

Publications, Patents, Talks

2025

Lehrstuhl für Medizinische Informationstechnik
Helmholtz-Institut für Biomedizinische Technik
Rheinisch-Westfälische Technische Hochschule Aachen

*Chair for Medical Information Technology
Helmholtz-Institute for Biomedical Engineering
RWTH Aachen University*

Director:

**Univ.-Prof. Dr.-Ing. Dr. med. Dr. h.c.
Steffen Leonhardt**

Artikel in Zeitschriften mit anonymem Gutachterwesen 2025 / *Papers in peer-reviewed Journals 2025*

1. Idoia Badiola, Swati Balaji, Diogo Silva, Vladimir Blazek, Steffen Leonhardt, Markus Lüken, „Real-Time Subject-Specific Predictive Modeling of PPG Signals for Artifact-Resilient SpO2 estimation under Hypoxia”, **Sensors** 2025, 25, 7176., 1-20, <https://doi.org/10.3390/s25237176>.
2. Idoia Badiola, Jan Seleng, Diogo Silva, Vladimir Blazek, Steffen Leonhardt, Markus Lueken, Stefan Borik, „Low-cost camera-based assessment of venous hemodynamics in the lower limbs: a study on young healthy volunteers“, **Biomedical Optic Express**, Vol. 16, No. 2 / 1 Feb 2025, 520-534, <https://doi.org/10.1364/BOE.547794>.
3. Patrick Borchers, Steffen Leonhardt, Marian Walter, “Trial-Based Hemolysis Modeling to Investigate Operating Modes of Continuous-Flow LVADs”, **Artificial Organs** 2025, 0; 1-10, <https://doi.org/10.1364/BOE.547794>.
4. Patrick Borchers, Ailin Österlein Kück, Steffen Leonhardt, Marian Walter, „Pump-Induced Hemolysis of Speed Modulated Axial-Flow Left Ventricular Assist Devices”, **Artificial Organs**, 2025, 49, 988-996, <https://doi.org/10.1111/aor.14966>.
5. Alfred C. Hülkenberg, Niko Strotmann, Amine Mokni, Leon Greulich, Thea Laurentius, L. Cornelius Bollheimer, Seward Rutkove, Todd Freeborn, Steffen Leonhardt, “Electrical Impedance Myography Quantifies Holding and Pushing During Isometric Muscle Contractions”, **IEEE Transactions in Neural Systems and Rehabilitation Engineering**, Vol. 33, 2025, 2659 – 2671, doi: 10.1109/TNSRE.2025.3581348.
6. Arnhold Lohse, Felix Röhren, Philip von Platen, Carl-Friedrich Benner, Dmitrij Ziles, Marius Hühn, Matthias Manfred Deininger, Thomas Breuer, Steffen Leonhardt, Marian Walter, “Control of end-tidal carbon dioxide during phrenic nerve stimulation with mechanical ventilation”, **Biomedical Signal Processing and Control** 105 (2025) 107649, <https://doi.org/10.1016/j.bspc.2025.107649>.
7. Qasem M. Qananwah, Hiam H. Alquran , Ahmad M. Dagamseh, Vladimir Blazek, Steffen Leonhardt, “Investigating the correlation between smoking and blood pressure via photoplethysmography”, **BioMedical Engineering OnLine** (2025) 24:57, 1-22, <https://doi.org/10.1186/s12938-025-01373-w>.
8. Moirangthem Sailash Singh, Ramkrishna Pasumarthy, Umesh Vaidya, Steffen Leonhardt, “Functional control of network dynamical systems: An information theoretic approach”, **Information Sciences** 699 (2025) 121781, 1-18, <https://doi.org/10.1016/j.ins.2024.121781>.
9. Shubhanshu Sharma, Bobby George, Chenglin Lyu, Philip von Platen, Markus Lüken, Marian Walter, L. Cornelius Bollheimer, Steffen Leonhardt, „Enhancing Gait Analysis and Pathway Classification Through Ground Impedance-Based Shoes: An Innovative

Approach”, **IEEE Transactions in Instrumentation and Measurement**, Vol. 74, 2025, 1-12, doi: 10.1109/TIM.2025.3538087.

