Diffusion problems on metric graphs

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Abstract:

In this mini-lecture I will present the main features of linear diffusion equations on metric graphs, including a gentle introduction to heat kernels and some distinguished qualitative properties, especially smoothness and pointwise bounds.

I will show how variational methods can be used to estimate the speed of convergence towards equilibrium of solutions, as well as the effectiveness of thermal insulation. I will present some elementary results in shape optimization of metric graphs with respect to both quantities.

If time allows, I will also mention some possible extensions to nonlinear diffusion.