

## **Abstracts of the introductory lectures: November 8 - 12, 2021**

### **Ilya Chevyrev (Univ. of Oxford): Hopf and pre-Lie algebras in regularity structures**

This mini-course will focus on the algebraic aspects of regularity structures. I will motivate the Hopf algebra appearing in "positive renormalisation" using polynomials and canonical lifts of smooth functions. I will discuss its similarity to the Connes-Kreimer algebra and present a pre-Lie structure obtained from linearising the group product. I will then discuss "negative renormalisation" and the Hopf algebra of sub-forest extractions. Finally, I will show how the two Hopf algebras (co-)interact and discuss the role of pre-Lie algebras in renormalising stochastic PDEs.

### **Frédéric Patras (Univ. de Nice): Renormalization à la Wick**

The mini-course will come back on a classical example of "finite renormalization": the theory of Wick polynomials, Wick products and chaos decompositions. The theory will be presented following a Hopf algebraic approach developed recently that parallels the now usual BWH decomposition in pQFT. Its extension to a noncommutative framework will also be explained as well as the connexion of the theory with other phenomena that received recently a renewed attention (quasi-shuffle products in algebra and probability, among others). The course will essentially be based on recent joint works with K. Ebrahimi-Fard, N. Tapia and L. Zambotti.

### **Kasia Rejzner (Univ. of York): Renormalization in perturbative algebraic quantum field theory**

In this series of lectures I will introduce perturbative algebraic quantum field theory (pAQFT), which is a rigorous framework for constructing interacting QFT models. It uses a formulation of renormalization called Epstein-Glaser renormalization, where no "infinities" are needed and the computation of physical quantities proceeds through the process of extending certain distributions. I will also explain how to incorporate the homological framework of the BV (Batalin-Vilkovisky) formalism into pAQFT and if time permits I will discuss gauge theories.

### **Lorenzo Zambotti (Univ. Paris VII): Analytic aspects of regularity structures**

In this mini-course I plan to introduce the main analytic tools of regularity structures. I'll start from the Reconstruction Theorem and the Schauder estimates in the general setting of germs, and then I'll explain the definitions of models and modelled distributions with the different operations acting on them. I'll try to explain how regularity structures are, in multiple ways, a theory of Taylor expansions.

The content of this mini-course will be based on ongoing work with Francesco Caravenna.