CONSERVATORIO DI MUSICA Niccolò Piccinni BARI

Ministero dell'Università e della Ricerca

RESEARCH DOCTORATE IN
COMPUTATIONAL ELECTROACOUSTIC MUSIC COMPOSITION, GENERATIVE ALGORITHMIC MODELS AND COMPUTATIONAL COMPLEXITY
Conservatorio di Musica "N. Piccinni" - Bari
42nd CYCLE (XLII CICLO) - academic year 2026/2027

English translation provided for information purposes only. In case of any discrepancy, the Italian version shall prevail.

DESCRIPTION

The Doctorate in Computational Electroacoustic Music Composition, Generative Algorithmic Models and Computational Complexity is designed to provide doctoral candidates with advanced, interdisciplinary training, integrating music theory, composition theory, electroacoustic composition theory, electronic music theory, computer science and mathematics.

This unique programme aims to develop both theoretical and practical skills, enabling doctoral candidates to explore and innovate in the field of computational music. The programme involves the Conservatorio di Bari and three university professors affiliated with the University of Bari and the Polytechnic of Bari. One of the specific features of the programme is the intersection of music, mathematics, computer science and engineering, the related technologies and the narrative practices that arise from them.

Drawing on the main disciplinary fields (COME/02 Electroacoustic Music Composition, COME/04 Electroacoustics (construction and representation of virtual spaces), COTP/06 Rhythmic Theory and Music Perception, ING-INF/05 Information Processing Systems (Artificial Intelligence), FIS/07 Applied Physics (complex systems, data analysis, network neuroscience), ICAR/13 Design (Interaction Design)), the doctoral programme focuses in particular on:

1. integrating the humanities with electroacoustic music technologies and musical and performance practices, promoting an interdisciplinary approach that enriches musical understanding and innovation;
2. developing new techniques of electroacoustic music composition, making use of sound programming environments and advanced computational tools;
3. designing and implementing algorithms for automatic music generation, also using artificial intelligence and machine learning tools to explore new creative possibilities;
4. studying the complexity of musical compositions through mathematical and computational models, understanding the emergent dynamics and intricate structures of music;
5. applying concepts of applied physics and network neuroscience to analyse and understand complex systems in music, using data analysis and complex-systems models;
6. integrating design principles with audio technologies to create innovative and engaging musical experiences, exploring the interactions between sound, space and performance;
7. using information processing systems to enhance music composition, rhythmic perception and music analysis, harnessing artificial intelligence for new musical applications.

In summary, the doctoral programme places particular emphasis on interdisciplinary integration and technological innovation, promoting advanced research and cutting-edge musical creation beyond

the boundaries of individual disciplines. It also fosters cultural and technological innovation aimed at understanding the distinctive features and complexities of cultural heritage, with particular reference to the relationship between tangible and intangible heritage.

OBJECTIVES

The doctoral programme in Computational Electroacoustic Music Composition, Generative Algorithmic Models and Computational Complexity is designed to provide doctoral candidates with advanced, interdisciplinary training that integrates music theory, computer science, mathematics and sound technologies.

The objectives of the programme are as follows:

1. Development of Advanced Skills in Electroacoustic Music Composition:
   - Train experts capable of creating original musical works using advanced sound programming tools and environments.
   - Promote innovation in electroacoustic music composition, making use of computational techniques and technologies.
2. Design and Implementation of Generative Algorithmic Models:
   - Develop advanced algorithms for automatic music generation, using approaches such as neural networks, Markov models, genetic algorithms and other machine learning techniques.
   - Create algorithmic models capable of generating innovative musical compositions, overcoming the limitations of traditional compositional techniques.
3. Analysis and Understanding of Computational Complexity in Music:
   - Apply mathematical and computational models to analyse complex musical structures.
   - Study the emergent dynamics of musical compositions, using tools from graph theory, combinatorics and network neuroscience.
4. Integration of the Humanities with Audiovisual Technologies and Musical Performance Practices:
   - Promote an interdisciplinary approach combining the humanities, audiovisual technologies and musical and performance practices.
   - Explore the intersections between sound, space and performance to create innovative and engaging musical experiences.
5. Application of Applied Physics and Network Neuroscience to Music:
   - Use concepts of applied physics and network neuroscience to analyse and understand complex systems in music.
   - Use data analysis and complex-systems models to develop innovative approaches to music composition and analysis.
6. Development and Use of Information Processing Systems (Artificial Intelligence):
   - Apply information processing systems to enhance music composition, rhythmic perception and music analysis.
   - Harness artificial intelligence to develop new musical applications and improve compositional techniques.
7. Promotion of Research and Interdisciplinary Collaboration:

