

# Master Thesis Topic: Variational Methods for Facial Reconstruction from (Partial) Skull Data

## Call for Application:

The goal of this thesis is to develop and apply **variational methods** for reconstructing accurate facial shapes from skull data. Given the challenges in **forensic science**, **medical imaging**, and **anthropology**, this project will explore advanced mathematical and computational techniques to estimate and refine facial reconstructions based on the underlying skeletal structure.

## Research Focus

- Develop a variational framework to model the relationship between skull and facial features, ensuring realistic facial reconstructions from 3D skull scans.
- Use shape analysis techniques to derive facial structures, considering factors like anatomical proportions, individual variation, and soft-tissue deformation based on skull geometry.
- Investigate data-driven optimization to refine facial shapes from skull data, including considering various tissue, ages, and musculature factors.
- Apply machine learning to enhance the accuracy and realism of reconstructions, leveraging both 3D skull data and datasets of facial anatomy.

## Key Research Challenges

- Reconstructing facial structures that adhere to biological and anatomical realism while accounting for the diversity of human features.
- Integrating partial skull data (often incomplete in forensic or archaeological cases) into a full 3D facial model using variational methods.
- Handling variability in skull shapes and corresponding facial features across different populations.

## Your Profile

- Master's student in **Computer Science, Applied Mathematics, or a related field**
- Solid background in 3D geometry, variational methods, and computer vision.
- Familiarity with 3D shape analysis, including statistical and machine learning techniques.
- Proficiency in Python, MATLAB, or C++, and experience with 3D modeling software.



## Start Date & Location & Duration

- Flexible start date in 2025
- Location: Berlin or Remote
- Duration: ~6 months (can be adapted based on requirements)



## What We Offer

-  **Close guidance from experienced researchers** in the fields of computer vision, machine learning, and medical imaging.
- Hands-on experience with cutting-edge techniques in **3D shape analysis and variational methods**.
- Access to **medical datasets** and powerful **computing resources**.
- Opportunity to contribute to **real-world applications** in forensic science, healthcare, and anthropology.
- Potential for **publication** in top-tier conferences and journals.



Interested? Send your CV, a short motivation letter, and your transcript of records to Jianning Li via [jianningli.me@gmail.com](mailto:jianningli.me@gmail.com) with the subject line: "Master Thesis Application – Facial Reconstruction". For more information: <https://jianningli.me/>