SHUFANG ZHU

Senior Research Associate
Department of Computer Science
University of Oxford
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EDUCATION

PhD in SOFTWARE ENGINEERING — Sept. 14 - Mar. 20
East China Normal University, China
Advisor: Prof. Geguang Pu
Thesis: Program Synthesis of Linear Temporal Logic over Finite Traces
Committee: Prof. Moshe Y. Vardi (Rice U.), Prof. Giuseppe De Giacomo (U. Oxford), Prof. Meng Sun (Peking U.), Prof. Naijun Zhan (Chinese Academy of Sci.), and Prof. Yuxin Deng (ECNU)

BSc in SOFTWARE ENGINEERING — Sept. 10 - Jun. 14
East China Normal University, China

EMPLOYMENT

Senior Research Associate in DEPARTMENT OF COMPUTER SCIENCE — Feb. 23 - Present
University of Oxford, UK
Mentor: Prof. Giuseppe De Giacomo

Research Associate in DEPT. OF COMP., CONTROL & MANAGEMENT ENGINEERING — Dec. 20 - Nov. 22
Sapienza University of Rome, Italy
Mentor: Prof. Giuseppe De Giacomo

Junior Researcher — May. 20 - Oct. 20
Shanghai Industrial Control Safety Innovation Technology Co. LTD, China

RESEARCH INTERESTS

My expertise lies in the interdisciplinary research area of artificial intelligence (AI) and formal methods (FM), with a focus on

- knowledge representation and reasoning
- autonomy and decision-making
- formal verification and synthesis

PUBLICATIONS

*** indicates author list has been sorted alphabetically by last name**

CONFERENCE PROCEEDINGS

[ECAI 23]* LTL_f Best-Effort Synthesis in Nondeterministic Planning Domains
Giuseppe De Giacomo, Gianmarco Parretti, **Shufang Zhu**
To appear at the European Conference on Artificial Intelligence (ECAI) 2023

[EUMAS 23]* LTL_f Synthesis Under Environment Specifications for Reachability and Safety Properties
Benjamin Aminof, Giuseppe De Giacomo, Antonio Di Stasio, Hugo Francon, Sasha Rubin, **Shufang Zhu**
To appear at the European Conference on Multi-Agent Systems (EUMAS) 2023

[EUMAS 23]* Symbolic LTL$_f$ Best-Effort Synthesis
Giuseppe De Giacomo, Gianmarco Parretti, **Shufang Zhu**
To appear at the European Conference on Multi-Agent Systems (EUMAS) 2023

[VSTTE 22]* Compositional Safety LTL Synthesis
Suguman Bansal, Giuseppe De Giacomo, Antonio Di Stasio, Yong Li, Moshe Y Vardi, **Shufang Zhu**
In Proc. of International Conference on Verified Software: Theories, Tools, and Experiments (VSTTE) 2022

[IJCAI 22]* LTL$_f$ Synthesis as AND-OR Graph Search: Knowledge Compilation at Work
Giuseppe De Giacomo, Marco Favorito, Jianwen Li, Moshe Y Vardi, Shengping Xiao, **Shufang Zhu**
In Proc. of International Joint Conference on Artificial Intelligence (IJCAI) 2022

[IJCAI 22] Synthesis of Maximally Permissive Strategies for LTL$_f$ Specifications
Shufang Zhu, Giuseppe De Giacomo
In Proc. of International Joint Conference on Artificial Intelligence (IJCAI) 2022

[KR 22] Act for Your Duties but Maintain Your Rights
Shufang Zhu, Giuseppe De Giacomo
In Proc. of International Conference on Principles of Knowledge Representation and Reasoning (KR) 2022

[IJCAI 21]* Finite-Trace and Generalized-Reactivity Specifications in Temporal Synthesis
Giuseppe De Giacomo, Antonio Di Stasio, Lucas M Tabajara, Moshe Y. Vardi, **Shufang Zhu**
In Proc. of International Joint Conference on Artificial Intelligence (IJCAI) 2021

[AAAI 21] On-the-fly Synthesis for LTL over Finite Traces
Shengping Xiao, Jianwen Li, **Shufang Zhu**, Yingying Shi, Geguang Pu, Moshe Y. Vardi
In Proc. of AAAI Conference on Artificial Intelligence (AAAI) 2021

[KR 21]* Synthesis with Mandatory Stop Actions
Giuseppe De Giacomo, Antonio Di Stasio, Giuseppe Perelli, **Shufang Zhu**
In Proc. of International Conference on Principles of Knowledge Representation and Reasoning (KR) 2021

[GandALF 21] On the Power of Automata Minimization in Temporal Synthesis
Shufang Zhu, Lucas M Tabajara, Geguang Pu, Moshe Y Vardi
In Proc. of International Symposium on Games, Automata, Logics, and Formal Verification (GandALF) 2021

[KR 20]* Two-Stage Technique for LTL$_f$ Synthesis Under LTL Assumptions
Giuseppe De Giacomo, Antonio Di Stasio, Moshe Y. Vardi, **Shufang Zhu**
In Proc. of International Conference on Principles of Knowledge Representation and Reasoning (KR) 2020

