

Research Areas

My primary research interest is to develop and evaluate various program analysis techniques that can be used in practice by exploring three aspects: scalability, precision, and usability. My interests span programming languages and software systems.

Education

Ph.D., Computer Science

2014

UNIVERSITY OF WATERLOO, CANADA

- Advisor: Ondřej Lhoták
- Thesis: The Separate Compilation Assumption
- Committee: Jan Vitek, Frank Tip, Reid Holmes, and Werner Dietl

MMath, Computer Science

2010

UNIVERSITY OF WATERLOO, CANADA

- Advisor: Raouf Boutaba
- Thesis: Algorizmi - A Configurable Virtual Testbed to Generate Datasets for Offline Evaluation of Intrusion Detection Systems
- Reviewers: Ian MacKillop and Urs Hengartner

B.Sc., Computer Science

2007

THE AMERICAN UNIVERSITY IN CAIRO, EGYPT

- Advisors: Sherif G. Aly and Sherif El-Kassas
- Thesis: A Jabber Framework for Building Communication Capable Java Mobile Applications
- Minor: Mathematics

Professional Experience

Assistant Professor, Department of Computing Science

Jul 2017–Present

UNIVERSITY OF ALBERTA, CANADA

Research Assistant Professor, Department of Computing Science

Jul 2016–Jul 2017

UNIVERSITY OF ALBERTA, CANADA

Postdoctoral Researcher, Secure Software Engineering

Oct 2014–Jul 2016

TECHNISCHE UNIVERSITÄT DARMSTADT, GERMANY

- Host: Eric Bodden
- Designing novel static analyses to detect misuses of cryptographic APIs in software systems
- Exploring new static analysis techniques that incorporate user feedback in a just-in-time fashion
- Developing various extensions to the IFDS analysis framework

Graduate Research Assistant, Programming Languages Group

2010–2014

UNIVERSITY OF WATERLOO, CANADA

- Conducted research for constructing partial static call graphs for Java programs
- Developed various call graph construction algorithms for Scala
- Studied static analysis techniques for various JVM-hosted languages

Graduate Research Assistant, Network Security Research Group

2008–2009

UNIVERSITY OF WATERLOO, CANADA

- Worked on various models of Intrusion Detection Systems: e.g., peer-to-peer, kernel methods
- Developed Algorizmi, an open-source evaluation system for Intrusion Detection Systems

Researcher, Department of Computer Science

2007

THE AMERICAN UNIVERSITY IN CAIRO, EGYPT

- Studied new techniques to support location management in Java-based pervasive systems

Software Engineer, Execution Team

2007

ITWORX, EGYPT

- Redesigned the graphical user interface of the stock brokerage system for Execution Ltd., London, UK

Awards and Honors

ACM SIGPLAN Distinguished Paper Award

2019

ACM SIGPLAN SYMPOSIUM ON PRINCIPLES OF PROGRAMMING LANGUAGES

Student's Choice Award

2018

UNIVERSITY OF ALBERTA

ACM SIGSOFT Distinguished Paper Award

2017

INTERNATIONAL SYMPOSIUM ON SOFTWARE TESTING AND ANALYSIS

Distinguished Artifact Award

2014

EUROPEAN CONFERENCE ON OBJECT-ORIENTED PROGRAMMING

David R. Cheriton Scholarship

2012–2014

UNIVERSITY OF WATERLOO, CANADA

\$20,000

Special Graduate Scholarship

2012

UNIVERSITY OF WATERLOO, CANADA

\$2,500

Queen Elizabeth II Graduate Scholarship in Science and Technology

2012

CANADA

\$5,000

Special Graduate Scholarship

2011

UNIVERSITY OF WATERLOO, CANADA

\$1,000

Graduate Entrance Scholarship

2008

UNIVERSITY OF WATERLOO, CANADA

\$3,000

B.Sc. Summa Cum Laude Honors

2007

THE AMERICAN UNIVERSITY IN CAIRO, EGYPT

Best CS Group Graduation Project Award

2007

THE AMERICAN UNIVERSITY IN CAIRO, EGYPT

Shell Endowed Scholarship

2003–2007

THE AMERICAN UNIVERSITY IN CAIRO, EGYPT

30% off tuition

Professional Service

PROGRAM COMMITTEE ORGANIZATION

SPLASH-I Co-Chair, ACM SIGPLAN Conference on Systems, Programming, Languages and Applications: Software for Humanity (SPLASH) 2018

