

SALONE DELL'ORIENTAMENTO 2026

CORSO DI LAUREA MAGISTRALE

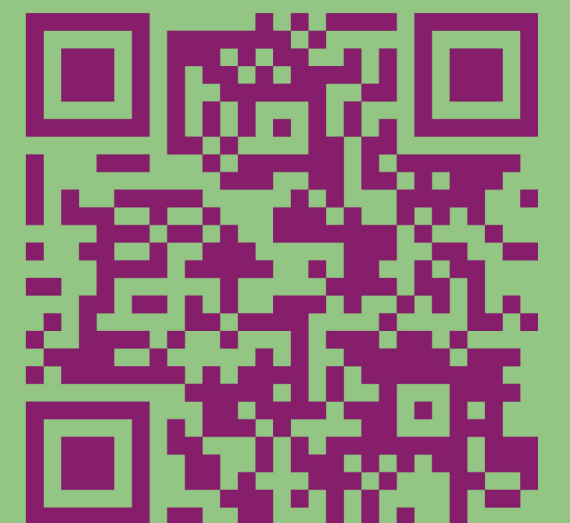
PHYSICS OF COMPLEX SYSTEMS

FISICA DEI SISTEMI COMPLESSI



**Politecnico
di Torino**

**SCOPRI TUTTI I
CORSI DI STUDIO
A.A. 2026/27
www.polito.it**



SALONE DELL'ORIENTAMENTO 2026

#BREAK THE PATTERN

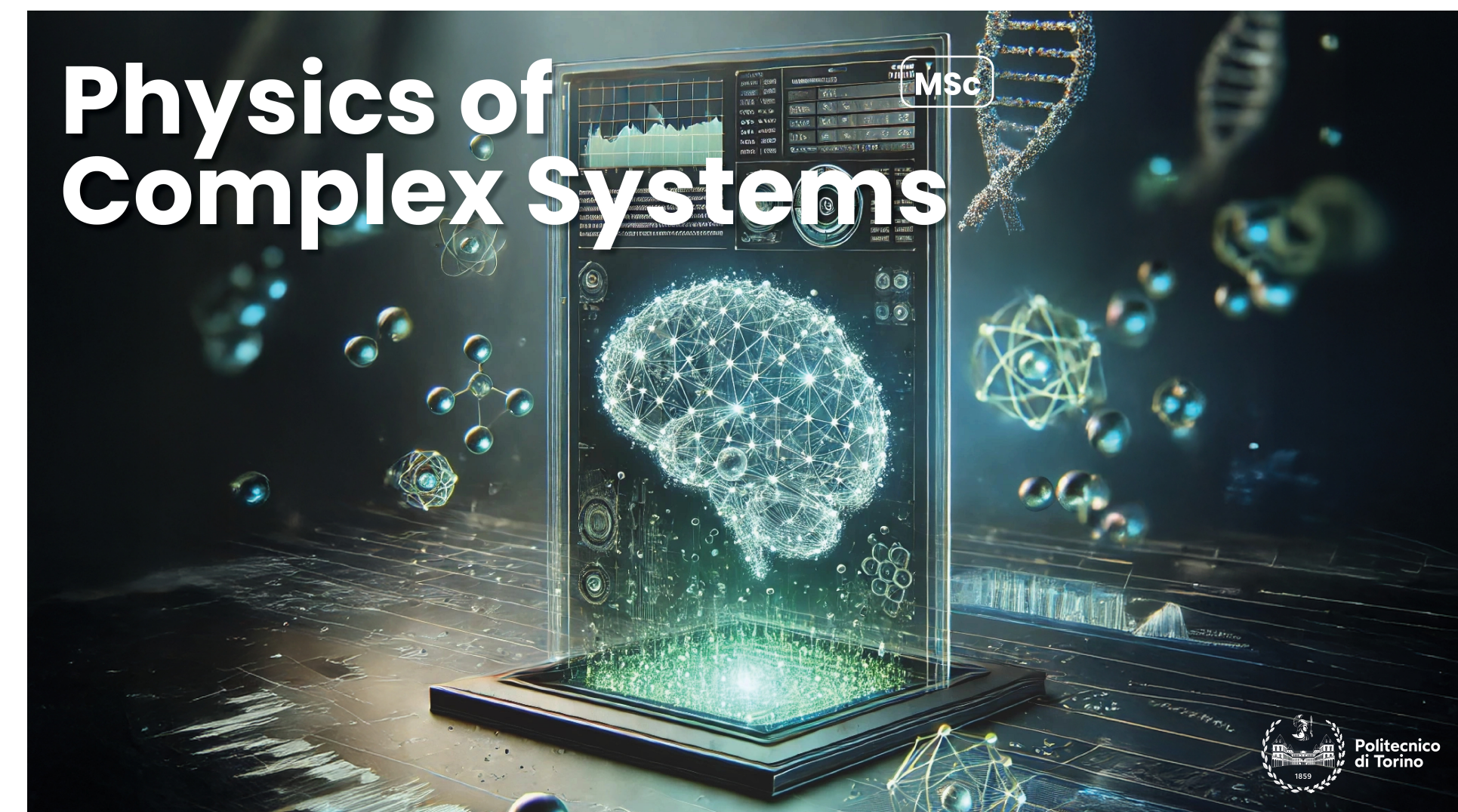
PHYSICS OF COMPLEX SYSTEMS

taking on challenges at the frontier between different fields

Coordinator: **Fabrizio DOLCINI**



**Politecnico
di Torino**



What is a complex system ?

from Google:

