

# University Academic Curriculum Vitae

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## Personal information

Alessandro Gianola  
Place of birth: Sondrio (SO), Italy  
Date of birth: 25/02/1993  
Nationality: Italian  
Number of children: 0  
Address: Via Glorenza 70, Bolzano (BZ), Italy  
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## Education since leaving school

- Master's Degree in Mathematics, Università degli Studi di Milano, 2017. Final mark: 110/110, cum laude.
- Bachelor's Degree in Mathematics, Università degli Studi di Milano, 2015. Final mark: 110/110, cum laude
- Diploma Liceo Classico, Istituto Comprensivo "G. Piazzi-L. Perpentì" (Sondrio), 2012. Final mark: 100/100, cum laude

## Present appointment

- Research Assistant in Computer Science
- Start of appointment: 01/11/2021
- Employer: Free University of Bozen-Bolzano
- Currently, I am a Research Assistant in Computer Science at the KRDB Research Centre for Knowledge and Data (Free University of Bozen-Bolzano), working on verification of complex processes enriched with structured data using automated reasoning techniques, formal methods and computational logic.
- Expected date for the PhD thesis defense: March 2022.
- Main Research Areas: Automated Reasoning, Formal Methods, Model Checking, Artificial Intelligence, Computational Logic, Business Process Management

## Professional experience

- My first professional experience was during my undergraduate studies, when I had an internship at Liceo Scientifico 'Donegani' (Sondrio, Italy): there, I was tutor of the mathematics class and I taught basic mathematical analysis.
- I was Teaching Assistant in the course of Probability Theory and Statistics for the Bachelor in Computer Science at the Free University of Bozen-Bolzano (academic year 2019/2020). The lecturer of the course was prof. Werner Nutt.
- I had an internship at the University of California San Diego (UCSD), where I was a research affiliate in the Database Lab.

From / to	Job title	Name of academic Institution	Academic level	responsibilities

01/03/2015 - 01/06/2015	Tutor	Liceo Scientifico 'Donegani' (Sondrio, Italy)	Undergraduate	Class of Mathematics
30.09.2019 – 30.09.2020	Teaching Assistant	Free University of Bozen-Bolzano	PhD Candidate	Course: Probability Theory and Statistics (Bachelor in Computer Science)
15/02/2020 -05/08/2020	Visiting Scholar – Research Affiliate	University of California San Diego (UCSD)	PhD Candidate	Research experience and collaboration at the Computer Science and Engineering (CSE) Department

### Experience in academic teaching

- Teaching Assistant Probability Theory and Statistics: Free University of Bozen-Bolzano, MAT/06, undergraduate course (Bachelor in Computer Science), academic year 2019/2020. Lecturer: Werner Nutt.
- Co-supervisor of a Bachelor's thesis in Computer Science (academic year 2018-2019): Davide Cremonini. Title of the thesis: *An SMT-based formalization of data-aware BPMN*. Supervisor: Prof. Marco Montali
- Co-supervisor of a Bachelor's thesis in Computer Science (academic year 2018-2019): Marco Briozzi. Title of the thesis: *Extending the ePNK Petri Net Framework towards DB-Net support*. Supervisor: Prof. Marco Montali

Thanks to my experiences in teaching both at the high-school and at the university level, I have developed several skills in order to communicate challenging topics in mathematics to students. I always try to find new effective techniques to make the students more confident. The experience of supervising bachelor's students taught me how to deeply understand and then help to solve in many different ways several types of problems that they can come across.

### Other academic responsibilities

- Appointment and Research Experience at the Department of Computer Science and Engineering (CSE), University of California San Diego (UCSD): Visiting Scholar – Research Affiliate from February to August 2020 (6 months). Research topic: formal verification of business processes enriched with complex data constrained by relational databases. Collaboration with prof. Victor Vianu and prof. Alin Deutsch.
- Research collaboration with prof. Silvio Ghilardi (Università degli Studi di Milano) since 2017, on the topic of formal verification of data-aware processes using automated reasoning techniques

