

Curriculum Vitae

PERSONAL INFORMATION

Dr. Stefan Fürtinger

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Gender Male | Date of birth March 22nd 1983

Nationality Austria



EMPLOYMENT

Since Jan 2018

Independent Scientific Consultant

Fuertinger Scientific Consulting, Frankfurt am Main (Germany)

Data-Mining and Pattern Recognition for Big Data Applications

I use experimental machine-learning techniques in combination with stochastic optimization schemes to identify patterns in natural language texts.

Software-Development and Optimization

I design and implement novel algorithmic strategies to optimize the run-time performance of computationally demanding numerical operations in high-performance computing environments.

Jan 2017 – Dec 2017

Research Scientist

Ernst Strüngmann Institute for Neuroscience in Cooperation with Max-Planck Society
Frankfurt am Main (Germany)

Mathematical Modeling of Complex Dynamical Systems

I designed and implemented a detailed computer model based on a system of non-linear stochastic differential equations for simulating brain activity during speech production.

High-Performance Computing

I worked on special implementations of novel graph partitioning strategies custom-tailored to high-performance clusters for the purpose of detecting modular patterns in unstructured large-scale networks.

May 2013 – Dec 2016

Postdoctoral Research Fellow

Icahn School of Medicine at Mount Sinai
New York, NY (USA)

Visualization of Complex Networks

I developed novel techniques to visualize high-density networks to illustrate complex relations in the topology of large-scale networks. Some of my visualizations have been published on the [Website](#) of the London Institute of Medical Sciences.

Initiation and Management of Inter-Disciplinary Research Projects

I have established cooperations with clinical practitioners, directed the coordinated integration of multimodal patient recordings across multiple different sources into a single data archiving architecture and acted as scientific mentor of numerous students across multiple research projects.

Apr 2013 – Nov 2014 **Scientific Consultant**

Renal Research Institute
New York, NY (USA)

- Design and implementation of a graphical multi-platform application for visualization of anonymized longitudinal patient data

Dec 2009 – Nov 2012 **Research Associate**

Special research center for Mathematical Optimization and Applications in Biomedical Sciences
Karl–Franzens University Graz (Austria)

- Inter-disciplinary research work in the area of mathematical imaging for real-world applications in nuclear medicine and radiology
- Design and implementation of an algorithmic strategy for segmentation and successive registration of dynamic contrast-enhanced magnetic resonance image recordings of the human abdominal region

Sep 2011 – May 2012 **Mathematics Lecturer**

FH Joanneum University of Applied Sciences
Kapfenberg (Austria)

- Lecturer for mathematics in the qualification course for university entrance

EDUCATION AND
TRAINING

2009–2012 **Ph.D. in Applied Mathematics**

Thesis Title: *An Approach to Computing Binary Edge Maps for the Purpose of Registering Intensity Modulated Images*

Institut für Mathematik und Scientific Computing
Karl–Franzens University Graz (Austria)

- Modern techniques for mathematical image processing
- Parallel programming
- Numerical methods for solving partial differential equations
- Applied functional analysis

2005–2009 **M.Sc. in Numerical Mathematics and Modeling**

Thesis Title: *Comparison of Cardiovascular Control Mechanisms under Orthostatic Stress*

Institut für Mathematik und Scientific Computing
Karl–Franzens University Graz (Austria)

- Numerical strategies for solving linear and non-linear equation systems
- Techniques for solving constrained and unconstrained optimization problems
- Analysis of dynamical systems
- Mathematical modeling of processes in biology and physics
- Theoretical principles of modern numerical analysis and linear algebra

2002–2005 **Pre-Diploma in Mathematics and Philosophy (Teacher Training)**

Karl–Franzens University Graz (Austria)

- Fundamentals of University-level mathematics
- Principles of educational theory and teaching
- Basic concepts of modern psychology and philosophy

PERSONAL SKILLS

Mother tongue German

Additional Languages English (Fluent)

Communication Skills

- Many years of experience working in multi-disciplinary research teams both in Europe and the US
- Successful track-record of working with international experts from various backgrounds in academia as well as the private sector
- Public speaking experience through numerous talks for scientific and general audiences as well as teaching experience with adults and teenagers

Organisational and Managerial Skills

- Several years of practical experience designing, managing and directing complex research projects
- Successful coordination of long-term projects with multiple inter-disciplinary collaboration partners
- Multiple years of experience training and mentoring undergraduate and high-school students
- Practical knowledge of writing and managing grant applications for research funding

Computational Working Environment

- Extensive knowledge and multiple years of practical experience working with the following programming languages:
 - **Python** including the packages *NumPy*, *SciPy*, *Matplotlib*, *Pandas*, *Cython*, *TensorFlow*, *scikit-learn* and *Plotly*
 - **MATLAB** including the *Optimization Toolbox*, *Statistics and Machine Learning Toolbox* and *Image Processing Toolbox*
 - **C** including the libraries *BLAS*, *LAPACK* and *SuiteSparse*
 - **R** including the packages *lme4*, *lsmmeans*, *coin* and *multcomp*
- Experienced using specialized data storage models for processing and archiving large complex datasets, such as *HDF5*
- Practical know-how of version control systems (mainly *Git*, previously *CVS* and *SVN*) for collaborative software development (public code library on [GitHub](#))
- Established team-wide coding and documentation standards and designed continuous integration pipelines (using, e.g., [Travis CI](#)) and testing suites (based on *pytest*) for automated quality control of large code repositories
- Routine use of kernel-level virtualization technologies (such as *Docker*) for sandboxing applications within containers to ensure software portability
- Multiple years of experience in system administration and maintenance of a variety of *Linux* distributions and *macOS* clients, professional user of *Windows*
- Well-versed using \LaTeX as well as all common Microsoft Office components
- Basic knowledge in *FORTRAN*, *C++*, *Mathematica* and *Perl*

