The Chair for Digital Additive Production (DAP) at RWTH Aachen University is closely collaborating with the Fraunhofer Institute for Lasertechnik ILT and mainly focusing in the area of Additive Manufacturing (AM). The chair aims to extend knowledge in this field and to play a strong role in the market at an international level. Therefore, advanced topics such as topology optimization, development of novel lattice structures, pre- and post-processing of AM processes along with studying advanced materials and process monitoring are main research interests in DAP. The chair is working on both industrial and publicly-funded projects in various applications such as automotive, aerospace, turbomachinery, medical and tooling industries. In addition, there is a strong team spirit in the chair and specialists with a strong background in processing, design or simulation of AM-produced parts as well as AM processes are collaborating together. Therefore, there exists a potential learning environment to gain concrete experience by interacting with the scientific staff in DAP.

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Masterarbeit
Ingenieurwissenschaften / Biowissenschaften
Material homogenization for the simulation of lattice structures produced with L-PBF

Deine Aufgabe
Laser powder bed fusion (L-PBF) is a process for the fabrication of components in a layer-upon-layer manner in which a metallic powder layer is melted selectively using one or several lasers. This technology is used to fabricate complex features such as lattice structures. To embed lattice structures in the design space of a component, it is required to verify their applicability and usability concerning the environmental conditions of the component such as loads and boundary conditions. This task is not trivial to be carried out efficiently. The reason is lattice structures are often composed of an enormous number of tiny struts and to simulate them, they need to be meshed resulting in a huge number of elements, usually many tetrahedral elements. Simulation of these structures with a lot of elements is computationally expensive. One approach to reduce the effort is to define an equivalent solid structure which can represent a lattice structure. Another approach can be homogenization approach. The goal of the thesis is to try to find an indirect way of simulating the lattice structures which is computationally more efficient than the direct simulation approach. Your tasks can be summarized as:

• Literature review on the L-PBF process, lattice structures and simulation of these structures
• Development of approaches to simulate lattice structures for a component under elastic loading
• Verification of the developed approaches
• Comparison between the results of the chosen approaches
• Documentation

Dein Profil
We are looking for a committed student with the following requirements:

• Familiarity with CAD software products such as Siemens NX and Rhino
• Familiarity with Abaqus/CAE
• Student of simulation sciences, computational engineering, mechanical engineering or any other comparable field of study
• Documentation of the thesis can be done in English or German.