a system of many components,
which may interact with each other



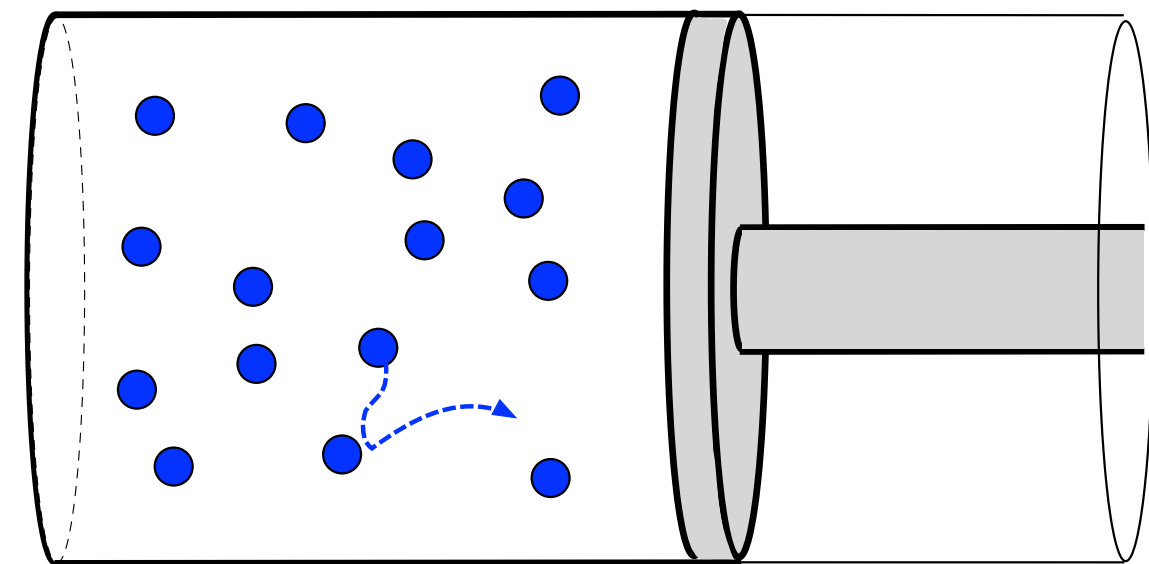
Examples

- people in a community exchange information, opinion, viruses...
- human brain (neurons communicate through synapses)
- financial market (investors, traders, regulators)
- social network (users are connected on a global scale)

What has Physics to do with all that ?

Physicists have started long ago to investigate systems with many components

molecules of a gas (interacting through Van der Waals forces)



$N \sim 10^{23}$ molecules

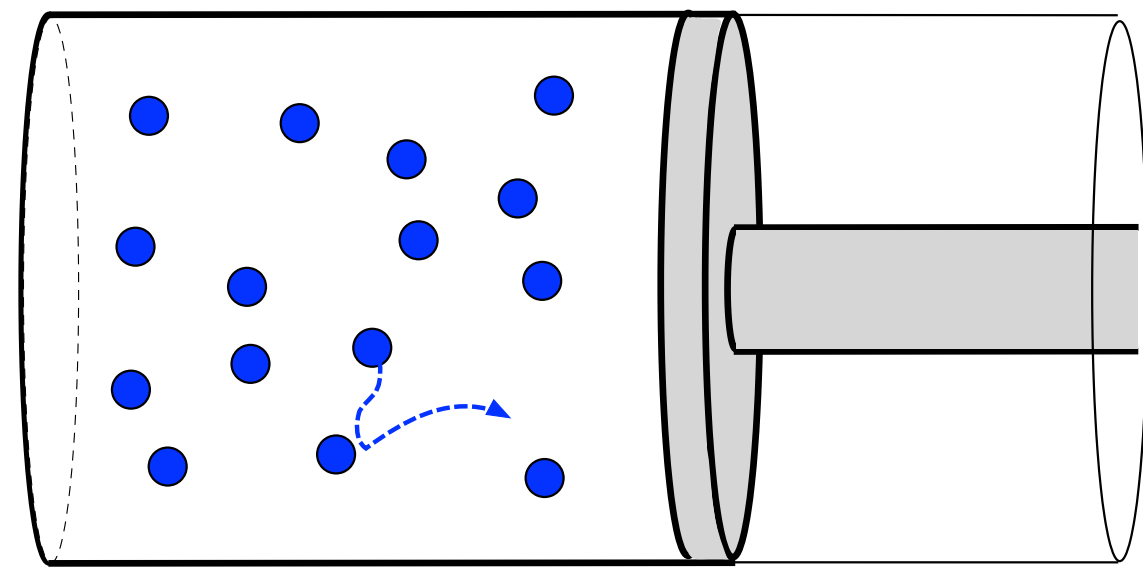
Foundation of Statistical physics (L. Boltzmann, J.C. Maxwell, J. Gibbs)

microscopic → **laws of macroscopic behavior**

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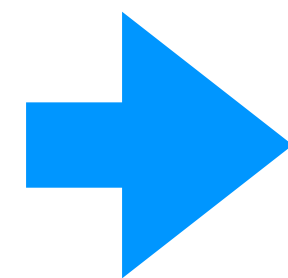
Foundation of Statistical physics (L. Boltzmann, J.C. Maxwell, J. Gibbs)