ADDITIONAL INFORMATION

Awards and Recognition

- Supervisor of semifinalist Jacob Yatvitskiy in the nationwide *Regeneron Science Talent Search 2017*, he was named one of **300 Regeneron STS 2017 Scholars**
- Featured in the Wall Street Journal: *The Brain Wiring Behind a Frustrating Speech Disorder*
- Nominated by Icahn School of Medicine at Mount Sinai for the nationwide *Regeneron Prize for Creative Innovation 2016* with the research proposal: *Optimal Control of Epileptogenic Networks*
- Winner of the *2014 Travel Award of the Office of Postdoctoral Affairs* of the Icahn School of Medicine at Mount Sinai
- 3rd Place in the 6th *Annual Neuroscience Call for Images Competition* of the Icahn School of Medicine at Mount Sinai
- Supervisor of semifinalist Stephen Leong in the nationwide *Siemens Competition for Math:Science:Technology 2013* with the project *Correlation Networking of Speech Production: Examining the Brain with Comparative Graph Analysis*

Publications Peer-Reviewed

S. Fuertinger and K. Simonyan. Task-specificity in focal dystonia is shaped by aberrant diversity of a functional network kernel. *Movement Disorders*, in press.

S. Fuertinger, J. C. Zinn, A. D. Sharan, F. Hamzei-Sichani, and K. Simonyan. Dopamine drives left-hemispheric lateralization of neural networks during human speech. *Journal of Comparative Neurology*, 526(5):920–931, Apr 2018.

S. Fuertinger and K. Simonyan. Connectome-wide phenotypical and genotypical associations in focal dystonia. *Journal of Neuroscience*, 37(31):7438–7449, Aug 2017.

S. Fuertinger and K. Simonyan. Stability of network communities as a function of task complexity. *Journal of Cognitive Neuroscience*, 30:1–14, Aug 2016.

G. Battistella, **S. Fuertinger**, L. Fleysler, L. J. Ozelius, and K. Simonyan. Cortical sensorimotor alterations classify clinical phenotype and putative genotype of spasmodic dysphonia. *European Journal of Neurology*, Jun 2016.

S. Fuertinger, K. Simonyan, M. R. Sperling, A. D. Sharan, and F. Hamzei-Sichani. High frequency brain networks undergo modular breakdown during epileptic seizures. *Epilepsia*, 57:1097–1108, 2016.

G. Battistella, P. Termsarasab, R. A. Ramdhani, **S. Fuertinger**, and K. Simonyan. Isolated focal dystonia as a disorder of large-scale functional networks. *Cerebral Cortex*, Dec 2015.

S. Fuertinger, B. Horwitz, and K. Simonyan. The functional connectome of speech control. *PLoS Biology*, 13(7), Jul 2015.

K. Simonyan and **S. Fuertinger**. Speech networks at rest and in action: interactions between functional brain networks controlling speech production. *Journal of Neurophysiology*, 113(7):2967–2978, Apr 2015.

S. Fürtinger, J. C. Zinn, and K. Simonyan. A neural population model incorporating dopaminergic neurotransmission during complex voluntary behaviors. *PLoS Computational Biology*, 10(11), 2014.

J. J. Batzel, **S. Fürtinger**, and D. Schneditz. Modeling the effects of intra-abdominal hypertension. In W. Backfrieder, F. Longo, J. Rosen, A. Bruzzone, and V. Novak, editors, *Proceedings of I-WISH, 2012, The International Workshop on Innovative Simulation for Healthcare, Sep. 19–21 2012, Vienna, Austria*, pages 175–180, Rende, Italy, 2012. CAL-TEK SRL.

S. Fürtinger, S. L. Keeling, G. Plank, and A. J. Prassl. *Deformation Models: Tracking, Animation and Applications*, volume 7 of *Lecture Notes in Computational Vision and Biomechanics*, chapter Elastic Registration of Edges Using Diffuse Surfaces. Springer, 2012.

S. Fürtinger, S. L. Keeling, G. Plank, and A. J. Prassl. Elastic registration of edge sets by means of diffuse surfaces - with an application to embedding purkinje fiber networks. In Leonid Mestetskiy and José Braz, editors, *VISAPP*, pages 12–21. SciTePress, 2011.

S. Fürtinger. *Comparison of Cardiovascular Controls under Orthostatic Stress: Derivation, Simulation and Interpretation*. VDM Verlag Dr. Müller, 2010.

Technical Reports

S. Fürtinger, S. L. Keeling, G. Plank, and A. J. Prassl. Registration of edge sets for mapping a purkinje fiber network onto an endocardium. Technical report, Institute for Mathematics and Scientific Computing, Karl–Franzens University, Graz, Austria, 2010.

J. J. Batzel, **S. Fürtinger**, M. Bachar, M. Fink, and F. Kappel. Sensitivity identifiability of a baroreflex control system model. Technical report, Institute for Mathematics and Scientific Computing, Karl–Franzens University Graz, Austria, 2009.

D. Serschen, J. J. Batzel, **S. Fürtinger**, G. Gratze, and F. Skrabal. Analysis of data on control responses to orthostatic stress in healthy controls, iron man and marathon athletes, and patients with autonomic disturbances of the cardiovascular system. Technical report, Institute for Mathematics and Scientific Computing, Karl–Franzens University Graz, Austria, 2009.

S. Fürtinger, J. J. Batzel, and M. Fink. Investigating physiological controls of the cardiovascular system. Technical report, Institute for Mathematics and Scientific Computing, Karl–Franzens University Graz, Austria, 2007.