Curriculum Vitae

Name:	Dipl.-Ing. Dr. Max Haberbusch, BSc.
Position:	Postdoctoral Associate
Address:	Medical University of Vienna
	Center for Medical Physics and Biomedical Engineering
	Währingergürtel 18-20, AKH-4L
	1090 Vienna, Austria
E-mail:	max.haberbusch@meduniwien.ac.at
Phone:	+43 (0)1 40400 39820
Birth:	May 3, 1991, Wels, Austria

Education

2019 – 2023	Doctor of Philosophy in Biomedical Engineering, Medical University of Vienna, Vienna, Austria
2017 – 2019	Master of Science in Biomedical Engineering with distinction, Vienna University of Technology, Vienna, Austria
2012 – 2016	Bachelor of Science in Computer Science, University of Vienna, Vienna, Austria

Work Experience

2023 – present	Postdoctoral research associate in the field of neural engineering and cardiovascular dynamics at the Center for Medical Physics and Biomedical Engineering, Medical University of Vienna, Vienna, Austria
2019 – 2023	Doctoral candidate in the field of neural engineering and cardiovascular dynamics at the Center for Medical Physics and Biomedical Engineering, Medical University of Vienna, Vienna, Austria
2018 – 2019	Assistance in brain motor control assessment studies in paraplegic patients at the Center for Medical Physics and Biomedical Engineering, Medical University of Vienna, Vienna, Austria

Scientific Activities

- Modeling of biological systems with a focus on neural and cardiovascular applications
- Hemodynamic and electrophysiological measurements in in-vivo animal experiments and isolated hearts
- Statistical analysis and interpretation of physiological and biomedical sensor data, encompassing both pre-clinical (animal experiments) and clinical studies.
- Electrical nerve stimulation experiments in small and large animal in-vivo experiments
- Control engineering for biomedical applications

Students Supervised

PhD Theses

- Laurenz Berger (junior supervisor, Medical University of Vienna, expected graduation 2025 [*Formal recognition of supervisory role pending official administrative approval*]).

Master Theses

- Karyna Volobuieva (supervisor, Medical University of Vienna, expected graduation summer term 2024)
- Berend Brandt (supervisor, Medical University of Vienna, expected graduation summer term 2024)
- Martina Aprile (supervisor, Medical University of Vienna, 2023)
- Julius Reil (co-supervisor, Medical University of Vienna, 2022)
- Silvia Frullini (co-supervisor, Medical University of Vienna, 2020)
- Daniela De Luca (co-supervisor, Medical University of Vienna, Austria, 2020)

Internships

- Christian Weich (Medical University of Vienna, 2022)
- Laura Bernardo (Sant'Anna - School of Advanced Studies Pisa, 2021)
- Lisa Galassi (Sant'Anna - School of Advanced Studies Pisa, 2021)

Teaching

- LV 840.083 24S 2SSt VU – Steuerung und Regelung in der Medizin (Medical University of Vienna)
- LV 804.003 24S 2,13SSt SK BL 11 – Herz und Kreislauf, Blut und Gefäße (Medical University of Vienna)
- LV 840.003 23W 2SSt SE – DiplomandInnenseminar (Medical University of Vienna)
- LV 840.083 23S 2SSt VU – Steuerung und Regelung in der Medizin (Medical University of Vienna)
- LV 801.002 22W 0,53SSt SE BL1 – Wahlfach Naturwissenschaftliche (Medical University of Vienna)
- LV 840.002 21W 4SSt PR – KfK-Praktikum (Medical University of Vienna)
- LV 801.002 21W 0,53SSt SE BL1 – Wahlfach Naturwissenschaftliche (Medical University of Vienna)

Membership in Scientific Societies

- Board member of the Austrian Society for Biomedical Engineering
- Member of the IEEE Engineering in Medicine and Biology Society
- Member of the European Society for Artificial Organs
- Member of the Cardiovascular Medicine Research Cluster, Medical University of Vienna

Grants Awarded

2023 – present	PREVENT – Precise Vagal Stimulation for Enhanced Neuro-Cardiac Therapy (City of Vienna, Agreement ID: H-463816/2023). Role: Principal Investigator

Publications

First-authorships

1. Haberbusch M., Kronsteiner B., Aigner P., Kiss A., Podesser B.K., Moscato F., „Importance of cardiac-synchronized vagus nerve stimulation parameters on 2 the provoked chronotropic response for different levels of cardiac 3 innervation", *Journal of Neural Engineering*, 2024. [*Under Review*]
2. Haberbusch, M., Reil, J., Schukro, C., Uyanik-Ünal, K., Zuckermann, A., Moscato F., „Decoding Cardiac Reinnervation from Cardiac Autonomic Markers: A Mathematical Model Approach". *Journal of Heart and Lung Transplantation*, 2023

3. Haberbusch, M., Bettina, K., Kramer, A.M., Kiss, A., Podesser, B.K. and Moscato, F., "Closed-loop vagus nerve stimulation for heart rate control evaluated in the Langendorff-perfused rabbit heart". *Scientific Reports*, 2022.

