Doctoral candidate 3: Mathematical modelling of shapes and deformations

Host Institution	University of Passau, Germany
PhD enrolment	University of Passau, Germany
Primary Supervisor	Prof. Dr. Tomas Sauer
Subject area	Mathematical modelling, shapes, deformations

About this doctoral project and your tasks

You will develop efficient algorithms with a strong mathematical focus to transfer shape information into a representation that can be integrated into reconstruction algorithms and serve as a basis for visual steering. This information will be used to enhance the quality and efficiency of reconstruction methods but also allows for a decomposition of the difference between measurement and prescribed shape into deformation vectors applied to the surface. You will identify proper formats for efficient interaction with reconstruction algorithms (e.g., discrete voxel representations), and their manipulation (e.g., by three-dimensional subdivision algorithms). Finally, the conversion between these formats and standard shape descriptors will be investigated to eventually improve the performance of reconstruction algorithms and to provide base data for visual steering for example by means of analysing and visualising deformation vector fields in deforming shape memory materials

Your tasks will include :

- Identify methods that include 3D CAD models in the reconstruction using discrete approximation techniques based on adaptive splines and multilevel refinement of surfaces and volumes; testing and mathematical verification of these methods.
- Extend model for deformations and to quantify deviations from prescribed shape
- Surface models integrated as boundary constraints into reconstruction algorithms and visualisation

Foreseen secondments

For this project, we foresee secondments to:

- **Prof. Dr. Jan Sijbers** (3 months) at University of Antwerp (Belgium)
- **Dr. Lucia Mancini** (3 months) at Slovenian National Building and Civil Engineering Institute (Slovenia)

Funded by the European Union

X-CELERATE is an MSCA-Doctoral Network funded by the European Union, starting in December 2025 (GA No. 101227146).

About the host institution and research group

Since its creation in 1978, the University of Passau (UP) has quickly developed into a first address in German academic research. With nearly 11,000 students and enrolled doctoral researchers, UP regularly attains top positions in academic rankings and is among the top 20 percent of all universities in the world. Internationalism has always been a hallmark for the University, as well as an important strategic aim.
The international connections are underpinned by the vibrant partnerships the UP maintains on a global scale, particularly the cross-border co-operative and research partnerships of its academics. Hence the UP is involved in European research programmes since the 5th European Framework Programme. Horizon 2020/Europe resulted in funding many research projects involving the UP, among which five MSCA doctoral networks.

About the offer

- The selected candidate will be employed by University of Passau for **36 months** on the MSCA-DN project.
- Doctoral candidates are offered a **competitive remuneration** based on the MSCA allowances and the regulations of the host institution. University of Passau has received the following EU-grant to recruit a Doctoral Candidate (DC): monthly Living Allowance € 4.058,12; monthly Mobility Allowance € 710; and monthly Family Allowance € 660 (only if applicable). The exact salary will depend on your personal circumstances. Please note that the final monthly gross salary will result from deducting (from the mentioned amounts) all compulsory national labour taxes (social security, etc.) to be borne by the employer. Moreover, funding is available for technical and personal skills training and participation in international research events.
- **Expected start date**: between April and September 2026. We encourage last-year master students who will graduate by this time to already apply.

More information is available in the general information document for X-CELERATE positions.

Specific Profile requirements

- Your profile aligns with the general requirements and eligibility criteria of the X-CELERATE project.
- You have a master's degree in **physics, computer science, mathematics, engineering, or related field** (or will have by the time of your appointment).
- Background in **scientific computing and/or computed tomography** is appreciated.
- You are proficient in at least one programming language

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How to apply

All applications must be submitted via the **X-CELERATE job platform.**

Deadline for applications: 16 November, 23:59. More information about the application procedure is available in the general information document for X-CELERATE positions.

Additional information

For additional information about the research project, contact:

Prof. Dr. Tomas Sauer
Email: Tomas.Sauer@uni-passau.de

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