Curriculum Vitae

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Sidi Mohamed Beillahi
Postdoctoral Researcher
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❖ Summary

I am interested in algorithmic verification, formal verification, and programming languages. I develop new techniques to improve the reliability of software systems. I work in a variety of application areas including concurrent programs, distributed systems, blockchain, smart contracts, and asynchronous programs.

❖ Education

Doctorate — Computer Science *Dec 2017 – Mar 2021*
University of Paris, France
Thesis Title: **Automated Verification of Programs Running on top of Distributed Systems**
Advisors: Ahmed Bouajjani and Constantin Enea

Master of Applied Science — Computer Engineering *Sep 2014 – Nov 2016*
Concordia University, Canada
Thesis Title: **Towards the Design Automation of Quantum Circuits**
Advisor: Sofiène Tahar

Engineer's Degree — Polytechnicien *Sep 2011 – Jun 2014*
Tunisia Polytechnic School, Tunisia
Thesis Title: **Formalization of Signal-Flow Graphs in HOL**
Advisor: Sofiène Tahar

DEUPC — Mathematics and Physics *Sep 2009 – Jun 2011*
Sfax Preparatory Engineering Institute
University of Sfax, Tunisia

❖ Experience

Postdoctoral Researcher, University of Toronto *Jun 2021 – present*
Advisors: Fan Long and Andreas Veneris
Toronto, Canada

Mitacs Accelerate Postdoctoral Fellow, University of Toronto and Bank of Canada *Sep 2022 – present*

Course Instructor, University of Toronto *Sep 2022 – present*

Research Assistant, University of Paris *Dec 2017 – May 2021*
Advisors: Ahmed Bouajjani and Constantin Enea
Paris, France

Teaching Assistant, University of Paris *Sep 2018 – Jan 2021*

Research Intern, SRI International *Apr 2019 – Aug 2019*
Advisor: Michael Emmi
New York City, USA

Software Programmer, TRU Simulation + Training *May 2017 – Dec 2017*
Montréal, Canada

Research Assistant, Concordia University *Mar 2014 – Nov 2016*
Advisor: Sofiène Tahar
Montréal, Canada

Teaching Assistant, Concordia University *Sep 2015 – May 2016*

Research Engineer, Marinvent inc. *Mar 2016 – Nov 2016*
Advisor: Sofiène Tahar
Montréal, Canada

Intern, STMicroelectronics *Jul 2013 – Aug 2013*
Advisor: Mohamed Ben Ahmed
Tunis, Tunisia

Intern, Mauritel S.A *Aug 2012 – Aug 2012*
Advisor: Mohamed Moujtaba
Nouakchott, Mauritania

❖ Awards and Recognitions

- IEEE ICBC Distinguished Paper Award, 2022.
- Invited to a Journal Special Issue for Selected CONCUR 2019 Papers, 2019.
- Best Undergraduate Thesis, Tunisia Polytechnic School, 2014.
- Ranked 31st in the National Grandes Ecoles Exam, Tunisia, 2011.
- Olympian in the International Mathematical Olympiad, Germany, 2009.
- Ranked 3rd in the National Mathematical Olympiad, Mauritania, 2009.
- Ranked 1st in the National Bac Exam in Mathematics, Mauritania, 2009.

❖ Grants and Scholarships

- NSERC Postdoctoral Fellowship, 2022 – 2024, CAD 90,000.
- Smart Contract Research Forum Grant, 2022, USD 1,000.
- VMW Scholarship Award for CAV 2016, USD 650.
- Concordia Graduate Student Association Conference Funding for CAV 2016, CAD 100.
- Concordia University Conference and Exposition Award for NFM 2016, CAD 1,000.
- Graduate Student Support Program, Concordia University, 2014 – 2016, CAD 20,000.
- National Scholarship, Mauritania, 2009 – 2014, EUR 13,500.
- Scholarship Award to Participate in the International Mathematical Olympiad, Mauritania, 2009, EUR 1,000.

❖ Service

- Co-organizer, IRIF Verification Seminar, Mar 2020 – July 2020.
- Artificat Evaluation Committees: POPL 2021, CAV 2021, OOPSLA 2021, POPL 2022, OOPSLA 2022.
- Extended Review Committees: OOPSLA 2022.
- Sub-Reviewer: FTSCS 2016, VMCAI 2020, CAV 2020, Blockchain 2021, ICBC 2022, ICDCS 2022.
- Journal Invited Reviewer: IEEE Transactions on Network and Service Management
- Student Volunteer: CAV 2016.

