Gianmarco Parretti

PhD Student
Dipartimento Ingegneria Informatica, Automatica e Gestionale Antonio Ruberti
University of Rome "La Sapienza"

Education

2014 - 2018	**BSc in Managment Engineering**
	University of Rome "La Sapienza"
2018 - 2022	**MSc Engineering in Computer Science**
	University of Rome "La Sapienza"
	Graduated, *110L/110*
Advisor:	Professor Giuseppe De Giacomo
Thesis:	Best-Effort Synthesis for Specifications in
	Linear Temporal Logic on Finite Traces
2022 - Present	**Italian National PhD Program in Artificial Intelligence**
	University of Rome "La Sapienza"
	PhD Supervisor: Professor Giuseppe De Giacomo
2023 Jan. - Jul.	Visiting Student at the University of Oxford

Work Experience

2025 May - Nov. Research Intern at Collins Aerospace Ltd. (IRL)

Job Description. My research internship at Collins Aerospace focused on the integration of AI planning techniques – mostly PDDL/HTN planning – with standard technologies employed in autonomous control systems. Specific work tasks included:

- Development of theoretical foundations for the integration of AI planning techniques with autonomous control systems technologies;
- Design of algorithmic solutions and software architectures to address challenges that autonomous control systems face during plan execution, e.g., adaptive replanning and planning unsatisfability;
- Implementation of software modules that integrates PDDL/HTN planning with existing autonomous control systems' tools.

Research Interest

My research activity focuses on the development of trustworthy and resilient autonomous AI agents by applying Formal Methods and Automated Planning techniques. Specifically: I employ reactive synthesis and PDDL/HTN planning for specifications in Linear Temporal Logic on Finite Traces (LTL_f) as an automated procedure to have AI agents autonomously deliberate the course of actions to accomplish temporally extended tasks. Being the tasks of autonomous agents inherently variegated, my research aims to extend reactive synthesis techniques to address the challenges that autonomous AI agents face while deliberating, thus improving their capabilities in practical application scenarios.

Projects

GitHub profile: GianmarcoDIAG

- **BeSyft** – Link – Paper

  BeSyft is a tool to synthesize best-effort strategies for LTL_f tasks in nondeterministic environments. Such strategies are returned as finite-state controllers and enable the agent to take action even when the realizability of a task is not guaranteed – in which case standard reactive synthesis fails. The synthesis of best-effort strategies is relevant, e.g., in human-robot cooperative tasks: the realizability of one such a task may be inadvertently compromised by the human operator, but best-effort strategies ensure task completion if the human operator does not exhibit strictly adversarial behavior.

- **MtSyft** – Link – Paper

  MtSyft is a tool to synthesize best-effort strategies for LTL_f tasks in multi-tiered nondeterministic environments. Such strategies are returned in the form of multiple parallel finite-state controllers and enable the agent to take action while simultaneously making multiple assumptions about the environment. Best-effort synthesis in multi-tiered environments is relevant for automated synthesis of fault-tolerant behaviors. For instance, the agent can be provided with two environment specifications: the first captures expected environment responses under nominal operating conditions, and the second captures exceptional environment responses resulting from, e.g., a mechanical failure. In such a scenario, the agent will be able to complete the task against the expected environment responses while handling, as far as possible, exceptional environment responses.

- **RIMS4LTLf** – Link – Paper

  RIMS4LTLf is a tool for dynamic LTL_f tasks' management. It implements a specification that enables the user to request the agent to: 1. complete a new task; 2. drop a currently adopted task; or 3. return the currently used strategy (represented, as usual, as a finite-state controller). Such specification extends that of standard reactive synthesis and is implemented by employing a data structure that minimizes the executions of computationally expensive operations. Dynamic LTL_f tasks' management enables the development of more adaptive and flexible autonomous agents.

- **LydiaSyftPlus** – Link – Paper

  LydiaSyftPlus is a tool for LTL_f^+/$PPLTL^+$ synthesis, formalisms that, while based on finite-trace formalisms such as LTL_f/PPLTL, enable to specify tasks over infinite-time horizons. It performs a reduction to Emerson-Lei or Manna-Pnueli symbolic games obtained by Deterministic Finite Automata (DFA) of LTL_f/PPLTL formulas. Doing so enables to skip the determinization of Nondeterministic Buchi Automata – which is the performance bottleneck in many tools for synthesis over infinite traces.

