



# Andrea Poltronieri

PH.D. STUDENT IN COMPUTER SCIENCE AND ENGINEERING

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## Education

### Visiting Researcher

UNIVERSITAT POMPEU FABRA - MUSIC TECHNOLOGY GROUP (MTG)

Barcelona, Spain

Nov. 2021 - PRESENT

- The visiting aims to develop an alignment of the symbolic content with the audio signal using multimodal datasets. The ultimate objective is to perform a thorough analysis of audio signals employing models that are either score- or symbolic-informed. This methodological approach ensures an in-depth analysis of audio signals grounded in the principles of musicology and music theory, thus enabling nuanced evaluations such as similarity assessments and classifications.
- *Supervisor:* [Martín Rocamora](#)

### Ph.D. Student in Computer Science and Engineering

ALMA MATER STUDIORUM - UNIVERSITY OF BOLOGNA

Bologna, Italy

Nov. 2021 - PRESENT

- Ph.D. financed by [Polifonia](#), an European project founded by the EU Horizon 2020 Programme. The main objective of the Ph.D. is to develop a fully explainable and interpretable system that can provide end-users with more control and understanding of music similarity and classification systems.
- *Supervisor:* [Valentina Presutti](#)
- *Courses:* Machine Learning and Constrained Optimization, Data Structure and Algorithms, Engineering Intelligent Collective Systems, Deep Natural Language Processing, Data Visualization for Scientists, Deep Learning Frameworks, Reinforcement Learning, Towards Developmental Machine Learning

### Master's degree in Digital Humanities and Digital Knowledge – International Degree

ALMA MATER STUDIORUM – UNIVERSITY OF BOLOGNA

Bologna, Italy

Oct. 2018 - Mar. 2021

- *Grade:* 110/110 with honour
- *Dissertation title:* Using Semantic Technologies to support Music Representation Interoperability and Musicological Analysis
- *Supervisor:* [Aldo Gangemi](#)
- *Co-supervisor:* [Albert Meroño Peñuela](#)
- *Courses (average mark 29.88/30):*
  - *Computer Science:* Computational Thinking and Programming, Data Modelling and Multimedia Databases, Information Modelling and Web Technologies, Usability and User Experience, Intangible Artifacts Cultural Heritage and Multimedia, Machine Learning
  - *Knowledge Management:* Knowledge Representation and Extraction, Knowledge Organization and Digital Methods in the Cultural Heritage Domain

### Exchange Student – Erasmus+ Program

UNIVERSIDADE NOVA DE LISBOA

Lisbon, Portugal

Sep. 2017 - Feb. 2018

- During this exchange period I passed 5 examinations mainly in the following areas:
  - *Computational musicology:* Music and Computing
  - *Musicology:* Philosophy of Music: Foundations, Ethnomusicology: Introduction, Theory and Methods of Ethnomusicology, Theory and Methods in Musicology

### Bachelor's degree in DAMS – Drama, Art and Music Studies

ALMA MATER STUDIORUM – UNIVERSITY OF BOLOGNA

Bologna, Italy

Sep. 2015 - Nov. 2018

- *Grade:* 105/110
- *Dissertation title:* Il “caso Gobatti”, un esempio di “fanatismo” nei Teatri d’opera italiani di fine Ottocento
- *Supervisor:* [Anna Scalfaro](#)
- During this degree I passed 14 examinations mainly in the following areas:
  - *Historical Musicology:* History of Music II: Seventeenth- Eighteenth Centuries, History of Music III: Nineteenth Century, History of Music IV: Twentieth Century, History of Light Music
  - *Harmony and Music Theory:* Elements of Harmony and Counterpoint

### High school diploma in scientific and informatic studies

GALILEO GALILEI HIGH SCHOOL

Ostiglia (MN), Italy

Sep. 2007 - Jul. 2012

# Professional Experience

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## Academic Tutor

UNIVERSITY OF BOLOGNA, DEPARTMENT OF MODERN LANGUAGES, LITERATURES, AND CULTURES - LILEC

Bologna, Italy

Sep. 2021 - PRESENT

- Tutor of the course *Information Technology Skills (LM)*, for the Master's degree courses of *Italian Culture and Language for Foreigners* and *Modern, Post-Colonial and Comparative Literatures* at the Department of Modern Languages, Literatures, and Cultures, held by Prof. Valentina Presutti. The main tutoring activities included:
  - The preparation of slides and teaching materials for the course;
  - Four lectures on the course topics (introduction to computer science; the World Wide Web; the WWW protocols; HTML and CSS);
  - Support in examination sessions, both in presence and online.