10. Filip Slapal, Diogo F. Silva, Steffen Leonhardt, Marian Walter, “Early thrombus detection in ECMO with optimized impedance measurements: A simulative study”, **Electr Bioimp**, Vol. 16, pp. 80–88, 2025, <https://doi.org/10.2478/joeb-2025-0011>.
11. Diogo F. Silva, Thomas Muders, Sebastian Reinartz, Christian Putensen, Steffen Leonhardt, “Adaptive Cardiorespiratory Separation with Harmonic Models and Filters: The Case of Electrical Impedance Tomography”, **IEEE Transactions on Biomedical Engineering**, Vol. 72, No. 11, Nov. 2025, 3288-3299, doi: 10.1109/TBME.2025.-3566608.
12. Diogo F. Silva, Sebastian Reinartz, Thomas Muders, Karin Wodack, Christian Putensen, Robert Siepmann, Benjamin Hentze, Steffen Leonhardt, “Contrast-Enhanced EIT Robustly Tracks Regional Lung Perfusion Compared to Non-Enhanced EIT and Pulmonary CT”, **IEEE Transactions on Medical Imaging**, Vol. 44, No. 9, Sep. 2025, 3683 – 3693, doi: 10.1109/TMI.2025.3552037.

**Patentanträge und erteilte Patente
mit Beteiligung des Lehrstuhls 2025 /
*Granted Patents and filed Patent Applications 2025***

1. George, Bobby, Sharma, Shubhanshu, Walter, Marian, Leonhardt, Steffen, Lyu, Chenglin, „A SYSTEM TO CALCULATE GAITPARAMETERS AND GROUND CLASSIFICATION“, Indian Paten No. 574815, erteilt: 28.11.2025.

Konferenzbeiträge mit Beteiligung des Lehrstuhls 2025 / *Conference Proceedings 2025*

**Clusterkonferenz 2025 – Zukunftsfähige Spitzenmedizin in NRW, April 1, 2025,
Düsseldorf, Germany**

1. Daniel Blase, Thea Laurentius, L. Cornelius Bollheimer, Steffen Leonhardt, Markus Lüken, „Measurements of the Pressure Loading-Response of the Gluteal and Sacral Skin Tissues when Lying in Bed Using Camera-based Techniques“, **Clusterkonferenz zur zukunftsfähigen Spitzenmedizin in NRW**, Poster.

**29th International Student Conference on Electrical Engineering (POSTER 2025),
Faculty of Electrical Engineering, CTU Prague, May 22th, 2025**

1. Forouzan Salehi Fergeni, “An ANOVA-based Sequential Forward Channel Selection Framework for BCI Application based on EEG Signals“, 29th International Student Conference on Electrical Engineering (**POSTER 2025**), Faculty of Electrical Engineering, CTU Prague, May 22, 2025, pp 1-4, ISBN 978-80-01-07422-0, https://poster-2025.sciencesconf.org/data/pages/POSTER_2025.pdf.
2. Nika Khosravi, “State of the Art in Pulsed-Dose Oxygen Delivery for Mechanical Ventilation“, 29th International Student Conference on Electrical Engineering (**POSTER 2025**), Faculty of Electrical Engineering, CTU Prague, May 22, 2025, pp 1-4, ISBN 978-80-01-07422-0, https://poster2025.sciencesconf.org/data/pages/POSTER_2025.pdf.
3. Urban Jacobs, Nathan Kühr, Lukas Mardak, “Pulse to Tone Dialling Converter“, 29th International Student Conference on Electrical Engineering (**POSTER 2025**), Faculty of Electrical Engineering, CTU Prague, May 22, 2025, pp 1-4, ISBN 978-80-01-07422-0, https://poster2025.sciencesconf.org/data/pages/POSTER_2025.pdf.