SPLASH-I Co-Chair, ACM SIGPLAN Conference on Systems, Programming, Languages and Applications: Software for Humanity (SPLASH) 2017

Artifact Evaluation Co-Chair, International Symposium on Engineering Secure Software and Systems (ESSoS) 2017

Demonstration Track Co-Chair, ACM SIGSOFT Symposium on the Foundations of Software Engineering (FSE) 2017

Program Committee Co-Chair, ACM SIGPLAN International Workshop on the State Of the Art in Program Analysis (SOAP) @ PLDI 2017

PROGRAM COMMITTEE MEMBER

ECOOP, European Conference on Object-Oriented Programming 2020

ISSTA, International Symposium on Software Testing and Analysis 2019

SOAP @ PLDI, ACM SIGPLAN International Workshop on the State Of the Art in Program Analysis 2019

SEAD @ ICSE, International Workshop on Software Security from Design to Deployment 2019

ECOOP, European Conference on Object-Oriented Programming 2018

ISSTA, International Symposium on Software Testing and Analysis 2018

CASCON, International Conference on Computer Science and Software Engineering 2017

Onward!, ACM International Symposium on New Ideas, New Paradigms, and Reflections on Programming and Software 2017

ARTIFACT EVALUATION COMMITTEE MEMBER

ISSTA , International Symposium on Software Testing and Analysis	2016
PLDI , ACM SIGPLAN Conference on Programming Language Design and Implementation	2015
ECOOP , European Conference on Object-Oriented Programming	2015
ECOOP , European Conference on Object-Oriented Programming	2014

WORKSHOP ORGANIZATION

PLMW Co-Chair , ACM SIGPLAN Conference on Systems, Programming, Languages and Applications: Software for Humanity (SPLASH)	2019
Co-Organizer , Program Analysis Hackathon (Panathon) @ ECOOP	2019
Co-Organizer , Program Analysis Hackathon (Panathon) @ ECOOP/ISSTA	2018
Co-Organizer , Workshop on Benchmarking (BenchWork) @ ECOOP/ISSTA	2018
Co-Organizer , Compiler-Driven Performance Workshop @ CASCON	2017
Co-Organizer , SOAP @ PLDI	2017
Co-Organizer , WALA Hackathon @ PLDI	2017
Co-Organizer , Workshop on Designing Code Analysis Frameworks (DECAF) @ ISSTA	2016
Co-Organizer , Workshop on WALA @ PLDI	2015

REVIEWER

TSE , IEEE Transactions on Software Engineering	2013, 2019
TOPLAS , ACM Transactions on Programming Languages and Systems	2018, 2019
SCP , Science of Computer Programming	2015

OTHER

Co-Founder , Canada Open-Source Projects (CANOSP)	2019–Present
Co-Organizer , Reverse EXPO	2018–Present
Steering Committee Member , Undergraduate Capstone Open Source Projects (UCOSP)	2018
Faculty Mentor , Undergraduate Capstone Open Source Projects (UCOSP)	2018
Associate Editor , IEEE Software Blog	2017–Present
Web Chair , European Conference on Object-Oriented Programming (ECOOP)	2018
Web Chair , International Symposium on Software Testing and Analysis (ISSTA)	2018
Subreviewer , International Conference on Compiler Construction (CC)	2017

Research Funding

Validating the Correct Usage of Cryptography Libraries 2018–2020

- IBM Centre for Advanced Studies Research Fellowship
- With: Sole PI
- Amount: CAD\$60,000

Scalable and Precise Program Analysis for Modern Software Systems 2017–2022

- Natural Sciences and Engineering Research Council of Canada (NSERC) Discovery Grant
- With: Sole PI
- Amount: CAD\$125,000