## Assistant Researcher

UNIVERSITY OF BOLOGNA, DEPARTMENT OF MODERN LANGUAGES, LITERATURES, AND CULTURES - LILEC

Bologna, Italy

May. 2021 - Oct. 2021

- Researcher within the project ArCo4Science (MiBACT). The research project involves the study of a computational approach for analysing large repositories of music content expressed in heterogeneous formats with the aim of identifying and formally representing common and significant patterns that are indicative of music identity and culture.
- In order to improve my skills with regard to the topics covered in the research project, I attended the following courses: *Knowledge Engineering*

## Conversation Designer

HERES S.R.L.

Bologna, Italy

Jan. 2020 - Apr. 2021

- Company working on chatbot development at enterprise-level. Within the company, I am responsible for the management and implementation of conversational flows and NLP algorithms.
- Responsibilities:
  - Design and development of conversational flows
  - Natural Language Processing algorithms development
  - Project management and customer relations
  - Research and product development

## Event Planner

MANTOVA CHAMBER MUSIC ORCHESTRA

Mantua, Italy

May. 2018 - Aug. 2018

- Within the foundation, I managed the organisation of an international classical music festival named *Trame Sonore*. The 2018 edition of the festival hosted 300 international artists who performed in over 200 concerts.
- Responsibilities:
  - Concerts planning and logistical organisation

## Musician - Guitarist

DEGO ORCHESTRA

Padua, Italy

Sep. 2014 - Nov. 2019

# Extracurricular Activity

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## IFIP International Conference on Entertainment Computing - ICEC2023

LOCAL CHAIR AND TRACK CHAIR

Bologna, Italy

Nov. 2023

- Local chair of the conference and co-chair of the track "Interactive and experiential works".

## DeepLearn 2023 Summer 10th International Gran Canaria School on Deep Learning

Las Palmas de Gran Canaria, Spain

SUMMER SCHOOL

Jul. 2023

- Attended summer school on Deep Learning and Big Data.

## International Semantic Web School - ISWS

LOGISTICS AND ACADEMIC TUTORING

Bertinoro, Italy

Jun. 2023

- Contributed in the organisation and co-tutored a group of student at the International Semantic Web School.

## International Semantic Web School - ISWS

SUMMER SCHOOL

Bertinoro, Italy

Jul. 2022

- Attended the International Semantic Web School.

## Bertinoro International Spring School - BISS

SUMMER SCHOOL

Bertinoro, Italy

Mar. 2022

- Attended the spring school which covered topics of Machine Learning, Optimization, and Serverless Systems.

## SciRoc Competition

LOGISTICS AND ORGANISATION

- Collaborated in the organisation of the second edition of the Smart City Robotics Challenge (SciRoc).

*Bologna, Italy*

*Sep. 2021*

## Rock Guitar Academy (RGA)

CCR DIPLOMA – ROCK GUITAR COURSE

*Milan, Italy*

*Nov. 2012 - Feb. 2015*

Acquired skills:

- Instrument practice
- Melodic and harmonic training
- Music scores sight-reading

## Personal Skills

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<b>Italian</b>	Native speaker
<b>English</b>	C1 level (Common European Framework of Reference for Languages) 7.0 IELTS Academic Overall Band Score (test date 18/07/2019)
<b>Portuguese</b>	B1 level (Common European Framework of Reference for Languages)
<b>Spanish</b>	A2 level (Common European Framework of Reference for Languages)

## Technical Skills

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<b>Programming</b>	Python, C++, JavaScript, TypeScript, Julia
<b>Web Design</b>	Django, NodeJS, Next, React, Tailwind CSS
<b>ML Libraries</b>	TensorFlow, PyTorch, JAX, Scikit-learn
<b>Notation software</b>	Finale, MuseScore, Sibelius
<b>DAW</b>	Cubase, Ableton, Logic
<b>Knowledge Engineering</b>	RDF, SPARQL, OWL, Protégé

## Conferences & Talks

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11/2023	<b>Presenter</b> - International Conference on Entertaining Computing - ICEC2023	<i>Bologna, Italy</i>
11/2023	<b>Presenter</b> - International Society for Music Information Retrieval - ISMIR2023	<i>Milan, Italy</i>
05/2023	<b>Presenter</b> - Extended Semantic Web Conference - ESWC 2023	<i>Hersonissos, Greece</i>
04/2023	<b>Presenter</b> - The Web Conference 2023	<i>Austin, TX, USA</i>
12/2022	<b>Attendee</b> - DMRN+17: Digital Music Research Network One-day Workshop 2022	<i>London, UK</i>
11/2022	<b>Presenter</b> - 22nd International Conference of the Italian Association for Artificial Intelligence - AIxIA 2022	<i>Udine, Italy</i>
10/2022	<b>Presenter</b> - 13th Workshop on Ontology Design Patterns	<i>Online</i>
09/2021	<b>Attendee</b> - Sónar+D	<i>Barcelona, Spain</i>
10/2021	<b>Presenter</b> - 12th Workshop on Ontology Design Patterns	<i>Online</i>
09/2021	<b>Presenter</b> - First International Workshop on Multisensory Data & Knowledge	<i>Zaragoza, Spain</i>

