



# Analysis of Medical Data and Visualization of Quantitative Data in CAMPVis

Project Management and Software Development  
for Medical Applications

## General Info

Project Title: Analysis of Medical Data and Visualization of Quantitative Data in CAMPVis

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The resulting information can be used in different ways: Intensity histograms can provide an overview and assist during transfer function generation, heatmaps may highlight interesting spots and an automatic distance measuring significantly helps during operation planning to find the right incision path.

## Project Abstract

CAMPVis is a new medical visualization framework developed at our chair. The goal of the proposed project is to implement data structures and algorithms for analysis of medical image (e.g. intensity distribution computation) and visualization techniques for the results (e.g. line plots, heatmaps).

## Background and Motivation

Data from medical contexts usually has a high dimensionality and/or density. The images acquired with today's imaging modalities easily exceed hundreds of MB. To extract useful information from such data, sophisticated methods for image analysis or post-processing are necessary and the results need advanced visualized techniques.

For instance, simple approaches compute the intensity distribution and use line plots to display the intensity histogram. More sophisticated methods, such as LH histograms, try to compute boundaries in images using gradients as derived measure.

## Student's Tasks Description

- Get an overview about other plotting tools (MATLAB, Visifire, etc.) and medical data analysis
- Design basic data structures for handling quantitative data
- Develop and implement medical data analysis algorithms for generating data
- Develop and implement algorithms for post-processing the data (e.g. filtering, grouping)
- Develop and implement suitable visualization techniques (in OpenGL)
- Optional: Develop suitable interaction metaphors

## Technical Prerequisites

Solid C++ skills, intermediate OpenGL skills are required. Experience in GPU programming is beneficial.

## Administrative Info

Working Time: 10h/week

Please send the completed document to us ([Ralf.stauder@tum.de](mailto:Ralf.stauder@tum.de)) before the project proposal deadline, September 30<sup>th</sup>. Please note that this proposal will be evaluated by the BMC coordinators and will be assigned to a student only in the case of acceptance.



Project Location: Garching/Home, weekly meeting in Garching

Required Equipment: Computer with dedicated Graphics hardware

### Timeline and Milestones

There are no hard deadlines besides the seminar schedule. The first weeks should be used to get into the topic and design the basic data structures.

To pass the seminar successfully, the student should have implemented at least basic algorithms for generating and post-processing quantitative data as well as basic visualization techniques, such as line plots, heatmaps, surface plots.



Furthermore, the student shall provide an adequate documentation for his or her project.

Specific time management is up to the student. Certainly, the project owner will assist/advise the student on this.

### References

**LH Histograms:** Sereda, P.; Bartroli, A.V.; Serlie, I.W.O.; Gerritsen, F.A. - *Visualization of boundaries in volumetric data sets using LH histograms* (2006)

**MATLAB Plotting Toolbox:**

<http://www.mathworks.com/products/matlab/>

**Visifire:** <http://visifire.com/>

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