

# Karim Ali

ASSISTANT PROFESSOR · UNIVERSITY OF ALBERTA

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## Research Areas

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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, compiler optimization, and software systems.

## Education

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### Ph.D., Computer Science

UNIVERSITY OF WATERLOO, CANADA

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

2014

### MMath, Computer Science

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

2010

### B.Sc., Computer Science

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

2007

## Professional Experience

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### Assistant Professor, Department of Computing Science

UNIVERSITY OF ALBERTA, CANADA

Jul 2017–Present

### Research Assistant Professor, Department of Computing Science

UNIVERSITY OF ALBERTA, CANADA

Jul 2016–Jul 2017

### Postdoctoral Researcher, Secure Software Engineering

TECHNISCHE UNIVERSITÄT DARMSTADT, GERMANY

Oct 2014–Jul 2016

- 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

UNIVERSITY OF WATERLOO, CANADA

2010–2014

- 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

UNIVERSITY OF WATERLOO, CANADA

2008–2009

- 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

THE AMERICAN UNIVERSITY IN CAIRO, EGYPT

2007

- 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

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### 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

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**Program Committee**, European Conference on Object-Oriented Programming

ECOOP '18

**Program Committee**, European Conference on Object-Oriented Programming

ISSTA '18

**Web Chair**, European Conference on Object-Oriented Programming

ECOOP '18

**Web Chair**, International Symposium on Software Testing and Analysis

ISSTA '18

**Co-Organizer**, Compiler-Driven Performance Workshop

CASCON '17

**Program Committee**, International Conference on Computer Science and Software Engineering

CASCON '17

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

SPLASH '17

**Program Committee**, ACM International Symposium on New Ideas, New Paradigms, and Reflections on Programming and Software *Onward!* '17

**Artifact Evaluation Co-Chair**, International Symposium on Engineering Secure Software and Systems

ESSoS '17

**Co-Organizer**, WALA Hackathon

PLDI '17

**Program Committee Co-Chair**, ACM SIGPLAN International Workshop on the State Of the Art in Program Analysis

PLDI '17

**Demonstration Track Co-Chair**, ACM SIGSOFT Symposium on the Foundations of Software Engineering

FSE '17

**Subreviewer**, International Conference on Compiler Construction

CC '17

**Artifact Evaluation Committee**, International Symposium on Software Testing and Analysis

ISSTA '16

**Co-Organizer**, Workshop on Designing Code Analysis Frameworks

ISSTA '16

**Artifact Evaluation Committee**, ACM SIGPLAN Conference on Programming Language Design and Implementation

PLDI '15

**Co-Organizer**, Workshop on WALA

PLDI '15

**Artifact Evaluation Committee**, European Conference on Object-Oriented Programming

ECOOP '15

**Reviewer**, Science of Computer Programming

SCP

**Artifact Evaluation Committee**, European Conference on Object-Oriented Programming

ECOOP '14

**Reviewer**, IEEE Transactions on Software Engineering

TSE

## Research Funding

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### 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

2017–2018

- IBM Centre for Advanced Studies Research Fellowship
- With: Sole PI
- Amount: CAD\$30,000

### Coarse-Grained Call Graph Analysis of Android Applications

2017–2018

- Huawei Innovation Research Program (HIRP)
- With: Sole PI
- Amount: USD\$46,200

## Publications

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### REFEREED JOURNAL ARTICLES

**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

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*, (to appear), 2017.

ASE '17  
Tool Paper

Johannes Späth, **Karim Ali**, and Eric Bodden. “IDE<sup>al</sup>: Efficient and Precise Alias-aware Dataflow Analysis”. *ACM SIGPLAN Conference on Object-Oriented Programming, Systems, Languages and Applications*, (to appear), 2017.

OOPSLA '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*, (to appear), 2017.

FSP '17

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*, (to appear), 2017.

SCAM '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

## 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

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“Designing Tomorrow’s Static Analyses - Addressing Scalability, Precision, and Usability”. University of Colorado Boulder, 2016.