Improving the Inlining Algorithms in the IBM Just-in-Time (JIT) Compiler 2017–2020

- IBM Centre for Advanced Studies Research Fellowship
- With: Sole PI
- Amount: CAD\$90,000

Publications

REFEREED JOURNAL ARTICLES

Johannes Späth, **Karim Ali**, and Eric Bodden. “Context-, Flow-, and Field-Sensitive Data-Flow Analysis Using Synchronized Pushdown Systems”. *PACMPL*, 3(POPL), 48:1–48:29, 2019. POPL '19
Distinguished Paper

Lisa Nguyen Quang Do, Stefan Krüger, Patrick Hill, **Karim Ali**, and Eric Bodden. “Debugging Static Analysis”. *IEEE Transactions on Software Engineering*, (to appear), 2018. TSE '18

Johannes Späth, **Karim Ali**, and Eric Bodden. “IDE^{al}: Efficient and Precise Alias-Aware Dataflow Analysis”. *PACMPL*, 1(OOPSLA), 99:1–99:27, 2017. OOPSLA '17

- Karim Ali**, Marianna Rapoport, Ondřej Lhoták, Julian Dolby, and Frank Tip. “Type-Based Call Graph Construction Algorithms for Scala”. *ACM Transactions on Software Engineering and Methodology*, 25(1), 9:1–9:43, 2015. TOSEM '15
- Sherif Aly, Sarah Nadi, and **Karim Hamdan**. “A Java-Based Programming Language Support of Location Management in Pervasive Systems”. *International Journal of Computer Science and Network Security*, 8(6), pp. 329–336, 2008. IJCSNS '08

REFEREED CONFERENCE PUBLICATIONS

- Abdul Ali Bangash, Hareem Sahar, Shaiful Alam Chowdhury, Alexander William Wong, Abram Hindle, and **Karim Ali**. “What do developers know about machine learning: a study of ML discussions on StackOverflow”. *International Conference on Mining Software Repositories*, pp. 260–264, 2019. MSR '19
Mining Challenge
- Artem Chikin, José Nelson Amaral, **Karim Ali**, and Ettore Tiotto. “Toward an Analytical Performance Model to Select between GPU and CPU Execution”. *IEEE International Workshop on High-Level Parallel Programming Models and Supportive Environments*, pp. 353–362, 2019. HIPS '19
- Stefan Krüger, Johannes Späth, **Karim Ali**, Eric Bodden, and Mira Mezini. “CrySL: An Extensible Approach to Validating the Correct Usage of Cryptographic APIs”. *European Conference on Object-Oriented Programming*, 10:1–10:27, 2018. ECOOP '18
- Lisa Nguyen Quang Do, Stefan Krüger, Patrick Hill, **Karim Ali**, and Eric Bodden. “VISUFLOW: A Debugging Environment for Static Analyses”. *International Conference on Software Engineering (Companion Volume)*, pp. 89–92, 2018. ICSE '18
Tool Paper
- Stefan Krüger, Sarah Nadi, Michael Reif, **Karim Ali**, Mira Mezini, Eric Bodden, Florian Göpfert, Felix Günther, Christian Weinert, Daniel Demmler, and Ram Kamath. “CogniCrypt: Supporting Developers in using Cryptography”. *International Conference on Automated Software Engineering*, pp. 931–936, 2017. ASE '17
Tool Paper
- Mona Nashaat, **Karim Ali**, and James Miller. “Detecting Security Vulnerabilities in Object-Oriented PHP Programs”. *IEEE International Working Conference on Source Code Analysis and Manipulation*, pp. 159–164, 2017. SCAM '17
- Taylor Lloyd, Artem Chikin, Erick Ochoa, **Karim Ali**, and J Nelson Amaral. “A Case for Better Integration of Host and Target Compilation When Using OpenCL for FPGAs”. *International Workshop on FPGAs for Software Programmers*, pp. 1–9, 2017. FSP '17
- Lisa Nguyen Quang Do, **Karim Ali**, Ben Livshits, Eric Bodden, Justin Smith, and Emerson Murphy-Hill. “Just-in-Time Static Analysis”. *International Symposium on Software Testing and Analysis*, pp. 307–317, 2017. ISSTA '17
Distinguished Paper
- Lisa Nguyen Quang Do, **Karim Ali**, Ben Livshits, Eric Bodden, Justin Smith, and Emerson Murphy-Hill. “Cheetah: Just-in-Time Taint Analysis for Android Apps”. *International Conference on Software Engineering - Companion Volume*, pp. 39–42, 2017. ICSE '17
Tool Paper
- Johannes Späth, Lisa Nguyen Quang Do, **Karim Ali**, and Eric Bodden. “Boomerang: Demand-Driven Flow-Sensitive, Field-Sensitive, and Context-Sensitive Pointer Analysis”. *European Conference on Object-Oriented Programming*, 22:1–22:26, 2016. ECOOP '16
- Steven Arzt, Sarah Nadi, **Karim Ali**, Eric Bodden, Sebastian Erdweg, and Mira Mezini. “Towards Secure Integration of Cryptographic Software”. *ACM SIGPLAN Symposium on New Ideas in Programming and Reflections on Software at SPLASH*, pp. 1–13, 2015. Onward! '15
- Karim Ali**, Marianna Rapoport, Ondřej Lhoták, Julian Dolby, and Frank Tip. “Constructing Call Graphs of Scala Programs”. *European Conference on Object-Oriented Programming*, pp. 54–79, 2014. ECOOP '14
Distinguished Artifact
- Karim Ali** and Ondřej Lhoták. “Averroes: Whole-Program Analysis without the Whole Program”. *European Conference on Object-Oriented Programming*, pp. 378–400, 2013. ECOOP '13
- Karim Ali** and Ondřej Lhoták. “Application-Only Call Graph Construction”. *European Conference on Object-Oriented Programming*, pp. 688–712, 2012. ECOOP '12

