BENEDETTA GAMBOSI

Biomedical engineer with a passion for neuroscientific research, combining technical expertise with a collaborative mindset. Fascinated by the brain's complexity, I explore it through artificial and bioinspired approaches, aiming to contribute to innovative and impactful discoveries.
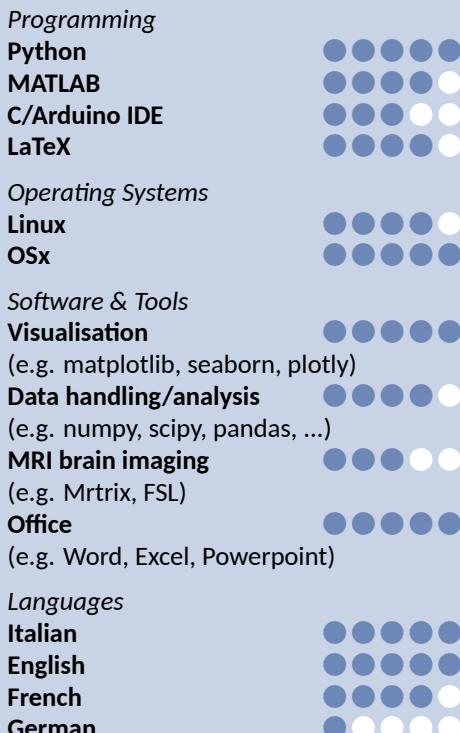
CONTACT

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- ⌨ @benedettagambosi
- in Benedetta Gambosi

EXPERTISE

Neuroengineering

Biomedical Engineering

Computational Neuroscience

Cerebellum   Spiking Neural Networks

MEA recording   Scientific Writing

Neural Signal Processing

SKILLS

Programming
Python   ●●●●●
MATLAB   ●●●●○
C/Arduino IDE ●●●○○
LaTeX   ●●●●○

Operating Systems
Linux   ●●●●○
OSx   ●●●●●

Software & Tools
Visualisation ●●●●●
(e.g. matplotlib, seaborn, plotly)
Data handling/analysis ●●●●○
(e.g. numpy, scipy, pandas, …)
MRI brain imaging ●●●○○
(e.g. Mrtrix, FSL)
Office   ●●●●●
(e.g. Word, Excel, Powerpoint)

Languages
Italian   ●●●●●
English   ●●●●○
French   ●●●○○
German   ●○○○○

CERTIFICATES

Cambridge English Certificate - CAE C1
Diplôme d'etudes de langue française - DELF B2

🧪 RESEARCH EXPERIENCE

Research Fellow ➜
@Bibilab, University of Rome La Sapienza
📅 10/2024 - Present
📍 Rome, Italy

PhD. Research Projects ➜
@NearLab, Politecnico di Milano
📅 11/2021 - Present
📍 Milan, Italy

PhD. Visiting Period ➜
@Brain Simulation Section, Charité
📅 11/2023 - 07/2024
📍 Berlin, Germany

🎓 EDUCATION

M.Sc. Biomedical Engineering 110/110 ➜
Politecnico di Milano
📅 10/2019 - 06/2021
📍 Milan, Italy

B.Sc. Biomedical Engineering 94/110 ➜
Politecnico di Milano
📅 09/2015 - 03/2019
📍 Milan, Italy

💼 TEACHING EXPERIENCE

Tutoring Master Thesis student ➜
@NearLab, Politecnico di Milano
📅 11/2021 - 09/2024
📍 Milan, Italy

Teaching Assistant & Project Workshop Tutor ➜
Neuroengineering Course, Politecnico di Milano
📅 10/2021 - 01/2025
📍 Milan, Italy

🏆 GRANTS & AWARDS

Assegni di Ricerca (Research Fellowships) ➜
Nationally funded post-graduate research grants
📅 2021 - Present
📍 Italy

Awarded Admissions to International Trainings ➜
Competitive selection-based scientific schools and conferences
📅 2022 - 2024
📍 Europe

