Sussex Analysis: Then and Now

Titles and abstracts

Friday 17 May 2019

Morning session

9:25-9:30 *Welcome*

9:30-10:20 John Toland

Finitely Additive Measures and Weak Convergence in $L_\infty(X, \mathcal{L}, \lambda)$

Abstract: A useful necessary and sufficient condition, for a bounded sequence in $L_\infty(X, \mathcal{L}, \lambda)$ that is pointwise convergent λ-almost-everywhere to be weakly convergent, will be developed following a crash course on the Yosida-Hewitt (1952) representation of $L_\infty(X, \mathcal{L}, \lambda)^*$ as a class of finitely additive measures. The resulting test, which will be illustrated by examples, can be localized to points of X_∞ when $(X, \mathcal{L}, \lambda)$ is the Borel measure space of a locally compact Hausdorff topological space X and X_∞ is its one-point-compactification. Miscellaneous observations, paradoxes and pathologies that arise during the development will be discussed in passing.

10:20-10:50 Coffee Break

10:50-11:40 Dmitri Vassiliev

Geometric wave propagator on Riemannian manifolds

Abstract: The talk deals with the wave equation on a Riemannian manifold. The propagator is the operator which maps initial conditions to a solution of the wave equation. The goal is to construct the propagator explicitly, modulo an integral operator with infinitely smooth kernel. Here by "explicitly" we mean reducing the problem to integration of ordinary differential equations. It has been known since the 1950s that this goal can be achieved using microlocal techniques, however in its standard version this construction is local in space and in time and involves taking compositions of operators. It turns out that the propagator can be written as a single oscillatory integral, global in space and in time, and that this can be done in an invariant geometric fashion.

This is joint work with Matteo Capoferri and Michael Levitin and is based on our preprint arXiv:1902.06982.

11:40-12:30 Alexander V. Sobolev

Quasi-classical asymptotics for truncated Wiener-Hopf operators

Abstract: The aim of the talk is to present a survey of results on the quasi-classical trace asymptotics for functions of truncated Wiener-Hopf operators. These results are used to describe scaling behaviour of entanglement entropy for free fermions at low temperature.

12:30-2:00 Lunch

Afternoon session

2:00-2:50 Masoumeh Dashti

MAP estimators and posterior consistency for Bayesian inverse problems

Abstract: We consider the problem of recovering an unknown function from noisy and indirect observations. We adopt a Bayesian approach and consider a class of product exponential priors with tails between Gaussian and Laplace. We discuss some results on characterisation of the modes of the posterior measure which lead to some weak consistency results. We then show a general contraction theory for the posterior measure. This is based on joint works with S. Agapiou, M. Burger and T. Helin.

2:50-3:20 Coffee Break

3:20-4:10 Konstantinos Koumatos

On the relative entropy method in quasiconvex elastodynamics

Abstract: The relative entropy method is a powerful tool in the theory of conservation and balance laws allowing for the comparison of two solutions when one is assumed smooth. Consequently, it has been instrumental in proving weak strong uniqueness results and convergence of approximations to smooth solutions.

However, the method relies heavily on the convexity of the energy associated to the system and is thus not generally applicable to the evolution problem of elasticity where the natural convexity condition is quasiconvexity in the sense of Morrey.

In this talk, we adapt the relative entropy method to the quasiconvex setting and, as a result, establish weak-strong uniqueness for dissipative measure-valued solutions to the system of conservation laws arising in elastodynamics. The proof borrows tools from the calculus of variations to prove a Garding type inequality involving quasiconvex functions.

4:10-5:00 Michael Melgaard

Rigorous mathematical results on nonlinear PDEs arising in Quantum Chemistry

Abstract: An introduction to electronic structure models is given and rigorous results are discussed on the existence of solutions (ground states and excited states) to weakly coupled, semi-linear elliptic PDEs with nonlocal operators arising in Hartree-Fock, Kohn-Sham and multiconfigurative many-particle models in quantum chemistry, in particular for systems with relativistic effects and external magnetic fields.

7:30 Evening Party