4. Haberbusch, M., Frullini, S. and Moscato, F., "A Numerical Model of the Acute Cardiac Effects Provoked by Cervical Vagus Nerve Stimulation". *IEEE Transactions on Biomedical Engineering*, 2021.

5. Haberbusch, M., De Luca, D. and Moscato, F. "Changes in Resting and Exercise Hemodynamics Early After Heart Transplantation: A Simulation Perspective". *Frontiers in physiology*, 2020.

Co-Authorships

1. Berger L., Haberbusch M., Moscato. F., "Enhancing Heart Failure Care: Deep Learning-Based Activity Classification in LVAD patients", *American Society for Artificial Internal Organs*, 2024. [*Major Revision*]

2. Berger L., Haberbusch M., Moscato. F., "Generative adversarial networks in electrocardiogram synthesis: recent developments and challenges", *Artificial Intelligence in Medicine*, 2023.

3. Kronsteiner, B., Haberbusch, M., Aigner, P., Kramer, A.M., Pilz, P.M., Podesser, B.K., Kiss, A., Moscato, F., "A novel ex-vivo isolated rabbit heart preparation to explore the cardiac effects of cervical and cardiac vagus nerve stimulation". *Scientific Reports*, 2023.

4. Ferraro, D., D'Alesio, G., Camboni, D., Zinno, C., Costi, L., Haberbusch, M., Aigner, P., Maw, M., Schlöglhofer, T., Unger, E., Aliperta, A., Bernini, F., Casieri, V., Terlizzi, D., Giudetti, G., Carpaneto, J., Pedrizzetti, G., Micera, S., Lionetti, V., Moscato, F., Massari, L., Oddo, M. O., "Implantable Fiber Bragg Grating sensor for continuous heart activity monitoring: ex-vivo and in-vivo validation". *IEEE Sensors Journal*, 2021.

Contributions to International Conferences

1. Haberbusch M., Aigner P., Kronsteiner B., Jiang D., Kiss A., Podesser B., Demosthenous A., Moscato F., "First Results on Feasibility Tests of an Electrical Impedance Spectroscopy Device for Cardiac Contractility Assessment". 46th Annual International Conference of the IEEE Engineering in Medicine and Biology Society, July 15-19, 2024. [accepted]

2. Haberbusch, M., Aprile M., Moscato, F., "Koopman Theory Meets Cardiology: A Neural Network Approach to Linearize Cardiovascular Dynamics". Annual Meeting of the Austrian Society for Biomedical Engineering, Vienna (Austria), November 2-3, 2023.

3. Haberbusch, M., Aprile M., Moscato, F., "Linearizing the Heart: Application of an Autoencoder Network to Identify Koopman Embeddings in Hemodynamic Signals". 68th Annual Conference of the American Society for Artificial Internal Organs, San Francisco (USA), June 14-17, 2023.

4. Haberbusch, M., Moscato, F., "From Models to Medicine: Leveraging Computer Modeling to Enhance Cardiac Applications of Vagus Nerve Stimulation". Meeting of the Austrian Cluster for Tissue Regeneration, May 2-4, 2023.

5. Haberbusch, M., Moscato, F., "Switching to Synchronization: Optimizing the Robustness of Closed-Loop Vagus Nerve Stimulation for Heart Rate Control through Switching". 11th International IEEE EMBS Conference on Neural Engineering, Baltimore (USA), April 25-27, 2023.

6. Haberbusch, M., Kronsteiner, B., Kramer, A.M., Kiss, A., Podesser, B.K. and Moscato, F., "Evaluation of closed-loop vagus nerve stimulation for heart rate control in a Langendorff-perfused isolated rabbit heart with

intact cardiac-vagal innervation". Joint Annual Conference of the Austrian, German and Swiss Societies for Biomedical Engineering, Innsbruck (Austria), September 28-30, 2022.

7. Haberbusch, M., Bernardo, L.A., Galassi, L., Oddo, C.M. and Moscato, F., "Simple Deep Neural Network Architecture for Electrocardiogram Delineation". World Congress of the International Union for Physical and Engineering Sciences in Medicine, Singapore, June 12-17, 2022.

8. Haberbusch, M., Bernardo, L.A., Galassi, L., Oddo, C.M. and Moscato, F., "Electrocardiogram Delineation Using Deep Neural Networks". 16th Annual Conference on Health Informatics meets Digital Health, Vienna (Austria), May 24-25, 2022.