## Honors & Awards

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11/2023	<b>Best Resource Paper Nominee</b> - International Semantic Web Conference - ISWC2023	<i>Athens, Greece</i>
05/2023	<b>Best Research Paper Award</b> - Extended Semantic Web Conference - ESWC2023	<i>Hersonissos, Greece</i>
07/2022	<b>Best Poster Award</b> - International Semantic Web School - ISWS2022	<i>Bertinoro, Italy</i>

## Harmory - The Harmonic Memory

PH.D. PROJECT

2023

The project uses the Tonal Pitch Space model to transform chord progressions into a musical context. Novelty-based analysis segments chords into meaningful structures. These are compared across progressions using harmonic similarity to reveal recurring patterns. A [knowledge graph](#) is built to connect patterns through temporal and similarity links.

- [Harmory GitHub Repository](#)

## ChoCo - The Chord Corpus

PH.D. PROJECT

2022

Choco is a large-scale dataset that semantically integrates harmonic data from 18 different sources in various representations and formats (Harte, Leadsheet, Roman numerals, ABC). The corpus leverage JAMS (JSON Annotated Music Specification) to effectively represent a variety of chord-related information (chord, key, mode, etc.) in a uniform way. ChoCo also consists of a converter module that takes care of standardising chord annotations into a single format, the Harte Notation. On top of it, a novel ontology modelling music annotations and involved entities (artists, scores, etc.) has been proposed, and a 30M triple [knowledge graph](#) has been built.

- [ChoCo GitHub Repository](#)

## Local Harmonic Agreement based on Recurrent Patterns (LHARP)

PH.D. PROJECT

2021

Work carried on in the context of the Polifonia Project. LHARP is a novel method for harmonic similarity that emphasises shared repeated patterns among symbolic chord sequences. Compared to other harmonic similarity methods on symbolic music, LHARP enables more explorative studies, as it can establish links when local harmonic patterns are found repeated in both sequences, while retaining global information to a lesser extent. This is also complemented with “The Harmonic Network” a computational tool allowing users to explore music collections by visualising harmonic similarities among tracks and interacting with the resulting graph to discover nontrivial relationships among authors, composers, and pieces.

- [LHARP GitHub Repository](#)

## HaMSE Ontology

UNIVERSITY PROJECT

2021

Project developed for master’s course final dissertation. It applies Semantic Technologies to musicological applications. The resulting ontology represents a wide range of musicological aspects (e.g., from the level of single note specificity to the representation of different types of melodic, harmonic, structural and emotional features) and allows interoperability between different representation systems.

- [HaMSE Ontology Website](#)
- [HaMSE GitHub Repository](#)

## Machine Learning Genre and Artist Classification

UNIVERSITY PROJECT

2020

Project developed for the final exam of Machine Learning. The project aims at automatically classifying the music genre and the performing artist of a given song. Both recurrent (RNN), convolutional (CNN), and hybrid approaches (CRNN) deep learning algorithms have then been developed. The results of accuracy in music genre classification stand at 88%.

- [GitHub Repository of the Project](#)

## Pop Words - Political Rhetorics of Populism

UNIVERSITY PROJECT

2019

Project developed for the final examination in Knowledge Representation and Extraction. The aim of this project is the analysis of common pattern in political rhetoric. For the project, close and distant reading methods have been employed, such as rhetorical device analysis, topic modelling, sentiment analysis, and lexical space analysis. Pop Words then creates ASAP, an OWL ontology formalizing rhetorical strategies employed by Right-wing populists.

- [Project Website](#)