👥 VOLUNTEERING

Save the children
Educational support and resources to disadvantaged children in Italy
📅 01/2022–Present
📍 Milan, Italy

Sant'Egidio Community
Providing peace education and conflict resolution skills among children and young people from different cultures and backgrounds.
📅 05/2011 - 07/2018
📍 Rome - Milan, Italy

Penny Wirton School
Delivering Italian language teaching and support to newcomers and asylum seekers
📅 09/2014 - 07/2015
📍 Rome, Italy

⚗ RESEARCH EXPERIENCE

1. Team Member AEGEUS Project (10/2024–Present)

Where: Bibilab, Department of Computer Control and Management Engineering, University of Rome La Sapienza; **Collaboration**: Medical Physics Lab, University of TorVergata, Rome, Italy; **Funding**: EU Horizon Europe Programme GA 101099210

Description: The AEGEUS Project develops an innovative brain analysis and therapy setup combining EEG, functional ultrasound imaging, and ultrasound-based neurostimulation. My role is to develop and implement computational brain simulations to test reconstruction strategies and predict seizure events on synthetic datasets, providing a validated framework to assess and optimize the EEG–functional ultrasound neurostimulation system.

2. Team Member ACT2 Project (10/2024–Present)

Where: Bibilab, Department of Computer Control and Management Engineering, University of Rome La Sapienza; **Funding**: Italian Ministry of University and Research PRIN 20207S3NB8

Description: The Acting Together Project explores how motor control and perceptual prediction work together during real-time social interaction. It investigates the influence of individual movement patterns and social skills on coordination, especially in autism, using high-density EEG and motion tracking to study brain-to-brain connectivity in dyads. My role is optimizing experimental setup, managing data acquisition in a hyperscanning setting, and performing network-based analyses to model brain-to-brain connectivity

3. Team Member CROSSBRAIN Project (01/2023–Present)

Where: NearLab, Politecnico di Milano; Bibilab, Department of Computer Control and Management Engineering, University of Rome La Sapienza; **Collaboration**: Medical Physics Lab, University of TorVergata, Rome, Italy; **Funding**: EU Horizon Europe Programme GA 10107090

Description: The CROSSBRAIN Project develops neuromorphic architectures and wireless microbots for precise brain tissue modulation and seizure prediction, preparing both real and simulated LFP recordings for testing. My role is to generate simulated LFP datasets to test and validate the neuromorphic architectures.

4. PhD Main Research Project: Multiscale Motor Control Models (11/2021–10/2024)

Where: NearLab, Politecnico di Milano; **Collaboration**: Department of Brain and Behavioural Sciences, University of Pavia; **Funding**: HBP RisingNet & EBRAINS 2.0 GA 101147319

Description: My project focused on the use spiking neural networks to explore and reproduce motor control under both physiological and pathological conditions. I focused on creating and refining neuronal and network models of specific microcircuits and brain regions involved in both resting and functional states (e.g. sensory-motor integration). To accomplish this, a multiscale multiarea system that encompasses the cerebellar and basal ganglia (BG) microcircuit, including models of the thalamocortical loop is being designed. After a validation of the model in physiological conditions, this multiarea model is being used to study the involvement of cerebellum in Parkinsonian conditions, introducing dopamine-dysfunction related mechanisms in both BG and cerebellum.

5. PhD Side Project: Parkinson's Prodromal Stage Classification (11/2021–10/2024)

Where: NearLab, Politecnico di Milano; **Collaboration**: Medical Physics Lab, University of TorVergata

Description: I focused on early detection of Parkinson's disease through brain structural network analysis. Neuroimaging data from the PPMI database were used to construct structural brain graphs, extract topological measures, and machine learning classifiers were used to distinguish prodromal-stage patients from controls.

