyderabad CSE Seminar Talks, 2023
- **Title:** An Introduction of DSLs, **Venue:** ACM Summer School on Compilers for AI/ML, Pune, 2024
- **Title:** An Introduction to C++(Basic to Advanced), **Venue:** ACM Summer School on Compilers for AI/ML, Pune, 2024

Academic Projects

- **Concurrency Control in Transactional Systems, IIT Hyderabad, Instructor: Dr. Sathya Peri**: Topics Learned: Page and Object Models, Conflict Serializability, Linearizability, Concurrency Control. (Aug '21 - Dec '21) **Projects:** (1) Implemented two algorithms, BOCC-TS and ROMV-BOCC-TS from scratch using CPP Multithreading.
- **Parallel and Concurrent Programming, IIT Hyderabad, Instructor: Dr. Sathya Peri**: Topics Learned: Multi-Threading, Locking Protocols, Multi-Processing, Lock-free Systems, Mutex, Synchronization, Barrier Synchronization, MIMD programming paradigm, Parallel Algorithms (Jan '22 - Jul '22) **Projects:** (1) Developed a novel Parallel Kruskal's Algorithm using Naive Parallel (Static Thread Mapping) and Smart Parallel (Dynamic Thread Mapping) Approach.
- **Introduction to Program Analysis and Optimization, IIT Hyderabad, Instructor: Dr. Jyothi Vedurada**: Topics Learned: Killdal's Algorithm, Data Flow Analysis, Points-to Analysis, Escape Analysis, Compositional Bottom-up Analysis, Polyhedral and Loop Optimizations (Jan '22 - Jul '22) **Framework Developed:** (1) Developed an intra-procedural flow-sensitive top-down may alias analysis for C++ programs using LLVM/Clang infrastructure.

Online Course works

- **GPU Architectures and Programming**:

  NPTEL, Instructor - Dr. Soumyajit De, IIT Kgp. (Jan' 22 - Apr' 22)[1]
- **Fundamentals of Accelerated Computing with CUDA C/C++** :

  NVIDIA DLI Workshop. (Jun' 22)
- **Programming in JAVA**:

  NPTEL, Instructor - Dr. Debasis Samanta, IIT Kgp. (Jan' 19 - Apr' 19)

[1] Awarded ELITE with Silver certificate

- **Programming, Data Structures and Algorithms using Python**:
  NPTEL, Instructor - Dr. Madhavan Mukund, IIT M. (Aug' 18 - Sep' 18)
- **Problem Solving through Programming in C**:
  NPTEL, Instructor - Prof. Anupam Basu, IIT Kgp. (Jan' 18 - Apr' 18)[2]

[2] Awared ELITE certificate