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Deep generative models for the design of Dual phase steel microstructures

Tuesday, 14 September 2021 19:00 (2 hours)

Dual Phase (DP) steels are an important family of steel grades used widely in the automotive industry because of their beneficial properties such as high ultimate tensile strength (GPa range), low initial yield stress, and high early-stage strain hardening. The DP steel microstructure consists of soft ferritic grains, which are mainly responsible for ductility, and hard martensitic zones, which give these steels their strength. However, due to the huge parameter space, establishing the microstructure-property relationship in DP steels is a combinatorial challenge. To tackle this challenge we use data from crystal plasticity simulations and train machine learning models to automatically extract the patterns from DP steel microstructures without any need of hand-designed features. In particular, I will present my work on using Variational Auto Encoders (VAEs, a generative machine learning model) to learn the low dimensional latent representations and to generate synthetic EBSD data for DP steels. Also, I will present, that the learned latent space can serve as a design space for microstructure design.

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