

María Guillermina Cledou

COMPUTER SCIENTIST · POSTDOC RESEARCHER

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Education

PhD in Computer Science

Braga, Portugal

UNIVERSIDADE DO MINHO

2013 - 2018

- Thesis: A Virtual Factory for Smart City Service Integration.
- Supervisors: Luis Soares Barbosa (UNU-EGOV & UMinho), Elsa Estevez (UNLP).
- Core subjects: software product lines, formal methods, component-based development, digital public services, smart cities, coordination, information systems.
- Final grade: Good with distinction.

Licenciado degree in Computer Science

Bahía Blanca, Argentina

UNIVERSIDAD NACIONAL DEL SUR

2006 - 2013

- University exchange program: 1 full semester of courses at Universidad de Colima, Colima, México (2010).
- Thesis: Implementation of Autonomous Agents for Real-Time Scenarios Using Defeasible Logic as Knowledge Base.
- Supervisor: Diego Cesar Martinez (UNS).
- Core Subjects: defeasible logic, autonomous agents, artificial intelligence.
- Final grade: 8.92/10.

Professional Experience

Postdoc Researcher

Braga, Portugal

HASLAB INESC TEC & UNIVERSIDADE OF MINHO

Dec. 2018 - Jul. 2021

- Supervisor: José Proença.
- Project: DaVinci - Distributed Architectures: Variability and Interaction for Cyber-Physical Systems
- Core activities: Formal methods for distributed families of systems, in particular cyber-physical systems, to capture constraints such as real-time, variability and quality of service. Contribution to the development of a framework for interactive and variable components (<https://reolanguage.github.io/ReoLive/snapshot/>).

Researcher

Braga, Portugal

HASLAB INESC TEC & UNIVERSIDADE OF MINHO

Jul. 2018 - Dec. 2018

- Supervisor: José Proença.
- Project: UminhoEGOV - Projeto Especial da Universidade do Minho para a Governação Electrónica.
- Core activities: Extension to the ReoLive project to support specification and visualization of IFTA, a formalism to model families of timed automata.

Research Internship

Tokyo, Japan

NATIONAL INSTITUTE OF INFORMATICS

Jan. 2018 - Apr. 2018

- Supervisor: Shin Nakajima
- Topic: Validation of Causal Loop Diagrams
- Core activities: Development of a formalism to model and analyse Causal Loop Diagrams based on Petri Nets. Development of a proof-of-concept prototype to validate the formalism (<https://github.com/guillecledou/clpn>).

Fellow

Macao SAR, China

CENTRE FOR ELECTRONIC GOVERNANCE AT UNU-IIST

Feb. 2013 - Oct. 2013

- Supervisor: Elsa Estevez
- Project: 'Electronic Governance for Sustainable Development - Applications' focused on Citizen Participation
- Core activities: State of the art on citizen participation initiatives through digital channels. Contribution to the development of guidelines to design and implement this kind of initiatives, in particular for the Macao government. Development of the website for the conference ICEGOV2013, organized by the Centre.

Software Engineer

Bahía Blanca, Argentina

ENTREPRENEURSHIP (ELECTROSMART)

Jun. 2011 - Dec. 2013

- Project: Development of a Portable Electrocardiograph for Mobile Devices. Small multidisciplinary team of 4 software engineers, 1 electrical engineer, and 1 economist.
- Core activities (in collaboration with some members): Development in C to capture ECG signals from the portable electrocardiograph, and transfer them via Bluetooth. Development in C++ Qt for a PC application that received, filtered and showed the ECG signals. Development of business plans and SWOT analysis.

Software Engineer

Bahía Blanca, Argentina

UNIVERSIDAD NACIONAL DEL SUR IN COLLABORATION WITH FLARED 3D

Apr. 2011 - Jul. 2011

- Project: Development of an automatic 3D object unwrapper for a gaming company (Flared 3D).
- Core activities: Development in ActionScript.

