

# Biophotonics Artificial Intelligence School

*Firenze, 17-21 February 2025*

Organized by



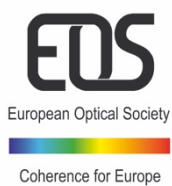
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**Biophotonics** has applications ranging from the detection of chemical and biological molecules and microorganisms to biomedical imaging, thus generating informative data of high complexity. **Artificial Intelligence** (AI) is a disruptive technology with applications that now pervade every field of knowledge.

Paradigms such as Machine learning, Deep Learning and Reinforcement Learning are able not only to find hidden patterns in complex data, but also to inspire new theoretical and experimental interpretations.

The School was born with the aim of exploring the crossroads between these two disciplines, with the aim of creating a training path for the development of AI applications in the field of Biophotonics.

### ***Directors of the School***

*Andrea Barucci, Ambra Giannetti, Francesca Rossi*

*Istituto di Fisica Applicata "Nello Carrara" – CNR, Sesto Fiorentino, Firen*



# 17 - 21 February 2025 | Firenze



	Monday 17		Tuesday 18		Wednesday 19		Thursday 20	Friday 21 BpAI Conference
09:30 - 10:00	BpAI School Welcome [Bernard Dika and School Directors]	08:30 - 09:20	BioP [Tombelli]		AI [Seidenari]		AI [Bagdanov]	Lectio magistralis [Pavesi]
10:00 - 10:50		AI [Diciotti]	09:30 - 10:20	BioP [Trono]				Lectio magistralis [Mecocci]
11:00	Coffee	10:30	Coffee		Coffee		Coffee	Coffee
11:30 - 12:20	BioP [Pini]	11:00 - 11:50	BioP [Cicchi]		BioP [Ratto]		AI [Mecocci]	Saluto delle autorità e Tavola rotonda
12:20 - 12:50	[Genovali]	12:00 - 12:50	BioP [Michelini]		BioP [Farina]			
13:00	Lunch	13:00	Lunch		Lunch		Lunch	Lunch
14:00 - 14:50	AI [Baccini]	14:00 - 14:50	AI [Marinai]		BioP [Mazzamuto]		AI [Mecocci]	Team-work presentations
		15:00 - 15:50						
15:00 - 18:00	AI [Marzi]	16:00 - Until closing	Datathon [Marzi, Diciotti]		Datathon [Marzi, Diciotti]		Datathon [Marzi, Diciotti]	Closing Remarks
		18:00 - 24:00	Social events					

# 17<sup>th</sup> February

Centro Didattico Morgagni – Room 006  
Viale Morgagni 40

09:30-10:00

Opening

BpAI school Directors (*Andrea Barucci, Ambra Giannetti, Francesca Rossi*)  
Senior Advisor to the President of Tuscany for innovation and youth policy  
and Cavaliere della Repubblica (*Bernard Dika*)

10:00-10:50

*Stefano Diciotti*

Introduction to Artificial Intelligence

11:00

Coffee Break

11:30-12:20

*Roberto Pini*

Photonics innovations for Life Science applications

12:20-12:50

*Katia Genovali*

Essential Tips for Researchers: Presenting Your Scientific Work in 5  
Minutes

13:00

Lunch Break

14:00-14:50

*Michela Baccini*

A statistical introduction to machine learning

15:00-15:50

*Chiara Marzi*

Learning or leaking? Designing frameworks for machine learning

16:00-16:30

*Chiara Marzi*

Datathon

# 18<sup>th</sup> February

Centro Didattico Morgagni – Room 006  
Viale Morgagni 40

08:30-09:20 | *Sara Tombelli*  
Functional and biomimetic molecules in optical biosensing: artificial intelligence approaches for their selection and target-binding prediction

09:30-10:20 | *Cosimo Trono*  
Optical biosensing: conventional methods and contribution from Artificial Intelligence

10:30 | Coffee Break

11:00-11:50 | *Riccardo Cicchi*  
Advanced optical microscopy and imaging techniques

12:00-12:50 | *Elisa Michelini*  
From biosensors to internet of biosensors

13:00 | Lunch Break

14:00-15:50 | *Simone Marinai*  
Clustering and unsupervised learning

16:00-17:00 | Group work - Datathon

## SOCIAL EVENTS

18:00-19:30 | Guided tour at **MAF**  
*P.za della SS. Annunziata, 9b*

20:30-24:00 | School Aperitif at **Ditta Artigianale**  
*Via Giosuè Carducci, 2/4r*

# 19<sup>th</sup> February

Centro Didattico Morgagni – Room 006  
Viale Morgagni 40

08:30-10:20

*Lorenzo Seidenari*  
Deep Generative Models

10:30

Coffee Break

11:00-11:50

*Fulvio Ratto*  
Redesigning Lateral Flow Tests for Pandemic Readiness

12:00-12:50

*Andrea Farina*  
Computational Imaging for biomedical optics: applications to multispectral fluorescence lifetime imaging and diffuse optical tomography

13:00

Lunch Break

14:00-14:50

*Giacomo Mazzamuto*  
Large-scale imaging and feature extraction using advanced high-resolution microscopy techniques

15:00

Group work - Datathon

# 20<sup>th</sup> February

Centro Didattico Morgagni – Room 006  
Viale Morgagni 40

08:30-10:20

*Andrew Bagdanov*  
Reinforcement Learning: From Classical to Deep

10:30

Coffee Break

11:00-12:50

*Alessandro Mecocci*  
Unveiling the AI landscape: algorithms, Models and Techniques with a focus on LLMs

13:00

Lunch Break

14:00-14:50

*Alessandro Mecocci*  
Unveiling the AI landscape: algorithms, Models and Techniques with a focus on LLMs

15:00-15:50

*Kristen Meiburger*  
Photoacoustic image reconstruction using deep learning

16:00

Group work - Datathon



# 21<sup>st</sup> February

## BpAI Conference

Con il patrocinio del **Dipartimento per la Trasformazione Digitale della Presidenza del Consiglio dei Ministri**



**DIPARTIMENTO**  
PER LA TRASFORMAZIONE  
DIGITALE

INNOVATION CENTER of Fondazione CR Firenze  
*Lungarno Soderini 21*

08:30-09:30	LECTIO MAGISTRALIS <i>Lorenzo Pavesi</i> Neuromorphic Photonics: From Neural Interfaces to Computing Paradigms
09:30-10:30	LECTIO MAGISTRALIS <i>Alessandro Mecocci</i> Emerging technologies, scientific developments, ethical issues, social changes in: Medicine, Robotics, Agriculture, and other critical sectors of the future
10:30	Coffee Break
11:00-11:30	<b>Saluti delle autorità</b> Eugenio Giani, Presidente Regione Toscana Giovanni Macelloni, Direttore CNR-IFAC Laura Sparavigna, Assessora Deleghe a Organizzazione e Personale, Efficienza amministrativa, Anagrafe, Protezione civile, Servizi informativi, Smart city e Innovazione, Intelligenza artificiale del Comune di Firenze
11:30-13:00	<b>Tavola Rotonda</b> – Moderatrice: Katia Genovali, CNR-ISTI  Dr. Maria Carmela Leo, AOU Meyer IRCCS Prof. Alessandro Mecocci, Università di Siena Prof. Emanuele Neri, Università di Pisa Dr. Cinzia Pozzi, giornalista scientifica e saggista
13:00	Lunch Break
14:00-15:30	Datathon - group work - presentations
15:30-16:00	Winning group award and Closing remarks