PYAPD: A PYTHON LIBRARY FOR COMPUTING OPTIMAL ANISOTROPIC POWER DIAGRAMS USING GPU ACCELERATION

MACIEJ BUZE

The microstructure of metals and foams can be effectively modelled with anisotropic power diagrams (APDs), which provide control over the shape of individual grains. One major obstacle to the wider adoption of APDs is the computational cost that is associated with their generation. In my talk I will present a novel fast approach for generating APDs with prescribed statistical properties, in which semi-discrete optimal transport techniques are combined with modern GPU-oriented computational tools, originally developed for the Sinkhorn algorithm. A three orders of magnitude speed-up versus a baseline CPU-only implementation is achieved, leading to a near instantaneous computation of a generic large APD, which unlocks the use of APDs in computational homogenisation. The algorithms are packaged as a Python library, PyAPD, and the talk will also include a showcase of the capabilities of this library, as well as a discussion on several ongoing extensions building upon PyAPD.