Curriculum Vitae

Name:	Dipl.-Ing. Dr. Max Haberbusch, B.Sc.
Position:	Postdoctoral Researcher & Principal Investigator
Address:	Medical University of Vienna
	Center for Medical Physics and Biomedical Engineering
	Währinger Gürtel 18-20, AKH-4L
	1090 Vienna, Austria
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Birth:	May 3, 1991, Wels, Austria

PROFESSIONAL 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
2024 – 2025	Postdoctoral research scholar in the field of medical device design at Department of Biomedical Engineering, George Washington University, Washington D.C., USA
2024	Postdoctoral fellow in the field of computational modelling of energy-tissue interactions at the Wiegers Department of Electrical and Computer Engineering, Manhattan, Kansas, USA
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

EDUCATION

2019 – 2023	Ph.D. in Applied Medical Sciences, Medical University of Vienna, Vienna, Austria
2017 – 2019	M.Sc. in Biomedical Engineering (with distinction), Vienna University of Technology, Vienna, Austria
2012 – 2016	B.Sc. in Computer Science, University of Vienna, Vienna, Austria

SCIENTIFIC ACTIVITES

- **Neural and Cardiovascular Engineering:** Advanced the understanding of interaction of neural and cardiovascular systems through cutting-edge computational modeling, biosensor development, machine learning, and translational research.
- **Development of Medical Technologies:** Designed and implemented technologies for remote monitoring, closed-loop control of medical devices, and precision neural stimulation, with a focus on clinical applicability.

- **Preclinical Investigations:** Led in vivo and ex vivo studies to bridge experimental findings with real-world medical solutions, contributing to the improvement of patient care in cardiac and neural health.

PROFESSIONAL MEMBERSHIPS

- **Board Member**, *Austrian Society for Biomedical Engineering* (since 2022)
- **Board Member**, *Therapeutic & Diagnostic Systems and Technologies Technical Community, IEEE Engineering in Medicine and Biology Society* (since 2024)
- **Active Member**, *European Society for Artificial Organs* (since 2023)
- **Active Member**, *International Society for Mechanical Circulatory Support* (since 2025)
- **Active Member**, *Cardiovascular Medicine Research Cluster, Medical University of Vienna since* (since 2023)

GRANTS AWARDED

2025 – present	CARDISENSE – An Integrated Remote Cardiac Assist Device Patient Monitoring Platform (Austrian Research Promotion Agency, Agreement ID: FO999922422). Role: Principal Investigator. Amount: **€ 493.664,00**
2023 – 2024	PREVENT – Precise Vagal Stimulation for Enhanced Neuro-Cardiac Therapy (City of Vienna, Agreement ID: H-463816/2023). Role: Principal Investigator. Amount: **€17.088,00**

HONORS AND AWARDS

1. Grand Prize of the *National Institute of Health Global SPARC Codeathon 2024* for the work "Reinforcement Learning for Medical Device Control Made Easy", 2024. (endowed $15,000)
2. International Communication Grant of the *Austrian Research Association* (Agreement ID: 06/16848), 2024. (endowed €750)
3. Publication Prize of the *Cluster for Cardiovascular Medicine of the Medical University of Vienna* in the Category "Translational", 2023. (endowed €250)
4. Travel Scholarship for the *3rd IEEE EMBS International Summer School on Computer Modeling in Medicine* 2023. (endowed $500)

PUBLICATIONS

First-authorships

1. **Haberbusch, M.**, Kronsteiner, B., Aigner, P., Kiss, A., Podesser, B.K. and Moscato, F., "Importance of cardiac-synchronized vagus nerve stimulation parameters on the provoked chronotropic response for different levels of cardiac innervation". *Frontiers in Physiology*, 2024.
2. **Haberbusch, M.**, Reil, J., Schukro, C., Uyanik-Ünal, K., Zuckermann, A. and 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.** and Moscato. F., "Enhancing Heart Failure Care: Deep Learning-Based Activity Classification in LVAD patients", *American Society for Artificial Internal Organs*, 2024.
2. Berger, L., **Haberbusch, M.** and 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. and 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. "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. and Moscato F., "Feasibility of an Electrical Impedance Spectroscopy Device for Cardiac Contractility Assessment", *46th Annual International Conference of the IEEE Engineering in Medicine and Biology Society*, Orlando, Florida (USA), July 15 – 19, 2024.
2. **Haberbusch, M.**, Aprile M. and 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. and 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.** and 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.
5. **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.
6. **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.
7. **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.

