

# Patrick Kugler

---

**Address:** Gebbertstr. 70  
91052 Erlangen  
GERMANY

Phone: +49 (0)9131 9743884  
Mobile: +49 (0)170 93 45 006  
patrick.kugler@cs.fau.de

**Nationality:** German

**Date of birth:** January 26th, 1983

## Education

**PHD program** 03/2009 – now

*Friedrich-Alexander-University Erlangen-Nuremberg, GERMANY*

*PHD student in the Computer Vision and Digital Sports Group at the Pattern Recognition Lab*

Industry project in close collaboration with the adidas AG, Herzogenaurach.

Topics: Application of algorithms from pattern recognition and machine learning to biomechanics and human motion. Research includes inertial sensors, body sensor networks, smartphone based real-time feedback, embedded classification systems and predictive dynamic multi body simulations.

**Masters program** 10/2003 – 01/2009

*Friedrich-Alexander-University Erlangen-Nuremberg, GERMANY*

*Computer Science major, Astrophysics minor*

01/2009 Diplom (Master of Science), grade 1.1, with honors

Diplomarbeit (master thesis):

Support Vector Classification of EMG intensity patterns using optimized kernel (grade 1.3)

Studienarbeit (study thesis):

GPU-Particle-Visualization of Diffusion-Tensor-Data (grade 1.0)

Main Courses and Final Exams:

R2D2 - project to build a robot that can find and classify objects using computer vision

ROBOCUP - development of a real-time computer vision system for autonomous soccer robots

real time systems lab (grade 1.0)

operating systems and real time systems (grade 1.3)

computer graphics and interactive computer graphics (grade 1.0)

finite fields and public key cryptography (grade 1.0)

astrophysics and x-ray astronomy (grade 1.0)

11/2005: Vordiplom (pre-degree examination), grade 1.2, best exam in class

**High School** 10/1993 – 07/2002

*Benedikt-Stattler-Gymnasium Bad Kötzing, GERMANY*

Mathematical/scientific branch, major in *Mathematics* and *Economics*

06/2001: Abitur (high school diploma), grade 1.3, best exam in class

**Primary School** 10/1989 – 09/1993

*Grundschule Blaubach, GERMANY*

05/1993: Übertrittszeugnis (primary school certificate), grade 1.7

# Research Experience

## Journal Publications

Klucken, Jochen; Barth, Jens; Kugler, Patrick; Schlachetzki, Johannes; Henze Thore; Marxreiter, Franz; Kohl, Zacharias; Steidl, Ralph; Hornegger, Joachim; Eskofier, Bjoern; Winkler, Juergen: *Unbiased and Mobile Gait Analysis Detects Motor Impairment in Parkinson's Disease*. PLoS ONE, 8(2):e56956, 2013.

Eskofier, Bjoern; Federolf, Peter; Kugler, Patrick; Nigg, Benno: *Marker-based classification of young-elderly gait pattern differences via direct PCA feature extraction and SVMs*. Computer Methods in Biomechanics and Biomedical Engineering, doi:10.1080/10255842.2011.624515, 2011.

Stirling, Lisa M.; von Tscharnner, Vinzenz; Kugler, Patrick; Nigg, Benno M.: *Piper rhythm in the activation of the gastrocnemius medialis during running*. Journal of Electromyography and Kinesiology, 21(1):178-183, 2011.

Stirling, Lisa M.; von Tscharnner, Vinzenz; Kugler, Patrick; Nigg, Benno M.: *Classification of muscle activity based on effort level during constant pace running*. Journal of Electromyography and Kinesiology, 21(4):566-571, 2011.

Klucken, Jochen; Barth, Jens; Maertens, Katharina; Eskofier, Bjoern; Kugler, Patrick; Steidl, Ralph; Hornegger, Joachim; Winkler, Juergen: *Mobile biometrische Ganganalyse*. Der Nervenarzt, 82(12):1604-1611, 2011.

Huber, Cora; Goepfert, Beat; Kugler, Patrick; von Tscharnner, Vinzenz: *The Effect of Sprint and Endurance Training on Electromyogram Signal Analysis by Wavelets.*, Journal of Strength and Conditioning Research, 24(6):1527-1536, 2010.

## Selected Conference Publications

Kugler, Patrick ; Nordhus, Philipp ; Eskofier, Bjoern : *Shimmer, Cooja and Contiki: A New Toolset for the Simulation of On-node Signal Processing Algorithms*. Proc. of the 10th Annual IEEE Body Sensor Networks Conference (BSN 2013), Boston, 2013.