microscopic → **laws of macroscopic behavior**

many components

+

- Interaction
- Disorder effects
- Quantum effects

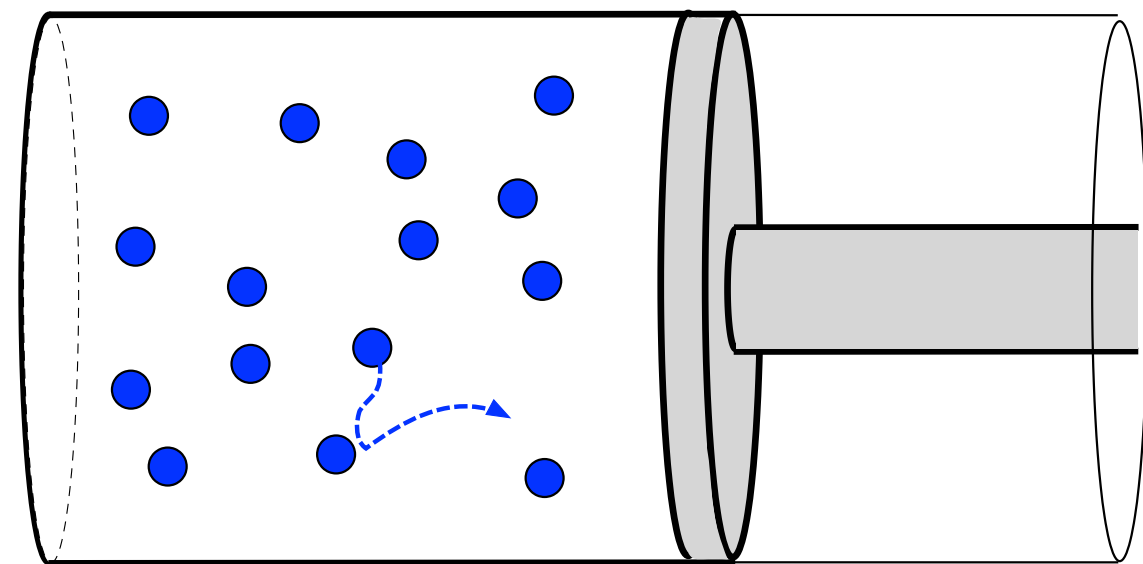


phase transitions, collective phenomena

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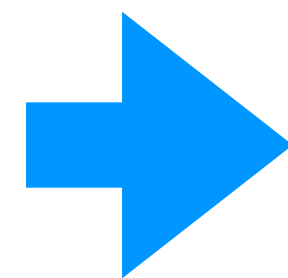
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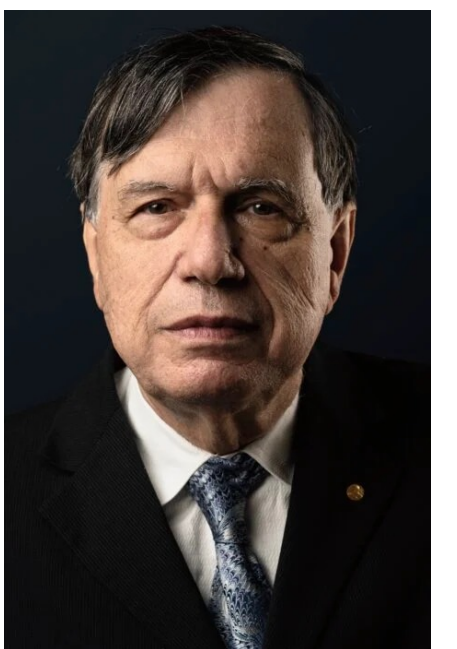
- Interaction
- Disorder effects
- Quantum effects



phase transitions, collective phenomena

Italian school of complex systems

Giorgio Parisi
Nobel Prize in Physics in 2021

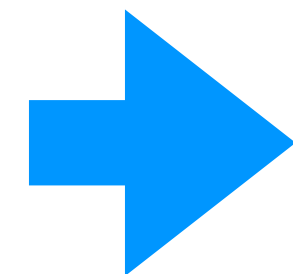


What has Physics to do with all that ?

→ Interdisciplinarity !

Learn approaches & methods of theoretical physics

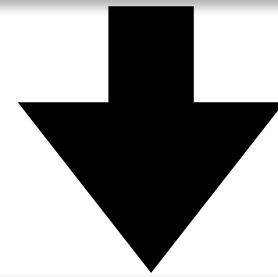
- Statistical physics
- Quantum physics
- Stochastic processes
- Algorithms and numerical methods



apply them to make predictions for

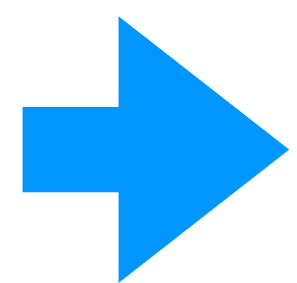
- biological systems
- neuroscience
- web economy
- financial markets
- epidemics
- nanotechnology

international network of researchers (mainly theoretical physicists)
working on complex systems



Laurea Magistrale (Master's Degree Programme)
in *Physics of Complex Systems*

Goal: shape profiles that are capable to make innovation at frontier between different fields



You will learn analytical and computational methods to model complex systems and solve problems across different disciplines:

physics, information engineering, biophysics, neuroscience, medicine and socio-economics, ...

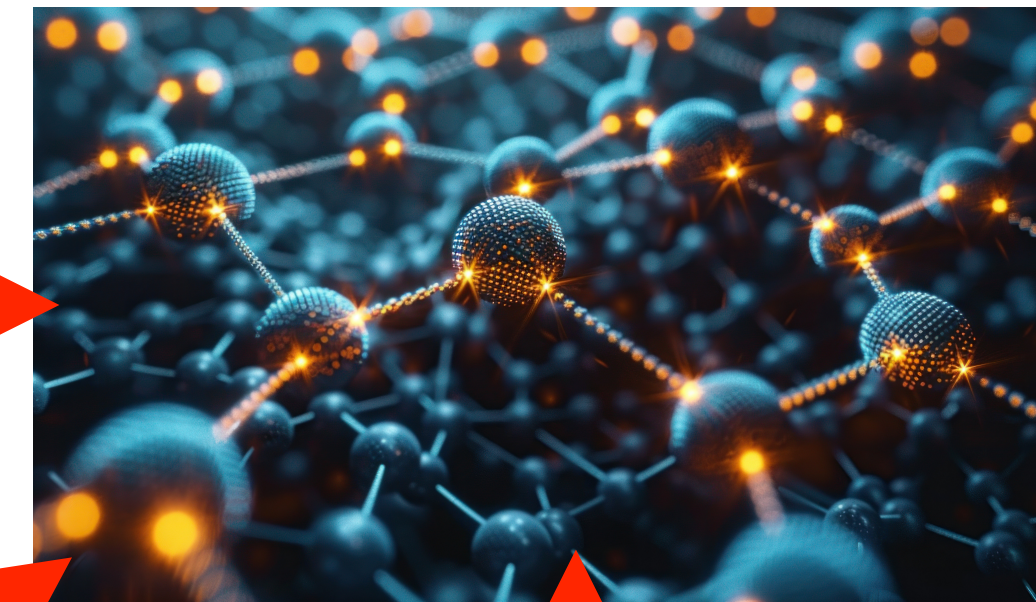
Master's Degree Programme in *Physics of Complex Systems*

4 educational areas

statistical physics
and stochastic processes



quantum physics



algorithms and numerical
simulation methods



biological systems



Master's Degree Programme in *Physics of Complex Systems*

2 parallel tracks: same educational purposes, different locations



National track

Entirely based in Torino at Politecnico (Italy)



International track

Based in Trieste (Italy), Torino (Italy), Paris (France)