OTHER REFEREED PUBLICATIONS

- Karim Ali**, Issam Aib, and Raouf Boutaba. “P2P-AIS: A P2P Artificial Immune Systems architecture for detecting DDoS flooding attacks”. *Global Information Infrastructure Symposium*, 2009. GIIS '09
- Karim Ali** and Raouf Boutaba. “Applying Kernel Methods to Anomaly-based Intrusion Detection Systems”. *Global Information Infrastructure Symposium*, 2009. GIIS '09

Selected Invited Talks

"Is Program Analysis The Silver Bullet Against Software Bugs?" Papers We Love Conference, 2019.	<i>PWLConf '19</i> St. Louis, MO, USA
"U Can't Inline This". TURBO Workshop, 2018.	<i>TURBO at SPLASH '18</i> Boston, MA, USA
"SWAN: A Program Analysis Framework for Swift". NJR Workshop, 2018.	<i>NJR at SPLASH '18</i> Boston, MA, USA
"Designing Tomorrow's Static Analyses - Addressing Scalability, Precision, and Usability". University of Colorado Boulder, 2016.	<i>Boulder '16</i> Boulder, CO, USA
"Designing Tomorrow's Static Analyses - Addressing Scalability, Precision, and Usability". Rochester Institute of Technology, 2016.	<i>RIT '16</i> Rochester, NY, USA
"Designing Tomorrow's Static Analyses - Addressing Scalability, Precision, and Usability". Iowa State University, 2016.	<i>ISU '16</i> Ames, IA, USA
"Evaluating Call Graph Construction for JVM-hosted Language Implementations". IFIP Working Group 2.4 on Software Implementation Technology, 2015.	<i>IFIP '15</i> Boppard, Germany
"Averroes - Letting go of the library!" Samsung Research America, 2015.	<i>SRA '15</i> Mountain View, CA, USA
"Whole-Program Analysis Without the Whole Program". McGill University, 2015.	<i>McGill '15</i> Montreal, QC, Canada

Students

CURRENT

Spencer Killen

UNIVERSITY OF ALBERTA, CANADA

2019–Present
Master's

David Seekatz

UNIVERSITY OF ALBERTA, CANADA

2019–Present
Master's

Ahmed Elkhair

UNIVERSITY OF ALBERTA, CANADA

2019–Present
Master's

Ifaz Kabir

UNIVERSITY OF ALBERTA, CANADA

2018–Present
Ph.D.