[AAAI 20] LTL$_f$ Synthesis with Fairness and Stability Assumptions
Shufang Zhu, Giuseppe De Giacomo, Geguang Pu, Moshe Y Vardi
In Proc. of AAAI Conference on Artificial Intelligence (AAAI) 2020

[TACM 19] First-Order vs. Second-Order Encodings for LTL$_f$-to-Automata Translation
Shufang Zhu, Geguang Pu, Moshe Y. Vardi
In Proc. of Annual Conference of Theory and Applications of Models of Computation (TAMC) 2019

[IJCAI 17] Symbolic LTL$_f$ Synthesis
Shufang Zhu, Lucas M. Tabajara, Jianwen Li, Geguang Pu, Moshe Y. Vardi
In Proc. of International Joint Conference on Artificial Intelligence (IJCAI) 2017

[HVC 17] A Symbolic Approach to Safety LTL Synthesis
Shufang Zhu, Lucas M. Tabajara, Jianwen Li, Geguang Pu, Moshe Y. Vardi
In Proc. of International Haifa Verification Conference (HVC) 2017

[ICCAD 17] Safety model checking with complementary approximations
Jianwen Li, **Shufang Zhu**, Yueling Zhang, Geguang Pu, Moshe Y. Vardi
In Proc. of IEEE/ACM International Conference on Computer-Aided Design (ICCAD) 2017

[HVC 15] SAT-Based Explicit LTL Reasoning
Jianwen Li, **Shufang Zhu**, Geguang Pu, Moshe Y. Vardi
In Proc. of International Haifa Verification Conference (HVC) 2015

JOURNAL ARTICLES

[JAIR 23]* Mimicking Behaviors in Separated Domains
Giuseppe De Giacomo, Dror Fried, Fabio Patrizi, **Shufang Zhu**
Journal of Artificial Intelligence Research 77 (2023):1087-1112

[FMSD 23]* Finite-trace and generalized-reactivity specifications in temporal synthesis
Giuseppe De Giacomo, Antonio Di Stasio, Lucas M. Tabajara, Moshe Y. Vardi, **Shufang Zhu**
Formal Methods System Design [Invited submission]
`https://doi.org/10.1007/s10703-023-00413-2`

[FMSD 19] SAT-based explicit LTL reasoning and its application to satisfiability checking
Jianwen Li, **Shufang Zhu**, Geguang Pu, Lijun Zhang, Moshe Y. Vardi
Formal Methods System Design 54(2): 164-190

[FAC 18] An explicit transition system construction approach to LTL satisfiability checking
Jianwen Li, **Shufang Zhu**, Geguang Pu, Moshe Y. Vardi, Jifeng He
Formal Aspects of Computing 30(2): 193-217

OPEN SOURCE TOOLS

Syft | Github Link

- The first symbolic reactive synthesis tool for LTL_f objectives [Paper]. It has also been integrated into **state-of-the-art LTL_f synthesizers** and extended to robotics motion and planning.
- Extension SyftMax to synthesize the maximally permissive controller for LTL_f objectives [Paper].
- Extension GFSynth to synthesize LTL_f objectives with LTL environment specifications [Paper].
- The latest version LydiaSyft got the **2nd place** in LTL_f track of SYNTCOMP 2023 [Results][Paper].
- Extension BeSyft to synthesize best-effort controller for LTL_f specifications [Paper].

TEACHING

Lecturer, Game-Theoretic Approach to Planning and Synthesis (MS/PhD level) — Jul. 23
European Summer School on Artificial Intelligence ESSAI, Ljubljana, Slovenia

Teaching Assistant, Foundations of Self-Programming Agents (MS/PhD level) — Hilary Term. 23
University of Oxford, UK

Lecturer, Game-Theoretic Approach to Planning and Synthesis (MS/PhD level) — Jul. 22
Italian PhD program in Artificial Intelligence & Artificial Intelligence Doctoral Academy
Sapienza University of Rome, Italy

Teaching Assistant, Tools of Software Analysis and Verification (MS/PhD level) Fall. 14
East China Normal University, China

RESEARCH MENTORING

Current Mentoring

1. Gianmarco Parretti (PhD, Sapienza University of Rome) Nov. 22 - Present
2. Maria Farberov (Master's, The Open University of Israel) Sept. 22 - Present

Previous Mentoring

1. Gianmarco Parretti (Master's, Sapienza University of Rome) Sept. 21 - Jul. 22
   Thesis: Symbolic best-effort synthesis for specifications in Linear Temporal Logic on finite traces
   Thesis received 110 (with Honors)/110 points
2. Yingying Shi (Master's, East China Normal University) Sept. 18 - Nov. 19
   Project: Automata-based LTL_f reasoning
3. Shengping Xiao (Undergraduate, East China Normal University) Sept. 18 - Nov. 19
   Project: MONA-based LTL_f to DFA conversion

AWARDS AND HONORS

Selected Mentee at F+Cube Program 2023
TU Delft, The Netherlands

Future Digileader 2023
Digital Futures, Sweden

Rising Star in Electrical Engineering and Computer Science (EECS) 2022
UT Austin, USA

