Isogeometric phase-field modeling of brittle fracture in thin plates and shells

Phase-field modeling of brittle fracture is a modern promising approach that enables a unified description of complicated failure processes, including crack initiation, propagation, branching, merging, as well as its efficient numerical treatment [1]. In this work, we apply the phase-field fracture approach to plates and shells, using an isogeometric Kirchhoff-Love shell formulation for structural analysis [2]. In order to avoid fracture in compression, we perform an additive split of the deformation tensor in tension and compression terms as proposed in [3]. We show that this requires special attention in structural models like plates and shells, where bending deformation typically induces both tension and compression at opposite sides of the structure. We propose a new approach [4] to take this effect correctly into account and verify it by detailed comparisons with results from 3D simulations.

References:

Prof. Josef Kiendl
Department of Marine Technology
Norwegian University of Science and Technology