Kugler, Patrick; Schlachetzki, Johannes; Schramm, Axel; Winkler, Jrgen; Klucken, Jochen; Eskofier, Bjrn: *Automated classification of Parkinson's disease and Essential Tremor by combining electromyography and accelerometer signals*. Basal Ganglia, 3(1):61, 2013.

Kugler, Patrick ; Jaremenko, Christian ; Schlachetzki, Jochen ; Winkler, Juergen ; Klucken, Jochen ; Eskofier, Bjoern : *Automatic Recognition of Parkinsons Disease Using Surface Electromyography During Standardized Gait Tests*. Proc. of the 36rd Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC 2013), Osaka, 2013.

Kugler, Patrick ; Lades, Felix ; von Tscharnner, Vincent ; Eskofier, Bjoern : *Real-time Analysis of EMG Signals Using Non-linearly Scaled Wavelets on Mobile Devices*. Proc. of the 19th Congress of the European Society of Biomechanics (ESB 2013), Patras, 2013.

Kugler, Patrick; Schlarb, Heiko; Joerg, Blinn; Picard, Antoni; Eskofier, Bjoern: *A Wireless Trigger for Synchronization of Wearable Sensors to External Systems during Recording of Human Gait*. Proceedings of the 34rd Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC2011), Boston, MA, USA, September 2011.

Kugler, Patrick; Jensen, Ulf; Eskofier, Bjoern: *Recording and Analysis of Biosignals on Mobile Devices*. 9. Symposium der dvs-Sektion Sportinformatik, Konstanz, September 2012.

Schuldhuis, Dominik; Kugler, Patrick; Leible, Magnus; Jensen, Ulf; Schlarb, Heiko; Eskofier, Bjoern: *Classification of Surfaces and Inclinations During Outdoor Running Using Shoe-Mounted Inertial Sensors*. Proceedings of the 21st International Conference on Pattern Recognition (ICPR2012), Tsukuba, Japan, 2012.

Eskofier, Bjoern; Kugler, Patrick; Melzer, Daniel; Kuehner, Pascal: *Embedded Classification of the Perceived Fatigue State of Runners: Towards a Body Sensor Network for Assessing the Fatigue State during Running*. 9th International Conference on Wearable and Implantable Body Sensor Networks (BSN), London, UK, 2012.

Kugler, Patrick; Schuldhaus, Dominik; Jensen, Ulf; Eskofier, Bjoern: *Mobile Recording System for Sport Applications*. Proceedings of the 8th International Symposium on Computer Science in Sport (IACSS2011), Shanghai, China, September 2011.

Kugler, Patrick ; von Tscharnner, Vinzenz ; Eskofier, Bjoern ; Hornegger, Joachim: *Visualization of Changes in Muscular Activation during Barefoot and Shod Running*. In: Proceedings of the 17th Congress of the European Society of Biomechanics, Edinburgh, 2010.

### Invited Talks

Kugler, Patrick ; van den Bogart, Ton: *Predictive Simulation of Human Running*. at Neuromuscular Biomechanics Lab, Stanford University (OpenSIM Advanced Users Workshop) in Stanford, CA, USA, 2013.

Kugler, Patrick ; Jensen, Ulf: *Tools and Application Examples for Embedded Classification using Shimmer*. at MIT, Cambridge (Workshop at the 10th Annual Body Sensor Networks Conference 2013) in Boston, MA, USA, 2013.

Kugler, Patrick ; von Tscharnner, Vincent: *Non-Linear Pattern Recognition for Classification of EMG-Signals*. at Human Performance Lab, University of Calgary (Musculoskeletal Seminar Series) in Calgary, Canada, 2008.

### Diplomarbeit (master thesis)

07/2008 – 01/2009

*Human Performance Laboratory, University of Calgary, CANADA*

*Chair of Pattern Recognition, University of Erlangen-Nuremberg, GERMANY*

Working on the topic “Support Vector Classification of EMG intensity patterns using optimized kernel“. Main research interest: Developing of new analysis methods for muscular activation with applications in sport research, industry and medicine.

Supervisors: Prof. Dr. Joachim Hornegger, Prof. PhD Vincent von Tscharnner, Dipl.-Ing. Björn Eskofier

## International Experience

### Visiting Scholar

09/2013

*Neuromuscular Biomechanics Laboratory*

*Stanford University, USA*

Participation at the OpenSIM advanced users workshop and visiting scholar at the lab of Prof. Scott Delp.

### Research Internship

05/2008 – 11/2008

*Human Performance Laboratory*

*University of Calgary, CANADA*

Research internship during master thesis working on EMG analysis in the group of Prof. Dr. Benno Nigg.

## Teaching Experience

### Lecture/Seminar Digital Sports

Assistance in conception of a new graduate level course for sports signal analysis.

