

Gianluca Aguzzi

PhD Student

Via Mulini 23/25
47521

Italy, Cesena

✉ gianluca.aguzzi@unibo.it

🌐 <https://cric96.github.io/>

🆔 0000-0002-1553-4561

👤 [cric96](#)

🏠 [gianluca-aguzzi](#)

Current Placement

2020–today **PhD in Computer Science And Engineering**, *Alma Mater Studiorum – Università di Bologna, Cesena*

Research Theme

My current research topics concern large-scale system coordination and machine learning algorithm in distributed and multi-agent systems. In particular, I am interested in *engineering* self-adaptive systems by means of *models*, *programming languages* and *disciplines*. Furthermore, I investigate the use of machine learning algorithms – and in particular Reinforcement Learning – in support of that engineering process making the collective program more *effective*, *efficient* and *smarter*.

Education

2021 **Attending @ PhD Summer School**, *22nd European Agent Systems Summer School*

2018–2020 **Master in Software Engineering**, *Alma Mater Studiorum – Università di Bologna, Cesena, 110 cum Laude*

Thesis: *Scafi web: a Scala-JavaScript platform for executing, simulating, and controlling aggregate computing systems*

Supervisors: *Mirko Viroli, Roberto Casadei*

2015–2018 **Bachelor in Computer Science and Software Engineering**, *Alma Mater Studiorum – Università di Bologna, Cesena, 110 cum Laude*

Thesis: *Sviluppo di un front-end di simulazione per applicazioni aggregate nel framework Scafi*

Supervisors: *Mirko Viroli, Roberto Casadei*

2015–2018 **High School on Computer Science**, *ITIS E. Mattei, Urbino, 100*

Scientific Activities

Publications

- [1] Gianluca Aguzzi. Research directions for aggregate computing with machine learning. In Esam El-Araby, Vana Kalogeraki, Danilo Pianini, Frédéric Lassabe, Barry Porter, Sona Ghahremani, Ingrid Nunes, Mohamed Bakhouya, and Sven

- Tomforde, editors, *IEEE International Conference on Autonomic Computing and Self-Organizing Systems, ACSOS 2021, Companion Volume, Washington, DC, USA, September 27 - Oct. 1, 2021*, pages 310–312. IEEE, 2021.
- [2] Gianluca Aguzzi, Giorgio Audrito, Roberto Casadei, Ferruccio Damiani, Gianluca Torta, and Mirko Viroli. A field-based computing approach to sensing-driven clustering in robot swarms. *Swarm Intell.*, 17(1):27–62, 2023.
- [3] Gianluca Aguzzi, Roberto Casadei, Niccolò Maltoni, Danilo Pianini, and Mirko Viroli. Scafi-web: A web-based application for field-based coordination programming. In Ferruccio Damiani and Ornela Dardha, editors, *Coordination Models and Languages - 23rd IFIP WG 6.1 International Conference, COORDINATION 2021, Held as Part of the 16th International Federated Conference on Distributed Computing Techniques, DisCoTec 2021, Valletta, Malta, June 14-18, 2021, Proceedings*, volume 12717 of *Lecture Notes in Computer Science*, pages 285–299. Springer, 2021.
- [4] Gianluca Aguzzi, Roberto Casadei, Danilo Pianini, Guido Salvaneschi, and Mirko Viroli. Towards pulverised architectures for collective adaptive systems through multi-tier programming. In Esam El-Araby, Vana Kalogeraki, Danilo Pianini, Frédéric Lassabe, Barry Porter, Sona Ghahremani, Ingrid Nunes, Mohamed Bakhouya, and Sven Tomforde, editors, *IEEE International Conference on Autonomic Computing and Self-Organizing Systems, ACSOS 2021, Companion Volume, Washington, DC, USA, September 27 - Oct. 1, 2021*, pages 99–104. IEEE, 2021.
- [5] Gianluca Aguzzi, Roberto Casadei, Danilo Pianini, and Mirko Viroli. Dynamic decentralization domains for the internet of things. *IEEE Internet Comput.*, 26(6):16–23, 2022.
- [6] Gianluca Aguzzi, Roberto Casadei, Danilo Pianini, and Mirko Viroli. Dynamic decentralization domains for the internet of things - simulation repository. <https://doi.org/10.21227/qgbp-w789>, April 2022. Accessed on YYYY-MM-DD.
- [7] Gianluca Aguzzi, Roberto Casadei, and Mirko Viroli. Addressing collective computations efficiency: Towards a platform-level reinforcement learning approach. In Roberto Casadei, Elisabetta Di Nitto, Ilias Gerostathopoulos, Danilo Pianini, Ivana Dusparic, Timothy Wood, Phyllis R. Nelson, Evangelos Pournaras, Nelly Bencomo, Sebastian Götz, Christian Krupitzer, and Claudia Raibulet, editors, *IEEE International Conference on Autonomic Computing and Self-Organizing Systems, ACSOS 2022, Virtual, CA, USA, September 19-23, 2022*, pages 11–20. IEEE, 2022.
- [8] Gianluca Aguzzi, Roberto Casadei, and Mirko Viroli. Machine learning for aggregate computing: a research roadmap. In *42nd IEEE International Conference on Distributed Computing Systems, ICDCS Workshops, Bologna, Italy, July 10, 2022*, pages 119–124. IEEE, 2022.