8. **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.
9. **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.
10. **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.

Invited Talks

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

PATENTS

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

ACADEMIC AND VOLUNTEER SERVICE

1. **Associate Editor**, *47th Annual International Conference of the IEEE Engineering in Medicine and Biology Society* (Theme: Therapeutic and Diagnostic Technologies), Copenhagen, Denmark, July 14-17, 2025.
2. **Session Chair**, *Annual Meeting of the Austrian Society for Biomedical Engineering (*Session: Biomedical Data Modelling and Analysis), Vienna, Austria, November 2-3, 2023.
3. **Session Chair**, "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.
4. **Reviewer**, *Journal of Cardiovascular Engineering and Technology* (ISSN: 1869-4098)
5. **Reviewer**, *Nature Scientific Reports* (ISSN: 2045-2322).
6. **Reviewer**, *Physiological Measurement* (ISSN: 0967-3334)
7. **Reviewer**, *Journal of Neural Engineering* (ISSN: 1741-2560)
8. **Reviewer**, *Journal of Heart and Lung Transplantation* (ISSN: 1 557-3117)
9. **Reviewer**, *Frontiers in Neuroscience* (ISSN: 1662-453X)
10. **Reviewer,** *Heart Rhythm* (ISSN: 2214-0271)
11. **Reviewer,** *Heart Rhythm O2* (ISSN 2666-5018)

TEACHING EXPERIENCE

1. **Instructor**, Medical Informatics, Medical University of Vienna, Summer 2024, "Steuerung und Regelung in der Medizin". Co-developed syllabus, prepared and presented class lectures, graded papers and presentations, and assigned final grades.

2. **Teaching Fellow**, Human Medicine, Medical University of Vienna, Summer 2024, "Herz und Kreislauf, Blut und Gefäße". Instructed students in the practical seminar on physical principles of measurements and diagnostics in cardiovascular applications.
3. **Instructor**, Medical Informatics, Fall 2023, "DiplomandInnenseminar". Supervised a student in her master thesis work in medical informatics, graded papers and presentations and assigned final grades.
4. **Instructor**, Medical Informatics, Medical University of Vienna, Summer 2023, "Steuerung und Regelung in der Medizin". Co-developed syllabus, prepared and presented class lectures, graded papers and presentations, and assigned final grades.
5. **Teaching Fellow**, Human Medicine, Medical University of Vienna, Fall 2022, "Wahlfach Naturwissenschaftliche". Taught a lecture on physical basics for freshmen in human medicine.
6. **Instructor**, Medical Informatics, Fall 2021, "KfK-Praktikum". Supervised a student in the field of medical informatics working on a project on biomedical signal analysis. Graded papers and assigned final grades.
7. **Teaching Fellow**, Human Medicine, Medical University of Vienna, Fall 2021, "Wahlfach Naturwissenschaftliche". Taught a lecture on physical basics for freshmen in human medicine.

THESIS SUPERVISION

1. Laurenz Berger, "Development of data analysis for wearable sensor systems in medical applications", *Dissertation*, expected 2025.
2. Karyna Volobuieva, "In-silico based development of closed-loop neuromodulation strategies for cardiovascular applications", *Master Thesis*, expected 2025.
3. Lars Berend Brandt, "Deep learning-based Koopman analysis for the prediction of multi-beat cardiovascular dynamics", *Master Thesis*, 2024.
4. Martina Aprile, "Model reduction and linearisation of a physiological dynamical system using deep learning-based Koopman analysis", *Master Thesis*, 2023.
5. Julius Reil, "Cardiovascular function after heart transplantation. A retrospective data analysis", *Master Thesis*, 2022.
6. Silvia Frullini, "Modeling cardiac effects of vagus nerve stimulation in heart transplant recipient", *Master Thesis*, 2020.
7. Daniela De Luca, "Restoring autonomic cardiovascular control in heart transplant recipients: a model-based approach", *Master Thesis*, 2020.