Dr. Nathalie Cauchi

Personal Webpage
London, United Kingdom
(+44) 7864686538
nathalie.cauchi@cs.ox.ac.uk
Google Scholar: N. Cauchi
ORCID:0000-0002-7564-1721

Short Bio

Nathalie has applied her interest of formal methods and verification techniques to real-world complex problems within the domain of cyberphysical systems. this involved bridging control engineering methods with novel computer science techniques and a mixture of model-based algorithms and machine learning.

Interests

- Probabilistic modelling
- Quantitative verification
- Cyber-physical systems
- Stochastic Hybrid Systems
- Predictive maintenance

Skills

Programming:

MATLAB, C++, Python	●●●●●
PRISM Model checker	●●●●●
NuSMV	●●●●○
STORM	●●●○○
Bash scripting	●●○○○

Tools:

MOSEK, CVX	●●●●○
TensorFlow	●●●○○
OpenCV, Panda	●●●○○

General

LaTeX	●●●●●
Git	●●●○○

Working Experience

Sep, 2019 – ongoing — **Quantative Developer** — **Marshall Wace, London**
Working on applying formal methods within the financial domain.

Apr, 2017 – Oct, 2019 — **Graduate Teaching Assistant** — **Univ. of Oxford, UK**
Tutorials, lab sessions and marker.

July, 2018 – Nov, 2018 — **Visiting Researcher** — **Honeywell Research Laboratories, Honeywell**
Worked on the FP7 European Project called Advanced Methods for Building Diagnostics and Maintenance (AMBI), where I developed algorithms for predictive maintenance of heating components within building automation systems.

Sept, 2014 – Sept, 2015 — **Research Associate** — **Institute of Aerospace Technologies, Univ. of Malta**
Worked on a number of European and Maltese projects under the supervision of Prof. David Zammit-Mangion.

Oct, 2014 – Jun, 2015 — **Electrical Engineer** — **Prominent Fluid Controls, Inc, Malta**
Designed and developed electronic hardware for a multi-channel industry grade pH electrode end-of line tester. The system is being used as an autonomous quality assurance process for the production of industry grade pH and redox electrodes.

Education

2016 – 2020 — **DPhil. in Computer Science** — **Univ. of Oxford, UK**
Title: Automatic Verification of Stochastic Processes: Certification of Building Automation Systems
Supervisor: Prof. Alessandro Abate

Smart Buildings | Verification | Stochastic Hybrid Systems

2010 – 2014 — **B.Sc. Electrical & Electronics Eng. (Hons)** — **Univ. of Malta, Malta**
Project Title:A Multi-Channel Industry Grade pH Probe Tester: Interface Design and Characterization
Supervisors: Dr. Marc. A. Azzopardi, Dr. Andrew Sammut
Industrial Sponsor: Prominent Fluid Control, Industrial Advisor: Dr. Conrad Pace
Grade: First Class Degree

Teaching Experience

Univ. of Oxford — **Computer-Aided Formal Verification** — Michaelmas'19, Michaelmas'18
Tutorials and lab sessions: Temporal Logic, Automata, Model Checking, NuSMV

Univ. of Oxford — **Systems Verification** — Hilary'18, Hilary'17
Temporal Logic, Abstraction Based Model Checking

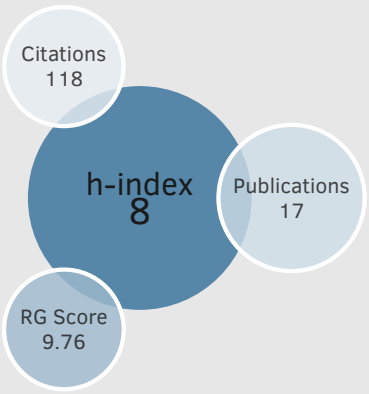
Univ. of Oxford — **Digital Systems** — Trinity'17
Practical demonstrator using Assembly language

