TECHNISCHE UNIVERSITÄT DRESDEN

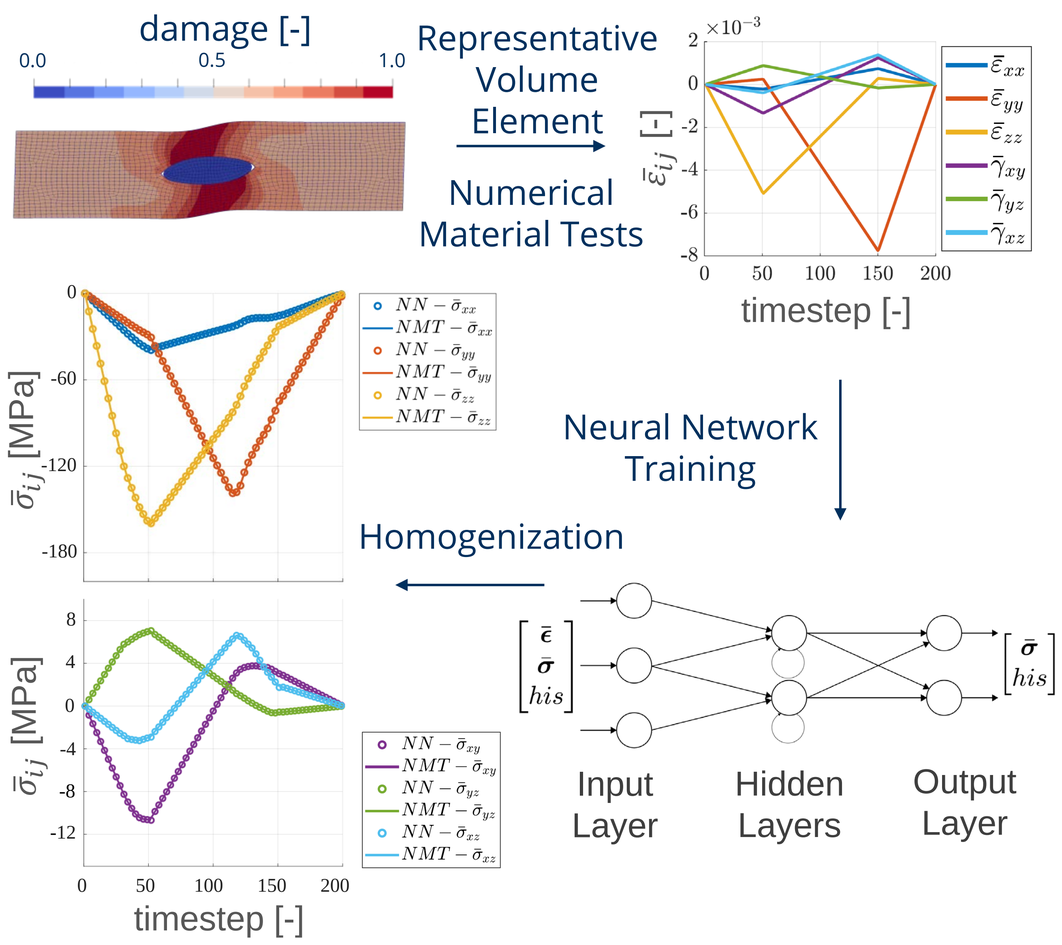
DFG GRK 2250 – Mineral-bonded composites for enhanced structural impact safety

Julien Stöcker – Doctoral Project B3/II

MESOMECHANICAL MODELLING OF HYBRID REINFORCED CONCRETE STRUCTURES AT IMPACT LOADING USING MACHINE LEARNING

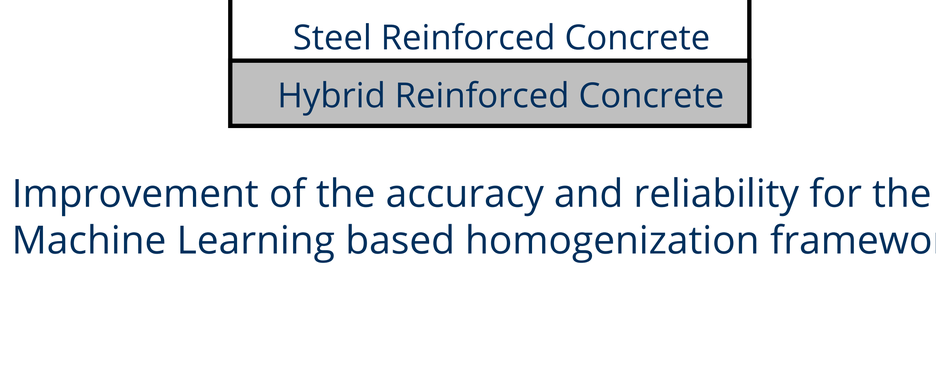
1 STATE OF THE ART

- Artificial Neural Network homogenization framework
- Representative Volume Element of TRC mesostructure
- Degradation mechanisms of TRC



2 OBJECTIVES

- Development of constitutive model for SHCC
- Extension of existing TRC-RVE for SHCC to represent the HRC meso structure



