Gowtham Kaki

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Interests   Program Logics, Type Systems and Static Analyses.

Education   **Ph.D., Computer Science.**   2012 - present
Advised by Prof. Suresh Jagannathan.
Purdue University, West Lafayette, IN.
Current GPA: 3.77/4.0

B.E.(Hons)., Computer Science.   July, 2009
BITS, Pilani, India.
GPA: 8.68/10.0

Research   **Broom : Safe Region-based Memory Management for Dataflow Systems**
(With G Ramalingam, K Vaswani, and D Vytiniotis) Distributed data processing en-
gines (e.g: MapReduce) rely on general-purpose language runtimes to manage the
execution of dataflow operators like `Join`. We observe that the memory behavior of
such operators exhibit certain characteristics, which render general-purpose garbage
collection a particularly ineffective memory management strategy. To address this
problem, we propose BROOM, dialect of C# with programmer-managed memory re-
gions. BROOM empowers dataflow system builders to implement efficient region-based
memory management strategies without incurring significant cost: it's region type sys-
tem guarantees safety of all dereferences that are otherwise safe in presence of GC,
while it's region type inference obviates any need for programmer-provided region type
annotations. Experiments with real-world dataflow operators demonstrate upto 59%
performance improvement due to safe region-based memory managegement afforded
via BROOM. An OCaml implementation of BROOM's region type system and type
inference can be obtained from `https://github.com/gowthamk/broomc`.
- Draft paper available at `http://gowthamk.github.io/docs/broom.pdf`
- Work-in-progress presentations at Microsoft Research India, Bangalore in August,
  2014 and July, 2015.

Declarative Programming over Eventually Consistent Data Stores
(With Sivaramakrishnan KC., and Suresh Jagannathan) Devised a logic-based language
framework to express high-level consistency requirements of NoSQL applications. The
framework delivers application programmers from having to manually tune consistency
levels of NoSQL stores, such as Cassandra, which are often tied to the implementation
nuances of these stores. The framework also comes with an extensive support for scal-
able transactions. The implementation of the framework (called QUELEA) is available
online at `https://github.com/kayceesrk/Quelea`.
- Published in the proceedings of ACM SIGPLAN Conference on Programming
  Languages Design and Implementation (PLDI'15)
- Presented at PLDI'15 at Portland, June 13-17, 2015.
- Presented at RF Seminar Series, Microsoft Research India, Bangalore in July,
  2015.

Relational Framework for Higher-order Shape Analysis
(With Suresh Jagannathan) Devised a specification language based on a decidable
relational logic to automatically reason about structural properties in ML-like lan-
guages. Our specification language makes it possible to capture rich semantics of data

structure transformations as logical formulas, and subsequently use them for either verification or proving program equivalence. The verification framework for our language (called CATALYST) has been implemented, and is available for experimentation at http://tycon.github.io/catalyst/.

- Published in the proceedings of the International Conference on Functional Programming (ICFP'14).
- Presented at ICFP'14, Gothenburg, 1st-6th September, 2014.
- Work-in-progress presentation at the Mid-west Verification Day (MVD), Chicago, 20th-21st September, 2013.
- Work-in-progress presentation on extending the framework with specification inference at the Mid-west Verification Day (MVD), Columbia, MO, 2nd-3rd October, 2014.

A Novel Adaptive Scheduling Algorithm for Computational Grids
(With S. Bansal, and Chittaranjan Hota) Devised a de-centralized dynamic load balancing algorithm for efficient task scheduling in computational grids.

- Published in the proceedings of IEEE conference on Internet Multimedia Systems Architecture and Applications (IMSAA), Bangalore, India, 2009.

Professional Experience

Research Intern, Microsoft Research India, Bangalore
(May - August, 2014 & July-August, 2015) Built a region type system and region type inference to ensure the safety of dataflow programs that rely on programmer-managed memory regions, instead of garbage collection for memory management.

Software Engineer, Yahoo SDC, Bangalore, India   August, 2009 - July, 2011
Frontend engineering for Yahoo content platforms group. Developed AJAX and php tools for querying, processing and presenting loosely-structured data from various content grids inside yahoo. The tools were used by Yahoo's content curators.

Engineering intern, Qualcomm, Hyderabad, India   January - June, 2009
QA Engineering for Application-specific integrated circuit (ASIC) - User interface module (UIM) group. Developed tools to test low-level mobile network code.

Academics

Relevant Graduate Coursework (With Grades)

- Design & Analysis of Algorithms (A), Programming Languages (A), Software Engineering (B), Metaprogramming and Program Generation (A+), Distributed Systems (A), Parallel Computing (A), and Current topics in Theoretical Computer Science (A-).
- Attended Oregon Programming Languages Summer School (OPLSS'13) at Eugene, OR.

Courses Handled as a Teaching Assistant

- CS240 C Programming. Fall 2012.
- CS565 Programming Languages. Spring, 2013.

Grants and Scholarships

- NSF Travel grant for PLDI 2014
- ACM SIGPLAN PAC travel grant for ICFP 2014.
- ACM SIGPLAN PLMW scholarship for POPL 2014.

- Institute merit-cum-need scholarship during all semesters of my undergraduate education at BITS, Pilani, India.

Professional Service

- Coordinating weekly sessions of Purdue PL (PurPL) reading group. Notes/Slides for some sessions when I led the discussion are available on my web page.
- Purdue CS Graduate Student Board (GSB) office member, Fall 2011 and Spring 2012.
- Secretary (junior year), and office member (freshman and sophomore years) of Computer Science Association (CSA) BITS, Pilani. We organized our techfest (APOGEE) in 2008.

References

Prof. Suresh Jagannathan (Purdue University).
Dr. Ganesan Ramalingam (Microsoft Research).
Other references will be available on request.