Nouraldin Jaber

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INTEREST

The intersection of programming languages and formal methods. Research topics include verification and synthesis of reliable parameterized distributed systems, static analysis, and programming models.

EDUCATION

Purdue University, West Lafayette, IN   **August 2019**
Ph.D. in Electrical and Computer Engineering   **GPA: 4.0**
Advisers: Milind Kulkarni and Roopsha Samanta
Interest: Synthesis and Verification of Parameterized Distributed Systems

Purdue University, West Lafayette, IN   **August 2015**
M.Sc. in Electrical and Computer Engineering   **GPA: 3.9**
Adviser: Milind Kulkarni
Awards: Fulbright Grant 2013-2015
Thesis Topic: Data Structure-Aware Computation Offloading

Islamic University Of Gaza (IUG), Gaza Strip   **January 2012**
B.Sc. in Computer Engineering   **GPA: 94.55 %**
Awards: Ranked as top student over Faculty of Engineering

PUPLICATIONS

N Jaber, and M Kulkarni. "Data structure-aware heap partitioning." *Proceedings of the 26th International Conference on Compiler Construction*. ACM, 2017. DOI

Y.H Lu, M Kulkarni, **N Jaber**, and J.X Zhu. "Programming language support for analyzing non-persistent data." In *IEEE Symposium on Technologies for Homeland Security (HST)*, 2016. DOI

EXPERIENCE

Research Assistant, School of Electrical and Computer Engineering   **Aug. 2013 - Present**
    - Area: Programming Languages and Formal Methods
Instructor, Computer Engineering Department, IUG   **Feb. 2012 - July 2013**
    - Courses: Networks, and Mobile Programming
Trainer, Computer Land, Gaza, Palestine   **July 2012**
    - Course: Mobile Development Using Android
Volunteer, PLDI 2016, Santa Barbra, CA   **June 2016**
    - Helped in coordinating the logistics of the conference
Volunteer, Programming Department IUG   **Jan. – June 2012**
    - Administrating Document Management System and Reporting tools

ACADEMIC PROJECTS

- PhD Research Project: Component-Based Parameterized Reasoning For Distributed Systems

We are developing a framework to tackle the challenging problem of parameterized verification and synthesis of distributed systems. The challenges arise because (1) building blocks of distributed systems are complex, and (2) that the system should be correct for any number of processes. We address the first challenge by developing correct *abstractions* of the components, and the second challenge by utilizing *parametrized* verification and parametrized synthesis techniques.

- Master's Thesis Project: Data Structure-Aware Heap Partitioning

Heap or (program) partitioning is a key concept in many applications like computation offloading. Fundamentally, we must generate code such that objects in the heap get partitioned to different locations. The *granularity* at which the heap is partitioned is the key factor in partition quality. We leverage *ownership types* to introduce the notion of *data structure–aware partitioning* to allow different data structures to be placed in different partitions, something which pervious granularities (e.g. class-based and allocation site–based) does not get right.

- Partitioning Mobile Application on Amazon AWS Cloud and Android Devices

Using Amazon elastic computing services to run a partitioned face recognition program on the cloud and its user interface on an android device. The goal is to run computation costly programs on mobiles.

- Synthesis of Coordination Skeletons for Distributed Reactive (Stream Processing) Systems

The input is state machines description for the actors and correctness specifications. Invalid global states are eliminated by generating coordination states which translates to coordination code.

- V-Way Cache Implementation in Gem5

A Variable-way (V-way) cache was implemented in C++ and Python using gem5 simulator. The goal was to reduce the average cache miss-rate in the processor.

- Compiler Program

This project involved using ANTLR4 tool to generate top-down lexer and parser for language and proceed with semantics, optimizations, and code generation for a 4-register architecture.

- Implementing MapRdeuce via OpenMP and MPI

This project's main idea was to implement Mappers and Reducers used by search engines on multiple computation nodes using MPI then optimize each node running time using OpenMP.

COMPUTER SKILLS

Research-related:

SOOT optimization framework for Java, MPI, OpenMP, gem5 simulator, ANTLR4 tool for compiler generation, Amazon AWS, TamiFlex, Apache Storm, Coq proof assistant, Sketch, Z3
General knowledge: Hadoop, Apache Spark [Streaming], Flume, Xilinx ISE

Programming languages:

Java [and Android Programming], Scala, C++, Active-HDL, Micro Basic PIC programming

AWARDS & HONORS

- Fulbright Grant 2013-2015: Purdue University, Computer Engineering.
- ACM Travel Grant to Volunteer at PLDI 2016.
- Hani Qaddumi Scholarship Foundation (HQSF) for undergraduate studies 2007-2012

SELECTED COURSES

- Fault-Tolerant Computer System Design ECE 60872
- Advanced Compilation and Automatic Programming ECE663
- Compiler and Translation Systems Engineering ECE573
- Programming Languages CS565
- Programming Parallel Machines ECE563
- Computer-Aided Program Reasoning CS590
- Computer Architecture ECE565
- Computer Network Systems ECE595

REFERENCES

Milind Kulkarni
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School of Electrical and Computer Engineering
Purdue University
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Roopsha Samanta
Assistant Professor
Department of Computer Sciences
Purdue University
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VISA STATUS

Student J-1 visa