- Encourage collaboration among students, teaching staff and researchers in interdisciplinary projects.
- Encourage active participation in workshops, conferences and other academic activities to foster the exchange of knowledge and skills.
- Disseminate research findings, including through the Institution's journal.

8. Preparation for Academic and Professional Careers:
   - Provide doctoral candidates with the skills needed to pursue careers in academia and research in the field of computational music.
   - Prepare doctoral candidates to become innovative leaders in their field, able to meet future challenges and make a significant contribution to the musical landscape.

These objectives aim to ensure that doctoral candidates develop an in-depth, advanced understanding of the key concepts of computational music, becoming qualified and innovative experts in their field.

CAREER AND EMPLOYMENT OPPORTUNITIES

The Doctorate prepares candidates for a wide range of career opportunities in the academic, technological and creative sectors and in the music industry.
Potential career paths and employment opportunities include:
Academic Field

1. AFAM Researcher:
   - Research positions at AFAM institutions (Italian Higher Education in Art, Music and Dance), universities and other higher education institutions.
   - Opportunities to conduct independent or collaborative research projects, publish scientific articles and take part in international conferences.
2. AFAM Lecturer:
   - Teaching courses in music composition, electroacoustic music, computer music and related subjects.
   - Supervision of academic diploma and doctoral theses, as well as participation in academic committees.

Music and Technology Industry

3. Composer and Sound Designer:
   - Creation of electroacoustic music for live performances, theatre productions, films, video games and art installations.
   - Development of sound and music for multimedia and audiovisual projects.
4. Music Software Developer:
   - Design and development of software tools for music composition, sound synthesis and audio signal processing.
   - Work at technology companies developing music software, audio plug-ins and hardware for music production.
5. Artificial Intelligence Specialist for Music:

- Implementation of machine learning and artificial intelligence algorithms for automatic music generation, musical pattern recognition and other advanced applications.
- Collaboration with interdisciplinary teams to develop new AI-based music technologies.

Research and Development Sector

6. Researcher at Research Centres and Private Laboratories:
   - Conducting advanced research at public and private research institutes, focusing on music technologies, data analysis and complex systems.
   - Developing innovative projects in collaboration with industry and academic institutions.
7. Complex Systems Analyst in Music:
   - Use of advanced data analysis and mathematical modelling techniques to understand complex musical processes and develop innovative approaches to them.
   - Work in scientific and technological fields, applying interdisciplinary skills to solve complex music-related problems.

Creative and Performing Arts Sector

8. Artistic Director and Curator:
   - Planning and management of artistic events, concerts and sound installations, with a focus on innovative and experimental works.
   - Collaboration with artists, musicians and technologists to create unique artistic experiences.
9. Electroacoustic Music Composer:
   - Composition of electroacoustic works in professional recording studios.
   - Collaboration with artists and composers to develop cutting-edge musical projects.

Education and Outreach Sector

10. Music Educator and Trainer:
    - Development and teaching of educational programmes for music schools, conservatories and vocational training institutions.
    - Creation of teaching materials and online courses to disseminate knowledge on computational music and music technologies.
11. Science Communicator and Author:
    - Writing articles, books and multimedia content to communicate knowledge and innovative developments in computational music.
    - Participation in scientific and cultural outreach programmes, at both national and international level.

These career and employment opportunities offer doctoral candidates a wide range of possibilities to apply their advanced skills in different contexts, contributing significantly to innovation and development in the field of computational music and music technologies.

ADMINISTRATIVE BASE
Conservatorio di Musica "N. Piccinni" - Bari

PLACES AND SCHOLARSHIPS
2 places with a scholarship

PROGRAMME COORDINATOR
Prof. Francesco Scagliola