

# Emanuele Pasqui

## Curriculum Vitae

Via Trieste, 63 – 35121 Padua, Italy

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### Personal information

Date of birth **October 28th, 1997**

Place of birth **Rome, Italy**

### Current position

Oct 2023 – Now **Ph.D. student in Mathematical Sciences, University of Padua**

*Subject:* Probability

*Research topic:* Gaussian Free Field in Random Environment

*Supervisor and co-supervisor:* Prof. Alberto Chiarini and Prof. Giambattista Giacomini

### Education

#### Main education

Sep 2019 – Mar 2022 **Master's Degree in Mathematics, Sapienza University of Rome**

*Subject:* Applied Mathematics

*Thesis title:* Oil And Water and Internal Diffusion Limited Aggregation

*Supervisor:* Prof. Lorenzo Taggi

*Abstract:* Oil And Water and Internal Diffusion Limited Aggregation are two interacting particle systems on graphs, where particles move randomly, and the aim of the thesis was to answer, for both, two questions:

1. the phase transition with respect to the initial particle density between two regimes: fixation, when on each vertex the dynamics stops in finite time, and activity, when it does not. Starting from a particle configuration distributed on the whole graph as a product measure with expected value  $\mu$ , the question was if there exists a critical threshold  $\mu_c$  such that if  $\mu < \mu_c$  one has fixation and if  $\mu > \mu_c$  one has activity;
2. internal aggregation, namely the shape of the visited cluster when the underlying graph is the integer lattice  $\mathbb{Z}^d$  and all particles start from the origin. Since Oil And Water has not a complete theory about internal aggregation, we analyzed a conjecture. For that purpose, we introduced a new, simpler model which was not present in the scientific literature, showing that its cluster has the same growth rate as the one of Oil And Water.

At the end, we analytically studied how particles distribute in the final cluster for Oil And Water, also comparing it with the one of Internal Diffusion Limited Aggregation, and numerically analyzed the fluctuations of the cluster around its predicted shape. We also covered Abelian Networks (automata networks whose final configuration does not depend on the order in which the individual automata act) and Activated Random Walks, identifying the studied systems in these sets.

*Grade:* 110 with honors/110

Sep 2016 – Sep 2019 **Bachelor's Degree in Mathematics, Sapienza University of Rome**

*Subject:* Mathematics

*Thesis title:* Mathematical formalization of the financial market and CRR Model

*Supervisor:* Prof. Gustavo Posta

*Abstract:* The aim was to mathematically formalize the structure of the financial market with a probabilistic approach, to study in this formalization the Cox-Ross-Rubinstein model and the Black-Scholes model for derivative pricing, and to introduce the concept of Greeks for derivatives.

Sep 2011 – Jul 2016 **High School Diploma**, *Liceo Scientifico Giuseppe Peano, Monterotondo (Rome)*

### Additional education

Apr 2022 – Jul 2022 **“Machine Learning for Finance” course**, *University of Eastern Piedmont*

*Course of affiliation:* Management and Finance

*Language of the course:* English

*Summary:* Machine Learning techniques applied to the financial field. Supervised Learning (Support Vector Machines, Decision Trees, Random Forests), Unsupervised Learning (Clustering and PCA), Neural Networks (modeling, activation function and regularization methods), advanced Neural Network structures (Siamese Networks and AutoEncoders)

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### Programming and markup languages

**Matlab** excellent

**C** excellent

**Python** excellent

**Mathematica** advanced

**FreeFEM** advanced

**R** excellent

**LaTeX** excellent

**VBA** basic

**Scilab** basic

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### Languages

**Italian** mother tongue

**English** fluent (writing and speaking) - *B2 level in CEFR standard*

**Spanish** fluent (writing and speaking)

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### Interests

What I am working on: **Probability, statistical mechanics, Gaussian free field**

What I am also interested in: Stochastic calculus, particle systems, finance.

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### Professional experiences

#### Main

Nov 2022 – Sep 2023 **Deloitte Touche - Analyst in the “Actuarial and Insurance Solutions” division**, *Rome*

*Description:* Financial consulting for insurance companies. The main duties were to manage Matlab and R codes to project the number of financial assets that an insurance company must buy or sell at any given time to aim for a predetermined return at the end of the considered period.