**19th IEEE Medical Measurements & Applications (MeMeA 2025), May 28 - 30th, 2025,
Chania, Greece**

1. Daniel Blase, Minju Kim, Steffen Leonhardt, Markus Lueken, “Reliable Staging of Pressure Ulcers using Deep Learning on an Unbalanced Dataset“, 2025 IEEE Medical Measurements & Applications (MeMeA), 979-8-3315-2347-3/25 DOI: 10.1109/MEMEA65319.2025.11068048, pp. 1-6.
2. Marian Walter, Gina van de Sand, Andre Stollenwerk, Rüdiger Kopp, Steffen Leonhardt, „ Non-Invasive Clip-On System of Blood Oxygenation Measurement in Extracorporeal Circulation“, 2025 IEEE Medical Measurements & Applications (MeMeA), 979-8-3315-2347-3/25, DOI: 10.1109/MEMEA65319.2025.11066291, pp.1-5.

International Conference on Electrical BioImpedance, and Electrical Impedance Tomography 2025 (ICEBI & EIT 2025), June 25 - 27, 2025, Monterrey, Mexico

1. P. Urban Jacobs, Tobias Menden, Steffen Leonhardt, "AixTOM – The mFEIT research platform from Aachen", Journal of Physics: Conference Series 3014 (2025) 012025, pp. 1-4, doi:10.1088/1742-6596/3014/1/012025

47th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC), July 14-17, 2025, Copenhagen, Denmark

1. Nico Blass, L. Cornelius Bollheimer, Steffen Leonhardt, Markus Lüken, „Pulse Deficit in Photoplethysmography as an Indicator for Atrial Fibrillation”, 2025 47th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC), 979-8-3315-8618-8/25, DOI: 10.1109/EMBC58623.2025.11252637, pp. 1-5.
2. Markus Lueken, Yessine Chaabene, Amir Chaabene, Amir Masmoudi, Matthias D. Zink, Steffen Leonhardt, "Inverse Filtering for ECG Signal Reconstruction – A Deep Learning Approach", 2025 47th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC), 979-8-3315-8618-8/25, DOI: 10.1109/EMBC58623.2025.11254051, pp. 1-6.

59th Annual Meeting of the German Society of Biomedical Engineering (BMT), Muttentz/Basel, Schweiz, September 09 - 11, 2025

1. Raphael Hoffmann, Steffen Leonhardt, Marian Walter, „Human Lower Leg Parameter Estimation using a Passive Exoskeleton Structure”; Abstracts of the 2025 Joint Annual Conference of the Austrian (ÖGBMT), German (VDE DGBMT) and Swiss (SSBE) Societies for Biomedical Engineering, Abstract 076, Track: Biomechanics, DOI: <https://doi.org/10.1515/bmt-2025-1001>.
2. Daniel Voss, Steffen Leonhardt, Marian Walter, „ Data-Driven Approach for Left Ventricular Volume Estimation using Intracardiac Admittance”, Abstracts of the 2025 Joint Annual Conference of the Austrian (ÖGBMT), German (VDE DGBMT) and Swiss (SSBE) Societies for Biomedical Engineering, Abstract 330, Track: Biomedical Instrumentation, DOI: <https://doi.org/10.1515/bmt-2025-1001>.
3. Daniel Blase, Mengying Wang, Steffen Leonhardt, Markus Lüken, „Generation of Artificial Pressure Ulcer Images Using Deep Convolutional GANs”, Abstracts of the 2025 Joint Annual Conference of the Austrian (ÖGBMT), German (VDE DGBMT) and Swiss (SSBE) Societies for Biomedical Engineering, Abstract 019, Track: Image & Signal Processing, DOI: <https://doi.org/10.1515/bmt-2025-1001>.
4. Markus Lueken, Lazar Trunk, Lukas Mardak, Maximiline Schmeißer, Wiebren Zijlstra, Steffen Leonhardt, L. Cornelius Bollheimer, „Determining Individual IR Marker Relevance for Frailty Assesment using Explainable AI”, Abstracts of the 2025 Joint Annual Conference of the Austrian (ÖGBMT), German (VDE DGBMT) and Swiss (SSBE) Societies for Biomedical Engineering, Abstract 344, Track: Movement Analysis, DOI: <https://doi.org/10.1515/bmt-2025-1001>.