Textile Reinforced Concrete (TRC) + Short-Fiber Reinforced Concrete (SHCC)

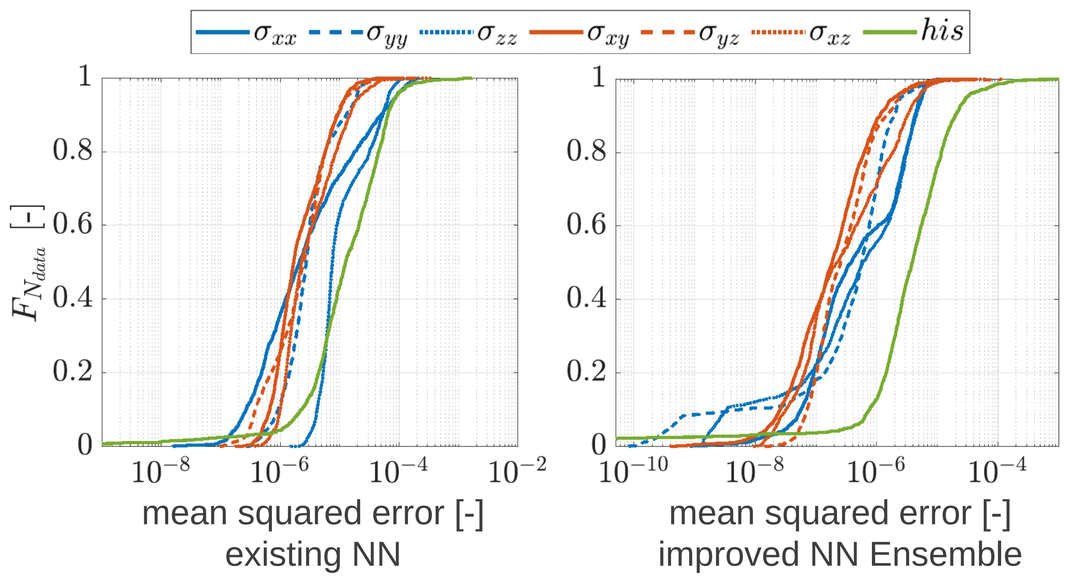
Mechtcherine et al. (2011)

- Investigation of microscopic damage and load bearing characteristics
- Characterization of mechanical behavior under dynamic loading

- Improvement of the accuracy and reliability for the Machine Learning based homogenization framework

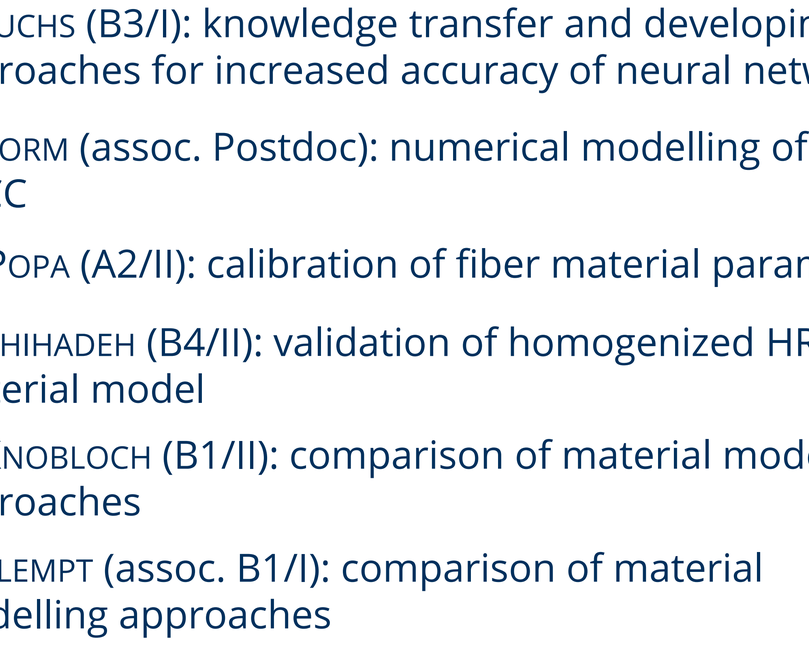
3 CONCEPTS

- Single Component Neural Network Ensemble



empirical distribution functions of estimation errors for existing and improved NN

- Implementing 1D fiber elements inside 3D mesh



Quarter of a Finite Element Model of a simplified TRC-RVE mesh with randomly distributed fiber elements

4 PLANNED COLLABORATIONS

- A. Fuchs (B3/I): knowledge transfer and developing approaches for increased accuracy of neural networks
- J. Storm (assoc. Postdoc): numerical modelling of SHCC
- M. Popa (A2/II): calibration of fiber material parameters
- A. Chihadeh (B4/II): validation of homogenized HRC material model
- H. Knobloch (B1/II): comparison of material modelling approaches
- V. Klempt (assoc. B1/I): comparison of material modelling approaches
- M. Böttcher (assoc. B4/I): knowledge transfer on neural network hyperparameter optimization