

## PhD Project Description

<b>School/Department:</b>	<b>Biomedical Imaging Group Rotterdam, Erasmus MC</b>
<b>Supervisor information:</b>	<ul style="list-style-type: none"> <li>• Associate Professor Dr. ir. Stefan Klein</li> <li>• <b>Email:</b> <a href="mailto:s.klein@erasmusmc.nl">s.klein@erasmusmc.nl</a></li> <li>• Prof. dr. WJ Niessen <a href="mailto:w.niessen@erasmusmc.nl">w.niessen@erasmusmc.nl</a></li> <li>• <b>Website:</b> <a href="http://www.bigr.nl">www.bigr.nl</a>, <a href="http://www.bigr.nl/people/StefanKlein">www.bigr.nl/people/StefanKlein</a>, <a href="https://scholar.google.nl/citations?user=iaAFK0MAAAAJ">https://scholar.google.nl/citations?user=iaAFK0MAAAAJ</a></li> <li>• <b>Selected publications:</b> <ul style="list-style-type: none"> <li>- Venkatraghavan et al. Disease Progression Timeline Estimation for Alzheimer's Disease using Discriminative Event Based Modeling, <i>NeuroImage</i>, 2019. <a href="https://arxiv.org/abs/1808.03604">https://arxiv.org/abs/1808.03604</a></li> <li>- Sun, Niessen, Klein. Randomly perturbed B-splines for nonrigid image registration. <i>IEEE Transactions on Pattern Analysis and Machine Intelligence</i>, 2017. <i>CSC funded</i></li> <li>- Huizinga et al. PCA-based groupwise image registration for quantitative MRI. <i>Medical Image Analysis</i>, 2016.</li> <li>- Bron et al. Standardized evaluation of algorithms for computer-aided diagnosis of dementia based on structural MRI: the CADDementia challenge. <i>NeuroImage</i>, 2015. <a href="https://caddementia.grand-challenge.org/">https://caddementia.grand-challenge.org/</a></li> <li>- Klein, Staring et al. Elastix: a toolbox for intensity-based medical image registration. <i>IEEE Transactions on Medical Imaging</i>, 2010. (&gt;2000x cited, software used by researchers and companies worldwide, <a href="http://www.elastix.isi.uu.nl">www.elastix.isi.uu.nl</a>)</li> </ul> </li> </ul>
<b>Project Title:</b>	<b>Image Analysis and Machine Learning</b>
<b>Abstract:</b>	<p>We develop advanced image analysis methods and machine learning approaches to extract more information from medical images than can be seen by the naked eye. PhD projects on the following topics are offered:</p> <p><u><b>Radiomics for precision cancer medicine</b></u> - Radiomics is a big-data analytics technique, in which hundreds of candidate features are calculated from imaging data and annotated tumour contours, quantifying location, shape and appearance of the tumour. Using machine-learning algorithms, such as SVMs or deep neural networks, these computational features are combined into predictive models, also called 'radiomics signatures'. At Erasmus MC, we have access to unique datasets that allow development of novel radiomics signatures that could aid the diagnosis and treatment of cancer.</p> <p><u><b>Disease progression modelling of neurodegenerative diseases</b></u> - Alzheimer's Disease and related disorders of the brain are a major challenge in the ageing population worldwide. Development of novel curative treatments is hampered by the heterogeneity of the disease, lack of reliable tools for early and differential diagnosis, and limited insight in the various disease progression patterns. In our research, we develop innovative computer-aided diagnosis methods and data-driven disease progression models, using spatiotemporal analysis of thousands of brain MRI scans.</p> <p><u><b>Image analysis and machine learning for osteoarthritis</b></u> - Osteoarthritis is the most common degenerative disorder of the knee joint. Reliable methods for early diagnosis, fine-grained disease staging, and accurate patient stratification are urgently needed to improve patient care. MRI provides 3D visualization of multiple tissues in and around the knee joint, and holds great promise as a basis for detailed phenotyping and spatial mapping of pathology. In collaboration with the ADMIRE group (headed by Dr. Oei), we develop methods for quantitative MRI analysis, and study the relation of MRI markers with clinical, biochemical, and genetic markers.</p>
<b>Requirements of candidate:</b>	<ul style="list-style-type: none"> <li>• This project requires a highly motivated, hardworking candidate with good communication skills, who likes to become part of our international team.</li> <li>• Master degree in a technical discipline (physics, mathematics, computer science, engineering, etc.)</li> <li>• Scholarship that will, at least, cover subsistence allowance and international air plane ticket (we could help with the scientific part of your scholarship proposal)</li> <li>• English language requirement:</li> <li>• <i>English speaking countries &amp; Netherlands:</i> no requirement</li> <li>• <i>Other countries:</i> IELTS 7.0 (min 6.0 for all subs), TOEFL 100 (min 20 for all subs)</li> </ul>

Erasmus MC, ranked world no. 32 for [Clinical Medicine US News 2020](#) no. 30 [Nature Index for Biomedical Sciences 2019](#)

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Application requirements & Deadlines:

<https://www.eur.nl/en/about-eur/erasmus-university-china-centre/csc-scholarship>

*Erasmus MC, ranked world*

*\* No.32 for Clinical Medicine US News 2020:*

<https://www.usnews.com/education/best-global-universities/clinical-medicine?page=3>

*\* No. 30 Nature Index for Biomedical Sciences 2019:*

<https://www.natureindex.com/supplements/nature-index-2019-biomedical-sciences/tables/healthcare>