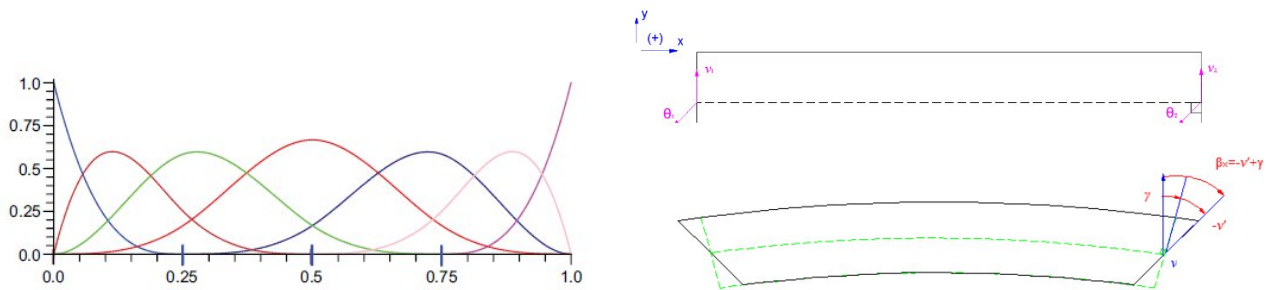


Bachelor's Thesis:

Implementation of an Isogeometric rotation-free Timoshenko beam element

The Timoshenko beam has an advantage compared to the Bernoulli beam, as it accommodates shear deformation. However, as a consequence, the displacement and rotation are decoupled and locking appears in the case of a very thin scenario. The idea of using a single variable, displacement, as the only unknown was then proposed [1], along with the combination of using B-spline basis functions as the ansatz functions, which is known as isogeometric analysis (IGA).



The goal of this bachelor's thesis is to study, implement and validate the rotation-free Timoshenko beam with isogeometric discretizations in Python or MATLAB. The candidate will have the opportunity to gain a deeper understanding of different beam theories as well as of isogeometric analysis.

Prerequisites:

- Knowledge in beam theories
- Background in Python or MATLAB

Language: English

Start date: Summer Semester 2026

Reference:

[1] Kiendl, J., et al. "Single-variable formulations and isogeometric discretizations for shear deformable beams." *Computer Methods in Applied Mechanics and Engineering* 284 (2015): 988-1004.

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