Publications

Publications marked with * have all authors sorted alphabetically by last name – in which case all authors contributed equally

[EUMAS-23][*]	Symbolic LTL_f Best-Effort Synthesis
	Giuseppe De Giacomo, Gianmarco Parretti, Shufang Zhu
	European Conference on Multi-Agent Systems 2023
[EUMAS-23b]	LTL_f Best-Effort Synthesis for Single and Multiple Goal and Planning Domain Specifications
	Gianmarco Parretti
	European Conference on Multi-Agent Systems 2023. Short paper
[ECAI-23][*]	LTL_f Best-Effort Synthesis in Nondeterministic Planning Domains
	Giuseppe De Giacomo, Gianmarco Parretti, Shufang Zhu
	European Conference on Artificial Intelligence 2023
[IJCAI-24][*]	Effective Approach to LTL_f Best-Effort Synthesis in Multi-Tier Environments
	Benjamin Aminof, Giuseppe De Giacomo, Gianmarco Parretti, Sasha Rubin
	International Joint Conference on Artificial Intelligence 2024.
[SNCS-25][*]	Symbolic LTL_f Synthesis: A Unified Approach to Synthesizing Winning, Dominant, and Best-Effort Strategies
	Giuseppe De Giacomo, Gianmarco Parretti, Shufang Zhu
	Springer Nature Computer Science.
[IJCAI-25][*]	Responsibility Attribution and Anticipation in LTL_f
	Giuseppe De Giacomo, Emiliano Lorini, Timothy Parker, Gianmarco Parretti
	International Joint Conference on Artificial Intelligence 2025
[AAMAS-25][*]	Managing an Agent's Changing Intentions Using LTL_f Synthesis
	Giuseppe De Giacomo, Yves Lespérance, Gianmarco Parretti, Fabio Patrizi Renzo Schram
	International Conference on Autonomous Agents and Multi-agent Systems Extended Abstract.
[ICAPS-25][*]	LTL_f Adaptive Synthesis for Multi-Tier Goals in Nondeterministic Domains
	Giuseppe De Giacomo, Gianmarco Parretti, Shufang Zhu
	International Conference on Automated Planning and Scheduling 2025
[KR-25]	Emerson-Lei and Manna-Pnueli Games for LTL_f+ and PPLTL+ Synthesis
	Daniel Hausmann, Shufang Zhu, Gianmarco Parretti, Christoph Weinhuber, Giuseppe De Giacomo, Nir Piterman
	International Conference on Principles of Knowledge Representation and Reasoning 2025
[ECAI-25][*]	Do Your Best, but Don't Take Too Many Chances: LTL_f Synthesis of Minimal Best-Effort Strategies in FOND Domains
	Giuseppe De Giacomo, Gianmarco Parretti, Elisa Santini
	European Conference on Artificial Intelligence 2025
[TIME-25][*]	PDDL to DFA: A Symbolic Transformation for Effective Reasoning
	Giuseppe De Giacomo, Antonio Di Stasio, Gianmarco Parretti
	International Symposium on Temporal Representation and Reasoning 2025

Workshop and DC: GenPlan@IJCAI2022; PhD-Day@EUMAS2023; LAMAS&SR@ECAI2023; ActSynt@ECAI2024; AAPEI@ECAI2024; DC@ECAI2024; SPIRIT@AIxIA2024; LAMAS&SR@KR2025;

Research Community Services

- **Conference Reviewer:**

  - **2023**

    - * Autonmous Agents and Multi-Agents Systems (AAMAS)
    - * Association for the Advanced of Artificial Intelligence (AAAI)

- **2024**
    - * Formal Methods (FM)
    - * Principles of Knowledge Representation and Reasoning (KR)
  - **2025**
    - * Autonmous Agents and Multi-Agents Systems (AAMAS)

- **Program Committee Member**

  - **2024**
    - * Association for the Advanced of Artificial Intelligence (AAAI)
  - **2025**
    - * Association for the Advanced of Artificial Intelligence (AAAI)

Technical Skills

- **Programming Languages**: Python, Java, C++, Javascript, HTML5;

- **Operating Systems**: macOS, Linux;

- **Typesetting**: LaTeX

Language Skills

- Italian: Native

- English: Fluent

Academic Community Services

Master's Thesis Co-Advisor

- 2025

  - **A Simulator for FOND Planning Domains with Non-Markovian LTL$_f$ Properties.** Student: Antonio Daddetta. Thesis Advisor: Prof. Fabio Patrizi
  - **Minimal Best-Effort Strategies for Planning in Non-Deterministic Domains.** Student: Elisa Santini. Thesis Advisor: Prof. Giuseppe De Giacomo
    Published at the European Conference on Artificial Intelligence, see [ECAI-25]

Other

- **2023 - Present.** Member of the Italian Association for Aritificial Intelligence (AIxIA)

December 7, 2025   Gianmarco Parretti