Thijs Kooi

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Summary

I am a machine intelligence engineer at Merantix working on medical applications of artificial intelligence, in particular deep learning. Prior to that, I obtained a Ph.D. in computer science from the Diagnostic Image Analysis Group in the Netherlands, an M.Sc. in artificial intelligence from the University of Amsterdam and a B.Sc. in the same field from the University of Groningen. I did internships and held visiting research positions at the Johns Hopkins University, The National University of Singapore and Keio University in Japan. I have a solid eight year background in machine learning and three years hands-on experience with deep learning using very big image datasets. Additionally, I have six years of experience with (medical) image analysis and computer vision techniques, ranging from feature extraction and image enhancement to tracking and registration algorithms.

Education

- Ph.D. in computer science. Radboud University.
  Thesis: *Computer aided diagnosis of breast cancer in mammography using deep neural networks*

- M.Sc. in Artificial Intelligence, University of Amsterdam. *(Cum Laude)*
  Thesis: *Rigid surface tracking for spatial augmented reality*

- B.Sc. in Artificial Intelligence, University of Groningen.
  Thesis: *Region enhanced neural Q-learning in partially observable markov decision processes*

Other degrees and certificates

I took part in the machine learning summer school (MLSS) 2016 (acceptance rate 30%), the deep learning summer school at the DTU 2015 and the biomedical image analysis summer school in Paris, 2013. Additionally, I have a summer school degree in Mandarin Chinese from Jiao Tong University in Shanghai, a language certificate in Japanese from Leiden university and a propaedeutic degree in arts, culture and media from the University of Groningen.

Work and research experience

- 2017 - present **Merantix** I work as a machine intelligence engineer at one of Europe's leading deep learning companies and am responsible for medical image analysis applications.

- 2013 - 2017 **Department or Radiology/Department of Computer Science, Radboud University**
  I developed advanced machine learning, mostly deep learning, methods to detect breast cancer in mammography. We worked with very large medical datasets and in an interdisciplinary team of technical and medical experts. My approach improved upon an algorithm that was considered state-of-the art for several decades and has led to several high impact publications.

- February 2016 - October 2016 **Department of Computer Science, Johns Hopkins University**
  I was hosted by Prof. Suchi Saria from the machine learning group and Prof. Jerry Prince from the medical imaging group. We worked on a conditional random field to model interactions between regions of interest and several other sources of context information. I actively participated in seminars and audited a machine learning course. The project is still ongoing but an early draft of the paper is ready.

- Oct 2012 - April 2013 **Department of Machine Learning/A*STAR Bioinformatics institute, National University of Singapore**
Together with a neuroscience department from the Duke-NUS neuroscience partnership, I designed tracking and interpretation algorithms to perform behavioral phenotyping of lab mice, using the Kinect, a low cost commodity depth sensor. I worked with mixture models for tracking and a hidden Markov model to interpret the sequences.

- January 2012 - August 2012 **Department of Computer Science, Keio University**
For my M.Sc. thesis research I visited Prof. Hideo Saito's lab, the leading lab in Japan on augmented reality and was supervised remotely by Prof. Theo Gevers. The project entailed tracking a surface under difficult circumstances, for which I proposed to use color descriptors based on a physics model, invariant to these conditions and evaluated several tracking algorithms. The project ended in a publication at a dedicated workshop (acceptance rate 18%) at the Asian Conference on Computer Vision (ACCV).

- September 2009 - March 2010 **Department of Computer Science, University of Groningen**
For my B.Sc. thesis research, we worked on a new POMDP algorithm based on neural networks. The project ended in a publication at the IJCNN 2012 and was graded a 9.5 out of 10.

Technical skills

I have a solid Python, C++, Matlab, Linux and Git/SVN background and have worked extensively with TensorFlow, Theano, Scikit-Learn, Shogun, Boost and Armadillo.

Languages and background

I speak Dutch and English on a (near) native level. Additionally, I have limited working proficiency in German and French and elementary proficiency in Spanish, Mandarin Chinese and Japanese. I have Dutch (The Netherlands), thus EU, citizenship.

Other activities

I reviewed several papers for IEEE Transactions on Medical Imaging, Elsevier Medical Image Analysis, the SPIE Journal of Medical Imaging, Medical Physics and JAMA oncology. I co-organized the first CIFAR Workshop on Deep learning in Medical Imaging (Together with Bram van Ginneken, Max Welling, Francesco Ciompi and Geert Litjens) in Amsterdam and worked as a volunteer at the European Conference on Computer Vision (ECCV) 2016 in Amsterdam. During my bachelor degree, I worked as a TA for three years for introductory AI and computational linguistics courses and worked as a TA for a graduate course on computer aided diagnosis during my Ph.D.

Selected publications

- *G. Litjens*, *T. Kooi*, *B. Ehteshami Bejnordi*, *A. Setio*, *F. Ciompi*, *M. Ghafoorian*, *J. van der Laak*, *B. van Ginneken*, *C. Sánchez* - A Survey on Deep Learning in Medical Image Analysis, Medical Image Analysis, 2017

- *T. Kooi*, *G. Litjens*, *B. van Ginneken*, *A. Gubern-Merida*, *C. Sanchez*, *R. Mann*, *A. den Heeten* and *N. Karssemeijer* - Large Scale Deep Learning for the Classification of Mammographic Lesions - Medical Image Analysis, 2017

- *T. Kooi* and *N. Karssemeijer* - Classifying Symmetrical Differences and Temporal Change for the Detection of Malignant Masses in Mammography Using Deep Neural Networks - Journal of Medical Imaging (Accepted), 2017

- *T. Kooi*, *B. van Ginneken*, *A. den Heeten* and *N. Karssemeijer* - Discriminating Solitary Cysts from Soft Tissue Lesions in Mammography using a Pretrained Deep Convolutional Neural Network - Medical Physics, 2017

- *T. Kooi*, *F. de Sorbier* and *H. Saito*. Colour Descriptors for Tracking in Spatial Augmented Reality, ACCV workshop on Detection and Tracking in Challenging Environments, Daejeon, Korea, 2012. (Master thesis)

- *M.A. Wiering* and *T. Kooi*. Region Enhanced Neural Q-learning for Solving Model Based POMDPs. International Joint Conference on Neural Networks, Barcelona, Spain, 2010. (Bachelor thesis)