Master's Degree Programme in *Physics of Complex Systems*

National track

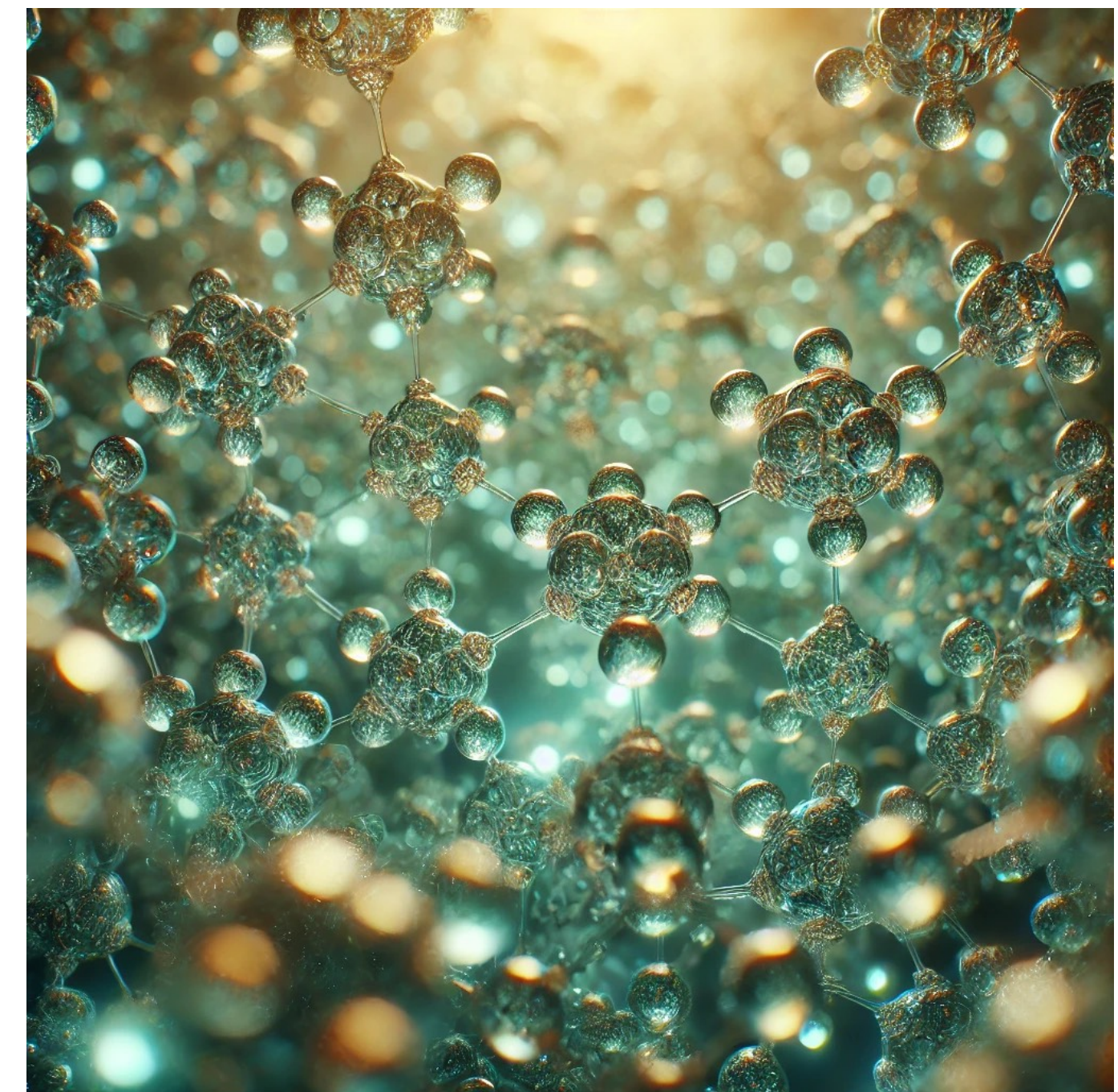


Semester 1: Torino (Politecnico di Torino)

Semester 2: Torino (Politecnico di Torino)

Semester 3: Torino (Politecnico di Torino)
[with possibility of Erasmus to Paris (France) or Leuven (Belgium)]

Semester 4:
MS Thesis (anywhere)

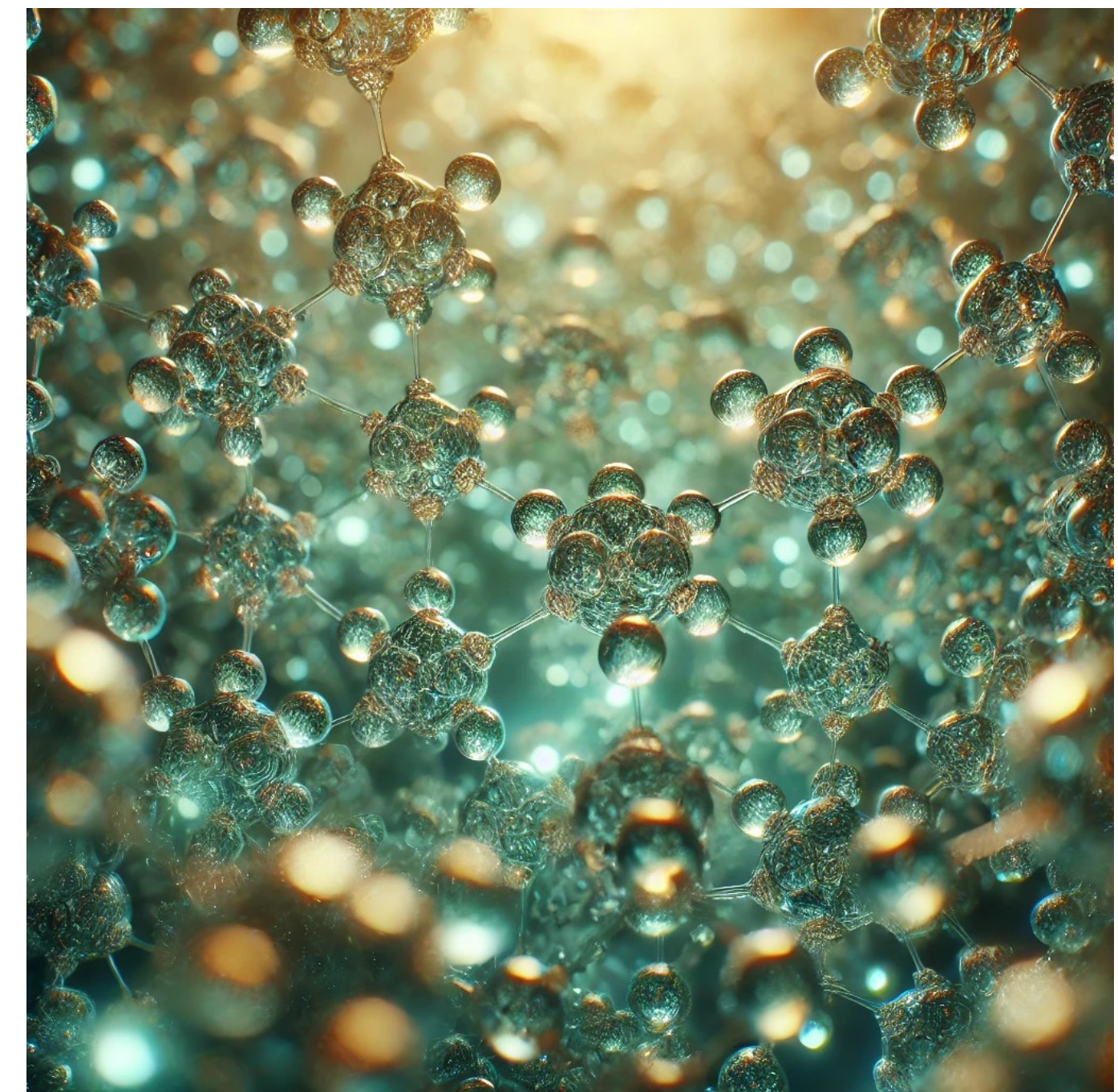


Master's Degree Programme in *Physics of Complex Systems*

National track



- courses are given **in English**
(only some optional courses are in Italian)
→ It is possible to take the entire programme in English
- **Italian Master's Degree:** Laurea Magistrale



