

Wonchan Lee

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Research Interests

I am interested in static analysis and verification techniques for software safety and reliability. In particular, I have focused on abstract interpretation-based static analyses and learning-based verification techniques.

Education

- Stanford University** Sep 2013 – Present
Ph.D. Candidate in Computer Science Department
Advisor: Prof. Kunle Olukotun (Winter Quarter)
- Seoul National University** Sep 2007 – Aug 2009
Master of Electrical Engineering and Computer Science
Thesis: Partial Dynamic Building of Main-memory Indexes
Advisor: Prof. Sangkyun Cha
- Seoul National University** Mar 2003 – Aug 2007
Bachelor of Electrical Engineering and Computer Science (*Cum Laude*)

Research Experience

- Stanford University** Sep 2013 – Present
Ph.D. Student
- ▶ **Lua/Terra Interface for Legion Runtime System** (Advisor: Prof. Alex Aiken) Sep 2013 – Present
I designed and implemented Lua/Terra interface for Legion runtime system for large-scale heterogeneous clusters. Incorporating staged JIT compilation and vectorization, Lua/Terra language allows programmers to write high-performance tasks for clusters.
- ROSAEC Center** Oct 2009 – Aug 2013
Research Associate Director: Prof. Kwangkeun Yi
- ▶ **Selective Context-Sensitivity Guided by Impact Pre-analysis** Nov 2012 – Present
I collaborated to design, implement, and evaluate a novel static analysis technique that adjusts its precision using the impact pre-analysis result. The technique analyses in a context-sensitive manner only the program points that deserve extra precision [1].
 - ▶ **Termination Analysis using Algorithmic Learning** Jun 2011 – Jul 2012
I collaborated to design, implement, and evaluate a learning-based termination analysis technique which combines active learning algorithm, transition predicate abstraction, and decision procedures [2].
 - ▶ **Sparse Analysis Framework for C-like Languages** Sep 2011 – Feb 2012
I formalized sparse analysis framework for abstract interpretation-based static analyses of C-like languages [5]. Sparse analysis technique eliminates redundant computations during static analyses without loss of precision.
 - ▶ **Dynamic and Static Semantics of Implicit Calculus** Nov 2010 – Feb 2012
I collaborated to design a core calculus for implicit programming and its dynamic and static semantics [4]. Our core calculus serves as a new foundation of generic programming.

► **Sound Clustering for Static Analysis Alarms** July 2011 – Oct 2011
I formalized sound non-statistical alarm clustering framework for abstract interpretation-based static analyses [6].

► **Predicate Generation for Learning-based Loop Invariant Generation** Jun 2010 – Oct 2010
We improved the efficiency of learning-based invariant generation technique with automatic predicate synthesis [3,7]. I participated in the design, implementation, and experimental evaluation of this extension.

University of California, Berkeley

Feb 2012 – Sep 2012

Visiting Scholar

Host: Prof. Dawn Song

► **Static Analysis Infrastructure for Android Apps** Feb 2012 – Sep 2012
I designed and implemented a static analysis infrastructure for Android apps. I also developed several domain-specific analyzers on top of the infrastructure, such as information flow analyzer and network signature generator.

Seoul National University

Sep 2007 – Aug 2009

M.S. Student in Petabyte-scale In-memory Database Lab

Advisor: Prof. Sangkyun Cha

► **Partial and Parallel Building of Main-memory Index Structures** Sep 2008 – Aug 2009
I designed and implemented partial and parallel index building schemes for main-memory index structures.

