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Genome-based prediction of autoimmune diseases using relation neural networks

The development of autoimmune diseases arises from a complex interplay of genetic predisposition and environmental influences. Deep learning based approaches could boost the predictive performance by capturing non-linear relationships between genetic variants and the phenotype. In this project, I present and evaluate a deep neural network architecture based on Relation Neural Networks, a network module specifically designed for relational reasoning tasks. The model receives genomic variants as input and represents them with the help of embedding layers. I have performed a successful proof-of concept classification task, predicting population affiliation for individuals from the 1000 Genomes Project. The proposed model is subsequently tested on two disease prediction tasks, predicting rheumatoid arthritis and inflammatory bowel disease for individuals in the UK Biobank.

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Keywords

Deep learning,
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