Master's Degree Programme in *Physics of Complex Systems*

National track



Semester 1: 30 ECTS (Torino)

- Advanced Quantum Mechanics & Quantum Statistics [10 ECTS]
- Stochastic Simulation methods in Physics [8 ECTS]
- Physics of Interacting agents [6 ECTS]
- One course chosen among [6 ECTS]
 - Statistical learning and neural networks
 - Materials and characterization for micro and nanotechnologies
 - Finite element modelling

Semester 2: 30 ECTS (Torino)

- Statistical Physics [6 ECTS]
- Biophysics [6 ECTS]
- Algorithms for optimization, Inference and learning [8 ECTS]
- Quantum Theory of Condensed Matter [10 ECTS]

Semester 3: 30 ECTS (Torino)

- Field theory and critical phenomena [6 ECTS]
- Out of Equilibrium Physics [6 ECTS]
- Inference in biological systems [6 ECTS]
- Disordered systems [6 ECTS]
- One course chosen among [6 ECTS]
 - Optimization for machine learning
 - Modelli di sistemi fisiologici [ITA]
 - Dinamiche su network [ITA]

Semester 4: 30 ECTS

MS Thesis (anywhere) [30 ECTS]

Master's Degree Programme in *Physics of Complex Systems*

International track



Politecnico
di Torino



SISSA



Université
Paris Cité



université
PARIS-SACLAY

Semester 1: Trieste

SISSA: Scuola Internazionale Superiore di Studi Avanzati,
ICTP: International Centre for Theoretical Physics

Semester 2: Torino (Politecnico di Torino)

Semester 3: Paris

Université Paris Cité
Sorbonne Université
Université Paris Saclay

Semester 4:

Spring College (Trieste, ICTP) on interdisciplinary topics
MS Thesis (anywhere)



Master's Degree Programme in *Physics of Complex Systems*

International track



Politecnico
di Torino



Université
Paris Cité



université
PARIS-SACLAY

- All courses are given in **English**
- **Double Master's degree**
Italian Laurea Magistrale (LM)
French M2
- **Only 20 students** are admitted every year



Master's Degree Programme in *Physics of Complex Systems*

International track



Politecnico
di Torino



Université
Paris Cité



université
PARIS-SACLAY

- All courses are given in **English**
- **Double Master's degree**
Italian Laurea Magistrale (LM)
French M2
- **Only 20 students** are admitted every year

Admission test:

- 60 % based on CV (e.g. transcript with Bachelor grades)
- 40% online oral exam (e.g. present in 10min a topic you are familiar with)



Master's Degree Programme in *Physics of Complex Systems*

International track



Politecnico
di Torino



Université
Paris Cité



université
PARIS-SACLAY

Semester 1: 30 CFU (Trieste)

- Advanced Quantum Mechanics [6 ECTS]
- Advanced Numerical Methods [4 ECTS]
- Probability and Information theory [8 ECTS]
- Introduction to Data Science [4 ECTS]
- 2 courses chosen among [4 ECTS]
 - Introduction to systems and computational Neuroscience
 - Ecology and evolution
 - Introduction to Quantum Mechanics

Semester 2: 30 ECTS (Torino)

- Statistical Physics [6 ECTS]
- Biophysics [6 ECTS]
- Algorithms for optimization, Inference and learning [8 ECTS]
- Quantum Theory of Condensed Matter [10 ECTS]

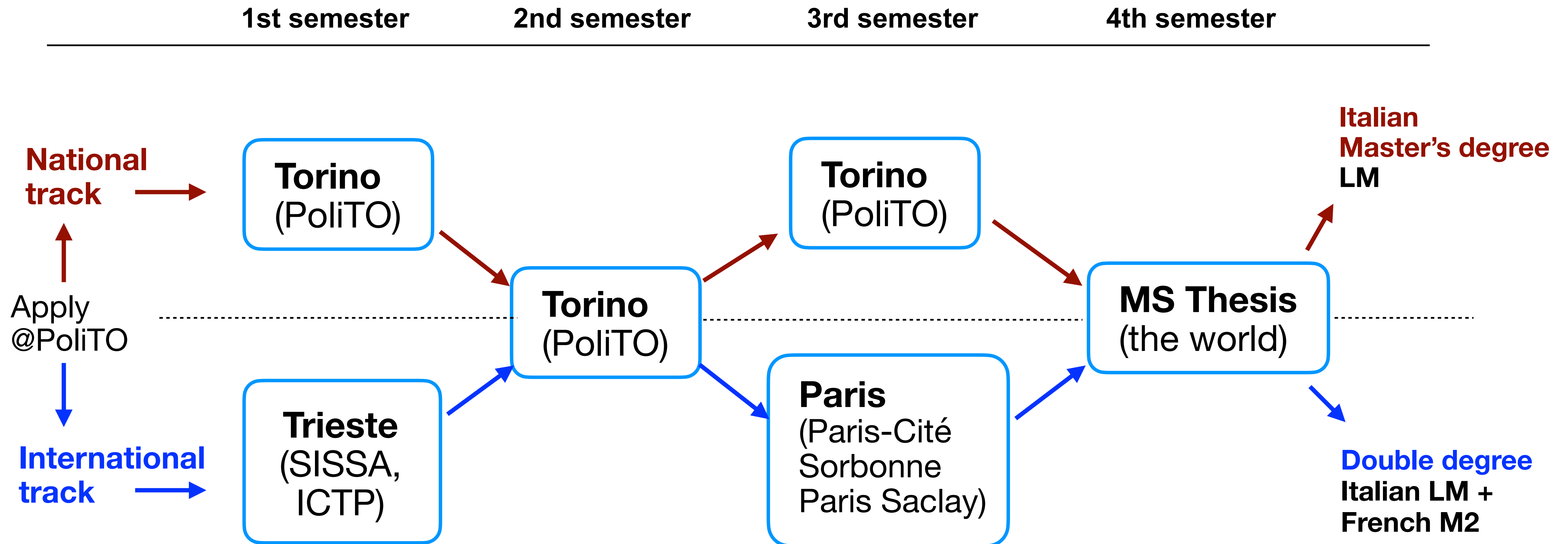
Semester 3: 30 CFU (Paris)

- Stochastic processes [6 ECTS]
- Computational Science [6 ECTS]
- Statistical Field Theory [6 ECTS]
- Nonlinear physics and dynamical systems [3 CFU, ENG]
- 2 courses chosen among [4 ECTS]
 - Advanced non linear physics [3 CFU, ENG]
 - Disordered systems [3 CFU, ENG]
 - Nonequilibrium and active systems [3 CFU, ENG]
 - Statistical field theory and soft matter [3 CFU, ENG]
 - Biophysics [3 CFU, ENG]
 - Quantum dynamics [3 CFU, ENG]
 - Quantum Information [3 CFU, ENG]

