

# Machine Learning for Non Matrix Data

Giacomo Boracchi,  
Cesare Alippi,  
Matteo Matteucci

[giacomo.boracchi@polimi.it](mailto:giacomo.boracchi@polimi.it)

<https://boracchi.faculty.polimi.it/teaching/Non-Matrix.htm>

# Goal of the Course

*This course aims at presenting **data-driven methods for handling non-matrix data**, i.e., data that are not represented as arrays. The course will give an overview of machine learning and deep learning models for handling graphs, point clouds, texts and data in bioinformatics.*

*Moreover, most relevant approaches in reinforcement learning and self-supervised learning will be presented.*

# Course Logistics

We were supposed to be here...



..but only 40 participants

Now there are more than 120 attendees



# A few technical information

- All the lectures will be always on the same MS Teams link,
- The schedule is reported on the course website <https://boracchi.faculty.polimi.it/teaching/Non-Matrix.htm>
- Slides will be made available by the speakers before the lecture and /or posted on the website
- Videos will be recorded and shared on MS streams for attendees
- Exams and official attendance certificates for officially registered students.
- Exam will be a short interview / presentation to be agreed with course organizers.

# Lectures

- As the lecture starts, make sure you are muted and your video is off
- We all wish for a useful interaction during our lectures. Please, feel free to ask questions in the chat or answer requests by the speaker.

# Exam Logistics

- Only for students «officially enrolled» that have at least 70% attendance
- Prepare a presentation on:
  - Option A: Your research, as long as it is related to the course topics. We believe this is going to be an individual presentation
  - Option B: Two papers creating some connections or a comparative analysis. This is meant for pair of students but you can make it also alone (present just one paper). You will propose which paper to present, we will check them and confirm / suggest alternatives
- Fill a form by Friday July 3rd where you will specify
  - The topic (for the sake of convenience refer to the lectures)
  - Option A) Whether it is going to be on your work
  - Option B) The two papers proposed and the name of the two students

Presentation will be in 10' (option A) or 15' (option B). On top of that there might be 5' questions. Do not exceed the allocated time!

Choose whether to make it in July or September



Link to register the exam:

<https://forms.office.com/Pages/DesignPage.aspx#FormId=K3EXCvNtXUKAjjCd8ope6ztteKg60ERCsstxb4n43e9U0FFFSkjZUzJaUDJLMoFESUk3RUwz0DFHUC4u>

Fill this in even if you are just interested in an attendance certificate

For everybody:  
Feedback Questionnaire

<https://forms.office.com/Pages/DesignPage.aspx#FormId=K3EXCvNtXUKAjjCd8ope6ztteKg60ERCsstxb4n43e9U0EhWUUNE0DE3UzdUQk5ITFUyNEZFMjVKMy4u>

# Invited Speakers

# Invited Speakers

Tuesday June 23rd 2020, 14:30 - 18:30

Alessandro Giusti, Senior Researcher at IDSIA, Lugano

“Self-supervised Learning and Domain Adaptation”

Wednesday June 24th 2020, 9:00 - 13:00

Alessandro Lazaric, Facebook Paris

“Reinforcement Learning And Application Of Deep-learning Models In RL”

Wednesday June 24th 2020, 14:30 - 18:30

Mark Carman, Politecnico di Milano

“Deep Learning Models For Text Mining And Analysis”

# Invited Speakers (cnt)

Thursday June 25th 2020, 9:00 - 13:00

Jonathan Masci, NNAISENSE SA, Switzerland

“Machine Learning And Deep Learning Models For Handling Graphs”

Thursday June 25th 2020, 14:30 - 18:30

Maks Ovsjanikov Laboratoire d'Informatique (LIX), École Polytechnique, France

“3d Shape Matching and Registration”

Friday June 26th 2020, 9:00 - 13:00

Gianluca Bontempi Université Libre de Bruxelles, Belgium

“Supervised Learning to Causal Inference in Large Dimensional Settings”

# Self-supervised Learning and Domain Adaptation

*Alessandro Giusti, Senior Researcher at  
IDSIA, Lugano*

# Alessandro Giusti

Alessandro Giusti is a Senior Researcher at Dalle Molle Institute for Artificial Intelligence (IDSIA, USI-SUPSI) in Lugano (Switzerland).

He works in Robotics, Machine Learning applications, Human-Robot interaction, Biomedical Image Processing, and Data Visualization.



