

Master thesis project

Bolus segmentation in videofluoroscopy swallowing studies

Swallowing is an essential function that allows for the intake of nutrients and liquids necessary for life. However, swallowing disorders, known as **dysphagia**, pose significant health risks and can lead to complications such as malnutrition, dehydration, and aspiration pneumonia. The gold standard for dysphagia assessment is videofluoroscopy studies, which provide dynamic X-ray images of the swallowing process. Within these studies, **tracking the bolus**—the mass of food or liquid being swallowed—is crucial for accurate assessment and diagnosis.

The main project. This thesis aims to segment the bolus in videofluoroscopy studies, a task that requires (i) temporal variant data and (ii) advanced deep learning techniques. Your tasks: you will prepare datasets from the United States and Germany to train U-Net-like architectures, exploring various configurations (small, medium, large, with or without attention mechanisms, feel free to explore other approaches) to determine the most effective and robust model. Identifying the data quality needed for successful training is also critical; metrics such as Natural Image Quality Evaluator (NIQE), Peak Signal-to-Noise Ratio (PSNR), and contrast will be evaluated to ensure optimal performance. All these points are key factors for a successful translation into the clinic.

The side project. You will collaborate with international partners (LSU, ECU, clinics in Finland and Greece) to collect additional data, aiming to create a comprehensive dataset similar to BAGLS (Benchmark for Automatic Glottis Segmentation). This expanded dataset will enhance the robustness and generalizability of our models, ultimately improving the assessment and treatment of dysphagia globally.

Pre-requisites

- Experience with (Advanced) Deep Learning
- Knowledge of Python, Object-oriented programming and Pytorch
- Medical imaging background
- Version control, documentation

You get

- Regular meetings with the PhD student and the professor
- Chance to work on paper-worthy projects
 - For papers on conferences, you can travel there (paid by us)
- Embedded in a social, supportive environment

Contact

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Send an email with your CV and Transcripts and a short motivation why you are the right person to tackle this project.