



UNIVERSITÀ
DI TRENTO

Dipartimento di
Matematica

DOTTORATO



CYCLE 38th
ORAL DEFENCE OF THE PHD THESIS

Tuesday 16th December 2025 – 2.00 pm

Department of Mathematics
Room A211 at POVO1

The event will take place in presence and online through the ZOOM platform. At Povo1
To get the access codes, please contact the secretary office

Tobia Filosi

PhD Student in Mathematics

Gaussian Stochastic Processes on Metric Graphs

Abstract:

Linear networks have been recently generalised by metric graphs: these are flexible graph topologies where each edge is in bijection with a segment of the real line, allowing points on edges to have a geometric meaning. Anderes et al. (2020) extended the classical notion of effective resistance distance to these new topologies and provided an ingenious method to define valid isotropic covariance functions (therefore, stochastic processes) on them. In this thesis, we collect some recent developments of this field: first, characterise the role this new framework can play in climate science, together with two other types of graphs. Then, we extend metric graphs to time-evolving dynamics, where both nodes and edges may appear or disappear in subsequent time instants, and where edge may also change length. We considered (for static graphs) a class of multivariate processes, based on a notion of multi- dimensional distance, whose marginal distribution coincide with the one defined in Anderes et al. (2020). Lastly, we explored efficient algorithms to simulate univariate isotropic Gaussian random fields on metric graphs. For each of these analyses, we mainly delved into theoretical properties of the defined objects, yet we motivated the statistical impact that they could have.

Supervisors: Claudio Agostinelli – Emilio Porcu

CONTATTI

Staff di Dipartimento - Matematica
tel. 0461 281508-1625-1701-3786

phd.maths@unitn.it
www.maths.unitn.it