Timeline showing milestones: ⭐ Prelim, ⭐ Midterm?, ⭐ Dissertation, across dates 2019.04, 2019.08, 2019.12, 2020.04, 2020.08, 2020.12, 2021.04, 2021.08, 2021.12, 2022.04.

Formulate and implement the phase-field fracture model based on the fourth-order Cahn-Hilliard theory.

Incorporate thermal effects, e.g. thermal expansion, thermal softening, heat transfer across weak discontinuities.

Investigate the effect of model hyperparameters on macroscopic responses. Foreseeable parameters include regularization length(s), parameters in the plastic-hardening law, parameters in the cohesive traction-separation law, parameters in the thermal softening law, etc..

Apply the model to simulate the Kalthoff-Winkler problem. Other problems, e.g. those from past Sandia fracture challenges, are also applicable where plasticity and thermal effects have proven to be critical in predicting the correct material response.

Wrap-up. Review (or even reformulate if necessary) previous modeling choices given previously obtained results.

Formulate the phase-field fracture problem without any arbitrary split in the elastic energy. Instead, explore other possibilities in enforcing the contact conditions between fracture surfaces.