

Signal Processing and Learning on Simplicial Complexes

— an edge case

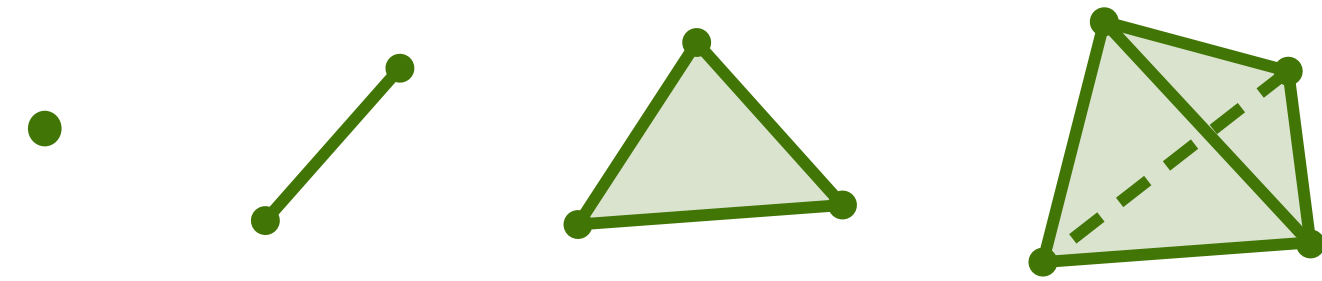
- Understand edge flows (simplicial signals): smoothness, spectrum
- Process edge flows: Convolutional filters, regularizations
- Learn edge flows: neural networks, Gaussian processes ...

