

Alessandro Pasqui

Curriculum Vitae


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Personal information

Date of birth 29 - 11 - 1995
Place of birth Rome
Nationality Italian


Education

Sep 2021 – present **MSCA PhD Candidate at PSL Université de Paris** 
Collège de France and École Normale Supérieure (Paris)

Subject: Theoretical Physics (AI and biophysics)

Supervisors: Dr. Hervé Turlier, Dr. Mathieu Coppey, Dr. Bogdan Stanciulescu

The PhD project is divided in two parts, the former on computer vision techniques for microscopy images in the context of developmental biology, and the latter on a new theoretical and computational framework that aims to improve the vertex model description for confluent tissues in biophysics. For the first part, I developed *ZAugNet*, a machine learning-based algorithm that aims to improve the z-resolution of 3d-stacks (Pasqui et al., in preparation). The idea is to increase the total number z-slices per stack through non-linear interpolations for images. The method shows excellent results with a wide variety of microscopy techniques (fluorescence, transmitted light, etc.) and with samples of different sizes (from cell organelles to single cells, from tissues to embryos). For the second part, I have chosen to focus on the theoretical study of confluent tissues. I am currently working on a new theoretical description of vertex models that takes into account new energetic dissipation terms that have never been considered in previous works on confluent tissues. To carry out my simulations, I am also developing a very general and fully differentiable computational framework (based on JAX by Google) that will allow any physical description of vertex models to be simulated on CPUs or GPUs.

Sep 2018 – Mar 2021 **Master's Degree at Sapienza University of Rome** 
Department of Physics and
Center For Life Nano Science at Italian Institute of Technology (CLNS-IIT)


Subject: Theoretical Physics (statistical mechanics)

Supervisors: Prof. Giancarlo Ruocco, Dr. Giorgio Gosti, Dr. Mattia Miotto

High performance matching algorithm based on orthogonal polynomials

The aim was to develop a computational algorithm able to detect portions of objects with complementary shapes: this algorithm was used to match the pieces of a puzzle and to combine them to rebuild the puzzle. In order to do that I used local shape descriptors in terms of different orthogonal polynomials. This thesis was my contribution to a larger project developed at the CLNS-IIT to study the interactions between spike proteins and the corresponding receptors involved in the viruses infection mechanisms (Milanetti et al. 2020).

Grade: 110 (with honors) / 110

Sep 2014 – Jan 2018 **Bachelor's Degree at Sapienza University of Rome** 
Department of Physics

Subject: Physics

Supervisor: Prof. Federico Ricci-Tersenghi

Percolation in models with long-range interactions

The aim was to study with theory and numerical simulations the critical point and some critical exponents for particular models of percolation with long-range interactions.

Research experiences

Apr 2021 – Aug 2021 **Collège de France - Centre Interdisciplinaire de Recherche en Biologie**

Supervisors: Dr. Hervé Turlier and Dr. Bogdan Stanciulescu

Image-to-image translation via convolutional neural networks for microscopy images in the context of developmental biology: from transmitted light microscopy to fluorescence microscopy (and back).

Jun 2020 – Mar 2021 **Center for Life Nano Science at Italian Institute of Technology**

Supervisors: Prof. Giancarlo Ruocco and Dr. Giorgio Gosti

High performance matching algorithm based on orthogonal polynomials.

Jan 2020 – Feb 2020 **Sapienza University of Rome**

Supervisor: Dr. Francesca Colaiori

Connection properties of the directed graph related to the election results for new Wikipedia administrators.

Mar 2019 – Jul 2019 **Center for Life Nano Science at Italian Institute of Technology**

Supervisors: Prof. Giancarlo Ruocco and Dr. Giorgio Gosti

Pairwise correlation function for neural cells during neural rosettes development through automatic segmentation algorithms based on deep learning using convolutional neural networks.

Sep 2017 – Jan 2018 **Sapienza University of Rome**

Supervisor: Prof. Federico Ricci-Tersenghi

Percolation in models with long-range interactions.

Programming

Python	excellent
C	excellent
C++	excellent
Shell Scripting	excellent
LaTeX	excellent

Languages

Italian	mother tongue
English	fluent
French	fluent
Spanish	advanced

Honors and Awards

Aug 2021 **Marie Skłodowska-Curie Actions (MSCA) - COFUND
AI4theSciences Doctoral Program 2021 at PSL Université Paris
Paris (France)**

I have been shortlisted for the interviews. I have passed all the steps of the selection process and I have been selected for the Cofund program.

Relevant conferences and courses

- Apr 2023 **Interchall2023 Conference - Interdisciplinary challenges: from non-equilibrium physics to life sciences**
Centro Congressi Frentani, Rome, Italy
The conference gathered a large community of theoretical and experimental early career researchers in biophysics. It comprised 1 week of talks about active matter, collective behaviour, neural networks, cellular dynamics and morphogenesis, etc.
- Dec 2022 **(Post)Modern Thermodynamics School and Workshop**
University of Luxembourg, Luxembourg
The school comprised 3 days of courses lectured by experts on distinct topics about thermodynamics based on stochastic processes. The workshop comprised 2 days of contributed talks to promote discussion on fundamental problems in non-equilibrium physics, cross-fertilizing areas such as stochastic thermodynamics, active matter, quantum thermodynamics, chemical reaction network theory, etc.
- Nov 2021 **Multiscale Integration in Biological Systems Course**
Institut Curie, Paris, France
The course comprised 1 week of lectures on modern physical tools that have been developed to address the issue of scale integration and on how these tools can be applied to specific biological systems.

Other experiences

- Jan 2016 – Dec 2016 **Librarian at Sapienza University of Rome**
Rome
I was selected for a merit-based student internship for activity support at the Library of the Department of Physics. The main duties were to assist library patrons in furnishing information, check books in and out of the library, classify and catalog books, publications and other library materials based on standard library classification systems.
- Sep 2013 – Apr 2021 **High School Private Tutor**
Monterotondo (Rome)
I have tutored many high school students in maths and physics. I also have experiences with students with learning disabilities.
- Sep 2009 – Apr 2021 **1st Trombone at Associazione Musicale Eretina**
Monterotondo (Rome)
I was the principal trombone in the orchestra of the music school.

Other skills

S.I.F. Member

I am a member of the Italian Physical Society.

Driving Licence

I have a B driving licence.

References

Dr. Hervé Turlier

Group leader at Collège de France (CIRB).
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