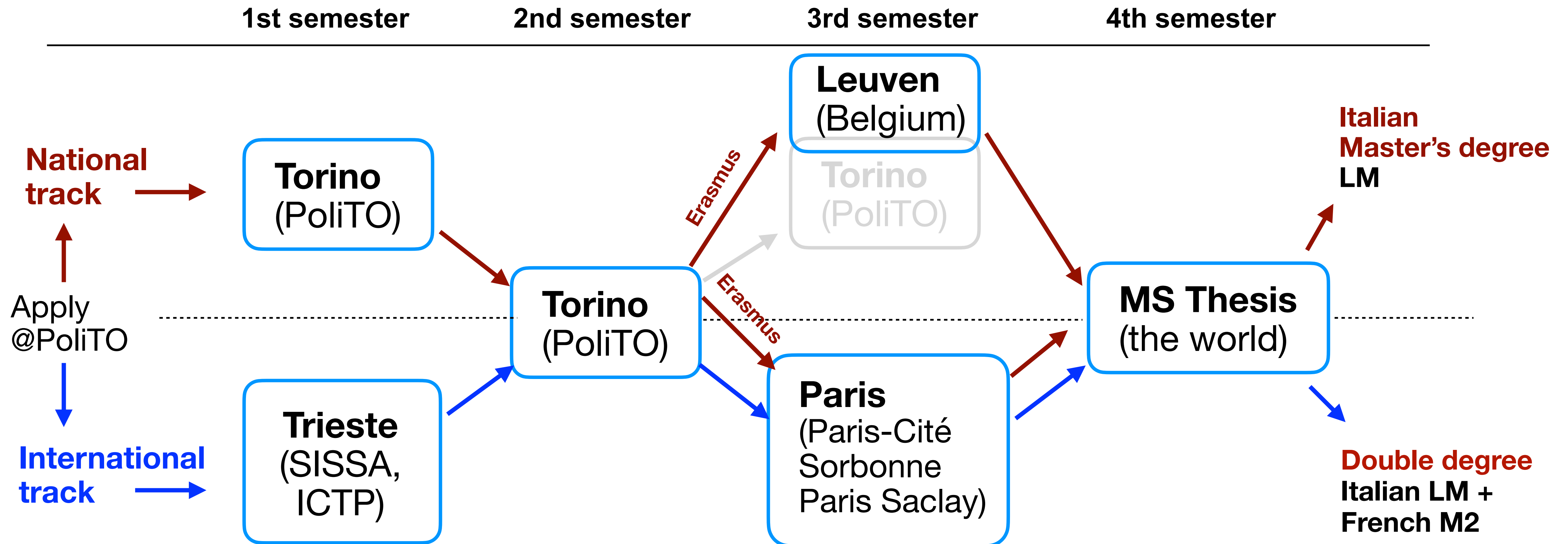
Semester 4: 30 CFU

- Spring College (ICTP) [12 ECTS]
- MS Thesis (anywhere) [18 ECTS]

Master's Degree Programme in *Physics of Complex Systems*



Master's Degree Programme in *Physics of Complex Systems*



Master's Degree Programme in *Physics of Complex Systems*

What do our students do after graduation ?

University career

PhD in physics (but also in machine learning neuroscience, computational biology, quantitative finance)

career in prestigious universities

- Scuola Normale Superiore (Pisa, Italy)
- University of Oxford (UK)
- University of Cambridge (UK)
- École Normale Supérieure (Paris)
- École Polytechnique (Paris)
- EPFL (CH)
- Princeton University (USA)
- Harvard (USA)

Job in the private sector

Data science companies

Risk assessment companies

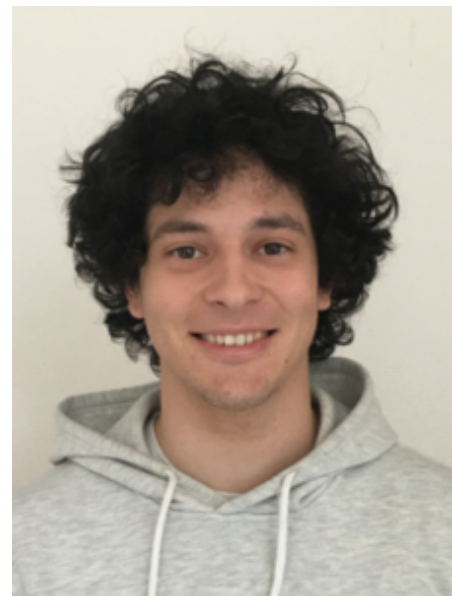
Climate change sector

AI-based archeology

Biomedical companies

Master's Degree Programme in *Physics of Complex Systems*

What do our students do after graduation ?



Andrea Pizzi

PhD in Physics in Cambridge
now: Junior fellow, Trinity college, Cambridge University

out of equilibrium phenomena in many-body systems



Gaia Tavoni

PhD in Statistical Physics at Ecole Normale Supérieure Paris
now Assistant Professor of Neuroscience at Washington University

develop models to understand how information is represented and processed within brain networks

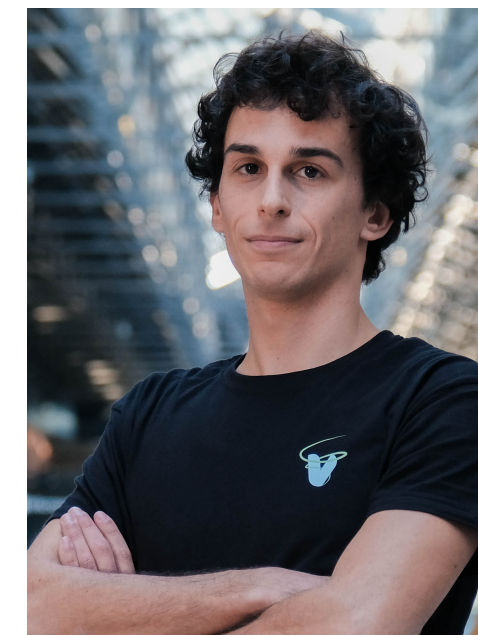


Adele Ravagnani

PhD in quantitative Finance at Scuola Normale Superiore (Pisa)
Worked at CONSOB

Now: Research fellow at Siena University

dynamic minimum-variance methods applied to portfolio hedging



Samuel Salini

Master of Business Administration
Data scientist for mobility projects in “Autostrade per l’Italia” group