Abdul Ali Bangash

UNIVERSITY OF ALBERTA, CANADA, (MAIN SUPERVISOR; CO-SUPERVISED WITH ABRAM HINDLE)

2018–Present
Ph.D.

Kristen Newbury

UNIVERSITY OF ALBERTA, CANADA

2018–Present
Master's

Stefan Krüger

UNIVERSITY OF PADERBORN, GERMANY, (CO-SUPERVISED WITH ERIC BODDEN)

2015–Present
Ph.D.

Lisa Nguyen

UNIVERSITY OF PADERBORN, GERMANY, (CO-SUPERVISED WITH ERIC BODDEN)

2015–Present
Ph.D.

ALUMNI

Erick Ochoa

UNIVERSITY OF ALBERTA, CANADA, (MAIN SUPERVISOR; CO-SUPERVISED WITH JOSÉ NELSON AMARAL)

- Master's Thesis: Guiding Inlining Decisions Using Post-Inlining Transformations

2019

Johannes Späth

UNIVERSITY OF PADERBORN, GERMANY, (CO-SUPERVISED WITH ERIC BODDEN)

- Ph.D. Thesis: Synchronized Pushdown Systems for Pointer and Data-Flow Analysis

2019
Research Associate at Fraunhofer IEM

Manuel Benz

TECHNISCHE UNIVERSITÄT DARMSTADT, GERMANY

- Master's Thesis: Interprocedural Data Dependency Graphs

2016

Ph.D. at University of Paderborn

Michael Appel

TECHNISCHE UNIVERSITÄT DARMSTADT, GERMANY

- Master's Thesis: Call Graph Summaries for the Android SDK

2016

Teaching

INSTRUCTOR

CMPUT 497	Foundations of Program Analysis , University of Alberta, Canada
CMPUT 229	Computer Organization and Architecture I , University of Alberta, Canada
CMPUT 620	Static Program Analysis , University of Alberta, Canada
SAS	Static Analysis Seminar , Technische Universität Darmstadt, Germany

Winter 2019–Present

Winter 2017–Present

Fall 2016–Present

Winter 2015

CO-INSTRUCTOR

APSA	Applied Static Analysis , Technische Universität Darmstadt, Germany
------	--

Spring 2016

SUBSTITUTE LECTURER

DECA	Designing Code Analyses for Large Software Systems , Technische Universität Darmstadt, Germany
CS 241	Foundations of Sequential Programs , University of Waterloo, Canada

Fall 2014

Spring 2013

GRADUATE TEACHING ASSISTANT

CS 241	Foundations of Sequential Programs , University of Waterloo, Canada
CS 444/644	Compiler Construction , University of Waterloo, Canada
CS 446/646	Software Design and Architectures , University of Waterloo, Canada
CS 456/656	Computer Networks , University of Waterloo, Canada
CS 125	Introduction to Programming Principles , University of Waterloo, Canada
CS 448	Security Engineering , The American University in Cairo, Egypt

2011–2013

2011–2013

Spring 2011

2008–2010

Winter 2008

Fall 2007

UNDERGRADUATE TEACHING ASSISTANT

CS 448	Security Engineering , The American University in Cairo, Egypt
CS 330	Computer Architecture , The American University in Cairo, Egypt
CS 106	Fundamentals of Computer Science , The American University in Cairo, Egypt

Fall 2007

2005–2006

2004–2005

Volunteer Work

CyberPatriot Technical Mentor , Strathcona High School, Edmonton, Alberta, Canada
Graduate Student Ambassador , University of Waterloo, Canada
Tour Guide, Computer Science Open House , University of Waterloo, Canada
President, Egyptian Students Association , University of Waterloo, Canada
Ushers Committee Leader, Honors Assembly , The American University in Cairo, Egypt
Academic Committee Head, ACM Chapter , The American University in Cairo, Egypt

2016–2018

Fall 2013

Winter 2012

2010–2011

Spring 2007

Spring 2007