## Memberships

## Editorial Activity

- **Reviewer**, Journal of Automated Reasoning (Journal). 2021
- **Reviewer**, Theoretical Computer Science (Journal). 2020
- **Additional Reviewer**, 10th international Joint Conference on Automated Reasoning (IJCAR 2020), Paris, France (Conference). 2020
- **Additional Reviewer**, 12th International Symposium on Frontiers of Combining Systems (FroCoS 2019), London, UK (Conference). 2019
- **Additional Reviewer**, 27th International Conference on Automated Deduction (CADE 27), Natal, Brazil (Conference). 2019
- **Additional Reviewer**, 34th Italian Conference on Computational Logic (CILC 2019), Trieste, Italy (Conference). 2019
- **Additional Reviewer**, Journal of Automated Reasoning - CADE 26 Special Issue (Journal). 2018
- **Additional Reviewer**, 9th international Joint Conference on Automated Reasoning (IJCAR 2018), Oxford, UK (Conference) 2018
- **Additional Reviewer**, 11th International Symposium on Frontiers of Combining Systems (FroCoS 2017), Brasilia, Brazil (Conference). 2017
- **Additional Reviewer**, 26th International Conference on Automated Deduction (CADE 26), Gothenburg, Sweden (Conference). 2017

## Research and scholarships

- I held a four-year PhD scholarship at the Free University of Bozen-Bolzano (November 2017- November 2021): € 17,000 per year.
- During the 27<sup>th</sup> International Conference on Automated Deduction (CADE-27), I was one of the recipients of the **Woody Bledsoe Award** 2019, which is a travel grant that supports students who obtained outstanding achievements in automated reasoning. I won it for the results in automated reasoning (applied to data-aware processes verification) that I obtained during my PhD project.
- I was part of the scientific staff (team member) of the RTD UNIBZ project SMARTTEST (01/11/2019 – 31/07/2020), which funded my research visit at UCSD (€ 6000)
- During my PhD projects, I obtained several results in the field of automated reasoning, most of which were applied to the investigate algorithmic methods to automatically verify complex business processes enriched with data. The continuation of the this project led to the collaboration with the Database Lab at UCSD, together with the applications to verification of Multi-Agent Systems, The last results were published in [C9,C11] (C9 won the Best Paper Award, whereas C11 was published in a A\* conference in the field of Artificial Intelligence)

Date granted	Award Holder(s)	Funding Body	Title	Amount received
01/11/2017	Alessandro Gianola	Free University of Bozen-Bolzano	PhD scholarship	€ 68,000
23/08/2019	Alessandro Gianola	Association of Automated Reasoning	Woody Bledsoe's Travel Award	€ 250
01/11/2019	Paolo Felli and Alessandro Gianola	Free University of Bozen-Bolzano	SMARTTEST: RTD Unibz Research project	€ 6000

### Research Impact

- According to Google Scholar, as of October 27, 2021:
  - my papers have received 182 overall citations
  - I have an h-index of 8
  - I have an i-10 index of 8
- According to Scopus, as of October 25, 2021:
  - my papers have received 90 overall citations;
  - I have have an h-index of 7.

### Awards

- Recipient of the **Best Paper Award** at the 19<sup>th</sup> International Conference on Business Process Management.
- Recipient of the **Best Paper Award** at the 23<sup>rd</sup> International Conference on Principles and Practice of Multi-Agent Systems (PRIMA 2020).
- Recipient of the **Woody Bledsoe Award** 2019 at 27<sup>th</sup> International Conference on Automated Deduction (CADE-27), Natal, Brazil.  
The Woody Bledsoe award honors outstanding contributions of students to automated reasoning and automated deduction.
- **XX olimpiade di filosofia, fase nazionale**, final round, Torino, Italy. 2012  
Second Place
- **XX olimpiade di filosofia, fase regionale (Lombardia)**, semi-final round (regional contest), Bergamo, Italy. 2012  
First Place

### Computer Skills

- **Programming Languages:** C, Matlab, R, LaTeX.
- **Software Employed:** Z3 (SMT Solver), Yices (SMT Solver), Mathsat (SMT Solver), SPASS (first order theorem prover), MCMT (model checker), Camunda (tool for business process modeling).

### Publications

- Chapters in refereed books

[B1] D. Calvanese, S. Ghilardi, A. Gianola, M. Montali, and A. Rivkin. *From Model Completeness to Verification of Data Aware Processes*. In C. Lutz, U. Sattler, C. Tinelli, A.-Y. Turhan, and F.

