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PDE models of natural networks

Transportation networks have been widely produced by nature. Neural networks, leaf venatures, vascular system, roots are example which share the property that the network trnasports a fluid or a current. In some cases, the formation of the network, during development of the individual, is based on a prematrix which can be seen has a porous media. The pressure produced by a source acts on this prematrix and generates new vessels. Physicists have proposed PDE models for to describe this interaction under the form of a singular system of parabolic/elliptic type.

This lecture will present some mathematical features of this system: energy considerations and existence of solutions, multiple and singular steady states.

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