# Francesco Pinotti

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**CURRENT POSITION**

*Research appointment (October 2019 - May 2020),* at Pierre Louis Institute of Epidemiology and Public Health (IPLESP), Paris, France, in the team of Pierre-Yves Boëlle: "Transmissible diseases: modeling and surveillance".

**EDUCATION**

**Ph.D. candidate in Epidemiology and Public Health (2016-2019),** Sorbonne University, Paris France. Thesis title: *Multi-strain dynamics on networks*. Expected defense date: 27/11/2019. Advisors: Chiara Poletto and Pierre-Yves Boëlle. Research work carried at Pierre Louis Institute of Epidemiology and Public Health (IPLESP) in the team "Transmissible diseases: modeling and surveillance".

- *Host contact dynamics and strain ecology* (Pinotti et al, *PLOS Comput Biol*, 2019): I investigated the dynamics of multiple strains competing for hosts while accounting for human contacts. I simulated multi-strain dynamics on both synthetic and empirical dynamical contact networks, highlighting the role of several properties of contacts, e.g. heterogeneities in social activity, on strain diversity, which I characterised through ecological indicators. As a case study, I considered the spread of *Staphylococcus aureus* in a French hospital, leveraging on a combined data-set of face-to-face interactions and *S. aureus* carriage. This analysis confirms the importance of accounting for contacts in multi-strain models and sheds new insights on multi-strain dynamics.
- *Heterogeneous interactions* (under review): I studied the interplay of heterogeneous interaction types in a minimal epidemic model with two cooperative pathogens, one of which is structured in two competing strains. Under the homogeneous mixing assumption I derived mathematical conditions for the existence and stability of each equilibrium and discussed the epidemiological and ecological implications. I simulated the model on several networks with and without community structure. I found that the cooperative interaction can allow for coexistence of all species if hosts are partitioned in well-separated groups. This analysis shows that concurrent interaction types due to, e.g., co-circulating pathogens, can affect strain competition.
- *Pandemic influenza emergence dynamics* (work in progress): I analyzed the emergence dynamics of pandemic influenza at the global scale. The aim is to study complex patterns observed in competing strains of influenza. I carried extensive numerical simulations in the metapopulation framework, integrating information about air-travel in order to model human mobility. This work may shed light on the conditions for the emergence of pandemic strains influenza as well as on the role of human mobility on epidemic spread.

*M2 "Theoretical Physics of Complex Systems" (2015-2016),* University Paris Sud, Paris, France. Ranked 2nd among 29 participants. Degree obtained in the context of a Dual Master Degre in Physics.

*Master Degree in Physics (2014-2016),* Ferrara University (2014-2016), Ferrara, Italy. Final mark: 110/110 cum laude. Degree obtained in the context of a Dual Master Degre in Physics.

*Bachelor in Physics (2011-2014),* University of Ferrara, Ferrara, Italy.
Final mark 110/110 cum laude.

**AWARDS & FELLOWSHIPS**

*Student support award (2017),* International School and Conference on Network Science, Indianapolis, Indiana, US.

*PhD scholarship (2016-2019),* Doctoral School Pierre Louis of Public Health, Paris, France.

*Mobility Grant (2015-2016),* University of Ferrara, Ferrara, Italy.

**SUBMITTED PUBLICATIONS**

**F. Pinotti**, F. Ghanbarnejad, P. Hövel, C. Poletto, Interplay between competitive and cooperative interactions in a three-player pathogen system, under review in *Royal Society Open Science*.

**PEER-REVIEWED PUBLICATIONS**

**F. Pinotti**, É. Fleury, D. Guillemot, P.-Y. Boëlle, C. Poletto, Host contact dynamics shapes richness and dominance of pathogen strains, *PLoS Computational Biology* 15(5): e1006530 (2019)

**COMMITTEES**

*Scientific Committees*: Internal referee at Spread of Pathogens in HealthCare Institutions and Networks: a modeling conference (SPHINx'19).

**ACADEMIC SERVICES**

*Referee for peer-reviewed journals*: Physical Review E, Mathematical Biosciences and Engineering.

**INVITED SEMINARS**

*Interplay between cooperative and competitive effects in multi-pathogen systems*, Berlin Technical University, Berlin, 22 Aug 2017.

**CONTRIBUTED TALKS**

*Host contact dynamics shapes richness and dominance of pathogen strains (24-25 June 2019)*, Spread of Pathogens in HealthCare Institutions and Networks: a modeling conference (SPHINx'19), Paris, France.

*Host contact dynamics shapes population diversity of pathogen strains (28 August - 5 September 2018)*, 2nd Erice International Conference on Mathematical and Computational Epidemiology (Erice MathCompEPi 2018), Erice, Italy.

*Interplay between cooperative and competitive effects in multi-pathogen systems (11-15 June 2018)*, International School and Conference on Network Science (NETSCI'18), Paris, France.

*Co-existence of multiple SIS processes on temporal networks: implications for control of bacterial infections in hospitals (19-23 June 2017)*, International School and Conference on Network Science (NETSCI'17), Indianapolis, Indiana, US.

*Short talk Co-existence of multiple SIS processes on temporal networks: implications for control of bacterial infections in hospitals*, Summer School Complex "Networks: Theory, Methods, and Applications", Como, Italy, 15-19 May 2017.

**POSTERS**

*Interplay between cooperative and competitive effects in multi-pathogen systems*, Epidemics[6] - International Conference on Infectious Disease Dynamics, Sitges, Spain, 29 Nov - 4 Dec 2017.

*Co-existence of multiple SIS processes on temporal networks: Implications for control of bacterial infections in hospitals*, Epidemics[6] - International Conference on Infectious Disease Dynamics, Sitges, Spain, 29 Nov - 4 Dec 2017.

**SCHOOLS ATTENDED**

*Workshop of SCIENTIFIC EVOLUTIONARY WRITING*, Paris, France, 30-31 January 2019.

*Society of Young Network Scientists Pre-Conference Event: Special Session: Constructing Great Scientific Papers* and *Paper Unwind: Deconstructing Great Scientific Papers*, Paris, France, 10 June 2018.

*Complexity72h Workshop*, Lucca, Italy, 7-11 May 2018.

*Doctoriales Sorbonne Université*, Paris, France, 9-13 April 2018.

*Summer School Complex "Networks: Theory, Methods, and Applications"*, Como, Italy, 15-19 May 2017.

**SCIENTIFIC VISITS**

*Technical University Berlin*, Berlin, Germany, 21-25 August 2017 and 11-15 December 2017.

*Institute for Scientific Interchange (ISI foundation)*, Turin, Italy, 3-21 July 2017 and 4-8 December 2017.

**SUPERVISION**

*Master students*: Fabio Mazza, internship for M2 Physics of Complex Systems, University Paris Diderot, January-June 2019.

**COMPUTER SKILLS**

*Languages & Software:* C, C++, Python (Numpy, Scipy, Pandas, NetworkX, scikit-learn), Bash, LaTeX, Windows, Linux, macOS

**LANGUAGES**

*Italian,* level: mother tongue

*English,* level: fluent

*French,* level: fluent