

7th Advanced Course on Data science & machine Learning – ACDL 2024

from Deep Learning to Generative Artificial Intelligence

Riva del Sole Resort & SPA – Castiglione della Pescaia (Grosseto) Tuscany, Italy

10 – 14 June 2024

<https://acdl2024.icas.events/>

lod@icas.cc

Schedule Ver. 3.0 (4 pages) – May 13, 2024

	Mon, 10 June	Tue, 11 June	Wed, 12 June	Thu, 13 June	Fri, 14 June
09:00 – 09:50	Sifakis	Liakata	Koumoutsakos	Van Hentenryck	Barth-Maroon
09:50 – 10:40	Liakata	Hasani	Pardalos	Hasani	Van Hentenryck
10:40 – 11:20	Coffee break	Coffee break	Coffee break	Coffee break	Coffee break
11:20 – 12:10	Koumoutsakos	Kassner	Romagnoli	Giesselbach	Huang
12:10 – 13:00	Kassner	Hasani	Kassner	Kassner	Van Hentenryck
13:00 – 15:00	Lunch	Lunch	Lunch	Lunch	Lunch
15:00 – 15:50	Koumoutsakos	Butenko	Hasani	Barth-Maroon	Welling
15:50 – 16:40	Liakata	Free time	Koumoutsakos	Free time	Giesselbach
16:40 – 17:20	Coffee break		Coffee break		Giesselbach
17:20 – 18:10	Liakata		Butenko		Huang
18:10 – 19:00	Giesselbach		Barth-Maroon		Huang
19:00 – 19:50	Barth-Maroon		Giesselbach		Free time
20:00	Dinner	Dinner	Dinner	Dinner	Social Dinner*
		21:30 Poster Session 1		21:30 Poster Session 2	

Conference Room: *The Crown* (in the conference centre of the Riva del Sole Resort & SPA)

Registration: June 9 @ 15:30 – 20:00 (in the foyer of the conference centre near The Crown conference room)

Inside the Riva del Sole it is mandatory to wear the badge.

Group Photo: June 10 @ 13:00 Meeting point: terrace adjacent to the restaurant.

* For the social dinner on the 14th, if possible, we advise everyone to **dress up** (jacket and tie, suit, etc.).

LECTURERS:

Joseph Sifakis, Verimag Laboratory, Grenoble, France **Turing Award**

Gabriel Barth-Maroon, DeepMind, London, UK

Sergiy Butenko, Texas A&M University, USA

Sven Giesselbach, Fraunhofer Institute - IAIS, Germany

Ramin Hasani, MIT, USA

Chin-Wei Huang, Microsoft Research Amsterdam, The Netherlands

Nora Kassner, DeepMind, London, UK

Petros Koumoutsakos, Harvard University, USA

Maria Liakata, The Alan Turing Institute, UK

Panos Pardalos, University of Florida, USA

Raniero Romagnoli, Almawave Spa, Italy

Pascal Van Hentenryck, Georgia Institute of Technology, USA

Max Welling, University of Amsterdam, The Netherlands

DIRECTORS:

Giuseppe Nicosia, University of Catania, Italy

Panos Pardalos, University of Florida, USA

“Those who have an eye find what they are looking for even with their eyes closed”

Italo Calvino

ACDL 2024 Lecturers

Joseph Sifakis, Verimag Laboratory, Grenoble, France **Turing Award**
Lecture “**Artificial Intelligence: Where We Are, Where We Are Going?**”

Gabriel Barth-Maroon, DeepMind, London, UK
4 Lectures on “**Multimodal Foundation Models**”

Sergiy Butenko, Texas A&M University, USA
Lecture “**Cluster-detection Methods in Network-based Data Analysis**”
Lecture “**Continuous Approaches to Cluster-Detection Problems in Networks**”

Sven Giesselbach, Fraunhofer Institute - IAIS, Germany
Lecture “**Introduction to Foundation Models**” 1/5
Lecture “**Large Language Models**” 2/5
Lecture “**Efficient Language Models**” 3/5
Lecture “**Foundation-Model Agents**” 4/5
Lecture “**Executing Data Science Projects with Foundation Models**” 5/5

Ramin Hasani, MIT, USA
4 Lectures on “**Sequence Models / Liquid Neural Networks**”

Chin-Wei Huang, Microsoft Research Amsterdam, The Netherlands
3 Lectures on “**Diffusion Models**”