Wolter, editors, *Description Logic, Theory Combination, and All That*, volume 11560 of LNCS, pages 212-239, Springer, 2019.  
[https://doi.org/10.1007/978-3-030-22102-7\\_10](https://doi.org/10.1007/978-3-030-22102-7_10)

- Conference papers with refereed proceedings
- [C1] A. Gianola, S. Kasangian and N. Sabadini. *Cospan/Span(Graph): an Algebra for Open, Reconfigurable Automata Networks*. Proceedings of CALCO 2017, volume 72, pages 2:1–2:17, Schloss Dagstuhl: LIPIcs, 2017.  
<https://doi.org/10.4230/LIPIcs.CALCO.2017.2>
- (\*) [C2] S. Ghilardi and A. Gianola, *Interpolation, Amalgamation and Combination (the non-disjoint signatures case)*. Proceedings of FroCoS 2017, volume 10483 of LNCS (LNAI), pages 316-332, Springer, 2017. [https://doi.org/10.1007/978-3-319-66167-4\\_18](https://doi.org/10.1007/978-3-319-66167-4_18)
- (\*) [C3] D. Calvanese, S. Ghilardi, A. Gianola, M. Montali, and A. Rivkin. *Formal Modeling and SMT-based Parameterized Verification of Data-Aware BPMN*. Proceedings of BPM 2019, volume 11675 of LNCS, pages 157-175, Springer, 2019.  
[https://doi.org/10.1007/978-3-030-26619-6\\_12](https://doi.org/10.1007/978-3-030-26619-6_12)
- (\*) [C4] D. Calvanese, S. Ghilardi, A. Gianola, M. Montali, and A. Rivkin. *Model Completeness, Covers and Superposition*. Proceedings of CADE-27, volume 11716 of LNCS (LNAI), pages 142-170, Springer, 2019. [https://doi.org/10.1007/978-3-030-29436-6\\_9](https://doi.org/10.1007/978-3-030-29436-6_9)
- (\*) [C5] D. Calvanese, S. Ghilardi, A. Gianola, M. Montali, and A. Rivkin. *Combined Covers and Beth Definability*. Proceedings of IJCAR 2020, volume 12166 of LNCS (LNAI), pages 181-200, Springer, 2020. [https://doi.org/10.1007/978-3-030-51074-9\\_11](https://doi.org/10.1007/978-3-030-51074-9_11)
- [C6] A. Gianola, S. Kasangian, D. Manicardi, N. Sabadini, S. Tini. *Compositional Modeling of Biological Systems in CospanSpan(Graph)*. Proceedings of ICTCS 2020, pages 61-66, CEUR-WS, 2020. [http://ceur-ws.org/Vol-2756/paper\\_6.pdf](http://ceur-ws.org/Vol-2756/paper_6.pdf)
- [C7] S. Ghilardi, A. Gianola, D. Kapur, *Computing Uniform Interpolants for EUF via (conditional) DAG-based Compact Representations*. Proceedings of CILC 2020, volume 2710, pages 67-81, CEUR-WS, 2020. <http://ceur-ws.org/Vol-2710/paper5.pdf>
- (\*) [C8] S. Ghilardi, A. Gianola, M. Montali, and A. Rivkin. *Petri Nets with Parameterised Data: Modelling and Verification*. Proceedings of BPM 2020, volume 12168 LNCS (LNAI), pages 55-74, Springer, 2020. [https://doi.org/10.1007/978-3-030-58666-9\\_4](https://doi.org/10.1007/978-3-030-58666-9_4)
- (\*) [C9] P. Felli, A. Gianola, M. Montali. *A SMT-based Implementation for Safety Checking of Parameterized Multi-Agent Systems*. Proceedings of PRIMA 2020, volume 12568, LNCS (LNAI), pages 259-280, Springer, 2021. **Best Paper Award at PRIMA 2020**.  
[https://doi.org/10.1007/978-3-030-69322-0\\_17](https://doi.org/10.1007/978-3-030-69322-0_17)
- (\*) [C10] S. Ghilardi, A. Gianola, D. Kapur. *Interpolation and Amalgamation for Arrays with MaxDiff*. Proceedings of FoSSaCS 2021, volume 12650 of LNCS, pages 268-288, Springer, 2021.  
[https://doi.org/10.1007/978-3-030-71995-1\\_14](https://doi.org/10.1007/978-3-030-71995-1_14)
- (\*) [C11] P. Felli, A. Gianola, M. Montali. *SMT-based Safety Checking of Parameterized Multi-Agent Systems*. Proceedings of AAAI 2021, pages 6321-6330, AAAI Press, 2021.  
<https://ojs.aaai.org/index.php/AAAI/article/view/16785>
- (\*) [C12] P. Felli, A. Gianola, M. Montali, A. Rivkin, S. Winkler. *CoCoMoT: Conformance Checking of Multi-Perspective Processes via SMT*.

