SHUFANG ZHU

Senior Research Associate

Department of Computer Science
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Education

09.14–03.20 **PhD in Software Engineering**, *East China Normal University*, Shanghai, 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)

09.10–06.14 **BSc in Software Engineering**, *East China Normal University*, Shanghai, China.

Current Position

Since 02.23 **Senior Research Associate**, *Department of Computer Science*, University of Oxford, UK.
- **Mentor:** Prof. Giuseppe De Giacomo

Previous Positions

12.20–11.22 **Research Associate**, *Depart. of Computer, Control and Management Engineering*, Sapienza University of Rome, Italy.
- **Mentor:** Prof. Giuseppe De Giacomo

05.20–10.20 **Junior Researcher**, *Shanghai Industrial Control Safety Innovation Technology Co. LTD*, China.
- **Mentor:** Prof. Geguang Pu

06.18–08.18 **Researcher Intern**, *OS Kernel Lab of Huawei*, China.
- **Mentors:** Dr. Ming Fu, Dr. Xin Gao

08.16–02.18 **PhD Researcher**, *Rice University*, USA.
- **Mentor:** Prof. Moshe Y. Vardi

Research Interests

My research concerns interdisciplinary knowledge across artificial intelligence (AI) and formal methods (FM), focusing on automated reasoning, planning and synthesis.

Teaching

07.23 **Lecturer**, *European Summer School on Artificial Intelligence ESSAI & ACAI*, Ljubljana, Slovenia,
Course: Game-Theoretic Approach to Planning and Synthesis (MS/PhD level).

02.23 **Teaching Assistant**, *University of Oxford*, Oxford, UK,
Course: Foundations of Self-Programming Agents (MS/PhD level).

07.22 **Lecturer**, *Sapienza University of Rome*, Rome, Italy,
Course: Game-Theoretic Approach to Planning and Synthesis (Italian national PhD prog. in AI).

11.14 **Teaching Assistant**, *East China Normal University*, Shanghai, China,
Course: Tools of Software Analysis and Verification (MS/PhD level).

Research Mentoring

09.21-07.22 **Gianmarco Parretti**, *Master Student*, Sapienza University of Rome.
- **Thesis:** Symbolic best-effort synthesis for specifications in Linear Temporal Logic on finite traces

09.18-11.19 **Yingying Shi**, *Master Student*, East China Normal University.
- *Project:* Automata-based LTL_f reasoning

09.18-11.19 **Shengping Xiao**, *Undergraduate Student*, East China Normal University.
- *Project:* MONA-based LTL_f to DFA conversion

Services for the Scientific Community

Chair.
2023: AAAI Spring Sympoium "On the Effectiveness of Temporal Logics on Finite Traces in AI"

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

Conference Paper Reviewer.
2023: CAV
2022: CSL
2019: ICALP

Journal Paper Reviewer.
Artificial Intelligence Journal
Formal Methods in System Design
Mathematical Problems in Engineering
IEEE Access

Conference Volunteer.
KR 2021, ATVA 2015 (Head Volunteer)

Research Talks

Reactive Synthesis of Linear Temporal Logic on Finite Traces.
- In the 12th workshop on Synthesis, 18/07/2023, Paris, France.
- In the 7th International Workshop "Women in Logic", 01/07/2022, Rome, Italy.

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.
- In the Annual Women In Computer Science Conference, 29/04/2023, Cambridge, 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.

Act for Your Duties but Maintain Your Rights.
- In the 19th International Conference on Principles of Knowledge Representation and Reasoning (KR), 03/08/2022, Haifa, Israel.

LTL_f Synthesis as AND-OR Graph Search: Knowledge Compilation at Work.
- In the 31st International Joint Conference on Artificial Intelligence (IJCAI), 29/07/2022, Vienna, Austria.
- In the VardiFest workshop: On the Not So Unusual Effectiveness of Logic, 31/07/2022, Haifa, Israel.

Synthesis of Maximally Permissive Strategies for LTL_f Specifications.
- In the 31st International Joint Conference on Artificial Intelligence (IJCAI), 29/07/2022, Vienna, Austria.

Symbolic Approaches to LTL_f Best-Effort Synthesis.
- In the 6th Workshop on Generalization in Planning (GenPlan), 23/07/2022, Vienna, Austria.

Finite-Trace and Generalized-Reactivity Specifications in Temporal Synthesis.

- In the 31st International Joint Conference on Artificial Intelligence (IJCAI), 25/08/2022, Online
- In the 5th Workshop on Generalization in Planning (GenPlan), 19/08/2021, Online.
- In the 2021 edition of the Conference on Highlights of Logic, Games and Automata, 15/09/2021, Online.

Synthesis with Mandatory Stop Actions.