Invited to **Dagstuhl Seminar** on **The Futures of Reactive Synthesis** Sept. 23

Invited to **Lorentz workshop** on **Contract Languages: Expressiveness, Abstraction, Interoperability, and Applications** Mar. 24

Invited to **Dagstuhl Seminar** on **Automated Synthesis: Functional, Reactive and Beyond** Apr. 24

Chinese Government Scholarship May. 2016
Chinese Scholarship Council

Academic Scholarship 2015, 2016, 2017, 2018, 2019
East China Normal University

Outstanding Student Scholarship 2012, 2013, 2014
East China Normal University

Notable Freshman Mentor 2011
East China Normal University

Travel Grants
KR Diversity & Inclusion Travel Grant 2022, IJCAI 2019, FLoC 2018, Travel Award for WiL 2018 & 2023

RESEARCH COMMUNITY SERVICES

Organizing Committee
Co-Chair. AAAI Spring Symposium Series 2023: On the Effectiveness of Temporal Logics on Finite Traces

Program Committee
2024. AAAI, AAMAS
2023. IJCAI, KR, FMCAD, ECAI
2022. AAAI, IJCAI
2021. AAAI

Conference Reviewer
2023. CAV
2022. CSL
2021. ICALP

Journal Reviewer
2023. Artificial Intelligence Journal
2020. Mathematical Problems in Engineering, IEEE Access
2017. Formal Methods in System Design

Conference Volunteer
KR 2021, ATVA 2015 (Head Volunteer)

RESEARCH VISITS

The CISPA Helmholtz Center for Information Security, Saarbrücken, Germany — Sept. 23
Visiting Postdoctoral Researcher
Host: Prof. Bernd Finkbeiner

Max Planck Institute for Software Systems (MPI-SWS), Kaiserslautern, Germany. — Sept. 23
Visiting Postdoctoral Researcher
Host: Dr. Anne-Kathrin Schmuck

Sapienza University of Rome, Rome, Italy. — Apr. 19
Visiting PhD student
Host: Prof. Giuseppe De Giacomo

Université libre de Bruxelles, Brussels, Belgium. — March. 19
Visiting PhD student
Host: Prof. Jean-François Raskin

Huawei OS Kernel Lab, Shanghai, China. — Jun. 18 - Aug. 18
Research Intern
Mentors: Dr. Ming Fu, Dr. Xin Gao

Rice University, Houston, USA. — Aug. 16 - Feb. 18
Visiting PhD student
Host: Prof. Moshe Y. Vardi

RESEARCH TALKS

Reactive Synthesis of Linear Temporal Logic on Finite Traces: An Evolving Journey

- (Invited) In a seminar series at the CISPA Helmholtz Center for Information Security (CISPA), 22/09/2023, Saarbrücken, Germany.
- (Invited) In a seminar series at Max Planck Institute for Software Systems (MPI-SWS), 18/09/2023, Kaiserslautern, Germany.

On the Power of LTL$_f$ in Assured Autonomy

- (Invited) In the Automata Group seminar, EPITA Research Laboratory (LRE), 07/07/2023, Online
- (Invited) In the OxCAV seminar, Univeristy of Oxford, 24/05/2023, Oxford, UK.
- (Invited) In the KRR seminar, University of Oxford, 15/05/2023, Oxford, UK.
- (Invited) In the Autonomous Systems Group seminar, University of Texas at Austin, 04/11/2022, Online.
- (Invited) In a seminar series, Sapienza University of Rome, 10/11/2022, Rome, Italy.

Program Synthesis of Linear Temporal Logic over Finite Traces

- (Invited) In a seminar held at Sapienza University of Rome, 11/06/2020, Online.

Temporal Synthesis with Reachability and Safety Goals

- (Invited) In a seminar series, Sapienza University of Rome, 01/04/2019, Rome, Italy.
- (Invited) In the Formal Methods and Verification group seminar, Université libre de Bruxelles, 28/03/2019, Brussels, Belgium.

Conference and Workshop Presentations

LAMAS&SR 2023, SYNTH 2023, WiL 2023, Oxbridge 2023, KR 2022, IJCAI 2022, VardiFest 2022, GenPlan 2022, IJCAI 2021, GenPlan 2021, Highlights of Logic, Games and Automata 2021, KR 2021, GandALF 2021, TAMC 2019, WiL 2018, IJCAI 2017, “ExCAPE: Expeditions in Computer Augmented Program Engineering” Annual Meeting 2017, IDEA4CPS 2015, YR-SETTA 2015

OUTREACH ACTIVITIES

Research Member of Common Room Sept. 23 - Present
Kellogg College, Oxford, UK

Seminar Series Coordinator May. 23 - Present
Oxford Women in Computer Science Society (OxWoCS), Oxford, UK

Taster-session Lecturer Jun. 23
Women in Sciences Day, Oxford, UK
A 45-min lecture on “Logic in Computer Science" to a group of young female and non-binary students aged 16-17 from the UK