#### Other

Dec 2023 – Apr 2024 **Tutor for initiatives of diffusion of the scientific culture of the National Institute for Nuclear Physics**, *Legnaro (Padua)*

Sep 2023 – Oct 2024 **Tutor for the course “Foundations of mathematical analysis and probability”**, *University of Padua*

Sep 2016 – Oct 2022 **University, High School and Middle School Private Tutor**, *Rome*

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### Contributions

17th-28th Feb 2025 Poster at *“Winter school on Statistical Mechanics, Nonequilibrium Processes and Probability”*, Sapienza University of Rome, Italy

- 10th, 12th Sep 2024 Poster at *"Particle Systems and PDE's XII"*, University of Trieste, Italy
- 17th Jun 2024 Poster at *"Workshop on Probabilistic Field Theories"*, Aalto University, Finland

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## Relevant attended conferences and workshops

- 11th Apr 2025 *"A Spring Day in Probability and Statistical Physics"*, University of Florence, Italy
- 17th-28th Feb 2025 *"Winter school on Statistical Mechanics, Nonequilibrium Processes and Probability"*, Sapienza University of Rome, Italy
- 23th-27th Sep 2024 *"Long-range phenomena in Percolation"*, University of Cologne, Germany
- 18th-20th Sep 2024 *"Large scale behaviour of interacting diffusions: from stochastic control to functional inequalities"*, University of Padua
- 9th-13th Sep 2024 *"Particle Systems and PDE's XII"*, University of Trieste, Italy
- 17th-19th Jun 2024 *"Workshop on Probabilistic Field Theories"*, Aalto University, Finland
- 10th-14th Jun 2024 *"4th Italian Meeting on Probability and Mathematical Statistics"*, Sapienza University of Rome, Italy
- 19th Apr 2024 *"A Spring Day in Probability and Statistical Physics"*, University of Florence, Italy

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## Honors and Awards

- Sep 2023 *Sapienza University of Rome*  
I won a PhD position without funding at Sapienza University of Rome.
- Sep 2023 *KTH Royal Institute of Technology Stockholm*  
I was shortlisted and invited for an on-site interview for a PhD position in Applied Mathematics (spec. Mathematical Statistics) at KTH Stockholm.
- Jan 2023 *Humboldt University - University of Oxford*  
I won a public competition for a PhD position in the IRTG 2544 "Stochastic Analysis in Interaction", a collaboration between University of Oxford, HU Berlin, TU Berlin, FU Berlin and WIAS Berlin. The position I won was at HU in collaboration with the Oxford University. Due to family problems, I had to reject the offer for this position.
- Nov 2022 *Sapienza University of Rome - Bank of Italy*  
I won a public competition for a traineeship for the university in collaboration with Bank of Italy.

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## Secondary research experiences

- Apr 2020 – Jun 2020 *Analysis of the inflammatory process after hemorrhagic shock*  
Qualitative study of the effect of several substances in the inflammatory process caused by hemorrhagic shock in mice, using ordinary differential equations to find the substances able to attenuate the acute inflammation sometimes caused by Sars-Cov-2 infection.
- Jan 2020 *Development of a software for the expansion of numbers in continued fraction with no rounding errors*

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## Attended doctoral courses

Products of random matrices  
A renormalisation group approach to log-Sobolev inequalities  
Hawkes processes: from theory to financial practice  
Stochastic and mean field optimal control  
Introduction to optimal transport  
Flows of Sobolev vector fields  
Integral operators in Hölder spaces  
Perturbative methods in dynamical systems

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## Skills

### Main

**Probability** Stochastic Processes, Probabilistic Potential Theory, Particle systems  
Statistical Mechanics, Mathematical Physics, Operator Theory  
Activated Random Walks, Automata Abelian Networks  
Stochastic Analysis, Kinetic Theories, ODEs, PDEs, SDEs

**Numerical, Physics and Finance** Programming, Numerical Methods for ODEs, PDEs and matrices  
Data Sequences Analysis, Simulations, (Least-Squares) Monte Carlo methods  
Financial Derivatives, Asset Pricing  
Hamiltonian Mechanics, Sturm-Liouville Problems, Mathematical Analysis

**Algebra** Group, Ring and Field Theories, Cryptography, Elliptic curves

### Other

Geometry Physics  
Qubit Calculus of Variations  
Machine Learning, Neural Networks, Convolutional Neural Networks, Reinforcement Learning

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## Other information

*B driving licence*

Apr 2020 – Feb 2022 *1st Clarinet and Member of the Board of Directors at “Associazione Musicale Eretina” music school, Monterotondo (Rome)*