Nora Kassner, DeepMind, London, UK
Lecture “**Large Language Models: Life after Pre-training**” 1/4
Lecture “**Large Language Models: Evaluation**” 2/4
Lecture “**Large Language Models: Reasoning and Factuality**” 3/4
Lecture “**Large Language Models: Retrieval augmentation and Tool-use**” 4/4

Petros Koumoutsakos, Harvard University, USA
Lecture “**Machine Learning for Modeling and Control of Complex Systems**” 1/2
Lecture “**Machine Learning for Modeling and Control of Complex Systems**” 2/2
Lecture “**Solving forward and inverse problems with and without neural networks**”
Lecture “**Bayesian Uncertainty Quantification**”

Maria Liakata, The Alan Turing Institute, UK
Lecture “**Introduction to Natural Language Processing (NLP) up to LLMs and associated challenges**” 1/4
Lecture “**Identifying changes in longitudinal user generated content (I)- (recurrence and path signatures)**” 2/4
Lecture “**Identifying changes in longitudinal user generated content (II)-(transformer based methods)**” 3/4
Lecture “**Timeline extraction, Timeline summarisation and demo on identifying longitudinal changes**” 4/4

Panos Pardalos, University of Florida, USA
Lecture “**Twin Support Vector Machines: Advances and Applications**”

Raniero Romagnoli, Almwave Spa, Italy
Lecture “**Challenges, approaches, needs and points of view for industry grade AI**”

Pascal Van Hentenryck, Georgia Institute of Technology, USA
3 Lectures on “**Fusing Machine Learning and Optimization for Engineering**”

Max Welling, University of Amsterdam, The Netherlands
Lecture “**Generalized Belief Propagation Algorithms for Tensor Network Contractions**”

“But don't you see that the whole trouble lies here? In words, words. Each one of us has within him a whole world of things, each man of us his own special world. And how can we ever come to an understanding if I put in the words I utter the sense and value of things as I see them; while you who listen to me must inevitably translate them according to the conception of things each one of you has within himself. We think we understand each other, but we never really do.”

Luigi Pirandello, Six Characters in Search of an Author.

Useful Information

1. **Very Important:** during lessons and Q&A sessions, absolute silence is recommended, you must not make noise, you must not disturb the Lecturer during the lesson or while she/he is answering questions posed by the audience.
2. Conference Room: **The Crown**. Number 7 on the resort map.
3. **Registration:** June 9 @ 15:30 – 19:30 (in the foyer of the conference centre near The Crown conference room). Inside the Riva del Sole it is mandatory to wear the badge.
4. **Group Photo:** June 10 @ 13:00 Meeting point: terrace adjacent to the restaurant.
5. **Resort Map, Castiglione della Pescaia Map,** and **ACDL 2024 Poster.**
6. In the program you will find the list of **accepted posters**. The **Poster Session 1** will be held on **Tue, June 11 @ 21:30** **Poster Session 2** will be held on **Thu, 13 June @ 21:30**. The two Poster Sessions will be held in the **Da Vinci Conference Room** (first floor of the Congress Centre, number 6 on the resort map). *Those who have problems and cannot make the poster, please send us an email now, deadline by June 2nd.*
 - a. We recommend to prepare and print a poster of **size B0** (1000 × 1414 mm or 39.4 × 55.7 inches) in **VERTICAL** orientation on the board (avoid landscape orientation). If for some reason the B0 size is not possible, then use the A0 size (841 mm x 1189 mm, or 33.1 inches x 46.8 inches).
 - b. **It is not possible to print posters at the course venue. When you arrive at the course venue the posters must already be printed.**
 - c. The Conference Organisers will provide all necessary supplies for mounting the posters (tape, etc).
 - d. *The poster boards will be ready each morning from 08:45.* All presenters are asked to hang their posters as soon as possible in the same morning of their assigned poster session. This way all delegates will be able to study them ahead of the poster session and come prepared with specific questions. Presenters are also asked to remove their posters at the end of the session. Any poster left unattended on its poster boards after the poster session will be removed.
7. Obviously, *we recommend bringing your work laptop.*
8. Participants who need to take an **exam/project/oral to have the 8 ECTS** credited are asked to email acd1@icas.cc and Prof. Nicosia giuseppe.nicosia.1@gmail.com
9. Inside Riva del Sole, **badges must be worn at all times.**
10. *For dinner on the 14th, if possible, we advise everyone to dress up (jacket and tie, suit, etc.).*
11. **Certificates** will be given out on the last day of the course. To receive the certificate you must have at least 85% of class attendance (we have CNNs/Transformers to compute and infer attendance ;-).
12. One last thing, do not forget bathing suits, sunscreen, and stay hydrated.

