

Dipanwita Sarkar

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OBJECTIVE

To use my background in compilers for increasing software reliability by :

- Performing effective and scalable program analysis for early detection of defects in code.
- Identifying and categorizing common program defects and their contexts.
- Applying a case-based approach to defect detection or test generation, using the above information in conjunction with analysis.
- Eliminating the class of defects caused mainly due to human error by automatically generating as much code as possible.

OTHER RESEARCH INTERESTS

- Program transformation systems, programming language paradigms and features that facilitate the writing of program transformation systems and use of program transformation systems in compiler construction.
- Compiler optimizations, combining compiler analyses and optimizations, and phase ordering problems.
- Use of artificial intelligence in developing heuristics for compiler optimizations.

EDUCATION

- **Ph.D Computer Science** *Expected June 2004*
Thesis: Nanopass Compiler Infrastructure
Indiana University, Bloomington, IN **GPA 3.92/4.00**
Advisor: Dr. R. Kent Dybvig
- **MS Computer Science** *Dec 2000*
Indiana University, Bloomington, IN **GPA 3.87/4.00**
- **BA Computer Science, Physics** *June 1999*
Knox College, Galesburg, IL **GPA 3.68/4.00**

RELEVANT COURSE WORK

- Database Management Systems, Advanced Operating Systems, Computer Architecture, Compiler Construction, Compiler Optimization, Programming Language Principles, Programming Language Foundations, Artificial Intelligence, Knowledge Based Computation (with a focus on Case Based Reasoning), Theory of Computation, Distributed Computing, Machine Learning, Computer Vision, Scientific Computing.

RESEARCH AND WORK EXPERIENCE

- **Programming Language Group - Indiana University**

Research assistant to Dr. R. Kent Dybvig and Dr. Oscar Waddell.

(June 2000 - present)

- Member of the research team for the *Scheme.NET* project funded by *Microsoft Research University Relations*.
- Worked on *Nanopass Compiler Infrastructure* that involves designing and developing a set of tools that makes compiler passes concise (therefore nanopass) and the task of writing compiler passes simpler and less tedious.
- The new infrastructure instills a higher degree of confidence in the compiler by allowing a nanopass to specify actions for only those parts of the intermediate language that undergo nontrivial transformation and leaving the rest to a pass expander, thus reducing scope for human error.
- The *nanopass* framework is being used to write the front-end of the *Scheme.NET* compiler that targets *Microsoft's MSIL language* for the *.NET framework*.

- **PPRC Reliability group - Microsoft Research, Redmond, WA**

Summer intern in the Reliability group - Programmer Productivity Research Center, MSR.

(May - Aug 2003)

- Developed a new *PREfast* compiler module that performed interprocedural analysis to find potential security problems caused by integer overflow.
- Analyzed the results obtained by running the analysis on Windows source code.
- The *integer overflow tool - PREcious* was included in the Toolbox and made available for regular use to all Microsoft Product groups.

(May - July 2002)

- Added value to the existing *PREFast* modules by detecting new defects that were suggested as *RFEs* in the *RAID* database.
- The new defect detection code contributed in increasing reliability of the code that *PREFast* compiled.
- The additions made during the course of my summer internship enabled *PREFast* to flag approximately 10000 new warnings in the *WindowsNT* code base.

(June - Aug 2001)

- Worked on the *Declarative Testing* project.
- Extended the capability of the *PREFast* compiler to take requests for defect detection from users, by adding a new module to it.
- Designed and implemented a working prototype of this new module.
- This prototype was later extended and is now in use as *PREdecl*.

- **CPED Group - Oakridge National Laboratory, Oakridge, TN**

Research assistant to Dr. Richard C. Ward, Computational Physics and Engineering Division.

(Sep - Dec 1998)

- Developed a compartment model in C++ for radionuclide uptake in body tissues using a genetic algorithm to optimize certain biokinetic parameters in the model.
- The project involved working with *CVODE* (an ordinary differential equation solver written in C) and using *PVM* (Parallel Virtual Machine) to do single program multiple data processing on a number of work stations with different architectures.

PUBLICATIONS

- **Robust and Effective Transformation of Letrec.** Oscar Waddell, Dipanwita Sarkar, R. Kent Dybvig. *Proceedings of Scheme Workshop 2002, Georgia Tech College of Computing Technical Report GIT-CC-02-48.*
- **Fixing Letrec: A Faithful Yet Efficient Implementation of Scheme's Recursive Binding Construct.** Oscar Waddell, Dipanwita Sarkar, R. Kent Dybvig. *Accepted for publication in the special issue of the Journal of Higher-Order and Symbolic Computation, 2004.*
- **Nanopass Compiler Infrastructure.** Dipanwita Sarkar, Oscar Waddell, R. Kent Dybvig. *Submitted to the 13th International Conference on Compiler Construction (CC) held as part of ETAPS 2004.*

TEACHING EXPERIENCE

- **Lecturer: Introduction to Computer Science:** Department of Computer Science, Indiana University. *Fall 2001 semester.* Responsibilities included teaching independently, grading and helping to write up assignments and exams.
- **Associate Instructor: Introduction to Computer Science:** Department of Computer Science, Indiana University. *August 1999 - May 2000.* Responsibilities included teaching, grading and holding discussion sessions for the course.
- **Teaching Assistant: Introduction to Computer Science:** Department of Computer Science, Knox College. *Jan 1997 - June 1999.* Responsibilities included grading, assisting in the laboratory and holding discussion sessions for the course.
- **Teaching Assistant: Programming Language Concepts:** Department of Computer Science, Knox College. *Winter 1998 - 1999 semesters.* Responsibilities included grading and holding discussion sessions for the course.
- **Teaching Assistant: Computer Organization and Assembly Language:** Department of Computer Science, Knox College. *Spring 1998 semester.* Responsibilities included grading and holding discussion sessions for the course.
- **Teaching Assistant: Precalculus:** Department of Mathematics, Knox College. *Fall 1996 semester.* Responsibilities included grading and holding discussion sessions for the course.
- **Tutor: Introductory Computer Science and Physics classes:** Learning Center, Knox College. *Jan 1997 - June 1999.* Responsibilities included tutoring undergraduate students outside class.

DEPARTMENTAL AND PROFESSIONAL SERVICES

- Webmaster for Computer Science Graduate Students Association (CSGSA) for the academic year 2000-2001
- Member of the Admissions Committee in the Department of Computer Science for the academic year 2001-2002.

HONORS AND AWARDS

- Paul's Prize in Computer Science, Knox College - June 1999
- Ford Fellowship Award - June 1998
- Dean's list (as an undergraduate)

MEMBERSHIPS

- Sigma Pi Sigma (since 1999)
- Sigma Xi (since 1999)

REFERENCES

- R. Kent Dybvig
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- Daniel P. Friedman
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