Jan Hendrik METZEN

Curriculum vitae

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Personal Information

Date of Birth	8th January 1981
Civil Status	Married, one daughter (age: 6 month)
Nationality	German
Driving License	Class B

Education

11/2009 - 02/2014 **Dr.rer.nat.**, University Bremen, Germany
Title: "Learning the Structure of Continuous Markov Decision Processes"
Grade: Magna cum laude
Advisor: Prof. Dr. Frank Kirchner

10/2001 - 07/2006 **Diploma** in Computer Science, University Münster, Germany
Grade: sehr gut (0.8)
Thesis title "Matching von Baumstrukturen in der medizinischen Bildverarbeitung"
Advisor: Prof. Dr. Xiaoyi Jiang

Professional Experience

11/2009 - current Research assistant
Robotics Research Group, University of Bremen

07/2007 - 10/2009 Researcher
Robotics Innovation Center, German Research Center for Artificial Intelligence (DFKI RIC, Bremen)

09/2006 - 06/2007 Research assistant
Robotics Research Group, University of Bremen

Leading and Management Experience

08/2014 - current Project leader "CASCADE: Cognitive AutonomouS CAtheters operating in Dynamic Environments",
Robotics Research Group, University Bremen

01/2013 - current Team leader "Sustained Learning",
Robotics Innovation Center, German Research Center for Artificial Intelligence (DFKI RIC, Bremen)

01/2008 - current Organizer of workgroup "Machine Learning and Optimization"
Robotics Research Group, University Bremen

Awards and Grants

2004 - 2006 **Scholarship** of "Studienstiftung des Deutschen Volkes" (German National Academic Foundation)

Skills

Spoken languages	German (mother tongue), English (fluent), Spanish (basic)
Programming languages	Python, C++, Cython, Julia
Software Packages	MS Office/Libre Office, LaTeX, revision control software (SVN, git, mercurial), painting and graphics software (Gimp, Inkscape), machine learning tools (scikit-learn, caffe, theano), computer vision (scikit-image, OpenCV)

Research Foci

Robot Control Learning
I am developing and extending methods from the domain of reinforcement learning (relevant publications) and evolutionary computation (relevant publications) for learning locomotion and manipulation behaviors of mobile robots. In particular, developing methods for decomposing complex problems into simpler subproblems and developing learning algorithms which combine policy search with active and multi-task learning have been foci of my work. I have conducted this work as part of the project BesMan.

BCIs
My work in Brain Computer Interfaces (BCIs) was focused on using supervised machine learning techniques to detect certain patterns in a human's electroencephalogram (EEG) that indicate that the human has perceived and recognized important messages that have been presented to him or that he intends to execute a movement shortly. My work in the VI-Bot and IMMI projects was focused mainly on developing supervised learning algorithms that allow detecting these patterns with a minimum amount of labeled training data from the current user by reusing data from historic sessions of the same and other users (Relevant publications).

Biomedical Pattern Recognition
Identifying patterns in biomedical data has been one focus of my work. Besides the work on BCIs, I have also developed novel graph-based methods for the matching of anatomical trees of liver and lung extracted from medical images recorded using CT and MRI, which allow the registration of several medical images of the same organ that have been recorded using different modalities or at different points in time (relevant publications). More currently, within the project Cascade, we have applied oversegmentation and supervised machine learning approaches to detect aortic calcifications and bifurcations in intravascular ultrasound (IVUS) and CT recordings.

Deep Learning
Together with colleagues, I am currently developing deep learning methods for detecting objects in RGB images of unstructured environments and for identifying suitable grasp poses for robotic manipulators based on RGB-D data. For this, a set of candidate regions in images which may contain objects is generated based on a heuristic and each of these regions is then classified using a deep neural network into different object categories. Another neural network is used to classify different grasp pose candidates for the detected objects into feasible and not feasible for a robotic gripper.

Scientific Publications

A list of my scientific publications is available on my official website. See also my Google Scholar page.

Industry Projects

12/2007 - 02/2008	PAHMIR: Application of time series analysis and machine learning for failure prediction (for Airbus Deutschland GmbH)

Talks

10/2015	"(Deep) Machine Learning - An Introduction, Soft- and Hardware Frameworks and Applications", 6. Tag der Sofwareentwicklung, Audi Electronics Venture GmbH
05/2015	Organizer and Lecturer of Robocademy Course "NT3 – Machine Learning for Autonomous Robots". Given a lecture on "Reinforcement Learning" for a class of 15 PhD students from different European countries; organized four lectures and four exercises on different areas of supervised, unsupervised, and reinforcement learning.

