

# Dr. Maximilian Schäfer

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Institute for Digital Communications (IDC)

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## Contact Information

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## Research Interests

General Interest	<b>Molecular Communications</b> with medical applications, <b>Internet of BioNanoThings</b> , Health Monitoring and Personalized Treatment, Multidimensional Signal Processing, Communications and Control Theory, and Digital Signal Processing and their applications to the Modeling of Physical, Biological and Electrical Systems, Sound Synthesis and Room Acoustics
Current Focus	Design and Analysis of Molecular Communication Systems, Multidimensional Systems Theory, Neural Network based Sound Synthesis, Room Acoustics
Previous Contributions	Modeling of electrical transmission lines, modeling of musical instruments, Predictive security concepts for Direct Current (DC) networks

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## Educational Background

2022 – present	<b>Habilitation Candidate</b> , FAU Erlangen-Nürnberg Topic: <i>“Information and Communications Technology”</i>
2015 – 2019	<b>Doctor of Engineering</b> , FAU Erlangen-Nürnberg Remark: Graduated with <b>“distinction”</b> (mit Auszeichnung bestanden)
2012 – 2015	<b>Master of Science</b> , FAU Erlangen-Nürnberg
2008 – 2012	<b>Bachelor of Science</b> , FAU Erlangen-Nürnberg
2007	<b>General Qualification for University Entrance (Abitur)</b> Simon-Marius Gymnasium Gunzenhausen, Germany

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## Academic Positions

2023	<b>Visiting Researcher, <i>Aalto University</i></b> , Aalto, Finland Topic: Room acoustic modeling
2022 – present	<b>Member of the PostDoc Graduate Center, <i>Bavarian Research Institute for Digital Transformation (bidt)</i></b> , Munich, Germany
2019 – present	<b>Postdoctoral Researcher, <i>FAU Erlangen-Nürnberg</i></b> , Institute for Digital Communications Topic: Analysis and Design of Synthetic Molecular Communication Systems
2015 – 2019	<b>Doctoral Researcher, <i>FAU Erlangen-Nürnberg</i></b> , Chair of Multimedia Communications and Signal Processing
2012 – 2015	<b>Research Assistant, <i>Fraunhofer Institute for Integrated Circuits (IIS)</i></b> , Erlangen, Germany
2013 – 2014	<b>Research Assistant, <i>FAU Erlangen-Nürnberg</i></b> , <i>International Audio Laboratories</i>

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## Honors, Awards, and Grants

Since 2025	<b>Member of “<i>Die Junge Akademie</i>”</b> at the Berlin-Brandenburg Academy of Sciences and Humanities (BBAW) and the German National Academy of Sciences Leopoldina
Since 2025	<b>IEEE Senior Member</b>
2024	<b>Best Paper Award</b> , <i>11th ACM International Conference on Nanoscale Computing and Communication</i> , Milan, Italy, awarded to M. Schäfer, A. Ettner-Sitter, L. Brand, S. Lotter, F. Vakiliipoor, T. Aung, S. Härteis, R. Schober for the paper [C1]
2024	<b>Research &amp; Travel Grant, <i>ERASMUS+ Staff mobility program</i></b> , for research and teaching conducted at the Aalto University, Finland
2023	<b>Research &amp; Travel Grant, <i>ERASMUS+ Staff mobility program</i></b> , for research and teaching conducted at the Aalto University, Finland
2022	<b>Best Paper Award</b> , <i>9th ACM International Conference on Nanoscale Computing and Communication</i> , Barcelona Spain, awarded to <b>M. Schäfer</b> , L. Brand, S. Lotter, A. Büyükoğlu, F. Enzenhofer, W. Haselmayr, K. Castiglione, D. Appelhans, R. Schober for the paper [C10]
2022	<b>3<sup>rd</sup> Best Paper Award</b> , <i>25<sup>th</sup> International Conference on Digital Audio Effects (DAFx)</i> , Vienna, Austria, awarded to Parker J., Schlecht S. J., Rabenstein R., <b>Schäfer M.</b> for paper [C6]
2020	<b>Teaching Award</b> , <i>Technical Faculty, FAU</i> , Erlangen, Germany for the lecture “Music Processing Synthesis” (5 <sup>th</sup> place out of 62 rated lectures)
2019	<b>Doctoral Degree with Distinction</b> , <i>FAU</i> , Erlangen, Germany
2017	<b>Goldener Igel Publication Award</b> , <i>Telecommunications Laboratory, FAU</i> , Erlangen, Germany
2017	<b>Student Travel Grant</b> , <i>Workshop on Molecular Communications</i> , Dublin, Ireland

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## Granted Research Projects

List of granted research projects where I am one of the principal applicants.

