Popular science summary of the PhD thesis

PhD student

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Title of the PhD thesis

Complexifications, Pseudo-Differential Operators, and the Poisson Transform

PhD school/Department

Scientific Computing

Science summary

* Please give a short popular summary in Danish or English (approximately half a page) suited for the publication of the title, main content, results and innovations of the PhD thesis also including prospective utilizations hereof. The summary should be written for the general public interested in science and technology:

In the engineering sciences, it is standard to use many sorts of algorithms to numerically solve complicated physics problems. For example, the distribution of heat in a reactor, waves generated by a ship at sea, or the scattering of light by a prism. These algorithms are rooted in a mathematical description of the physical world in terms of partial differential equations.

Sometimes, to properly understand the algorithms themselves, and make them viable for real-world application, it is necessary to draw upon our understanding of such equations as mathematical poetry, expressed in the language of functional analysis and differential geometry.

Unfortunately, this arcane language is not spoken by many people – even many engineers and scientists speak only a simplified version of it. In this language, a physical scenario, like the scattering of light by an object, is called a “boundary problem”. The main character is an object called a “differential operator”. It is supported by a cast of “boundary operators”, and the play takes place on a stage called a “manifold”.

This project explores some aspects of differential operators on manifolds, and their generalization, pseudo-differential operators, which could maybe one day help to make it easier to apply certain promising numerical algorithms to boundary problems.