❖ Journal Publications

J4 **LMPT: A Novel Authenticated Data Structure to Eliminate Storage Bottlenecks for High Performance Blockchains** *2022*
Jemin Andrew Choi, **Sidi Mohamed Beillahi**, Srisht Fateh Singh, Panagiotis Michalopoulos, Peilun Li, Andreas Veneris, Fan Long
Under submission to IEEE Transactions on Network and Service Management
Invited special issue for best papers from ICBC 2022

J3 **SigVM: Enabling Event-Driven Execution for Truly Decentralized Smart Contracts** *Oct 2022*
Zihan Zhao, **Sidi Mohamed Beillahi**, Ryan Song, Yuxi Cai, Andreas Veneris, Fan Long
Proceedings of the ACM on Programming Languages, 6(OOPSLA2), 149:673 – 149:698

J2 **Robustness Against Transactional Causal Consistency** *Feb 2021*
Sidi Mohamed Beillahi, Ahmed Bouajjani, Constantin Enea
Logical Methods in Computer Science, 17(1): 12:1 – 12:42
Invited special issue for selected papers from CONCUR 2019

J1 **A Modeling and Verification Framework for Optical Quantum Circuit** *Mar 2019*
Sidi Mohamed Beillahi, Mohamed Yousri Mahmoud, Sofiène Tahar
Formal Aspects of Computing, 31(3): 321 – 351

❖ Conference Publications

C14 **FlashSyn: Flash Loan Attack Synthesis via Counterexample-Driven Approximation** *2022*
Zhiyang Chen, **Sidi Mohamed Beillahi**, Fan Long
under submission, https://arxiv.org/abs/2206.10708

C13 **A Robust Front-Running Methodology for Malicious Flash-Loan DeFi Attacks** *2022*
Xun Deng, Zihan Zhao, **Sidi Mohamed Beillahi**, Han Du, Cyrus Minwalla, Keerthi Nelaturu, Andreas Veneris, Fan Long
under submission, 2022

C12 **Möbius: an Atomic State Sharding Design for Account-Based Blockchains** *2022*
Srisht Fateh Singh, Panagiotis Michalopoulos, **Sidi Mohamed Beillahi**, Andreas Veneris, Fan Long
under submission, 2022

C11 **LVMT: An Efficient Authenticated Storage for Blockchain** *2022*
Chenxing Li, **Sidi Mohamed Beillahi**, Guang Yang, Ming Wu, Wei Xu, Fan Long
under submission, 2022

C10 **Automated Synthesis of Asynchronizations** *Dec 2022*
Sidi Mohamed Beillahi, Ahmed Bouajjani, Constantin Enea, Shuvendu Lahiri
29th Static Analysis Symposium (SAS), 2022

C9 **Automated Auditing of Price Gouging TOD Vulnerabilities in Smart Contracts** *May 2022*
Sidi Mohamed Beillahi, Eric Keilty, Keerthi Nelaturu, Andreas Veneris, Fan Long
In Proc. IEEE International Conference on Blockchain and Cryptocurrency (ICBC), 2022

C8 **LMPTs: Eliminating Storage Bottlenecks for Processing Blockchain Transactions** *May 2022*
Jemin Andrew Choi, **Sidi Mohamed Beillahi**, Peilun Li, Andreas Veneris, Fan Long
In Proc. IEEE International Conference on Blockchain and Cryptocurrency (ICBC), 2022
IEEE ICBC Distinguished Paper Award.

C7 **Smart Contracts Refinement for Gas Optimization** *Sep 2021*
Keerthi Nelaturu, **Sidi Mohamed Beillahi**, Fan Long, Andreas Veneris
In Proc. 3rd Conference on Blockchain Research & Applications for Innovative Networks and Services (BRAINS), 2021

C6 **Checking Robustness Between Weak Transactional Consistency Models** *Mar 2021*
Sidi Mohamed Beillahi, Ahmed Bouajjani, Constantin Enea
In Proc. 30th European Symposium on Programming (ESOP), 2021

C5 **Behavioral Simulation for Smart Contracts** *Jun 2020*
Sidi Mohamed Beillahi, Gabriela Ciocarlie, Michael Emmi, Constantin Enea
In Proc. 41st annual ACM SIGPLAN conference on Programming Language Design and Implementation (PLDI), 2020

C4 **Robustness Against Transactional Causal Consistency** *Sep 2019*
Sidi Mohamed Beillahi, Ahmed Bouajjani, Constantin Enea
In Proc. 30th International Conference on Concurrency Theory (CONCUR), 2019
Invited to a Journal Special Issue for Selected CONCUR 2019 Papers.