### Lecture Biosignal Analysis

Assistance in conception and stand-in lecturing of the graduate level engineering course *Biosignal Analysis*.

### Exercise Biosignal Analysis

Independent conception and supervision of the exercise for *Biosignal Analysis*.

### Seminar Android Apps for Sensor Networks

Independent conception and supervision of the seminar *Android Apps for Sensor Networks*, a highly successful and popular graduate level course where students work on own small projects with sensors.

### Teaching Assistant

Teaching Assistant for various undergraduate courses (*Introduction to Algorithms, Mathematics*)

## Awards and Scholarships

### ESB travel award

Travel award by the European Association of Biomechanics to present the paper *Real-time Analysis of EMG Signals Using Non-linearly Scaled Wavelets on Mobile Devices* at the 2013 ESB conference in Patras, Greece.

### DAAD travel scholarships

Awarded two short-time scholarships by the German Academic Exchange Service (Deutscher Akademischer Austauschdienst, DAAD) providing funding to present papers at conferences in China and Japan.

### DAAD short-term scholarship

Awarded a short-time scholarship by the German Academic Exchange Service (Deutscher Akademischer Austauschdienst, DAAD) providing funding to work at the Human Performance Laboratory at the University of Calgary, Canada

### Research scholarship

Awarded a short-time scholarship by the University of Erlangen-Nuremberg in cooperation with the Adidas GmbH providing funding to work at the Human Performance Laboratory at the University of Calgary, Canada

### Leonardo Kolleg

Awarded membership in the support-program for top students of the University of Erlangen-Nuremberg, the “*Leonardo Kolleg*”. Main aim of this program is to provide interdisciplinary seminars, talks with prominent persons from industry and science as well as trips to conferences and cultural events.

### Preis für die beste Vordiplomsprüfung

Best pre-degree exam in class

### MLP-Förderpreis

MLP-Award for outstanding performance in the lecture “*Algorithms I*”

### e-fellows.net

Prize awarded for excellent Abitur

## Memberships

<b>IEEE</b> Institute of Electrical and Electronics Engineers, Inc.	12/2008 – Present
<b>IEEE Societies</b> Engineering in Medicine and Biology Society, Computing Society, Signal Processing Society	06/2012 – Present
<b>ESB</b> European Society of Biomechanics	07/2010 – Present
<b>ISB</b> International Society of Biomechanics	10/2008 – Present
<b>VDI (Verband deutscher Ingenieure e.V.)</b> German association for engineers	12/2007 – Present
<b>GI (Gesellschaft für Informatik e.V.)</b> German association for computer science	03/2007 – Present
<b>ACM (Association for Computing Machinery)</b> International association for computer science	02/2007 – Present

## Extracurricular Activities

### **Robotics Erlangen e.V.**

11/2007 – Present

Foundation member and president of the Erlangen Robotic Activities, a club dedicated for development and research on robotic topics in cooperation with the University of Erlangen-Nuremberg. The club's aim is to organize teams for the participation at *ROBOCUP* or similar robotic competitions and to focus the research of the university and industry about autonomous robots.

### **Automobilsporclub Bad Kötzing e.V.**

04/2005 – Present

Member of the executive board and youth group treasurer of the Motorsport Association Bad Kötzing, which is a registered co-association of the ADAC (the german automotive society). Activities as co-organizer of many motorsport events (like the "Bayerwald-Rallye") and road safety educations.

## Skills and Interests

astronomy, photography, cinema, biking, hiking, reading, computer games

Languages: German (native), English (very good), Latin (5 years), Japanese (university course)

full clean driving license

## References

### **Prof. Dr.-Ing. Joachim Hornegger**

Pattern Recognition Lab, University of Erlangen-Nuremberg  
hornegger@informatik.uni-erlangen.de

### **Prof. Dr. Björn Eskofier**

Pattern Recognition Lab, University of Erlangen-Nuremberg  
bjoern.eskofier@informatik.uni-erlangen.de

### **Dr. Berthold Krabbe**

Regional Head of Research & Testing, adidas AG, Herzogenaurach  
berthold.krabbe@adidas.com

### **Prof. Dr. Benno Nigg**

Human Performance Laboratory, University of Calgary, Canada  
nigg@ucalgary.ca

### **Prof. PhD Vincent von Tscharner**

Human Performance Laboratory, University of Calgary, Canada  
vincent@kin.ucalgary.ca

### **Prof. Dr. Ton van den Bogert**

Cleveland State University, Cleveland, Ohio, USA  
bogert@orchardkinetics.com

### **Prof. Dr.-Ing. Marc Stamminger**

Institute of Computer Graphics, University of Erlangen-Nuremberg  
marc.stamminger@informatik.uni-erlangen.de

*More references upon request.*