# Curriculum Vitae

**Sidi Mohamed Beillahi**
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## ❖ Research Interests

Software engineering; Software security; Software verification; Distributed systems; Blockchain; Formal verification; Algorithmic verification; Programming languages; Program synthesis.

## ❖ Education

**Ph.D. — Computer Science** — *Dec 2017 – Mar 2021*
Paris Diderot University, France

Thesis: **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: **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

**NSERC Postdoctoral Research Fellow, 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, York University** — *Jan 2024 – present*
Toronto, Canada

**Research Consultant, Conflux Network** — *Dec 2021 – present*

**Course Instructor, University of Toronto** — *Sep 2022 – Apr 2023*

**Research Assistant, Institut de Recherche en Informatique Fondamentale** — *Dec 2017 – May 2021*
Advisors: Ahmed Bouajjani and Constantin Enea — Paris, France

**Teaching Assistant, Paris Diderot University** — *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

- ACM SIGSOFT Distinguished Paper Award, ICSE 2024.
- Invited to a Journal Special Issue for Selected OSDI 2023 papers, 2023.
- 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

- PI in two MITACS Accelerate Partnership Grants, 2022 – 2024, CAD 205,500.
- 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, Institut de Recherche en Informatique Fondamentale Verification Seminar, Mar 2020 – July 2020.
- Artificat Evaluation Committees: POPL 2021-2022, CAV 2021, CAV 2024, OOPSLA 2021-2022.
- Extended Review Committees: OOPSLA 2022.
- Sub-Reviewer: FTSCS 2016, VMCAI 2020, CAV 2020, Blockchain 2021, ICDCS 2022, ICBC 2022-2023, TACAS 2024.
- Journal Invited Reviewer: IEEE Transactions on Network and Service Management
- Student Volunteer: CAV 2016.

## ❖ Journal Publications

J5 **LVMT: An Efficient Authenticated Storage for Blockchain** *2023*
Chenxing Li, **Sidi Mohamed Beillahi**, Guang Yang, Ming Wu, Wei Xu, Fan Long
*Under submission to the ACM Transactions on Storage*
**Invited special issue for best storage papers from OSDI 2023**

J4 **LMPT: A Novel Authenticated Data Structure to Eliminate Storage Bottlenecks for High Performance Blockchains** *2023*
Jemin Andrew Choi, **Sidi Mohamed Beillahi**, Srisht Fateh Singh, Panagiotis Michalopoulos, Peilun Li, Andreas Veneris, Fan Long
*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

C18 **HEMVM: a Heterogeneous Blockchain Framework for Interoperable Virtual Machines** *2024*
Vladyslav Nekriach, **Sidi Mohamed Beillahi**, Chenxing Li, Peilun Li, Ming Wu, Andreas Veneris, Fan Long
*under submission*

C17 **Demystifying Invariant Effectiveness for Securing Smart Contracts** *July 2024*
Zhiyang Chen, Ye Liu, **Sidi Mohamed Beillahi**, Yi Li, Fan Long
*Accepted to ACM International Conference on the Foundations of Software Engineering (FSE 2024)*

C16 **FlashSyn: Flash Loan Attack Synthesis via Counterexample-Driven Approximation** *April 2024*
Zhiyang Chen, **Sidi Mohamed Beillahi**, Fan Long
*In Proc. 46th IEEE/ACM International Conference on Software Engineering (ICSE 2024)*

C15 **Safeguarding DeFi Smart Contracts against Oracle Deviations** *April 2024*
Xun Deng, **Sidi Mohamed Beillahi**, Cyrus Minwalla, Han Du, Andreas Veneris, Fan Long
*In Proc. 46th IEEE/ACM International Conference on Software Engineering (ICSE 2024)*
**ACM SIGSOFT Distinguished Paper Award.**

C14 **LVMT: An Efficient Authenticated Storage for Blockchain** *July 2023*
Chenxing Li, **Sidi Mohamed Beillahi**, Guang Yang, Ming Wu, Wei Xu, Fan Long
*In Proc. 17th USENIX Symposium on Operating Systems Design and Implementation (OSDI), 2023*
**Invited to a Special Issue of the ACM Transactions on Storage Journal for Selected OSDI 2023 Papers.**

C13 **A Robust Front-Running Methodology for Malicious Flash-Loan DeFi Attacks** *July 2023*
Xun Deng, Zihan Zhao, **Sidi Mohamed Beillahi**, Han Du, Cyrus Minwalla, Keerthi Nelaturu, Andreas Veneris, Fan Long
*In Proc. IEEE International Conference on Decentralized Applications and Infrastructures (DAPPS), 2023*

C12 **Möbius: an Atomic State Sharding Design for Account-Based Blockchains** *May 2023*
Srisht Fateh Singh, Panagiotis Michalopoulos, **Sidi Mohamed Beillahi**, Andreas Veneris, Fan Long
*In Proc. IEEE International Conference on Blockchain and Cryptocurrency (ICBC), 2023*

C11 **Comparing Causal Convergence Consistency Models** *May 2023*
**Sidi Mohamed Beillahi**, Ahmed Bouajjani, Constantin Enea
*In Proc. 11th International Conference on Networked Systems (NETYS), 2023*

C10 **Automated Synthesis of Asynchronizations** *Dec 2022*
**Sidi Mohamed Beillahi**, Ahmed Bouajjani, Constantin Enea, Shuvendu Lahiri
*In Proc. 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 Special Issue of the Logical Methods in Computer Science Journal 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

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

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

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

## ❖ Teaching

- Course Instructor at York University
  - EECS3342Z: System Specification and Refinement for 3rd Year Software Engineering Students, Jan 2024 – present.
- Course Co-Instructor at University of Toronto
  - CSC323H1S: Principles of Programming Languages for 3rd Year Computer Science Students, Jan 2023 – Apr 2023.
  - ECE345H1F: Algorithms & Data Structures for 3rd Year Computer Engineering Students, Sep 2022 – Dec 2022.
- Teaching Assistantships at Paris Diderot University
  - 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.

## ❖ Professional Affiliations

ACM (2020); IEEE (2022).

## ❖ Supervision

- Keerthi Nelaturu, Ph.D. student, University of Toronto
- Zihan Zhao, MASc student, University of Toronto - graduated in 2022
- Zhiyang Chen, Ph.D. student, University of Toronto
- Eric Keilty, MASc student, University of Toronto - graduated in 2023
- Srisht Fateh Singh, MASc student, University of Toronto - graduated in 2023
- Hossein Ghotbaddini, MASc student, University of Toronto - graduated in 2023
- Xun Deng, MASc student, University of Toronto
- Vladyslav Nekriach, MASc student, University of Toronto
- Jacky Zhou, MASc student, University of Toronto

## ❖ Talks

**Securing Smart Contracts Through Program Synthesis**
IRIF Verification Seminar, Université Paris Cité (virtual) *April 2024*

**Improving the Reliability and Performance of Distributed Software Systems**
School of Information Technology, York University (virtual) *April 2024*

**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, Paris Diderot University (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, Paris Diderot University *Dec 2019*
CONCUR 2019, Amsterdam, Netherlands *Sep 2019*

**Checking Robustness Against Snapshot Isolation**
ANR Project AdeCoDS Kick-off Meeting, IRIF, Paris Diderot University — *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

## ❖ Recent media articles on the work published in C17

Blockchain Security Firm Quantstamp Hopes to Battle Flash Loan Attacks With New Service — *CoinDesk - Aug 2023*

Quantstamp unveils tool to detect DeFi flash loan vulnerabilities — *THE BLOCK - Aug 2023*