Grants & Awards

Jul. 2018 - Apr. 2019	Research Grant (UMINHO/BI/181/2018) , UminhoEGOV	Braga, Portugal
Jan. 2018 - Apr. 2018	Research Internship , National Institute of Informatics	Tokyo, Japan
Jan. 2014 - Dec. 2017	PhD Grant (PD/BD/52238/2013) , Fundação para a Ciência e a Tecnologia (FCT)	Braga, Portugal
Aug. 2010 - Jan. 2011	University Exchange Program , Jóvenes de Intercambio México-Argentina (JIMA)	Colima, México
2013	Best Development Project (ElectroSmart) , FRIDA - Fondo Regional para la Innovación Digital en América Latina y el Caribe	Argentina
2012	Best Business Plan (ElectroSmart) , ECapital Argentina-Uruguay	Argentina
2012	Best Business Plan (ElectroSmart) , Jóvenes Emprendedores Santander Río	Argentina
2012	ElectroSmart , Crédito Fiscal CIC - Ministerio de Producción, Ciencia y Tecnología	Argentina

Summer Schools & Other Courses

1th School on Foundations of Programming and Software Systems

Vila Verde, Portugal

PROBABILISTIC PROGRAMMING

Jun. 2017

- Role: Participant

12th LASER Summer School on Software Engineering

Elba, Italy

CONCURRENCY THE NEXT FRONTIER

Sep. 2015

- Role: Participant and Presenter (PhD work)

MAP-i Spring School

Braga, Portugal

LOGIC OF DYNAMICAL SYSTEMS

Mar. 2014

- Role: Participant

Key Publications

FORMAL METHODS

2018 **A Net-based Formal Framework for Causal Loop Diagrams [6]**, Guillermina Cledou, Shin Nakajima, *In CSD&M Asia, Advances in Intelligent Systems and Computing, vol 878 (pdf)*.

Casual Loop Diagrams (CLD) are used to study System Dynamics in many important areas such as aerospace engineering. However, because of the lack of formal semantics, it cannot benefit from automatic analysis. This work proposes a formalism based on Petri Nets to formally model CLD and analyse possible behaviours.

2017 **A Refinement Relation for Families of Timed Automata [7]**, Guillermina Cledou, José Proença, Luís Barbosa, *In SBMF, volume 10623 of Lecture Notes in Computer Science (pdf)*.

It follows from [8], by proposing a notion of refinement for families of timed systems. It does so by separating the notion of variability refinement from behavioural refinement. At the level of behavioural refinement it considers internal and external behaviour of the system, as well as time constraints and multi-action steps. By doing this, it is possible to verify in a compositional way if a family of timed systems can be replaced by another one, and obtain a congruent system that preserves input behaviour.

- 2017 **Composing Families of Timed Automata [8]**, Guillermina Cledou, José Proença, Luís Barbosa, *In FSEN, volume 10522 of Lecture Notes in Computer Science (pdf)*.
It addresses the challenges of designing and analysing large families of composed system, where in this case, each component in the family has real-time and variability requirements. It proposes a formalism to build families of real-time systems in an incremental and modular way and it explores the application of such formalism to Reo connectors, to design complex orchestration mechanism that adapt to the presence and absence of the components they orchestrate.

DIGITAL GOVERNMENT

- 2018 **A Taxonomy for planning and designing Smart Mobility services [5]**, Guillermina Cledou, Elsa Estevez, Luís Barbosa, *Government Information Quarterly, Volume 35, Issue 1 (pdf)*.
This work aims at addressing the lack of contextualized tools for government practitioners to plan and design smart mobility services. It does so by proposing a taxonomy of smart mobility services that can be used for strategic planning and policy making because it helps to identify stakeholders to whom services shall be delivered, to identify and illustrate different types of services to be delivered, and to identify corresponding benefits and beneficiaries, facilitating the justification of business cases for each initiative. In addition it identifies common functionality present in many services. This can help IT people to develop smart mobility services in a more efficient way.

