# Analysis on graph-like spaces

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*Abstract*:

In this mini-course I will give some basic spectral analysis on spaces that resemble graphs, including discrete graphs, metric graphs and spaces that have a network-like structure. As a simple example of such a structure one can think of a small neighbourhood of a metric graph embedded in the plane. A natural question is now whether and how Laplacians (or more general Schrödinger operators) on the small neighbourhood converge to some limit operator on the underlying metric graph.

I will develop the abstract ideas along many examples in order that students with different background are able to follow. A rough structure of my lectures is as follows:

1. Fixing the notation: Discrete and metric graphs and their Laplacians

2. Spectra of discrete and metric graphs

3. Graph-like spaces: thin neighbourhoods of graphs

4. The tool-box: how to define convergence of operators when the spaces change?

5. The results: convergence of Laplacians on graph-like spaces