Maosheng Yang

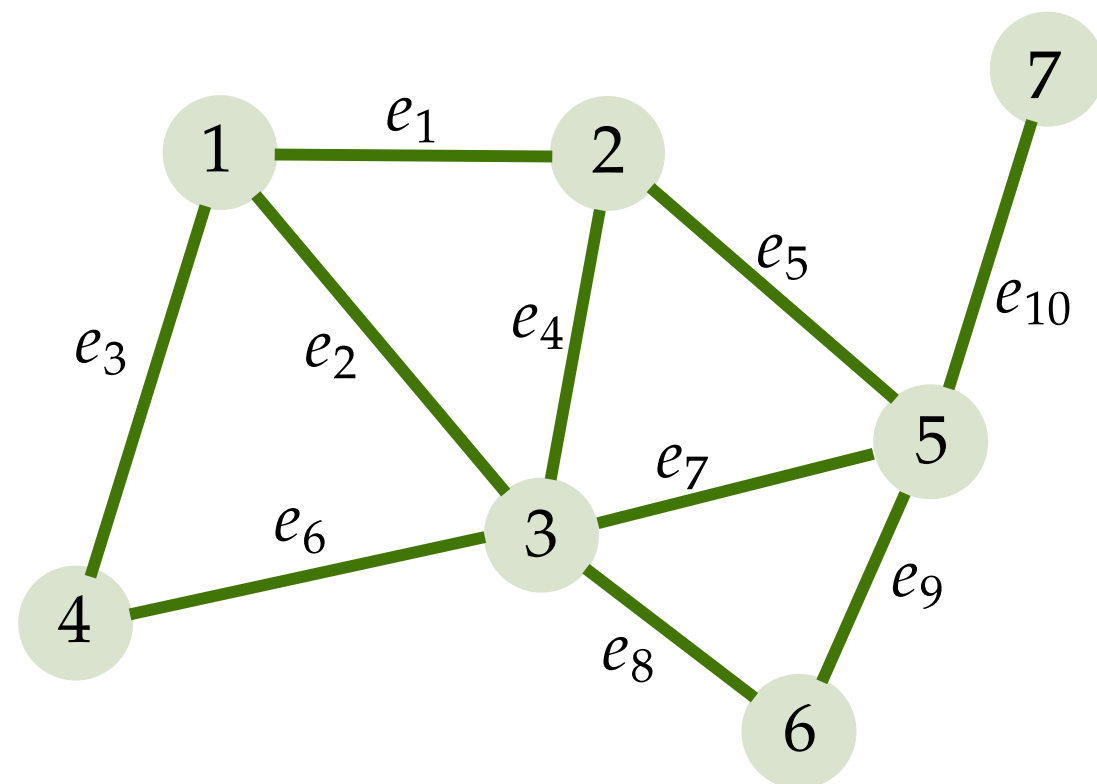
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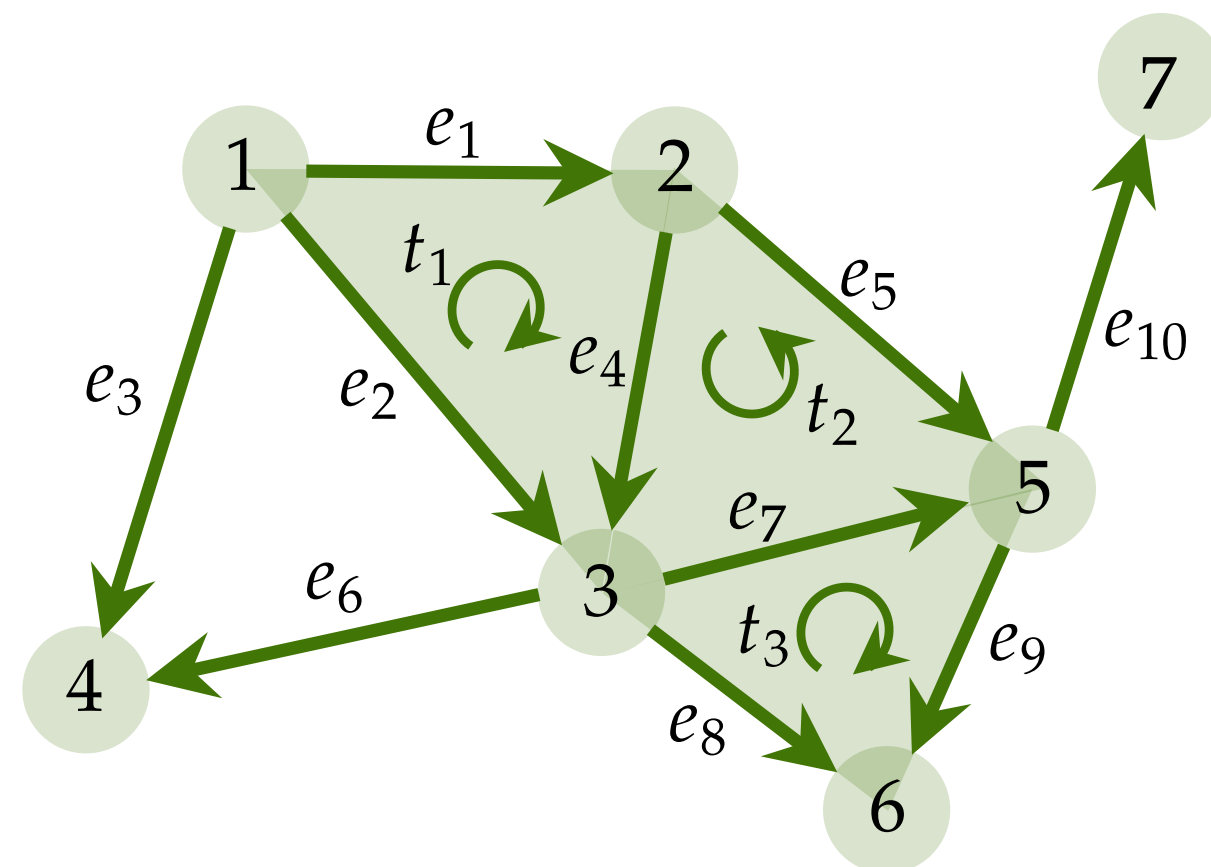
Graphs vs Simplicial 2-Complexes



0-, 1-, 2-, 3-simplices



Graph = Simplicial 1-complex



Simplicial 2-complex

- Oriented simplices (equivalence class of permutations)

Where are SCs used?

- Network analysis
- Topological data analysis
- Topological signal processing
- Topological deep learning
- Numerical methods
- Computer graphics
- ...

- To model Higher-order network structure
- To support Higher-order signals