

IDEA League

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Report on Research Project under the IDEA League Student Grant

Personal Information			
Full Name		Malavika Hari Krishnan Nambiar	
Field of study		Biomedical Engineering	
Degree pursued		MSc	Current year of studies 1.5
Home university		TU Delft	
Sponsoring professor at home university	Name	Prof. Jie Zhou	
	Email	J.Zhou@tudelft.nl	

Information about the research stay			
Host university		ETH Zurich	
Research topic		Tissue characterisation and registration of fracture callus in femur defects treated with collagen scaffolds	
Dates of research stay		From	01.08.2018 To 30.11.2018
Sponsoring professor at home university	Name	Prof. Ralph Muller	
	Email	ram@ethz.ch	

Summary of research project (200 words max.)	
<p>Critical size bone defects need intervention to promote healing and many biomaterials are gaining attention in this regard. This study focuses on detection of collagen in bone samples and collagen scaffolds and registration of histology sections to micro-CT data. The methodology of tissue characterisation focuses on various techniques to characterise collagen and ultimately use one method, to analyze a fracture healing model of a mouse femur, with a porous collagen scaffold loaded with bone morphogenetic protein-2 (BMP-2). While the focus lies on collagen detection and characterisation, it is also important to differentiate other cells and tissues from the scaffold material itself. Various histology staining techniques have been analysed and the Sirius red staining was the chosen technique to analyse samples with BMP-2 loaded and control samples.</p> <p>The histology sections are intended to be registered to CT data using a novel registration algorithm, to develop a better understanding of the molecular processes and bone healing. The scope of the project includes optimizing the automatic registration tool by registering synthetic data and validating and developing a processing tool for histology images. Parts of the process, such as the segmentation of the images have been automated and recommendations for further optimisation of the registration algorithm, based on results obtained, have been reported.</p>	

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Experience Report

(Please tell us about your personal experience at the host university and give us an evaluation of the benefits of the research stay for the course of your studies)

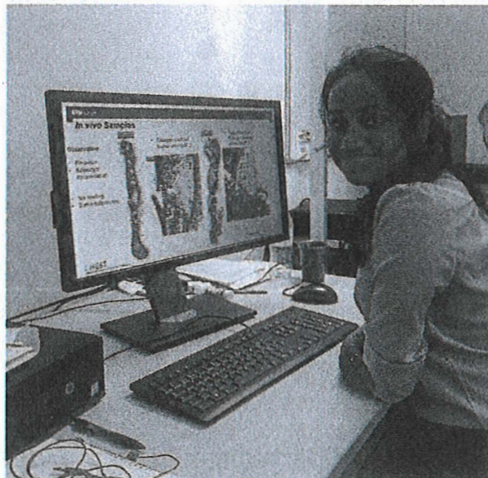
Personally, all techniques and methods used in this internship were of a new domain for me. I gained hands on lab experience in histology techniques and a more elaborate insight on molecular processes and cellular level biology. I learned to characterise different cells and materials. On the computational end, I learned the basics of Python which is a new programming language under my belt now and also Image registration, gave me insights on many new mathematical and scientific methods.

From the course of the master framework, a lot of theory fell into place after gaining this practical experience at ETHZ. This internship also added perspective on scientific thinking and this will be invaluable when I go on to do my thesis

My supervisors were extremely helpful and always present, thus making the experience a wonderful one.

Picture

(Please provide a picture of you at the host university)



Host professor

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