Publications

- [1] Hakjoo Oh, **Wonchan Lee**, Kihong Heo, Hongseok Yang, and Kwangkeun Yi. Selective Context-Sensitivity Guided by Impact Pre-Analysis. To appear in *Proceedings of the 35th ACM SIGPLAN Conference on Programming Language Design and Implementation (PLDI 2014)*. <http://ropas.snu.ac.kr/~wcllee/papers/pldi14.pdf>
- [2] **Wonchan Lee**, Bow-Yaw Wang, and Kwangkeun Yi. Termination Analysis with Algorithmic Learning. In *Proceedings of the 24th International Conference on Computer Verification (CAV 2012)*. Springer, 2012. <http://ropas.snu.ac.kr/~wcllee/papers/cav12.pdf>
- [3] **Wonchan Lee**, Yungbum Jung, Bow-Yaw Wang, and Kwangkeun Yi. Predicate Generation for Learning-Based Quantifier-Free Loop Invariant Inference. In *Logical Methods in Computer Science (LMCS)*, vol. 8(3:25). 2012. <http://arxiv.org/pdf/1207.7167.pdf>
- [4] Bruno C. d. S. Oliveira, Tom Schrijvers, Wontae Choi, **Wonchan Lee**, and Kwangkeun Yi. The Implicit Calculus: A New Foundation for Generic Programming. In *Proceedings of the 33rd ACM SIGPLAN Conference on Programming Language Design and Implementation (PLDI 2012)*. ACM, 2012. <http://ropas.snu.ac.kr/~wcllee/papers/pldi12a.pdf>
- [5] Hakjoo Oh, Kihong Heo, **Wonchan Lee**, Woosuk Lee, and Kwangkeun Yi. Design and Implementation of Sparse Global Analyses for C-like Languages. In *Proceedings of the 33rd ACM SIGPLAN Conference on Programming Language Design and Implementation (PLDI 2012)*. ACM, 2012. <http://ropas.snu.ac.kr/~wcllee/papers/pldi12b.pdf>
- [6] Woosuk Lee, **Wonchan Lee**, and Kwangkeun Yi. Sound Non-Statistical Clustering of Static Analysis Alarms. In *Proceedings of the 13th International Conference on Verification, Model Checking, and Abstract Interpretation (VMCAI 2012)*. Springer, 2012. <http://ropas.snu.ac.kr/~wcllee/papers/vmcai12.pdf>
- [7] Yungbum Jung, **Wonchan Lee**, Bow-Yaw Wang, and Kwangkeun Yi. Predicate Generation for Learning-Based Quantifier-Free Loop Invariant Inference. In *Proceedings of the 17th International Conference on Tools and Algorithms for the Construction and Analysis of Systems (TACAS 2011)*. Springer, 2011. <http://ropas.snu.ac.kr/~wcllee/papers/tacas11.pdf>

Presentations

1. “Termination Analysis with Algorithmic Learning”. *The 24th International Conference on Computer Aided Verification (CAV 2012)*. Berkeley, CA. July 10th 2012. <http://ropas.snu.ac.kr/~wlee/talks/cav12.pdf>
2. “The Implicit Calculus: A New Foundation for Generic Programming”. *The 33rd ACM SIGPLAN conference on Programming Language Design and Implementation (PLDI 2012)*. Poster Talk. Beijing, China. June 12th 2012. <http://ropas.snu.ac.kr/~wlee/talks/pldi12.pdf>
3. “Termination Analysis with Algorithmic Learning”. *The 39th ACM SIGPLAN Symposium on Principles of Programming Languages (POPL 2012)*. Lightning Talk. Philadelphia, PA. January 25th 2012. <http://ropas.snu.ac.kr/~wlee/talks/pop112.pdf>

Teaching Experience

Teaching Assistant – SNU 4541.664A Program Analysis (Grad) Spring 2010
Teaching Assistant – SNU 4190.310 Programming Languages Spring 2011

Professional Activities

External Reviewer

FOSSACS 2013, POPL 2013(additional reviewer), SAS 2012, POPL 2012(additional reviewer), SPLASH 2011, ESOP 2011, SPLASH 2010, CAV 2010, ICDE 2009

Honors & Awards

Kwanjeong Scholarship Sep 2013 – Present
Kwanjeong Educational Foundation

Silla Cultural Scholarship Mar 2004 – Aug 2006
Silla Cultural Foundation

References

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