Proceedings of BPM 2021, volume 12875 of LNCS, pages 217-234, Springer. 2021. **Best Paper Award at BPM 2021.**  
[https://doi.org/10.1007/978-3-030-85469-0\\_15](https://doi.org/10.1007/978-3-030-85469-0_15)

- (\*) [C13] S. Ghilardi, A. Gianola, M. Montali, A. Rivkin. *Delta-BPMN: a Concrete Language and Verifier for Data-Aware BPMN*. Proceedings of BPM 2021, volume 12875 of LNCS, pages 179-196, Springer. 2021. [https://doi.org/10.1007/978-3-030-85469-0\\_13](https://doi.org/10.1007/978-3-030-85469-0_13)
- [C14] E. Di Lavore, A. Gianola, M. Román, N. Sabadini, P. Sobociński. *A canonical algebra of open transition systems*. Proceedings of FACS 2021, Springer. To appear.
- Journal articles in refereed academic journals
  - (\*) [J1] S. Ghilardi and A. Gianola, *Modularity Results for Interpolation, Amalgamation and Superamalgamation*. Annals of Pure and Applied Logic, volume 169, n. 8, pages 731-754, 2018.  
<https://doi.org/10.1016/j.apal.2018.04.001>
  - [J2] A. Gianola, S. Kasangian, D. Manicardi, N. Sabadini, F. Schiavio, S. Tini. *CospanSpan(Graph): a compositional description of the heart system*. Fundamenta Informaticae, volume 171 (1-4), pages 221–237, 2020. <https://doi.org/10.3233/FI-2020-1880>
  - (\*) [J3] D. Calvanese, S. Ghilardi, A. Gianola, M. Montali, and A. Rivkin. *SMT-based verification of data-aware processes: a model-theoretic approach*. *Mathematical Structures in Computer Science*, volume 30, n. 3, pages 271–313, 2020.  
<https://doi.org/10.1017/S0960129520000067>
  - (\*) [J4] D. Calvanese, S. Ghilardi, A. Gianola, M. Montali, A. Rivkin. *Model completeness, Uniform Interpolants and Superposition Calculus (with Applications to Verification of Data-Aware Processes)*. Journal of Automated Reasoning, volume 65, n. 7, pages 941-969, 2021. <https://doi.org/10.1007/s10817-021-09596-x>
- Workshop papers with referred proceedings
  - [W1] D. Calvanese, S. Ghilardi, A. Gianola, M. Montali, and A. Rivkin. *Verification of Data-Aware Processes: Challenges and Opportunities for Automated Reasoning*. Proceedings of ARCADE 2019, 2nd International Workshop on Automated Reasoning: Challenges, Applications, Directions, Exemplary Achievements. EPTCS, volume 311, pages 53–58, 2019.  
<http://dx.doi.org/10.4204/EPTCS.311.9>
  - [W2] J. A. Castellanos Joo, S. Ghilardi, A. Gianola and D. Kapur. *AXDInterpolator: a Tool for Computing Interpolants for Arrays with MaxDiff*. Proceedings of SMT 2021, volume 2908, pages 40-52, CEUR-WS, 2021. <http://ceur-ws.org/Vol-2908/paper15.pdf>
  - [W3] A. Burattin, A. Gianola, Hugo A. López, M. Montali. *Exploring the Conformance Space (Extended Bastract)*. Proceedings of ITBPM 2021, volume 2952, pages 62-67, CEUR-WS, 2021. [http://ceur-ws.org/Vol-2952/paper\\_301a.pdf](http://ceur-ws.org/Vol-2952/paper_301a.pdf)
  - [W4] D. Calvanese, A. Gianola, A. Mazzullo, M. Montali. *SMT-Based Safety Verification of Data-Aware Processes under Ontologies (Preliminary Results)*. Proceedings of DL 2021, volume 2954, CEUR-WS, 2021. <http://ceur-ws.org/Vol-2954/paper-9.pdf>
  - [W5] A. Gianola, M. Montali, M. Papini. *Automated Reasoning for*

*Reinforcement Learning Agents in Structured Environments.*  
Proceedings of OVERLAY 2021, volume 2987, pages 43-48,  
CEUR-WS, 2021. <http://ceur-ws.org/Vol-2987/paper8.pdf>