6. PhD Visiting Project: Multiscale Modeling in TVB (11/2023–10/2024)

Where: Brain Simulation Section, Charité, Berlin, Germany; **Collaboration**: NearLab, Politecnico di Milano

Description: I integrated a multiarea spiking neural network models of cerebellum and basal ganglia into The Virtual Mouse Brain framework. I fine-tuned simulations to replicate physiological brain function and study dopamine-depletion effects relevant to Parkinson's disease.

10. Master Thesis: Nitric Oxide Diffusion in Spiking Neural Networks

Where: NearLab, Politecnico di Milano; **Collaboration**: Department of Brain and Behavioural Sciences, University of Pavia

Description: I developed simulation tools for nitric oxide diffusion in large spiking neural networks to study synaptic plasticity and neurovascular coupling.

11. Bachelor Thesis: Classification of Cognitive Function via Speech Analysis

Where: NearLab, Politecnico di Milano; **Collaboration**: Fondazione IRCCS Ca' Granda Policlinico di Milano

Description: I implemented voice-based machine learning classification of elderly cognitive states to identify normal, mild decline, and compromised cognitive function.

✏️ PUBLICATIONS

Journal Articles

1. Dopamine Depletion Drives Whole-Brain Oscillatory Disruptions: A Multiscale Model of Parkinson's Disease in Mice

   👥 **B. Gambosi**, A. Antonietti, P. Ritter, A. Pedrocchi   📅 In prep.

2. Squeeze More Out of Your LSM: STDP for Big Results on a Small Budget

   👥 L. Rosati, **B. Gambosi**, N. Toschi, A. Duggento   📅 in prep.

3. Parkinson's Prodromal Stage Classification through Brain Network Analysis

   👥 **B. Gambosi**, M. Giannelli, C. Tessa, N. Toschi   📅 in prep.

4. Maternal Brain Network Reorganization Induced by Mindfulness Training During Pregnancy

   👥 **B. Gambosi***, A. Nakaki*, A. Conti, Y. Gomez, S. Castro-Barquero, I. Casas, M. Genero, L. Youssef, L. Benitez, N. Encabo, A. Martín-Asuero, T. Oller-Guzmán, I. Morilla, A. Martínez-Áran, R. Estruch, E. Vieta, F. Crispi, E. Gratacos, N. Toschi, F. Crovetto   📅 Submitted

5. Mindfulness-based stress reduction intervention during pregnancy changes maternal brain

   👥 Y. Gomez, A. Nakaki, A. Conti, S. Castro-Barquero, **B. Gambosi**, I. Casas, M. Genero, L. Youssef, L. Benitez, N. Encabo, R. Casas, A. Martín-Asuero, T. Oller-Guzmán, I. Morilla, A. Martínez-Àran, N. Bargallo, N. Toschi, R. Estruch, E. Vieta, F. Crispi, E. Gratacos & F. Crovetto   📅 Scientific Reports   📓 2025   🔗 DOI

6. Linking cellular-level phenomena to brain architecture: the case of spiking cerebellar controllers

   👥 E. D'Angelo, A. Antonietti, A. Geminiani, **B. Gambosi**, C. Alessandro, E. Buttarazzi, A. Pedrocchi, C. Casellato   📅 Neural Networks   📓 2025   🔗 DOI

7. Modeling nitric oxide diffusion and plasticity modulation in cerebellar learning

   👥 C. Sartori, A. Trapani, **B. Gambosi**, A. Pedrocchi, A. Antonietti   📅 2025   📓 APL Bioengineering   🔗 DOI

8. A model with dopamine depletion in basal ganglia and cerebellum predicts changes in thalamocortical beta oscillations

   👥 **B. Gambosi**, F. Sheiban, M. Biasizzo, A. Antonietti, E. D'Angelo, A. Mazzoni, A. Pedrocchi   📅 2024   📓 Internation Journal of NEural Systems   🔗 DOI