- [9] Gianluca Aguzzi, Roberto Casadei, and Mirko Viroli. Towards reinforcement learning-based aggregate computing. In Maurice H. ter Beek and Marjan Sirjani, editors, *Coordination Models and Languages - 24th IFIP WG 6.1 International Conference, COORDINATION 2022, Held as Part of the 17th International Federated Conference on Distributed Computing Techniques, DisCoTec 2022, Lucca, Italy, June 13-17, 2022, Proceedings*, volume 13271 of *Lecture Notes in Computer Science*, pages 72–91. Springer, 2022.
- [10] Roberto Casadei, Gianluca Aguzzi, and Mirko Viroli. A programming approach to collective autonomy. *J. Sens. Actuator Networks*, 10(2):27, 2021.
- [11] Roberto Casadei, Danilo Pianini, Gianluca Aguzzi, Giorgio Audrito, Gianluca Torta, Marco Ottina, Ferruccio Damiani, and Mirko Viroli. Towards automated engineering for collective adaptive systems: Vision and research directions. In *IEEE Intl. Conf. on Dependable, Autonomic and Secure Computing, Intl Conf on Pervasive Intelligence and Computing, Intl Conf on Cloud and Big Data Computing, Intl Conf on Cyber Science and Technology Congress, DASC/PiCom/CBDCOM/CyberSciTech 2022, Falerna, Italy, September 12-15, 2022*, pages 1–6. IEEE, 2022.
- [12] Roberto Casadei, Mirko Viroli, Gianluca Aguzzi, and Danilo Pianini. Scafi: A scala DSL and toolkit for aggregate programming. *SoftwareX*, 20:101248, 2022.
- [13] Giovanni Delnevo, Gianluca Aguzzi, Simone Letizi, Marta Luffarelli, Andrea Petreti, and Silvia Mirri. Encouraging users in waste sorting using deep neural networks and gamification. In Ombretta Gaggi, Pietro Manzoni, and Claudio E. Palazzi, editors, *GoodIT '21: Conference on Information Technology for Social Good, Roma, Italy, September 9-11, 2021*, pages 230–235. ACM, 2021.

Talks in International Conferences

- 2022 **Addressing Collective Computations Efficiency: Towards a Platform-level Reinforcement Learning Approach**, *International Conference on Autonomic Computing and Self-Organizing Systems - ACSOS*
- 2022 **Machine learning for aggregate computing: a research roadmap**, *Workshop on Distributed Collective Intelligence*
- 2022 **Towards reinforcement learning-based aggregate computing**, *International Conference on Coordination Models and Languages - COORDINATION*
- 2021 **Research directions for aggregate computing with machine learning**, *Doctoral Symposium International Conference on Autonomic Computing and Self-Organizing Systems - ACSOS*
- 2021 **ScaFi-Web: A Web-Based Application for Field-Based Coordination Programming**, *International Conference on Coordination Models and Languages - COORDINATION*

Participation in International Conferences

- 2023 **Artifact Evaluation Committee**, *International Conference on Pervasive Computing and Communications - PerCom*

2023 **Program Chair Committee**, *Workshop on DIStributed COLlective Intelligence - DISCOLI*

2022 **Artifact Evaluation Committee**, *International Conference on Coordination Models and Languages - DisCoTec*

2021 **Artifact Evaluation Committee**, *International Conference on Autonomic Computing and Self-Organizing Systems - ACSOS*

Volunteering

2022 **Student Volunteer**, *International Conference on Distributed Computing Systems - ICDCS*

Visiting

2023 **Visiting PhD**, *Aarhus University – Lukas Esterle, Aarhus, Denmark*

Review Activity

Reviewer for several scientific journals – Science of Computer Programming, Scientific Programming, Frontiers in Robotics and AI

Research Group Collaboration

2021 - **Università di Bologna**, *Prof. Mirko Viroli*, In Prof. Viroli's research group, my activities have mainly focused on the topics of aggregate computing and multi-agent reinforcement learning applied to cyber swarms systems.

2021 - **Università di Torino**, *Prof. Ferruccio Damiani*, In Ferruccio Damiani's group, our primary focus was on the application of aggregate computing in swarm robotics. This fruitful collaboration resulted in the publication of the paper titled "A field-based computing approach for sensing-driven clustering in robot swarms."

2021 **St. Gallen University**, *Prof. Guido Salvaneschi*, In collaboration with Guido Salvaneschi, we endeavoured to expand the concepts of pulverized architecture through multitier programming languages. Our joint efforts culminated in the publication of the paper titled "Towards Pulverized Architectures for Collective Adaptive Systems through Multi-tier Programming"

2022 **Aarhus Universitat**, *Prof. Lukas Esterle*, Throughout my time abroad, our research was centred around exploring distributed collective intelligence within the realm of large-scale systems. Our primary emphasis was on the application of graph neural networks for developing distributed controllers.