## Further Data

## Presentations at International Conferences and Workshops

- **3rd Workshop on Artificial Intelligence and Formal Verification, Logic, Automata, and Synthesis (OVERLAY 2021)**, Padova, Italy. September 2021.  
Speaker: presentation of accepted workshop paper
- **24th International Conference on Foundations of Software Science and Computation Structures (FoSSaCS 2021)**, Online. March 2021.  
Speaker: presentation of accepted conference paper
- **10th International Joint Conference on Automated Reasoning (IJCAR 2020)**, Online. July 2020.  
Speaker: presentation of accepted conference paper
- **35th Italian Conference on Computational Logic (CILC 2020)**, Rende, Italy. October 2020.  
Speaker: presentation of accepted conference paper
- **27th International Conference on Automated Deduction (CADE 27)**, Natal, Brazil. August 2019  
Speaker: presentation of accepted conference paper
- **2nd International ARCADE (Automated Reasoning: Challenges, Applications, Directions, Exemplary Achievements) Workshop**, Natal, Brazil. August 2019.  
Speaker: presentation of accepted workshop paper
- **34th Italian Conference on Computational Logic (CILC 2019)**, Trieste, Italy. June 2019  
Speaker: presentation of accepted conference paper
- **33rd Italian Conference on Computational Logic (CILC 2018)**, Bolzano, Italy. September 2018  
Speaker: presentation of accepted conference paper

## International Seminars and Talks

- **SMT-based verification of data-aware processes**, Talk at UCSD, San Diego (CA), USA. February 2020  
Speaker
- **Towards a compositional, SMT-based verification of data-aware processes**,  
Talk at the MIT Categories Seminar, Boston (MA), USA. March 2020  
Speaker
- **Uniform Interpolation and Quantifier Elimination for Verification of Data-Aware Processes**, Talk at UCSD, San Diego (CA), USA. April 2020

**Statement of interest**

I have started working on mathematical logic and its applications to formal verification since my Master's thesis in Mathematics in 2017: there, I studied the combination of modal logics and of theories well-studied in automated reasoning (then published in [J1,C2]). These results can be also used to automatically reason about data structures employed in software model checking. During my PhD at the KRDB Research Centre (UNIBZ), I have studied the theoretical foundations of the safety verification of data-aware processes (cf. [J3]) via automated reasoning and SMT-based techniques (cf. [C4,C5), and then their applications to the analysis of real-world business processes enriched with concrete data ([C3]) and extensions of Petri nets ([C8]). This verification is carried out exploiting the state-of-the-art SMT-based model checker MCMT. Recently, I have also leveraged the theoretical framework of [J3] to attack the problem of formally verifying safety of Multi-Agent Systems ([C9,C11]) via the model checker MCMT: this work was supported by the RTD UNIBZ project SMARTTEST. Therefore, during the last 4 years I have developed several skills in the context of modeling and representing data-aware business processes using concrete tools like Camunda, and in the context of formal verification of those enriched processes via automated reasoning and SMT-solving: apart from MCMT, I have a long experience in using SMT solvers like Z3, Mathsat (especially for computing interpolants [C10]) and Yices, first order theorem provers like SPASS and on verifiers for data-aware processes like VERIFAS. My PhD project created a fruitful collaboration between Prof. Silvio Ghilardi (UNIMI) and the KRDB Research Centre: during this project, I also co-supervised two Bachelor's theses on strictly related topics (SMT-based formalization of data-aware business process, and implementation of data-aware extensions of Petri nets). Last year, I was also Visiting Scholar at the CSE Department of the University of California San Diego (UCSD), working in the Database Lab, where I started an on-going collaboration with prof. Victor Vianu and prof. Alin Deutsch (main developers of VERIFAS) on modeling and verification of database-driven business processes, with the aim of combining the framework I introduced with theirs and of developing a new tool merging MCMT and VERIFAS capabilities. The topic of my research project for my current job position is the natural continuation of my PhD project and of the collaborations with the UCSD Database Lab and UNIMI. I expect to continue these collaborations so as to devise original automated reasoning methods able to handle more sophisticated systems of processes with data, and to extend the results obtained so far to verification tasks different than safety (e.g., liveness), both from the foundational and the practical perspective. Finally, I am currently investigating extensions of the theoretical framework from [J3] to Description Logic (DL) ontologies: the goal is to obtain theoretical and algorithmic results regarding the verification of complex processes whose background knowledge (i.e., the data-enrichment part) is constrained by DL ontologies. These results can be then directly applied to real-world ontology-based systems, thanks to the availability of the model checker MCMT.

**Language competence**

Italian: Native Speaker (C2)  
English: Fluent (C1)

**Driving license**

B Category (European Driving License)



Aggiornato al 29/10/2021.

Alessandro Gianola