

# Karim Ali

ASSISTANT PROFESSOR · UNIVERSITY OF ALBERTA

3-42, Athabasca Hall, Edmonton, Alberta, T6G 2E8, Canada

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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 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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### 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

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### 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

**ISSTA**, International Symposium on Software Testing and Analysis 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

<b>Co-Organizer</b> , Program Analysis Hackathon (Panathon) @ ECOOP/ISSTA	2018
<b>Co-Organizer</b> , Workshop on Benchmarking (BenchWork) @ ECOOP/ISSTA	2018
<b>Co-Organizer</b> , Compiler-Driven Performance Workshop @ CASCON	2017
<b>Co-Organizer</b> , WALA Hackathon @ PLDI	2017
<b>Co-Organizer</b> , Workshop on Designing Code Analysis Frameworks (DECAF) @ ISSTA	2016
<b>Co-Organizer</b> , Workshop on WALA @ PLDI	2015

## REVIEWER

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

## OTHER

<b>Faculty Mentor</b> , Undergraduate Capstone Open Source Projects (UCOSP)	2018–Present
<b>Associate Editor</b> , IEEE Software Blog	2017–Present
<b>Web Chair</b> , European Conference on Object-Oriented Programming (ECOOP)	2018
<b>Web Chair</b> , International Symposium on Software Testing and Analysis (ISSTA)	2018
<b>Subreviewer</b> , International Conference on Compiler Construction (CC)	2017

## Research Funding

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<b>Validating the Correct Usage of Cryptography Libraries</b>	2018–2020
<ul style="list-style-type: none"><li>IBM Centre for Advanced Studies Research Fellowship</li><li>With: Sole PI</li><li>Amount: CAD\$30,000</li></ul>	
<b>Scalable and Precise Program Analysis for Modern Software Systems</b>	2017–2022
<ul style="list-style-type: none"><li>Natural Sciences and Engineering Research Council of Canada (NSERC) Discovery Grant</li><li>With: Sole PI</li><li>Amount: CAD\$125,000</li></ul>	
<b>Improving the Inlining Algorithms in the IBM Just-in-Time (JIT) Compiler</b>	2017–2020
<ul style="list-style-type: none"><li>IBM Centre for Advanced Studies Research Fellowship</li><li>With: Sole PI</li><li>Amount: CAD\$60,000</li></ul>	
<b>Coarse-Grained Call Graph Analysis of Android Applications</b>	2017–2018
<ul style="list-style-type: none"><li>Huawei Innovation Research Program (HIRP)</li><li>With: Sole PI</li><li>Amount: USD\$46,200</li></ul>	

## Publications

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### REFEREED JOURNAL ARTICLES

Lisa Nguyen Quang Do, Stefan Krüger, Patrick Hill, <b>Karim Ali</b> , and Eric Bodden. “Debugging Static Analysis”. <i>IEEE Transactions on Software Engineering</i> , (to appear), 2018.	<i>TSE '18</i>
Johannes Späth, <b>Karim Ali</b> , and Eric Bodden. “IDE <sup>al</sup> : Efficient and Precise Alias-Aware Dataflow Analysis”. <i>PACMPL</i> , 1(OOPSLA), 99:1–99:27, 2017.	<i>OOPSLA '17</i>
<b>Karim Ali</b> , Marianna Rapoport, Ondřej Lhoták, Julian Dolby, and Frank Tip. “Type-Based Call Graph Construction Algorithms for Scala”. <i>ACM Transactions on Software Engineering and Methodology</i> , 25(1), 9:1–9:43, 2015.	<i>TOSEM '15</i>
Sherif Aly, Sarah Nadi, and <b>Karim Hamdan</b> . “A Java-Based Programming Language Support of Location Management in Pervasive Systems”. <i>International Journal of Computer Science and Network Security</i> , 8(6), pp. 329–336, 2008.	<i>IJCSNS '08</i>

## REFEREED CONFERENCE PUBLICATIONS

- 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*, (to appear), 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

## Students

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### CURRENT

#### Ifaz Kabir

UNIVERSITY OF ALBERTA, CANADA

2018–Present  
Ph.D.

#### Kristen Newbury

UNIVERSITY OF ALBERTA, CANADA

2018–Present  
Master's

#### Abdul Ali Bangash

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

2018–Present  
Ph.D.

## 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

## Teaching

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### 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

Winter 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

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**CyberPatriot Technical Mentor**, Strathcona High School, Edmonton, Alberta, Canada

*2016–2018*

**Graduate Student Ambassador**, University of Waterloo, Canada

*Fall 2013*

**Tour Guide, Computer Science Open House**, University of Waterloo, Canada

*Winter 2012*

**President, Egyptian Students Association**, University of Waterloo, Canada

*2010–2011*

**Ushers Committee Leader, Honors Assembly**, The American University in Cairo, Egypt

*Spring 2007*

**Academic Committee Head, ACM Chapter**, The American University in Cairo, Egypt

*Spring 2007*