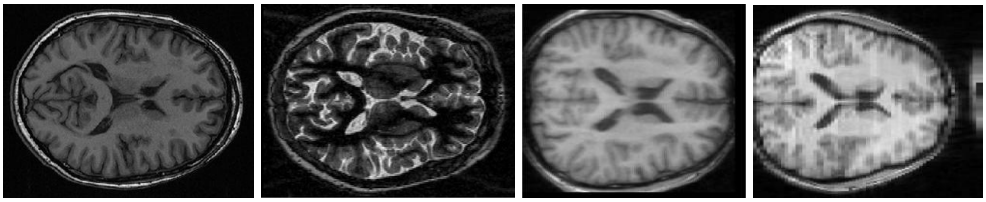
ERASMUS UNIVERSITEIT ROTTERDAM

Erasmus University Rotterdam, the Netherlands
CSC PhD 2015 Project Description

School/Department:	Biomedical Imaging Group Rotterdam (BIGR), Departments of Radiology and Medical Informatics, Erasmus MC www.bigr.nl
Project Title:	**Transfer learning in medical image analysis**
Abstract:	Biomedical image analysis techniques often use supervised learning – learning from examples – to derive suitable models for automatic image segmentation, computer aided diagnosis, or image-based disease prognosis. These techniques have proven to be very successful on a large variety of tasks and generally outperform traditional unsupervised methods. Yet, they require a representative training set and do not always perform well on new images that look different from those encountered in the training stage. This seriously hampers application of such techniques in practice, where images acquired with a different scanner model or in a different hospital often have slightly different appearance. This project investigates novel *transfer learning* techniques to develop image analysis tools that can share information between databases with different image characteristics and can perform consistently across sites, imaging protocols, scanner models, or even imaging modalities. Applications in different medical imaging problems will be studied, a.o. brain, lung, and bone imaging.  *Fig 1. MR brain scans acquired with similar settings may still look quite different, causing automated analysis techniques to fail.*
Requirements of candidate:	Background: You should have a Master's degree in physics, electrical engineering, mathematics, biomedical engineering, computer science, or a related field. Experience with biomedical image analysis and/or machine learning is an advantage. You should be familiar with programming. Strong theoretical skills and affinity with experimental work are required. Master degree: Yes IELTS Grade: 7.0 *(minimal 6.0 per component)* *or* TOEFL: *100 (minimal 20 per component)*

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Supervisor information:	Associate Professor Marleen de Bruijne marleen.debruijne@erasmusmc.nl http://bigr.nl/people/MarleendeBruijne Marleen de Bruijne is associate professor of medical image analysis at Erasmus MC, The Netherlands, and at the University of Copenhagen, Denmark. She received an MSc degree in physics (1997) and a PhD degree in medical imaging (2003), both from Utrecht University. Before joining the University of Copenhagen (2007) and Erasmus MC (2008) she was assistant professor and later associate professor at the IT University of Copenhagen. Marleen currently supervises 7 PhD students and has supervised 9 PhD students who successfully defended their theses in the past few years. She has (co-)authored over 140 peer-reviewed full papers in international conferences and journals and 18 patent applications. She was a member of the program committee of many international conferences in medical imaging and computer vision, associate editor for Image and Vision Computing and Medical Physics, and is a member of the editorial board of Medical Image Analysis. Her research interests are model based and quantitative analysis of medical images with applications a.o. in lung, brain, cardiac, and vascular imaging. Below a selection of papers published in 2014 is given, a full publication list is available from http://bigr.nl/people/MarleendeBruijne • H. C. Achterberg; F. van der Lijn; T. den Heijer; M. W. Vernooij; M. A. Ikram; W. J. Niessen & M. de Bruijne, Hippocampal shape is predictive for the development of dementia in a normal, elderly population., Human Brain Mapping, 2014 • N. Baka; B. Kaptein; J. Giphart; M. Staring; M. de Bruijne; B. Lelieveldt & E. R. Valstar, Evaluation of automated statistical shape model based knee kinematics from biplane fluoroscopy, Journal of Biomechanics, 2014 • V. Cheplygina; L. Sorensen; D. M. Tax; J. H. Pedersen; M. Loog & M. de Bruijne, Classification of COPD with Multiple Instance Learning, 22nd International Conference on Pattern Recognition (ICPR) 2014 • P. Ciet; P. Wielopolski; R. Manniesing; S. Lever; M. de Bruijne; G. Morana; P. Muzzio; M. Lequin & H. Tiddens, Spirometer controlled cine-magnetic resonance imaging to diagnose tracheobronchomalacia in pediatric patients, European Respiratory Journal,2014 • A. van Engelen; W. Niessen; S. Klein; H. Groen; H. Verhagen; J.

	Wentzel; A. van der Lugt & M. de Bruijne, Atherosclerotic plaque component segmentation in combined MRI and CTA Data incorporating class label uncertainty, PLoS ONE,2014 • A. van Engelen; T. Wannarong; G. Parraga; W. Niessen; A. Fenster; J. Spence & M. de Bruijne, Three-dimensional carotid ultrasound plaque texture predicts vascular events, Stroke,2014 • J. Petersen; M. Nielsen; P. Lo; L. H. Nordenmark; J. H. Pedersen; M. M. W. Wille; A. Dirksen & M. de Bruijne, Optimal surface segmentation using flow lines to quantify airway abnormalities in chronic obstructive pulmonary disease., Medical Image Analysis,2014 • J. Petersen; M. Wille; L. Raket; A. Feragen; J. Pedersen; M. Nielsen; A. Dirksen & M. de Bruijne, Effect of inspiration on airway dimensions measured in maximal inspiration CT images of subjects without airflow limitation, European Radiology, 2014 • R. Tennakoon; A. Bab-Hadiashar; Z. Cao & M. de Bruijne, Non-rigid Registration of Volumetric Images Using Ranked Order Statistics, IEEE Transactions on Medical Imaging, 2014 • G. van Tulder & M. de Bruijne, Learning Features for Tissue Classification with the Classification Restricted Boltzmann Machine, MICCAI 2014 Workshop on Medical Computer Vision: Algorithms for Big Data,2014