*Boulder '16*  
Boulder, CO, USA

“Designing Tomorrow’s Static Analyses - Addressing Scalability, Precision, and Usability”. Rochester Institute of Technology, 2016.

*RIT '16*  
Rochester, NY, USA

“Designing Tomorrow’s Static Analyses - Addressing Scalability, Precision, and Usability”. Iowa State University, 2016.

*ISU '16*  
Ames, IA, USA

“Evaluating Call Graph Construction for JVM-hosted Language Implementations”. IFIP Working Group 2.4 on Software Implementation Technology, 2015.

*IFIP '15*  
Boppard, Germany

“Averroes - Letting go of the library!” Samsung Research America, 2015.

*SRA '15*  
Mountain View, CA, USA

“Whole-Program Analysis Without the Whole Program”. McGill University, 2015.

*McGill '15*  
Montreal, QC, Canada

## Students

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### CURRENT

#### **Erick Ochoa**

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

*2017–Present*  
Master’s

#### **Johannes Späth**

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

*2015–Present*  
Ph.D.

#### **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

#### **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*

#### **Stefan Triller**

TECHNISCHE UNIVERSITÄT DARMSTADT, GERMANY

- Ph.D. withdrawn

*2015–2016*  
Software Engineer at Deutsche Telekom

## Teaching

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### INSTRUCTOR

CMPUT 620	<b>Static Program Analysis</b> , University of Alberta, Canada	Fall 2017
CMPUT 229	<b>Computer Organization and Architecture I</b> , University of Alberta, Canada	Winter 2017
CMPUT 620	<b>Static Program Analysis</b> , University of Alberta, Canada	Fall 2016
SAS	<b>Static Analysis Seminar</b> , Technische Universität Darmstadt, Germany	Winter 2015

### CO-INSTRUCTOR

APSA	<b>Applied Static Analysis</b> , Technische Universität Darmstadt, Germany	Spring 2016
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### SUBSTITUTE LECTURER

DECA	<b>Designing Code Analyses for Large Software Systems</b> , Technische Universität Darmstadt, Germany	Winter 2014
CS 241	<b>Foundations of Sequential Programs</b> , University of Waterloo, Canada	Spring 2013

### GRADUATE TEACHING ASSISTANT

CS 241	<b>Foundations of Sequential Programs</b> , University of Waterloo, Canada	2011–2013
CS 444/644	<b>Compiler Construction</b> , University of Waterloo, Canada	2011–2013
CS 446/646	<b>Software Design and Architectures</b> , University of Waterloo, Canada	Spring 2011
CS 456/656	<b>Computer Networks</b> , University of Waterloo, Canada	2008–2010
CS 125	<b>Introduction to Programming Principles</b> , University of Waterloo, Canada	Winter 2008
CS 448	<b>Security Engineering</b> , The American University in Cairo, Egypt	Fall 2007

### UNDERGRADUATE TEACHING ASSISTANT

CS 448	<b>Security Engineering</b> , The American University in Cairo, Egypt	Fall 2007
CS 330	<b>Computer Architecture</b> , The American University in Cairo, Egypt	2005–2006
CS 106	<b>Fundamentals of Computer Science</b> , The American University in Cairo, Egypt	2004–2005

## Volunteer Work

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<b>CyberPatriot Technical Mentor</b> , Strathcona High School, Edmonton, Alberta, Canada	2016–2018
<b>Graduate Student Ambassador</b> , University of Waterloo, Canada	Fall 2013
<b>Tour Guide, Computer Science Open House</b> , University of Waterloo, Canada	Winter 2012
<b>President, Egyptian Students Association</b> , University of Waterloo, Canada	2010–2011
<b>Ushers Committee Leader, Honors Assembly</b> , The American University in Cairo, Egypt	Spring 2007
<b>Academic Committee Head, ACM Chapter</b> , The American University in Cairo, Egypt	Spring 2007