



# Open Master Thesis Project

Automated dental drill analysis for miniature intraoral robot development

BIROMED-Lab

Department of Biomedical Engineering

The Bio-Inspired RObots for MEDicine-Laboratory (BIROMED-Lab) at the Department of Biomedical Engineering (DBE) at the University of Basel offers an exciting, multidisciplinary, and applied learning- and research environment. Our research is interdisciplinary and organized in close collaboration with clinicians and industrial partners.

## Project background:

You will join the BIROMED-Lab performing medical robotics and mechatronics research under the lead of Prof. Dr. Georg Rauter. You will be part of the team for the project **Miniature Intraoral Robot (MIR) Performing Minimal-invasive, Personalized and Precision Dentistry**. In this project we aim to develop a robotic device for tooth preparation enabling a fully digital treatment workflow. The basis for the development of this miniature intraoral robot is a sensorized dental phantom head, which we are currently developing.

## Project description:

During a dental treatment involving drilling and milling of a tooth, the dentist changes the drill types regularly, for example between different treatment steps or due to wear. An important functionality of the phantom head is an automatic recognition of the dental drill type, length, diameter and wear level currently in use. Therefore, you will develop a strategy and a corresponding system of devices for automated tool analysis. This system will also include a solution to provide user feedback on the current treatment duration, workstep and tool used. The development will include hardware design and software programming. Possible implementations for the drill monitoring could be a sensor solution or an image analysis approach. Your tasks will include:

- Analyze the requirements for the drill analysis system
- Perform literature research on the state-of-the-art of tool type recognition and wear level monitoring systems
- Select a promising concept for the drill analysis and design a system prototype
- Implement a graphical user interface to display the relevant information to the user of the phantom head
- Evaluate the performance of the drill analysis system with respect to the set requirements

**Start date:** March 2024 or upon agreement. You will work at the DBE located in the new SIP Basel Area main campus, an exciting and modern working environment in which various research groups of the DBE are located.

## Your profile:

- You are pursuing a master's degree in electrical, mechanical or computational engineering or a closely related discipline
- You are a hands-on person who likes to work with hardware
- You are curious, motivated and self-driven
- You want to work in and contribute to an interdisciplinary and applied research project

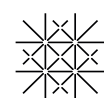
**Ready to revolutionize dentistry? We are.**

Apply for this project by email sending us ([carina.schmidt@unibas.ch](mailto:carina.schmidt@unibas.ch)) the following materials:

- CV
- diplomas and course transcripts



**Want to know more about us?** check out [www.dbe.biomed.unibas.ch](http://www.dbe.biomed.unibas.ch) and contact us for a lab visit.



**University  
of Basel**

Department of  
Biomedical Engineering