## Articles

- Berardinis, Jacopo de, Valentina Anita Carriero, Nitisha Jain, Nicolas Lazzari, Albert Meroño Peñuela, **Poltronieri, Andrea**<sup>1</sup>, and Valentina Presutti. “The Polifonia Ontology Network: Building a Semantic Backbone for Musical Heritage”. In: *Proceedings of the 22nd International Semantic Web Conference*. 2023. URL: [https://link.springer.com/chapter/10.1007/978-3-031-47243-5\\_17](https://link.springer.com/chapter/10.1007/978-3-031-47243-5_17).
- Berardinis, Jacopo de, Valentina Anita Carriero, Albert Meroño-Peñuela, **Poltronieri, Andrea**<sup>1</sup>, and Valentina Presutti. “The Music Meta Ontology: a flexible semantic model for the interoperability of music metadata”. In: *Proceedings of the the 24th International Society for Music Information Retrieval Conference*. 2023. URL: <https://arxiv.org/pdf/2311.03942>.
- Berardinis, Jacopo de, Albert Meroño-Peñuela, **Poltronieri, Andrea**<sup>1</sup>, and Valentina Presutti. “ChoCo: a Chord Corpus and a Data Transformation Workflow for Musical Harmony Knowledge Graphs”. In: 2023. URL: <https://www.nature.com/articles/s41597-023-02410-w>.
- Berardinis, Jacopo de, Albert Meroño-Peñuela, **Poltronieri, Andrea**<sup>1</sup>, and Valentina Presutti. “The Harmonic Memory: a Knowledge Graph of harmonic patterns as a trustworthy framework for computational creativity”. In: *Proceedings of the ACM Web Conference 2023*. 2023, pp. 3873–3882. URL: <https://dl.acm.org/doi/pdf/10.1145/3543507.3587428>.
- Berardinis, Jacopo de, Albert Meroño-Peñuela, **Poltronieri, Andrea**<sup>1</sup>, and Valentina Presutti. “The Music Annotation Pattern”. In: *Proceedings of the 13th Workshop on Ontology Design and Patterns (WOP 2023)*. Ed. by Vojtěch Svátek, Valentina Anita Carriero, María Poveda, Christian Kindermann, and Lu Zhou. 2022. URL: [https://www.albertmeronyo.org/wp-content/uploads/2022/11/WOP2022\\_paper\\_3461.pdf](https://www.albertmeronyo.org/wp-content/uploads/2022/11/WOP2022_paper_3461.pdf).
- Carriero, Valentina Anita, Fiorela Ciroku, Jacopo de Berardinis, Delfina Sol Martinez Pandiani, Albert Meroño-Peñuela, **Andrea Poltronieri**<sup>1</sup>, and Valentina Presutti. “Semantic Integration of MIR Datasets with the Polifonia Ontology Network”. In: *ISMIR Late Breaking Demo*. Nov. 2021. URL: <https://archives.ismir.net/ismir2021/latebreaking/000020.pdf>.
- Lazzari, Nicolas, **Poltronieri, Andrea**<sup>1</sup>, and Valentina Presutti. “Classifying sequences by combining context-free grammars and OWL ontologies”. In: *European Semantic Web Conference (ESWC)*. 2023.
- Lazzari, Nicolas, **Poltronieri, Andrea**<sup>1</sup>, and Valentina Presutti. “Pitchclass2vec: Symbolic Music Structure Segmentation with Chord Embeddings”. In: *Proceedings of the 1st Workshop on Artificial Intelligence and Creativity*. Ed. by Allegra De Filippo, Michela Milano, Valentina Presutti, and Alessandro Saffiotti. Nov. 2022. URL: <https://ceur-ws.org/Vol-3278/paper2.pdf>.
- Poltronieri, Andrea**. “Knowledge-based Multimodal Music Similarity”. In: *European Semantic Web Conference (ESWC)*. 2023. URL: [https://2023.eswc-conferences.org/wp-content/uploads/2023/05/paper\\_Poltronieri\\_2023\\_Knowledge-based.pdf](https://2023.eswc-conferences.org/wp-content/uploads/2023/05/paper_Poltronieri_2023_Knowledge-based.pdf).
- Poltronieri, Andrea** and Aldo Gangemi. “The HaMSE Ontology: Using Semantic Technologies to support Music Representation Interoperability and Musicological Analysis”. In: *Proceedings of the 1st Workshop on Multisensory Data and Knowledge (MDK 2021), Zaragoza, Spain, September 1, 2021*. 2021. URL: <http://ceur-ws.org/Vol-3064/mdk5.pdf>.
- Poltronieri, Andrea** and Aldo Gangemi. “The Music Note Ontology”. In: *Proceedings of the 12th Workshop on Ontology Design and Patterns (WOP 2021), Online, October 24, 2021*. Ed. by Karl Hammar, Cogan Shimizu, Hande Küçük McGinty, Luigi Asprino, and Valentina Anita Carriero. Nov. 2021. URL: <http://ceur-ws.org/Vol-3011/pattern2.pdf>.

## Technical Reports

- Peñuela, Albert Meroño, Christophe Guillotel-Nothmann, Jacopo de Berardinis, Delfina Sol Martinez Pandiani, Valentina Anita Carriero, Mari Wigham, **Andrea Poltronieri**, Fiorela Ciroku, and Philippe Rigaux. *D2.1: Ontology-based knowledge graphs for music objects (V1. 0)*. 2021. URL: <https://hal.archives-ouvertes.fr/hal-03512869/>.

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<sup>1</sup>Alphabetical order.