Now: Project Manager at Miticoro Foundation

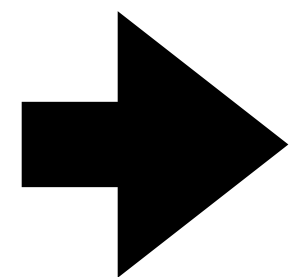
Training academy for young entrepreneurs working in clean technologies against climate change

Master's Degree Programme in *Physics of Complex Systems*

What do our students do after graduation ?

find more in the video gallery on our MS Programme webpage

www.polito.it/en/courses/37-573



Politecnico di Torino

keywords or people

INFORMATION FOR

POLITO

EDUCATION

RESEARCH

INNOVATION

SOCIAL IMPACT

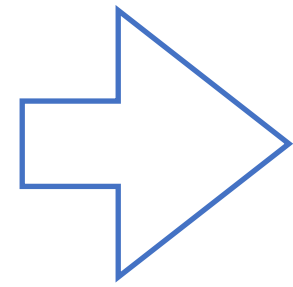
Master's degree programme
PHYSICS OF COMPLEX SYSTEMS

Programme details | Specialist tracks | Programme curriculum | Financial support | Master Thesis | **After graduation**

Our former students today

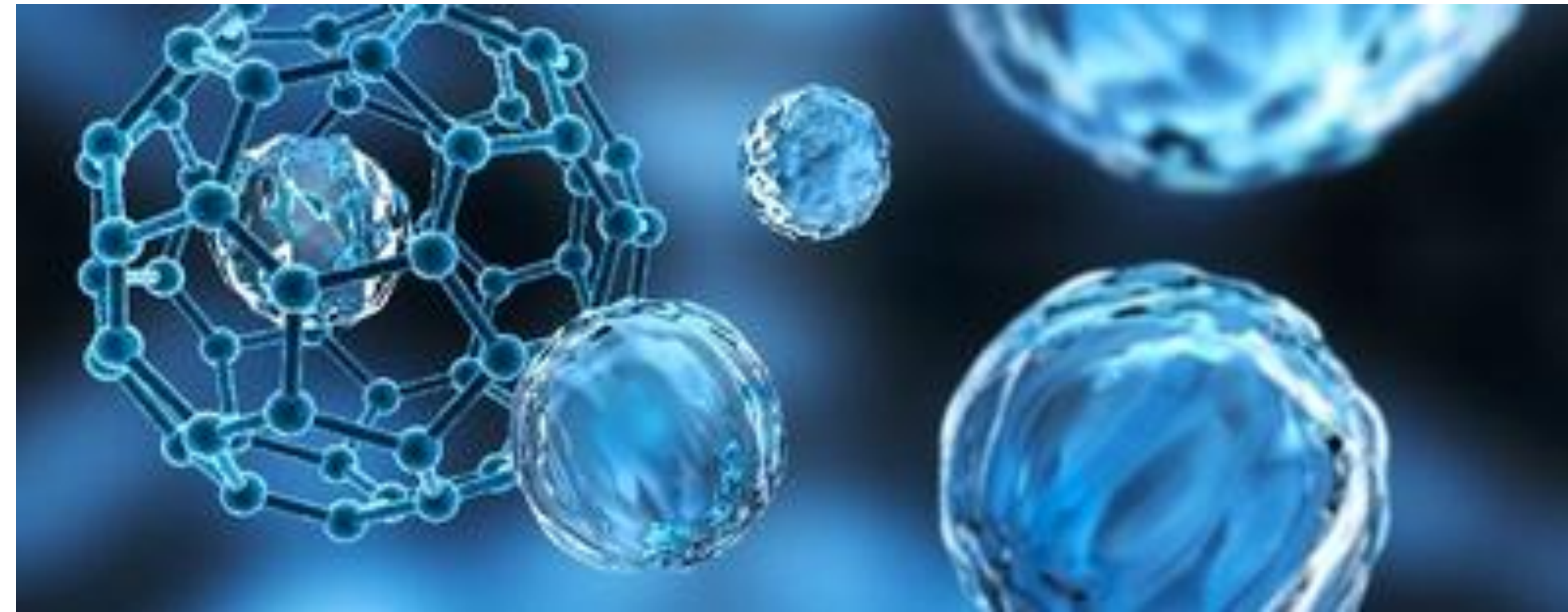
Our former students today

Master's Degree Programme in *Physics of Complex Systems*



shortened path

2nd Master's Degree in Nanotech for ICT ?



Students graduated from PCS can receive a second Master in **Nanotech for ICT @PoliTO** by passing a limited number of supplementary exams

Master's Degree Programme in *Physics of Complex Systems*

Financial support

Semester 1

International track (Trieste): about 1800€ overall

(students from developing countries → additional 950€/month for the first 6-9 months)

Semester 2 (Torino): none

Semester 3

International track (Paris): about 550€/month x 5 months (+ some (5-6) scholarship from Paris Cité & Paris-Saclay Universities)

National track: Erasmus fellowships for students who go to Paris or Leuven

Semester 4

International track (Trieste): Spring College at ICTP: partly or entirely covered

National and **International** tracks: PoliTO scholarship for MS thesis abroad

Master's Degree Programme in *Physics of Complex Systems*

Who can apply?

The programme is offered to Bachelors in

- Physics
- Physics Engineering
- Mathematics / Maths for Engineering
- Engineering in the Information area
- Related disciplines (see regulations on the MSc webpage)

www.polito.it/en/courses/37-573

Master's Degree Programme in *Physics of Complex Systems*

How to apply?

