

Predicting mechanical properties of porous materials using topological data analysis

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Porous metals are increasingly important in technology. Due to their tunable mechanical properties, they are promising candidates in various emerging applications such as metallic scaffolds for load-bearing bones and lightweight structures for transport technologies. The aim of this study is to create topological descriptors of porous materials that allow a fast prediction of their mechanical properties. At present, the main focus is on Young's modulus. The topological properties of an object do not change when the object is rotated, while Young's module may depend on direction. To construct direction-aware descriptors, we encoded direction-dependent information in filtration values. We combine topological data analysis with theoretical models based on material porosity for better results. In this talk, we will present new topological descriptors of porous materials and discuss the effectiveness of regression models based on them.