Participation in Projects

- Sep. 2018 - present **DaVinci**. *Distributed Architectures: Variability and Interaction for Cyber-Physical Systems* - An FCT Project to analyse interactions between software components considering aspects such as real time and variability (<http://davinci.di.uminho.pt/>). Participant.
- Sep. 2016 - present **TRUST**. *Trustworthy Software Design with Alloy* - An FCT project, where the main goal is to develop a methodology for trustworthy software design that is both formal, unified, and lightweight, using Alloy (<http://haslab.github.io/TRUST/>). Participant.
- Feb. 2013 - Sep. 2013 **EGOV4SD**. *Electronic Governance for Sustainable Development - Electronic Participation* - A project from UNU-IIST. The e-Participation part focused on developing government guidelines to design and implement citizen participation initiatives through digital channels. Participant.

Tool Development

- ArcaTools**. Contribution to the development of tools to support analysis of how heterogeneous and concurrent components interact. It groups various development projects and includes notions of variability, real-time, and quality of service, among others. (<http://arcatools.org>).
- CLN**. A proof-of-concept prototype to formally model Causal Loop Diagrams and verify properties over them using Causal Loop Petri Nets (CLPN) [6]. It provides a small Scala DSL to specify CLPN, methods to obtain reachability graphs, to visualize CLPN and reachability graphs, and to verify some properties over CLPN (<https://github.com/guillcledou/clpn>).
- IFTA**. A Scala implementation for Interface Featured Timed Automata [8]. It provides a small Scala DSL to specify IFTA, methods to compose them, translate them to the Uppaal model checker, and to visualise the resulting automata in different visualisers and at a different levels of abstraction (<https://github.com/haslab/ifta>).

Other Scientific Activities

- Organization and moderation of two focus groups**. The aim was to discuss a taxonomy of smart mobility services [5] with the participants, to capture valuable feedback concerning the suitability of the taxonomy, validity of the concepts, completeness, weaknesses, improvements, etc. Both groups included people from academia and government.
- Panels**. I participated in the panel *Smart Cities - Smart Government* at the SmartGov'19 Seminar for Innovation in the Public Administration, Porto Alegre, Brazil.
- Presentations in Scientific Events**. I presented results from the conducted research in different international venues, including: CSD&M ASIA'18, Singapore; SBMF'17, Recife, Brazil; FormaliSE'17, Buenos Aires, Argentina; FSEN'17, Tehran, Iran; LASER Summer School'15, Elba, Italy; ICEGOV'15-16, Montevideo, Uruguay; ICEGOV'14, Guimarães, Portugal; and ISDOC'14, Lisbon, Portugal.
- Program Committee**. I participated in the program committee of the following international conferences: SmartGov'19, ICEDEG'20.

Revisions. I participated as a reviewer for the following editions of two international journals, two international conferences, and a local conference: ITSM'19 (IEEE journal), JAIHC'19 (Springer Journal), ICIS'19, FACS'19, and JAIHO-SIE'19 (Argentina) .

Web chair. SmartGov'19 - EAI International Conference on Smart Governance for Sustainable Smart Cities, held in Braga, Portugal.

Languages

Spanish Native.

English Reading and listening: Excellent. Oral and written expression: Very good.

Portuguese Reading and listening: Very good. Oral and written expression: Good.