9. Haberbusch, M., Reil, J., Uyanik-Uenal, K., Zuckermann, A., Podesser, B.K. and Moscato, F.," Relationship Between Cardiac Autonomic Markers and Degree of Cardiac Reinnervation in Heart Transplant Patients: Insights from a Mathematical Model". 42nd Annual Meeting of the International Society for Heart and Lung Transplantation, Boston (USA), April 27-30, 2022.

10. Haberbusch, M., Kronsteiner, B., Kiss, A., and Moscato F., "Preliminary Results on the Importance of Vagus Nerve Stimulation Parameters for Its Chronotropic Effects in Vagotomized Rabbits". 43rd Annual International Conference of the IEEE Engineering in Medicine and Biology Society, Guadalajara (Mexico), October 30 – November 5, 2021.

11. Haberbusch, M., Kronsteiner, B., Kiss, A., and Moscato F., "Model-based development of a closed-loop heart rate control strategy using vagus nerve stimulation". Annual Meeting of the Austrian Society for Biomedical Engineering, Graz (Austria), September 30 – October 1, 2021.

12. Haberbusch, M., and Moscato F., "How computer simulations may help us understand what heart rate variability tells us about cardiac reinnervation after heart transplantation". 47th Conference of the European Society for Artificial Organs, London (United Kingdom), September 7-11, 2021.

13. Haberbusch, M., De Luca, D. and Moscato F., "Preliminary Results of a Numerical Model to Predict Heart Rate Variability Changes Following Cardiac Denervation and Later Reinnervation in Heart Transplant Patients". 8th European Medical and Biological Engineering Conference, Portorož (Slovenia), November 27 – December 3, 2020.

14. Haberbusch, M., Frullini, S. and Moscato, F., "Towards Vagus Nerve Stimulation to Restore Heart Rate Control in Heart Transplant Patients: A Simulation Study". 18th Nordic Baltic Conference on Biomedical Engineering and Medical Physics, Reykjavik (Iceland), September 17-20, 2020.

15. Haberbusch M., Luna, J.L.V. and Mayr W., "Preliminary observations on the Interaction of Monosynaptic and Polysynaptic Posterior Root Reflexes in Human". 13th Vienna International Workshop on Functional Electrical Stimulation, Vienna (Austria), September 23-24, 2019.

Invited Talks

1. Haberbusch M., Neufeld E., "From Models to Heartbeats: Computational Design of Vagus Nerve Stimulation for Cardiac Health". Inside Scientific, Webinar, October 18, 2023.

2. Haberbusch, M., Moscato, F., "Unlocking Cardiac Sympathovagal Balance: Insights from a Mathematical Model and Autonomic Markers". 10th International Conference on Computational Bioengineering, Vienna (Austria), September 20-22, 2023.

Datasets

1. Haberbusch, M., De Luca, D., Frullini, S., Iavarone, E., & Moscato, F. (2023). Cardiovascular system model for comprehending the acute cardiac effects of vagus nerve stimulation (Version 2) [dataset]. *SPARC Consortium*. https://doi.org/10.26275/5YVU-TR0D

2. Kronsteiner, B., Heimel, P., Slezak, P., Weninger, W. J., Podesser, B., Kiss, A., Oberoi, G., Zopf, L., Haberbusch, M., & Moscato, F. (2023). MicroCT imaging of the fascicular structure in the porcine right and left cervical vagus nerve (Version 1) [dataset]. *SPARC Consortium*. https://doi.org/10.26275/GFWU-PI0P

Protocols

1. Kronsteiner B., Haberbusch M., Moscato F., „MicroCT Imaging of the Fascicular Structure in the Porcine Right and Left Cervical Vagus Nerve". *protocols.io*. dx.doi.org/10.17504/protocols.io.ewov1qd2ygr2/v1

Patents

1. Switching stimulation modes to improve robustness of vagus nerve stimulation for heart rate control (A60143/2022)

Awards

1. Publication Prize of the Cluster for Cardiovascular Medicine of the Medical University of Vienna in the Category "Translational", 2023s.

2. Travel Scholarship for the 3rd IEEE EMBS International Summer School on Computer Modeling in Medicine 2023.

Other Contributions to Scientific Community

1. Chair of the Scientific Session "Biomedical Data Modelling and Analysis" at the Annual Meeting of the Austrian Society for Biomedical Engineering, Vienna, Austria, November 2-3, 2023.

2. Chair of the Scientific Session "Healthcare Analytics, Big Data and AI" at the World Congress of the International Union for Physical and Engineering Sciences in Medicine, Singapore, June 12-17, 2022.

3. Reviewer for the Journal of Cardiovascular Engineering and Technology (ISSN: 1869-4098)

4. Reviewer for Scientific Reports, Nature (ISSN: 2045-2322).

5. Reviewer for Physiological Measurement (ISSN: 0967-3334)