Open Source Software

I regularly contribute to open source machine learning software in the following projects:

BOLeRo **Core contributor**. BOLeRo provides tools to learn behaviors for robots. That includes behavior representations as well as reinforcement learning, black-box optimization, and evolutionary algorithms and imitation learning. It provides a C++ and a Python interface to be efficient where this is required and to be flexible and convenient where performance is not an issue. Because the library provides a C++ interface, it is easy to integrate in most robotic frameworks, e.g. the robot operating system (ROS) or the robot construction kit (Rock).

scikit-learn **Contributor**. scikit-learn is the de-facto standard tool for machine learning in the scientific Python tool stack. It is widely used in academia and industry. I have contributed tools for probability calibration of classifiers and for kernel ridge regression to scikit-learn. Moreover, I have written a complete redesign of the Gaussian process module in this pull request, which will most likely be contained in version 0.18 of scikit-learn.

pySPACE **Core contributor**. pySPACE is a Signal Processing And Classification Environment (SPACE) written in Python interfacing to the user with YAML configuration files and enabling parallel process execution. pySPACE allows rapid specification, execution, and analysis of empirical investigations (short: benchmarking) in signal processing and machine learning. Besides the benchmarking way of executing pySPACE where you can evaluate your data with your own configuration of algorithms, the software also provides an on-line mode where you can directly execute signal processing as soon as you have the data in an on-line fashion. For more information, please refer to our paper published in the research topic “Python in Neuroscience II” in the Frontiers in Neuroinformatics journal.

MMLF **Lead developer**. The Maja Machine Learning Framework (MMLF) is a general framework for problems in the domain of Reinforcement Learning (RL) written in python. It provides a set of RL related algorithms and a set of benchmark domains. Furthermore it is easily extensible and allows to automate benchmarking of different agents. Among the RL algorithms are TD(lambda), CMA-ES, Fitted R-Max, Monte-Carlo learning, the DYNA-TD and the actor-critic architecture. MMLF contains different variants of the maze-world and pole-balancing problem class as well as the mountain-car testbed and the pinball maze domain.

Scientific Community

2015 Reviewer of the Artificial Intelligence journal

2015 Scientific Program Committee of the International Symposium on Intelligent Computing Systems (ISICS 2016)

2014 Reviewer of the Scientific Reports journal of the Nature publisher

2013 Reviewer of the Frontiers in Cognitive Science journal

2013-2014 Reviewer of the Journal of Machine Learning Research (JMLR)

2012 Program committee of 5th International Workshop on Evolutionary and Reinforcement Learning for Autonomous Robot Systems (ERLARS 2012)

2009 Reviewer of the Image and Vision Computing Journal (IVC)

University Teaching

SS 2015 Reinforcement Lernen

WS 2014 Lernverfahren für autonome Roboter

SS 2014 Reinforcement Lernen

WS 2013 Lernverfahren für autonome Roboter

SS 2013 Reinforcement Lernen

WS 2012 Lernverfahren für autonome Roboter

SS 2012	Reinforcement Lernen
WS 2012	Lernverfahren für autonome Roboter
SS 2011	Reinforcement Lernen
WS 2011	Maschinelles Lernen für autonome Roboter 2
SS 2010	Maschinelles Lernen für autonome Roboter 1
WS 2010	Maschinelles Lernen für autonome Roboter 2

Supervised Student Theses

Diploma theses:

08/2009	KOMBeR - Koevolutionäre Optimierung der Morphologie und Bewegung von Robotern

Master theses:

ongoing	Contextual Policy Search for Ball-Throwing on a Real Robots
05/2015	Crossing the “Reality Gap” with the Transferability Approach
10/2013	Adaptive Variational Bayesian Approaches For Brain-Computer Interfaces
10/2011	Analysis of Transfer Techniques in Reinforcement Learning and Application to the BRIO Labyrinth Game
03/2009	Minimierung und Untersuchung des Simulation-Reality-Gaps anhand eines BRIO Labyrinth-Spiels
02/2009	Combination of the neuroevolutionary method EANT with Q-Learning and CMA-ES

Bachelor theses:

08/2009	Evaluation of Exploration Algorithms in Reinforcement Learning

Personnel Development

09/2012	Seminar “Starke Stimme - starker Auftritt - Selbstpräsentation”, University Bremen
03/2011	Seminar “Rhetorik 1- Frei sprechen und überzeugend argumentieren”, University Bremen
03/2010	Seminar “Projektmanagement”, Geue Coaching & Consulting KG