Conference/School Abstracts

1. Functional Ultrasound Imaging of Epileptic Dynamics: A Model-Based Investigation

   👥 **B. Gambosi**, C. Buda, M. Monti, N. Toschi, L. Astolfi   📅 September 29 - 02 October, 2025   📍 Bernstein Conference 2025   🔗 PDF

2. Functional Ultrasound Imaging in Simulated Brain State Analysis

   👥 **B. Gambosi**, C. Buda, N. Toschi, L. Astolfi   📅 July 14-17, 2025   📍 47th International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC)

3. A Deep Learning Approach to EEG Subcortical Source Localization

   👥 C. Buda, **B. Gambosi**, N. Toschi, L. Astolfi   📅 July 14-17, 2025   📍 47th International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC)

4. Spiking Reservoir Computing Architectures for Model-based Epileptic Brain State Recognition

   👥 L. Rosati, **B. Gambosi**, N. Toschi, A. Duggento   📅 July 14-17, 2025   📍 47th International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC)

5. Towards Brain State Classification with Functional Ultrasound Imaging

   👥 **B. Gambosi**, C. Buda, N. Toschi, L. Astolfi   📅 June 16-18, 2025   📍 IX Congress of the National Group of Bioengineering (GNB)   🔗 PDF

6. A Deep Learning Approach to EEG Subcortical Source Localization

   👥 C. Buda, **B. Gambosi**, N. Toschi, L. Astolfi   📅 June 16-18, 2025   📍 IX Congress of the National Group of Bioengineering (GNB)   🔗 PDF

7. A multiarea model predicts the changes in thalamocortical beta oscillations caused by dopamine depletion in basal ganglia and cerebellum

   👥 **B. Gambosi**, F. Sheiban, M. Biasizzo, A. Antonietti, E. D'Angelo, A. Mazzoni, A. Pedrocchi   📅 June 17-18, 2024   📍 NEST Conference 2024   🔗 PDF

8. Squeeze More Out of Your LSM: STDP for Big Results on a Small Budget

   👥 L. Rosati, **B. Gambosi**, N. Toschi, A. Duggento   📅 May 28-31, 2024   📍 The Fifth International Convention on the Mathematics Of Neuroscience and AI

9. Dopamine-dependent cerebellar dysfunction enhances beta oscillations and disrupts motor learning in a multiarea model

   👥 **B. Gambosi**, F. Sheiban, M. Biasizzo, A. Antonietti, E. D'Angelo, A. Mazzoni, A. Pedrocchi   📅 September 27-29, 2023   📍 Bernstein Conference 2023   🔗 PDF

10. Investigating the interplay between basal ganglia and cerebellum in Parkinson's Disease: a multi-scale brain model approach

    👥 **B. Gambosi**, F. Sheiban, M. Biasizzo, A. Antonietti, A. Mazzoni, A. Pedrocchi   📅 July 2-8, 2023   📍 FENS – Chen Institute – NeuroLéman Summer School on "Motor control: from thought to action

11. Nitric Oxide diffusive plasticity model in Cerebellar SNN

    👥 C. A. Sartori, A. Antonietti, A. Pedrocchi, A. Trapani, **B. Gambosi**   📅 June 18, 2023   📍 NEST Conference 2023   🔗 PDF

12. Nitric Oxide production and diffusion model in a cerebellar spiking neural network

👥 A. Trapani, **B. Gambosi**, A. Antonietti, G. Naldi, E. D'angelo, A. Pedrocchi 📅 November 12-16, 2022 📍 Neuroscience 2022 - Society for Neuroscience 🔗 PDF

13. A spiking neural network control system for the investigation of sensori-motor protocols in neurorobotic simulations

👥 **B. Gambosi**, A. Geminiani, A. Antonietti, C. Casellato, E. D'Angelo, A. Pedrocchi 📅 June 23-24, 2022 📍 NEST Conference 2022 🔗 PDF