- In the 18th International Conference on Principles of Knowledge Representation and Reasoning (KR), 11/11/2021, Online + KR local gathering at Sapienza University of Rome, Italy.

On the Power of Automata Minimization in Temporal Synthesis.

- In the 12th International Symposium on Games, Automata, Logics, and Formal Verification (GandALF), 20/09/2021, Online.

Program Synthesis of Linear Temporal Logic over Finite Traces.

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

First-Order vs. Second-Order Encodings for LTL$_f$-to-Automata Translation.

- In the 15th Annual Conference of Theory and Applications of Models of Computation (TAMC), 16/04/2019, Kitakyushu, Japan.

Temporal Synthesis with Reachability and Safety Goals.

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

First-Order vs. Second-Order Encodings for LTL$_f$-to-Automata: An Extended Abstract.

- In the 2nd Women in Logic (WiL) Workshop, 08/07/2018, UK.

Symbolic LTL$_f$ Synthesis.

- In the 26th International Joint Conference on Artificial Intelligence (IJCAI), 22/08/2017, Australia.

Symbolic Synthesis from LTL$_f$ Formulas.

- In the 2017 Expeditions in Computing project "ExCAPE: Expeditions in Computer Augmented Program Engineering" Annual Meeting, 04/05/2017, USA.

SAT-based Explicit LTL Reasoning.

- In the 1st Young Researchers Workshop on Formal Methods (YR-SETTA), 03/11/2015, China.
- In the 2015 annual Sino-Danish Basic Research Center IDEA4CPS Workshop, 30/11/2015, China.

Awards and Honors

Rising Star in Electrical Engineering and Computer Science (EECS), 2022.

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

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

Chinese Government Scholarship, *Chinese Scholarship Council*, 2016.

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

Notable Freshman Mentor, *East China Normal University*, 2011.

Open Source Tools

Syft, *Github link:* `https://github.com/Shufang-Zhu/SyftMax`.

- The first symbolic reactive synthesis tool for LTL$_f$ specifications, which also has been integrated into all state-of-the-art LTL$_f$ synthesizers and extended to support various synthesis scenarios.
- Extension of synthesizing maximally permissive controller for LTL$_f$ specifications.
- The lastest version LydiaSyft got the **2nd place** in the synthesis competition (SYNTCOMP) 2023.

GFSynth, *Github link:* `https://github.com/Shufang-Zhu/GFSynth`.

- Reactive synthesis for LTL$_f$ specifications under Generalized Reactivity (1) environment specifications.

Publications

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

Conference Proceedings

[ECAI 23] * Giuseppe De Giacomo, Gianmarco Parretti, **Shufang Zhu**. "LTL$_f$ Best-Effort Synthesis in Nondeterministic Planning Domains" To appear at the 26th European Conference on Artificial Intelligence (ECAI), 2023.

[EUMAS 23] * Benjamin Aminof, Giuseppe De Giacomo, Antonio Di Stasio, Hugo Francon, Sasha Rubin, **Shufang Zhu**. "LTL$_f$ Synthesis Under Environment Specifications for Reachability and Safety Properties" To appear at the 20th European Conference on Multi-Agent Systems (EUMAS).

[EUMAS 23] * Giuseppe De Giacomo, Gianmarco Parretti, **Shufang Zhu**. "Symbolic LTL$_f$ Best-Effort Synthesis." To appear at the 20th European Conference on Multi-Agent Systems (EUMAS).

[VSTTE 22] * Suguman Bansal, Giuseppe De Giacomo, Antonio Di Stasio, Yong Li, Moshe Y Vardi, **Shufang Zhu**. "Compositional Safety LTL Synthesis." To appear at the 14th International Conference on Verified Software: Theories, Tools, and Experiments (VSTTE).

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

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

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

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

[AAAI 21] Shengping Xiao, Jianwen Li, **Shufang Zhu**, Yingying Shi, Geguang Pu, Moshe Y. Vardi. "On-the-fly Synthesis for LTL over Finite Traces." The 35th AAAI Conference on Artificial Intelligence (AAAI).

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

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

[KR 20] * Giuseppe De Giacomo, Antonio Di Stasio, Moshe Y. Vardi, **Shufang Zhu**. "Two-stage technique for LTL$_f$ synthesis under LTL assumptions." In Proc. of International Conference on Principles of Knowledge Representation and Reasoning (KR).

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

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

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

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

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

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

Journal Articles

[JAIR 23] * Giuseppe De Giacomo, Dror Fried, Fabio Patrizi, **Shufang Zhu**. "Mimicking Behaviors in Separated Domains." Journal of Artificial Intelligence Research. `https://doi.org/10.1613/jair.1.14591`

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

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

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