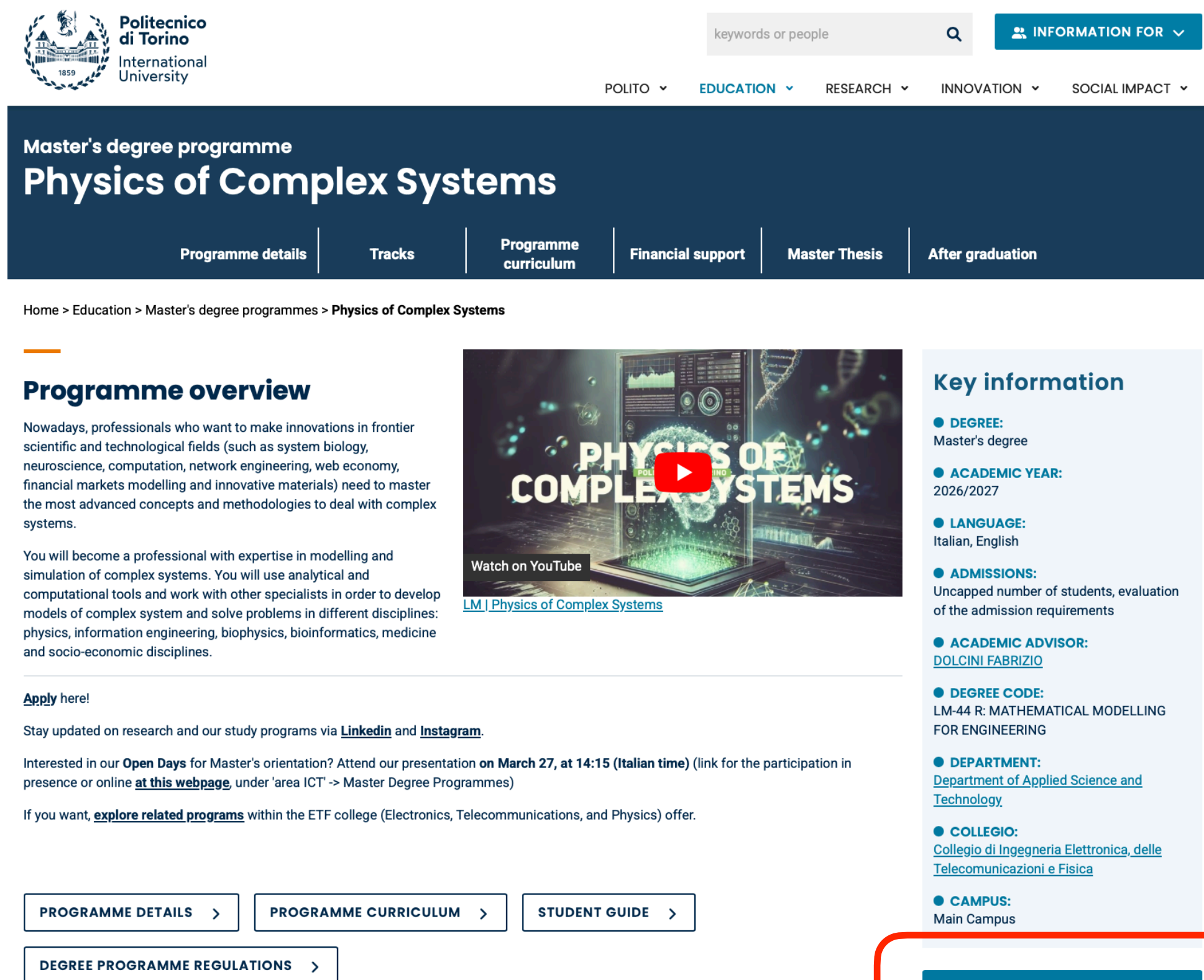
Applications (for the National or the International track) must be submitted to Politecnico di Torino through the Apply@PoliTO

Important: this holds also for the International track!

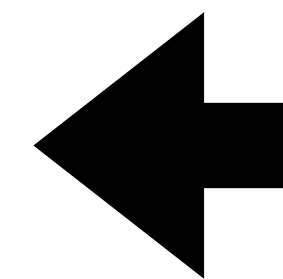
- Politecnico will be issuing the Italian Master's degree
- Only in the second year you'll have to enrol at one of the French Universities

Master's Degree Programme in *Physics of Complex Systems*

How to apply?



The screenshot shows the website for the Master's degree programme in Physics of Complex Systems at Politecnico di Torino. The page includes a navigation menu with options like POLITO, EDUCATION, RESEARCH, INNOVATION, and SOCIAL IMPACT. The main content area features a video player for 'PHYSICS OF COMPLEX SYSTEMS' and a 'Key information' section with details such as Degree (Master's degree), Academic Year (2026/2027), Language (Italian, English), Admissions (Uncapped number of students), Academic Advisor (DOLCINI FABRIZIO), Degree Code (LM-44 R: MATHEMATICAL MODELLING FOR ENGINEERING), Department (Department of Applied Science and Technology), Collegio (Collegio di Ingegneria Elettronica, delle Telecomunicazioni e Fisica), and Campus (Main Campus). A red box highlights the 'APPLY' button at the bottom right of the page.



Go to our webpage at Politecnico di Torino
www.polito.it/en/courses/37-573

Click on Apply

Master's Degree Programme in *Physics of Complex Systems*

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Our Master's degree programmes provide students with advanced level training for a highly qualified activities in specific fields.

In this section you will find useful information about the admission requirements, application procedures and deadlines.

ARCHITECTURE AREA >

ENGINEERING AREA >

Classification for the Italian Ministry of University & Research:
LM-44

Modellistica matematico-fisica per l'ingegneria
(=Physical and Mathematical modelling for Engineering)

Master's Degree Programme in *Physics of Complex Systems*

Deadlines for application

National track

Applicants with an Italian qualification:
from July 2026

Applicants with a non-Italian qualification:
deadline: **April 17, 2026 (at 2pm ITA time)**

International track (tba)

a call will be published soon by April/May 2026
on the Politecnico di Torino website

Last year (=2025) time window:
Opening May 5, 2025
Deadline: May 25, 2025

Master's Degree Programme in *Physics of Complex Systems*



Information:

www.polito.it/en/courses/37-573

Fabrizio Dolcini

referente.lm.pcs@polito.it



Master's Degree Programme in *Physics of Complex Systems*

Salone OFF event:

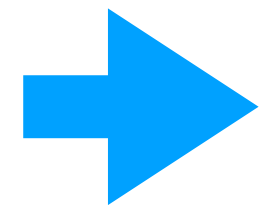
Physics of Complex Systems afterhours

a conversation with women who chose this path

When: May 8, 2026 at 4:15pm

Where: Aula 1F (DISAT) + online

Master's Degree Programme in *Physics of Complex Systems*



in a few minutes

Direct account by two of our former students



Francesca Mignacco

PhD in theoretical physics from Institute of Theoretical Physics, Paris Saclay

Current position: Research fellow at the center of biological functions (Princeton University/ City University of NY)

Topic of research: *theory of neural networks*

Awards or career highlights: Junior fellowships of the Simons Society and Human Frontier Science Program



Francesco Mori

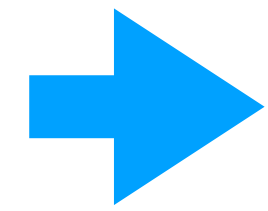
PhD in theoretical physics at Paris Saclay, then Leverhulme-Peierls Fellow University of Oxford (UK)

Current position: Research Associate at the Harvard Center of Mathematical Sciences and Applications

Topic of research: *non-equilibrium statistical physics, stochastic processes, active matter, machine learning*

Awards or career highlights: Early Career Prize 2025 of the European Physical Society

Master's Degree Programme in *Physics of Complex Systems*



in a few minutes

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Awards or career highlights: and Human Frontier Science Program

from March 2027:
hired as Assistant Professors at Imperial College (London)



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