The First International Symposium on Biomechatronics and Robotics in Healthcare (BioMRH 2025), September 20-22, 2025, Brussels, Belgium

1. Alfred C. Hülkenberg, Luke Josephy, Vereia Bismor, Steffen Leonhardt, "Automating Seated Leg Extension Exercise for Electrical Impedance Myography Studies", Proceedings of the First International Symposium on Biomechatronics and Robotics in Healthcare (BioMRH 2025), Lecture Notes in Networks and Systems 1778, https://doi.org/10.1007/978-3-032-14160-6_8, pp. 77-87

IUPESM World Congress on Medical Physics and Biomedical Engineering (IUPESM WC2025), 29 September – 4 October, 2025, Adelaide, Australia

1. Jannik Prüßmann, Dogukan Dogan, Yaser Akmik, Steffen Leonhardt, Markus Lueken, „Modulation of cardio-mechanical dynamics in the contact pressure of a cECG test Bench“, Proceedings of IUPESM World Congress on Medical Physics and Biomedical Engineering XXVII, ISBN 978-3-032-20290-1, Due: 21 June 2026.
2. Felix Röhren, Vincent Hütsch, Arnhold Lohse, Steffen Leonhardt, and Marian Walter, "Multivariable Feedforward Control of Inspiratory Oxygen Using Low Pressure Sources for Mechanical Ventilation", Proceedings of IUPESM World Congress on Medical Physics and Biomedical Engineering XXVII, ISBN 978-3-032-20290-1, Due: 21 June 2026

08. Nürnberger Wundkongress, Dezember 4 – 5, 2025, Nürnberg, Germany

1. Daniel Blase, Michael Klennert, Jana Klennert, Max Klennert, Felix Gremse, Steffen Leonhardt, Markus Lüken, „Eine Forschungsplattform für die kamerabasierte Wunddiagnostik einschließlich verteilter Ausführung neuronaler Netze mit erhöhtem Datenschutz“, Fachzeitschrift für das interprofessionelle Wundteam, 2025/19 - Supplement WUKO 2025, S. 59

Eingeladene Vorträge 2025 /

Invited Talks and Lectures 2025

Physical Talks

1. Steffen Leonhardt *"Model-based Design in Cardio-pulmonary Engineering"*, 2025 IEEE – EMBS Int. Summer School on "Advanced Data Analytics in Physiology", Università di Pisa, Centro congressi Le Benedettine, Piazza San Paolo a Ripa D'Arno, 16, Pisa, Italy, May 30th, 2025.
2. Steffen Leonhardt, *"Digitale Technologien - Wearables and mHealth"*, 20. Nationale Branchenkonferenz Gesundheitswirtschaft 2025, Rostock, 11. und 12. Juni 2025.
3. Steffen Leonhardt & Markus Lüken, *"Unlocking the Secrets of Vital Signs in your Car Seat - A Journey into Unseen Monitoring Techniques"*, INCABIN.SENSING - Next-Gen In-Cabin Monitoring & Interior Sensing Systems, Hotel Titanic Chaussee, Berlin, June 16, 2025,
4. Steffen Leonhardt, *"Control of therapeutic systems interacting with pathophysiological systems – why mother nature is closing the loop and why we should do this, too!"* Symposium on Control Engineering for Health, HZI Braunschweig, 20. - 21. Nov. 2025.

Digital Talks

5. Steffen Leonhardt, *"Wearables für die Medizin der Zukunft – vom Herzstolpern zur Stoffwechseltherapie"*, Vortragsserie in Kooperation mit der Fakultät für Informatik der RWTH, FZ Jülich, Regionalgruppe der Gesellschaft für Informatik (RIA), Regionaler Industrieclass Informatik Aachen (Regina) und der Gruppe Aachen des Deutschen Hochschulverbands, 27. Nov. 2025.