Academic Supervision

2017–2018 — **Automated Strategy Synthesis for Condition Based Maintenance: an Application in Smart Devices** — M.Sc.
Lina Gotzha

2015–2016 — **Learning the Model of a Smart Building: Parameter Inference and State Estimation** — M.Sc.
Apoorva Honnegowda Roopa

Metrics



Extracurricular

- Oxford Foundry All-Innovate Competition, Top 20
- Oxford Women in Computer Science, Seminar Series Coordinator
- Volunteer for Federated Logic Conference (FLoC 2019)
- Helped in the organisation of IFAC Conference on Analysis and Design of Hybrid Systems (ADHS) 2018
- Online Tuition Courses on Spire.co
- IEEE Student Branch, Vice President
- Robot Wars, 2013 - 2014
- Texas Instrument Innovation Challenge, 2014

Review Duties

- Journals: Automatica, Software Quality Journal, Sustainable Simulation Modelling Practice and theory
- Conferences: HSCC'19, HSCC'18, QEST'18, NEWCAS'18, QEST'16, ECC'17, ADHS'18, SEFM 2019

Profiles

Honours and Awards

2018	**Best Overall Presentation** 5th Oxbridge Women in Computer Science Conference	Cambridge Univ.,
2017	**Second place in Innovation Award** Malta Innovations	Malta
2016	**Best Poster** Oxford Computer Science Student & Research Staff Conference	Univ. of Oxford
2015	**Awarded Ph.D. Scholarships (25,000 EUR)** ENDEAVOUR Scholarships	Malta
2015	**Best Paper of Session** 34^{th} AIAA/IEEE Digital Avionics Systems Conference (DASC)	Czech Republic
2014	**Best Final Year Student's Project** Malta Chambers of Engineers	Malta
2014	**Best Runner's up & Best Manoeuvrability** Robot Wars	IEEE Malta Student Branch
2013	**Best Tactics** Robot Wars	IEEE Malta Student Branch

Presentations

2019	**Tools for Stochastic Hybrid Systems Quo Vadis** Key note speaker at Applied Verification for Continuous and Hybrid Systems (ARCH) workshop	Canada
2019	**Results for Stochastic Models group** Applied Verification for Continuous and Hybrid Systems (ARCH) workshop	Canada
2019	**StocHy: Automated Verification of Stochastic Processes** 25^{th} International Conference on Tools and Algorithms for the Construction and Analysis of Systems, Porsche Reseach Labs	Czech Republic
2019	**Efficiency through Uncertainty: Scalable Formal Synthesis for Stochastic Hybrid Systems** Hybrid Systems and Control Conference (HSCC)	Canada
2018	**A Modular Model Library for Building Automation Systems** IFAC Conference on Analysis and Design of Hybrid Systems (ADHS)	UK
2018	**Assessment of Maintenance Policies for Smart Buildings applying Formal Methods to Fault Maintenance Trees** European Conference of the Prognostics and Health Management Society (PHME)	The Netherlands
2017/8	**Efficient Probabilistic Model Checking of Smart Building Maintenance using Fault Maintenance Trees** The 4^{th} ACM International Conference on Systems for Energy-Efficient Built Environments, 5^{th} Oxbridge Women in Computer Science Conference	The Netherlands, UK
2017	**Synthesis of Optimal Maintenance Actions for a Biomass Boiler** 4^{th} Oxbridge Women in Computer Science Conference	UK
2016	**Modeling Smart Building Dynamics** The Oxford Student and Research Staff Conference, Univ. of Oxford	UK

Program Committees

HSCC 2020	**Hybrid Systems and Controls** Program member for the poster and demonstration session
ARCH 2019, 2018	**Stochastic Models Group** Core-creator and organiser of the stochastic modelling group within the ARCH competition

Publications

[1] Alessandro Abate et al. “ARCH-COMP18 Category Report: Stochastic Modelling.” In: *ARCH@ ADHS*. 2018, pp. 71–103.