**Reinforcement Learning And Application Of  
Deep-learning Models In RL**  
*Alessandro Lazaric, Facebook*



# Alessandro Lazaric

Alessandro Lazaric is a research scientist at Facebook AI in Paris. Previously, he was a researcher in the Sequel team at Inria Lille (France) for 8 years. He has been actively working on machine learning and reinforcement learning for the last 12 years, with over 40 papers in top machine learning conferences and journals on topics such as approximate dynamic programming algorithms, transfer learning, and exploration-exploitation.

He has been the lecturer of the Reinforcement learning course at Master MVA in ENS Cachan since 2013.



# Deep Learning Models For Text Mining And Analysis

*Mark Carman, Politecnico di Milano*

# Mark Carman

Mark Carman is an Associate Professor at the Politecnico di Milano since 2019, after eight years at Monash University in Melbourne, Australia. He was a postdoc at the University of Lugano. He received his PhD from the University of Trento in 2006 having spent his PhD tenure at both the Fondazione Bruno Kessler (FBK) and the Information Sciences Institute (ISI) of USC.

Mark's research lies in Data Science with a particular focus on problems in Information Retrieval. He has worked on techniques for learning web search rankings, scaling machine learning algorithms to large data quantities, robust clustering in high dimensions, improving quality-control in crowd-sourcing, and personalising search results and recommended content. Other applications of his work include speeding up digital forensic investigations, detecting sentiment and sarcasm in text, correcting errors in OCR output, and estimating user expertise in social media.

Mark has authored a large number of publications in prestigious venues, including full papers at SIGIR, KDD, IJCAI, CIKM, ECIR, WSDM, HT, CoNLL, EACL, HCOMP and ICDAR, and articles in TOIS, IR, JMLR, ML, PR, JAIR, CS&L, JASIST, DI and CSUR.



**Machine Learning And Deep Learning  
Models For Handling Graphs**  
*Jonathan Masci, NNAISENSE SA*

# Jonathan Masci

Jonathan Masci is co-founder of NNAISENSE, a startup which aims at building the first practical general purpose AI, where he leads the Deep Learning efforts.

He obtained his PhD under the supervision of Prof. Jürgen Schmidhuber at the Dalle Molle Institute for Artificial Intelligence (IDSIA) and University of Lugano (USI).

His main interests are Deep Learning, Machine Learning, and their applications to Computer Vision and pattern recognition, Time-series data analysis, and non-Euclidean learning.

He serves in the program committees and as area chair for the top machine learning and computer vision conferences and journals (NIPS, PAMI, JMLR, IJCV, IJCAI, etc).



**3D Shape Matching and Registration**  
*Maks Ovsjanikov, École Polytechnique LIX*

# Maks Ovsjanikov

Maks Ovsjanikov is a Professor at Ecole Polytechnique in France. He works on 3D shape analysis with emphasis on shape matching and correspondence. He has received a Eurographics Young Researcher Award in 2014 “in recognition of his outstanding contributions to theoretical foundations of non-rigid shape matching”. He has served on the technical program committees of international conferences including SIGGRAPH and SIGGRAPH Asia, as a member of the editorial board of Computer Graphics Forum and has co-chaired the Symposium on Geometry Processing in 2016. In 2017 he received an ERC Starting Grant from the European Commission and a Bronze Medal from the French National Center for Scientific Research (CNRS) for research contributions in Computer Science in 2018.



**Supervised Learning to Causal Inference in  
Large Dimensional Settings**

*Gianluca Bontempi Université Libre de  
Bruxelles, Belgium*



# Gianluca Bontempi

Gianluca Bontempi is Full Professor in the Computer Science Department at the Université Libre de Bruxelles (ULB), Brussels, Belgium and co-head of the ULB Machine Learning Group ([mlg.ulb.ac.be](http://mlg.ulb.ac.be)). He has been Director of (IB)<sup>2</sup>, the ULB/VUB Interuniversity Institute of Bioinformatics in Brussels ([ibsquare.be](http://ibsquare.be)) in 2013-17.

His main research interests are big data mining, machine learning, bioinformatics, causal inference, predictive modeling and their application to complex tasks in engineering (time series forecasting, fraud detection) and life science (network inference, gene signature extraction). Since March he is co-leader of the CLAIRE COVID19 Task Force.

