

Abstracts

Stefania Lisai

Surface semi-geostrophic equations and their smooth solutions

Jeta Molla

Multiscale modeling of lithium batteries

Abstract: We investigate composite cathodes in lithium batteries where we adopt the dilute solution theory for the diffusion of ions in an electrically neutral, and binary electrolyte and where the transport of lithium in the solid particles is described by classical diffusion and interstitial diffusion. Based on this formulation, we systematically derive effective macroscopic cathode equations using the method of asymptotic two-scale expansions.

Xander O'Neill

African Swine Fever in Wild Boar

Abstract: With the current rise in number of African swine fever cases throughout Europe, there is a need for mathematical models to help understand the epidemiological dynamics of the system and in turn try to provide potential reduction measures on the spread of the disease. In this talk we provide some background knowledge on the topic, introduce two deterministic ODE models and then conduct parameter analysis on a few select terms.

Albert Sola Vilalta

The Adequacy Problem

Abstract: How will we manage the next generation electricity grid? One of the main challenges is the increased uncertainty due to the increase of renewable generation, which needs to be addressed. One possible solution could be the use electricity storage. In this talk, we will discuss the use of storage for adequacy, i.e., use storage to counter generation shortfalls. We will present the solution to the one store case, and, time permitting, discuss the recent solution of the multiple store case

Jakub Stoeck

Space-time adaptive finite elements for nonlocal parabolic variational inequalities

Ioannis Stylianidis

Grassmannian flows and applications to Smoluchowski's coagulation equation

Abstract: Starting with a system of linear equations, we construct a solution to an evolutionary partial differential equation with nonlocal nonlinearities. In principle, this is achieved by considering a certain coordinate patch of the Fredholm Grassmannian associated with the linearised flow. We present how this works in practice in the case of a nonlocal Fisher-Kolmogorov type equation and the more general case of Smoluchowski's coagulation equation. In particular, regarding the latter, we show how our approach can be applied to the range of kernels for which it is known to be explicitly solvable, and investigate how it might be extended beyond these.

David Torkington

The Thermodynamics of a Plastic Material

Abstract: We examine mechanical dissipation within a plastic region subjected to applied stresses. We derive an effective heat equation inside the plastic region, using the first law of thermodynamics and a simplistic plastic constitutive equation. We aim to answer qualitative questions about the heat profile within the material.