ACDL 2024 Poster Sessions

Tue, 11 June @ 21:30 Poster Session 1 (Da Vinci Conf Room, 1st floor of the Congress Centre, number 6 on the resort map).

Generating math problems with large language models, Igor Griva, George Mason University, United States

Color Disentanglement on Textile Samples, Ludovica Schaerf, Max Planck Society - University of Zurich, Switzerland

Drug design for Tmprss2 inhibition, Katarina Elez, Freie Universität Berlin, Germany

Batch Bayesian Optimization for the Discovery of Redox Active Quinones, Giacomo De Gobbi, TU Graz, Austria

Large Language Models and Autophagy, Gizem Gezici, Scuola Normale Superiore, Italy

The Power of Noise: Redefining Retrieval for RAG Systems, Florin Cuconasu, Sapienza University of Rome, Italy

Upper Error Bounds for Score-Based Inverse Problem Solving in Imaging, Irina Dobrianski, Graz University of Technology, Austria

Graph Neural Networks Applied to Electroencephalography (EEG) Data for Dementia Classification, Thomas Barbera, University of Milano-Bicocca, Italy

Exact Soft Analytical Side-Channel Attacks using Tractable Circuits, Thomas Wedenig, Graz University of Technology, Austria

A Synergy of Language Models and Sensorimotor representations for Sensory Information Extraction, Cédric Boscher, INSA Lyon, France

Scaling While Privacy Preserving: A Comprehensive Synthetic Tabular Data Generation and Evaluation in Learning Analytics, Qinyi Liu, University of Bergen, Norway

Point Cloud Geometry Scalable Coding with a Quality-Conditioned Latents Probability Estimator, Daniele Mari, University of Padova, Italy

A reduced order approach for Artificial Neural Networks applied to Object Recognition, Laura Meneghetti, SISSA, Italy

An Intuitive Self-Supervised Parasite Egg Detection System powered by Foundation Models, Salvatore Capuozzo, University of Naples Federico II, Italy

Thu, 13 June @ 21:30 Poster Session 2 (Da Vinci Conf Room, 1st floor of the Congress Centre, Num 6 on the resort map).

Large Language Models Meet Static Analysis: Experimentally Evaluating Vulnerability Remediation in Code Generation, Greta Dolcetti, Ca' Foscari University of Venice, Italy

Inference of Biological Regulation in the Presence of Noise: A Probability Flow Approach, Suryanarayana Maddu, Flatiron Institute/Simons Foundations, New York, United States

To Generate or to Retrieve? On the Effectiveness of Artificial Contexts for Medical Open-Domain Question Answering, Giacomo Frisoni, University of Bologna, Italy

A Model of Semantic Completion in Generative Episodic Memory, Zahra Fayyaz, Ruhr University Bochum, Germany

Generative Adversarial Networks for Synthetic Data Generation in Finance: Evaluating Statistical Similarities and Quality Assessment, Faisal Ramzan, Università degli Studi di Cagliari, Italy

Big data and machine learning-based nutritional and health assessment of dietary patterns, Maria Teresa Rebelo, Technical University of Denmark, Denmark

PINA: a PyTorch Framework for Solving Differential Equations by Deep Learning, Dario Coscia, SISSA, Italy

Physics-Informed Neural Networks for Heat Transfer, Zeyuan Miao, University of Manchester, United Kingdom

Personalized Prediction of Blood Glucose Concentration using Multimodal Data, Giorgia Rigamonti, University of Milano-Bicocca, Italy

Improving Timber Log Traceability Using Deep Learning Models, Yohann Jacob Sandvik, Norwegian University of Life Sciences, Norway

SynapNet: A Complementary Learning System Inspired Algorithm with Real-Time Application in Multimodal Perception, Nilay Kushawaha, Scuola Superiore Sant'Anna, Italy

Synthetic Data Generation for Smart City Applications: A SUMO Approach, Debora Russo, Università degli Studi di Napoli Federico II, Italy