14. A multiscale network model to investigate the basal ganglia and cerebellum interplay in Parkinson's Disease

👥 **B. Gambosi**, F. Sheiban, M. Biasizzo, A. Antonietti, A. Mazzoni, A. Pedrocchi 📅 June 13-15, 2022 📍 EBRAIN Workshop "Brain Activity across Scales and Species: Analysis of Experiments and Simulations"

15. In silico experimental setup for Nitric Oxide diffusion in Spiking Neural Networks

👥 **B. Gambosi**, A. Trapani, A. Antonietti, G. Naldi, E. D'Angelo, A. Pedrocchi 📅 November 30 - December 4, 2021 📍 International School of Brain Cells and Circuits "Camillo Golgi"

Book Chapters

1. In silico brain models for understanding pathologies". In Gruppo Nazionale di Bioingegneria "Neurotechnologies to understand and restore the nervous system

👥 A. Antonietti, **B. Gambosi**, A. Geminiani 📅 2024 📄 Neurotechnologies to understand and restore the nervous system - Gruppo Nazionale di Bioingegneria

🏆 GRANTS

1. National Research Fellowships (Assegni di Ricerca)

Description: *Assegni di Ricerca* are competitive national research fellowships awarded by Italian universities to support early-career researchers in conducting independent or collaborative research projects. They provide salary funding for a fixed-term period, typically 1–3 years, and are linked to specific research programs or projects.

- **Network-Based Analysis of Multimodal Brain Data**
  Institution: University of Rome La Sapienza; **Funding:** PRIN 2020 ACT2 Project; **Start**: 10/2024
  Focused on analysis of multimodal brain data under physiological and pathological conditions, with emphasis on motor control and brain-to-brain connectivity.
- **Explainable Neural Networks and Trustworthy AI**
  Institution: Politecnico di Milano; **Funding:** Horizon Europe I3LUNG GA 101057695; **Start**: 10/2023
  Development of explainable and trustworthy AI methods for biomedical and neuroscience applications.
- **Bioinspired Neural Networks for Multi-Area Brain Simulations**
  Institution: Politecnico di Milano; **Funding:** HBP SGA3 GA 945539; **Start**: 10/2021
  Creation of bioinspired spiking neural network models for multi-area brain simulations, integrated into the EBRAINS platform.

Awarded Admission

- **FENS – Chen Institute – NeuroLéman Summer School "Motor control**: July 2-8, 2023, Lausanne, Switzerland.
- **Advanced Tools for Data Analysis in Neuroscience**: Sept 5-10, 2022, Strasbourg, France.
- **Trieste Next – 8th edition "BIG DATA, DEEP SCIENCE"**: Awarded stay grant.

💼 TEACHING EXPERIENCE

Master Thesis Supervision @NearLab, Politecnico di Milano

Description: Mentored five MSc students, fostering a research-oriented and inclusive environment. Guided thesis design, milestones, practical work, and provided constructive feedback.
Projects:

- Co-supervisor: "Diffusive Plasticity Model in Spiking Neural Network" (Carlo Sartori, 2023), "HiPSC analysis with MEA technology" (Kevin Sangalli, 2023), "Signal encoding in morphologically detailed cerebellar SNN" (Rachele Bonometto, 2025)
- Tutor: "Multiarea neurorobotic controller for Parkinson's disease" (Marco Biasizzo, 2022), "Cell-type specific connectivity in mouse somatosensory cortex" (Giulia Ruffo, 2022)

Teaching Assistant & Project Workshop Tutor – Neuroengineering Course Politecnico di Milano

Duration: 10/2021 – 01/2025
Description: Designed and supervised team-based workshops and assisted in course teaching to foster critical thinking and hands-on application of neuroengineering concepts. Delivered lectures on the NEST simulation environment, moderated paper discussions, and guided students through experimental project design and execution. Selected through competitive teaching calls.
Projects:

- Dec 2021: Automatic quantitative joint attention evaluation for ASD children
- Dec 2022: Cerebellum-driven perturbed hand reaching task via spiking neural network