Full List of Publications

- [1] João Casal and Guillermina Cledou. "Understanding Students' Mobility Habits Towards the Implementation of an Adaptive Ubiquitous Platform". In: *Proceedings of the International Conference on Information Systems and Design of Communication*. ISDOC '14. Lisbon, Portugal: ACM, 2014, pp. 67–72. ISBN: 978-1-4503-2713-8. DOI: 10.1145/2618168.2618179. URL: <http://doi.acm.org/10.1145/2618168.2618179>.
- [2] Guillermina Cledou. "A Virtual Factory for Smart City Service Integration". In: *Proceedings of the 8th International Conference on Theory and Practice of Electronic Governance*. ICEGOV '14. Guimaraes, Portugal: ACM, 2014, pp. 536–539. ISBN: 978-1-60558-611-3. DOI: 10.1145/2691195.2691288. URL: <http://doi.acm.org/10.1145/2691195.2691288>.
- [3] Guillermina Cledou and Luis Soares Barbosa. "Modeling Families of Public Licensing Services: A Case Study". In: *Proceedings of the 5th International FME Workshop on Formal Methods in Software Engineering*. FormalISE '17. Buenos Aires, Argentina: IEEE Press, 2017, pp. 37–43. ISBN: 978-1-5386-0422-9. DOI: 10.1109/FormaliSE.2017..8. URL: <https://doi.org/10.1109/FormaliSE.2017..8>.
- [4] Guillermina Cledou and Luís Soares Barbosa. "An Ontology for Licensing Public Transport Services". In: *Proceedings of the 9th International Conference on Theory and Practice of Electronic Governance*. ICEGOV '15-16. Montevideo, Uruguay: ACM, 2016, pp. 230–239. ISBN: 978-1-4503-3640-6. DOI: 10.1145/2910019.2910101. URL: <http://doi.acm.org/10.1145/2910019.2910101>.
- [5] Guillermina Cledou, Elsa Estevez, and Luis Soares Barbosa. "A taxonomy for planning and designing smart mobility services". In: *Government Information Quarterly* 35.1 (2018). Internet Plus Government: Advancement of Networking Technology and Evolution of the Public Sector, pp. 61–76. ISSN: 0740-624X. DOI: <https://doi.org/10.1016/j.giq.2017.11.008>. URL: <http://www.sciencedirect.com/science/article/pii/S0740624X16301265>.
- [6] Guillermina Cledou and Shin Nakajima. "A Net-Based Formal Framework for Causal Loop Diagrams". In: *Complex Systems Design & Management Asia*. Ed. by Michel Alexandre Cardin, Daniel Hastings, Peter Jackson, Daniel Krob, Pao Chuen Lui, and Gerhard Schmitt. Cham: Springer International Publishing, 2019, pp. 1–12. ISBN: 978-3-030-02886-2.
- [7] Guillermina Cledou, José Proença, and Luís S. Barbosa. "A Refinement Relation for Families of Timed Automata". In: *Formal Methods: Foundations and Applications*. Ed. by Simone Cavalheiro and José Fiadeiro. Cham: Springer International Publishing, 2017, pp. 161–178. ISBN: 978-3-319-70848-5.
- [8] Guillermina Cledou, José Proença, and Luis Soares Barbosa. "Composing Families of Timed Automata". In: *Fundamentals of Software Engineering*. Ed. by Mehdi Dastani and Marjan Sirjani. Cham: Springer International Publishing, 2017, pp. 51–66. ISBN: 978-3-319-68972-2.
- [9] Guillermina Cledou, José Proença, Bernhard H. C. Spath, and Eric Verhulst. "Coordination of Tasks on a Real-Time OS". In: *Coordination Models and Languages*. Ed. by Hanne Riis Nielson and Emilio Tuosto. Springer International Publishing, 2019, pp. 250–266. ISBN: 978-3-030-22397-7.
- [10] Maria Guillermina Cledou, Sara Fernandes, and Elsa Estevez. "WeLEaD: Collaborative Toolkit for Learning, Engaging and Deciding". In: *Proceedings of the 7th International Conference on Theory and Practice of Electronic Governance*. ICEGOV '13. Seoul, Republic of Korea: ACM, 2013, pp. 378–379. ISBN: 978-1-4503-2456-4. DOI: 10.1145/2591888.2591968. URL: <http://doi.acm.org/10.1145/2591888.2591968>.