Teaching

Tutoring

2023–today **Concurrent and Distributed Programming**, *Alma Mater Studiorum – Università di Bologna*, Master in Computer Science and Engineering

2023–today **Programming and Development Paradigms**, *Alma Mater Studiorum – Università di Bologna*, Master in Computer Science and Engineering

2022 **Concurrent and Distributed Programming**, *Alma Mater Studiorum – Università di Bologna*, Master in Computer Science and Engineering

- 2022 **Programming and Development Paradigms**, *Alma Mater Studiorum – Università di Bologna*, Master in Computer Science and Engineering
- 2018 - 2019 **Snap! courses**, *CRIAD Coding*, Grade schools

Thesis (Co)Supervisor

- 2023 **Master Thesis**, *Alma Mater Studiorum – Università di Bologna*, Daily Medical Team Briefings in Ambiente Collaborativo con Schermi Multi-Touch
Student: Bazzocchi, Luca
- 2023 **Master Thesis**, *Alma Mater Studiorum – Università di Bologna*, Gestione degli effetti in linguaggi di programmazione funzionale: tecniche di modellazione e interpretazione
Student: Cavalieri, Giacomo
- 2022 **Bachelor Thesis**, *Alma Mater Studiorum – Università di Bologna*, Progettazione di un ambiente di programmazione visuale block-based per ScaFi.
Student: Cerioni, Matteo
- 2022 **Bachelor Thesis**, *Alma Mater Studiorum – Università di Bologna*, ScaFi: Integration and Performance Analysis with Scala Native.
Student: Mancini, Kevin

Talks

- 2023 **Intro to Deep Reinforcement Learning**, *Università Di Urbino*, Talk @ Fundamentals of Artificial Intellingence
- 2022 **Engineering Cyber-Physical Swarm**, *Aarhus Universitat*, Talk @ DIGIT lunch meetings
- 2022 **Multi-Agent Reinforcement Learning, Introduction**, *Alma Mater Studiorum – Università di*, Talk @ Pervasice Computing
- 2022 **Scala to the large**, *Alma Mater Studiorum – Università di Bologna*, Talk @ Programming and Development Paradigms
- 2022 **Cross Platform in Scala**, *Alma Mater Studiorum – Università di Bologna*, Talk @ Programming and Development Paradigms
- 2021 **On Collective Reinforcement Learning**, *Alma Mater Studiorum – Università di Bologna*, Talk @ Pervasive Computing
- 2021 **MVC meets Monad**, *Alma Mater Studiorum – Università di Bologna*, Talk @ Programming and Development Paradigms
- 2019 **Crea il tuo videogioco in Snap!**, *Talk @ Salone dell'Orientamento, Forlì*

Awards

- 2023 **Best Master Thesis**, *Sergio Focardi Awards*, <https://www.serinar.unibo.it/gianluca-aguzzi-si-aggiudica-la-ii-edizione-del-premio-di-laurea-sergio-focardi/>
- 2017 **Prize for Meritous Students**, *Alma Mater Studiorum – Università di Bologna, Campus Cesena*

Technical Skills

Programming Languages

●●●● Scala	●●●● Kotlin	●●●● TypeScript
●●●● Java	●●●● JavaScript	●●●● Haskell
●●●● C#	●●●● Bash	●●●● C++
●●●● C	●●●● Prolog	

Other Languages

●●●● HTML	●●●● Markdown	●●●● SPARQL
●●●● XML	●●●● LaTeX	●●●● YAML
●●●● JSON	●●●● OWL	●●●● SQL
●●●● RDF		

Libraries

●●●● Scala.js	●●●● Monix	●●●● ScalaPy
●●●● Tensorflow	●●●● Matplotlib	●●●● Cats
●●●● Pytorch	●●●● Akka	●●●● ZIO
●●●● OpenAI Gym		

Software Tools

●●●● Gimp	●●●● Inkscape	●●●● NPM
●●●● Git	●●●● Blender	●●●● SBT
●●●● GHA	●●●● OWL	●●●● Hugo
●●●● Docker	●●●● Kdenlive	●●●● Gradle

Software Projects

- 2021 – today **Co-designer and main contributor of ScaFi-Web**, *It is a web-based application allowing in-browser editing, execution, and visualisation of ScaFi programs.*
<https://github.com/scafi/scafi-web>
- 2021 – today **Designer of scalapy-gym**, *It is a Scala facade that enable the usage of open ai gyms in the JVM!*
<https://github.com/cric96/scalapy-gym>
- 2020 – today **Co-designer of Fluvium**, *An IoT project for river controll that uses AWS lambda*
<https://github.com/sbricco-house/fluvium>

Open Source Contributions

2018 – today **Development of GUI & simulator for ScaFi**
<https://github.com/scafi/scafi>

2021 – today **Contributions to ScaFi incarnations in Alchemist**
<https://github.com/AlchemistSimulator/Alchemist>

Miscellaneous

- 2022 **Attending @ MOOC, *Introduction to Complexity* @ Santa Fe Institute**
- 2020 **Student class representative @ Alma Mater Studiorum**
- 2018 **Presenting Snap! @ Notte dei ricercatori**
- 2013-2015 **Student class representative @ ITIS**