C3 **Checking Robustness Against Snapshot Isolation** *Jul 2019*
Sidi Mohamed Beillahi, Ahmed Bouajjani, Constantin Enea
In Proc. 31st International Conference on Computer Aided Verification (CAV), 2019

C2 **Hierarchical Verification of Quantum Circuits** *Jun 2016*
Sidi Mohamed Beillahi, Mohamed Yousri Mahmoud, Sofiène Tahar
In Proc. 8th International Symposium NASA Formal Methods (NFM), 2016

C1 **Formal Analysis of Power Electronic Systems** *Nov 2015*
Sidi Mohamed Beillahi, Umair Siddique, Sofiène Tahar
In Proc. 17th International Conference on Formal Engineering Methods (ICFEM), 2015

❖ Workshop Publications

Formal Analysis of Engineering Systems Based on Signal-Flow-Graph Theory *Jul 2016*
W3 **Sidi Mohamed Beillahi**, Umair Siddique, Sofiène Tahar
In Proc. 9th International Workshop Numerical Software Verification (NSV-CAV), 2016

On the Formal Analysis of Photonic Signal Processing Systems *Jun 2015*
W2 Umair Siddique, **Sidi Mohamed Beillahi**, Sofiène Tahar
In Proc. 20th International Workshop Formal Methods for Industrial Critical Systems (FMICS), 2015

A Tool for the Formal Verification of Quantum Optical Computing Systems *Apr 2015*
W1 **Sidi Mohamed Beillahi**, Mohamed Yousri Mahmoud, Sofiène Tahar
In Proc. Automated Reasoning Workshop (ARW), 2015

❖ Teaching

- Course Instructor at University of Toronto
  - ECE345H1F: Algorithms & Data Structures for 3rd Year Computer Engineering Students, Sep 2022 – Dec 2022.
- Teaching Assistantships at University of Paris
  - Automata and Lexical Analysis for 2nd Year Computer Science Students, Sep 2020 – Dec 2020.
  - Principles of Binary Machines for 1st Year Computer Science Students, Sep 2020 – Dec 2020.
  - Java Programming for 1st Year Computer Science Students, Sep 2019 – Dec 2019.
  - Principles of Object-Oriented Programming in Java for 2nd Year Computer Science Students, Sep 2019 – Dec 2019.
  - Python Programming for 1st Year Social Science Students, Sep 2018 – Dec 2018.
  - Relational Databases and SQL for 2nd Year Computer Science Students, Sep 2018 – Dec 2018.
- Teaching Assistantships at Concordia University
  - Hardward Functional Verification for Graduate and Senior Undergraduate Students, Jan 2016 – Apr 2016.
  - Computer Architecture and Design for Graduate Students, Jan 2016 – Apr 2016.
  - Digital Design for Undergraduate Students, Jan 2016 – Apr 2016.
  - Microprocessors and their Applications for Graduate Students, Sep 2015 – Dec 2015.

❖ Supervision

- Keerthi Nelaturu, Ph.D. student, University of Toronto
- Zihan Zhao, MASc student, University of Toronto
- Zhiyang Chen, MASc student, University of Toronto
- Eric Keilty, MASc student, University of Toronto
- Hossein Ghotbaddini, MASc student, University of Toronto
- Xun Deng, MASc student, University of Toronto

❖ Talks

Automated Synthesis of Asynchronizations
SAS 2022 at SPLASH 2022, Auckland, New Zealand *Dec 2022*

SigVM: Enabling Event-Driven Execution for Truly Decentralized Smart Contracts
OOPSLA 2022 at SPLASH 2022, Auckland, New Zealand *Dec 2022*
Research Meeting with Bank of Canada, University of Toronto *Jul 2022*

Automated Auditing of Price Gouging TOD Vulnerabilities in Smart Contracts
ICBC 2022, Shanghai, China (virtual) *May 2022*

Checking Robustness Between Weak Transactional Consistency Models
ANR Project AdeCoDS Meeting, LIP6, Sorbonne University (virtual) *Jun 2021*
IRIF Verification Seminar, University of Paris (virtual) *May 2021*
ESOP 2021, Luxembourg, Luxembourg (virtual) *Mar 2021*

Behavioral Simulation for Smart Contracts
COVID papers at SPLASH 2022, Auckland, New Zealand *Dec 2022*
GROUP SEMINAR, University of Toronto (virtual) *Dec 2021*
SEMINAR UM6P-CS, Morocco (virtual) *Jul 2020*
PLDI 2020, London, UK (virtual) *Jun 2020*

Robustness Against Transactional Causal Consistency
IRIF Verification Seminar, University of Paris *Dec 2019*
CONCUR 2019, Amsterdam, Netherlands *Sep 2019*

Checking Robustness Against Snapshot Isolation
ANR Project AdeCoDS Kick-off Meeting, IRIF, University of Paris *Nov 2019*
CAV 2019, New York City, USA *Jul 2019*

Formal Analysis of Engineering Systems Based on Signal-Flow-Graph Theory *Jul 2016*
NSV-CAV 2016 Toronto, Canada

Hierarchical Verification of Quantum Circuits *Jun 2016*
NFM 2016 Minneapolis, USA

Formal Analysis of Power Electronic Systems *Oct 2015*
Hardware Verification Group Meeting Concordia University

On the Formal Analysis of Photonic Signal Processing Systems *May 2015*
Hardware Verification Group Meeting Concordia University