[2] Alessandro Abate et al. “ARCH-COMP19 Category Report: Stochastic Modelling”. In: *EPiC Series in Computing* 61 (2019), pp. 62–102.

[3] Alessandro Abate et al. “Assessment of Maintenance Policies for Smart Buildings: Application of Formal Methods to Fault Maintenance Trees”. In: *4th European Conference of the Prognostics and Health Management Society, PHME 2018*. PHM society. 2018.

[4] Alessandro Abate et al. “Modelling Smart Buildings Using Fault Maintenance Trees”. In: *European Workshop on Performance Engineering*. Springer, Cham. 2018, pp. 110–125.

[5] Nathalie Margaret Cauchi. “Automatic Verification of Stochastic processes: Certification of Building Automation Systems”. PhD thesis. University of Oxford, 2019.

[6] Nathalie Margaret Cauchi. “Modelling Smart Buildings using Fault Maintenance Trees”. In: *15th European Performance Engineering Workshop*. 15th European Performance Engineering Workshop. 2018.

[7] Nathalie Cauchi and Alessandro Abate. “Benchmarks for Stochastic Models from Building Automation Systems”. In: *ARCH@ ADHS*. 2018, pp. 242–250.

[8] Nathalie Cauchi and Alessandro Abate. “StocHy: Automated Verification and Synthesis of Stochastic Processes”. In: *Tools and Algorithms for the Construction and Analysis of Systems*. Ed. by Tomáš Vojnar and Lijun Zhang. Cham: Springer International Publishing, 2019, pp. 247–264. ISBN: 978-3-030-17465-1.

[9] Nathalie Cauchi, Karel Macek, and Alessandro Abate. “Model-Based Predictive Maintenance in Building Automation Systems with user discomfort”. In: *Energy* 138 (2017), pp. 306–315.

[10] Nathalie Cauchi et al. “A Decision Support Tool for Weather and Terrain Avoidance during Departure”. In: *2015 IEEE/AIAA 34th Digital Avionics Systems Conference (DASC)*. IEEE. 2015, 2G1–1.

[11] Nathalie Cauchi et al. “Efficiency Through Uncertainty: Scalable Formal Synthesis for Stochastic Hybrid Systems”. In: *Proceedings of the 22Nd ACM International Conference on Hybrid Systems: Computation and Control*. 2019, pp. 240–251.

[12] Nathalie Cauchi et al. “Efficient Probabilistic Model Checking of Smart Building Maintenance Using Fault Maintenance Trees”. In: *Proceedings of the 4th ACM International Conference on Systems for Energy-Efficient Built Environments*. BuildSys ’17. Delft, Netherlands: Association for Computing Machinery, 2017. ISBN: 9781450355445.

[13] Nathalie Cauchi et al. “Maintenance of Smart Buildings using Fault Trees”. In: *ACM Transactions on Sensor Networks (TOSN)* 14.3-4 (2018), pp. 1–25.

[14] Jason Gauci et al. “Design and Evaluation of a Touch screen Concept for Pilot Interaction with Avionic Systems”. In: *2015 IEEE/AIAA 34th Digital Avionics Systems Conference (DASC)*. IEEE. 2015, pp. 3C2–1.

[15] Sofie Haesaert, Nathalie Cauchi, and Alessandro Abate. “Certified Policy Synthesis for General Markov Decision Processes: An Application in Building Automation Systems”. In: *Performance Evaluation* 117 (2017), pp. 75–103.

[16] Khaza Anuarul Hoque, Nathalie Cauchi, and Alessandro Abate. “Analyzing Occupancy-Driven Thermal Dynamics in Smart Buildings”. In: *arXiv preprint arXiv:1903.06123* (2019).

[17] Karel Macek et al. “Long-term Predictive Maintenance: A Study of Optimal Cleaning of Biomass Boilers”. In: *Energy and Buildings* 150 (2017), pp. 111–117.