- 2024 **Principal Applicant** within the Project “**Modeling, Design, and Implementation of a 3D in vivo Molecular Communication System**”, funded by the **German Research Foundation (DFG)**. The project duration is 3 years and starts in 2025.
- 2024 **Principal Applicant** withing the European Project “**Information Transfer between Medical Doctors and Implanted Medical Devices via Synthetic Molecular Communication (ERMES)**”, funded by the **European Innovation Council (EIC)**. The project duration is 3 years and starts in April 2025. (EIC Pathfinder Success Rate 2024: **4,1%**)  
**Project website:** <https://www.ermes-project.eu>
- 2024 **Principal Applicant** within the Project “**Innovative Testplattform für molekulare Kommunikation und mikrochirurgische Ausbildung – Fluoreszenz-Systeme, neuartige Prothesen und Technologien**”, funded by the **Federal Ministry of Education and Research (BMBF)**. The project duration is 3 years and started in April 2024.
- 2024 One of four **Principal Applicants** from FAU within the Project “**Internet of BioNanoThings (IoBNT)**” funded by the **BMBF**. The project duration is 3 years and started in January 2024.  
**Project website:** <https://www.internet-of-bio-nano-things.org>
- 2022 Fellowship within the “**Graduate Center for PostDocs**” of the Bavarian Research Institute for Digital Transformation (bidt) and the **Bavarian Ministry of Science and Art (StWMK)** for the interdisciplinary research project “The Networked Human – Health Monitoring in the Internet of BioNanoThings”.
- 2022 **Emerging Talents Initiative (ETI) Grant**, FAU  
*The program supports excellent young researchers in applying for external funding for their research projects*

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## Further Involvement in Research Projects

List of granted research projects where I am part of the research team at FAU and where I was involved in the proposal writing and development process.

- 2024 – present **Associated Researcher** in the Research Training Group (RTG 2950) “**Synthetic Molecular Communications Across Different Scales: From Theory to Experiments**” funded by DFG.  
**Involvement:** Development of research directions, proposal writing, administrative application process, site-visit organization, supervision of PhD students, lecturer in the qualification program.  
**Project website:** <https://www.symocads.research.fau.eu>
- 2022 – present **Senior Researcher** in the Research Project “**Modelling, Design, and Implementation of Molecular Communication Systems - Phase 2: Media-Modulation based Molecular Communication**”, funded by DFG.  
**Involvement:** Project planning and execution, supervision of junior researchers

- 2019 – 2023 **Senior Researcher** in the Research Project “**Transfer Function Models for Molecular Communication Systems**” funded by DFG.  
**Involvement:** Development of research directions/focus, proposal writing, project planning and execution
- 2019 - 2023 **Senior Researcher** in the Research Project “**Makroskopische Molekulare Kommunikation Sender- und Empfängerkonzepte für die Informationsübertragung in flüssigen Medien (MaMoKo)**” funded by BMBF.  
**Involvement:** Project planning and execution, supervision of junior researchers

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## University Services

- 2024/25 **Member of the faculty recruitment committee at FAU** for the professorship “W2-Professur für Computational Movement Science”
- 2022/23 **Member of the faculty recruitment committee at FAU** for the professorship “Smart Power Electronics Innovation for Industrial Applications”
- 2022 – present **Mentor in the ARIADNETechNat Career Mentoring Program** at FAU *ARIADNETechNat is the career mentoring program for young female scientists at FAU’s Faculty of Engineering and the Faculty of Sciences.*
- 2021 – present **Member of the Degree Program Committee (Studienkommission) for Advanced Signal Processing and Communications Engineering (ASC) at FAU**  
*ASC is a 4-semester Elite Master’s program at FAU within the „Elitenetzwerk Bayern“ for highly qualified students that aim for higher career goals. This committee is responsible for the structure and the further development of the study program.*
- 2021 – present **Interviewer for the aptitude test of the study programs Advanced Signal Processing and Communications Engineering (ASC) and Communications and Multimedia Engineering (CME)**  
*The interviewers rate the quality of the applicants for the international master study programs ASC and CME at FAU.*
- 2019 – present **Organizer of weekly seminars at IDC**  
*Organization and implementation of the weekly seminars for students and PhD students at IDC.*

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## Services to the Scientific Community

- 2025 **Web Chair** – 16th EAI International Conference on Bio-inspired Information and Communications Technologies (BICT 2025), London, UK, 2025.
- 2025 **Publicity Chair** – 12<sup>th</sup> ACM International Conference on Nanoscale Computing and Communications (NanoCom), Chengdu, China, 2025
- 2025 **Tutorial** on “Synthetic Molecular Communication: Introduction, Theoretical Foundations, and Experimental Verification“, at 14<sup>th</sup> International ITG Conference on Systems, Communications and Coding (SCC), Karlsruhe, Germany, 2025  
**Together with:** Prof. Robert Schober
- 2025 **Track Chair** - SAC Molecular, Biological, and Multi-Scale Communications, IEEE International Conference on Communications (ICC), Montreal, Canada, 2025

2025	<b>Organizer</b> – 2 <sup>nd</sup> Workshop on Molecular, Biological, and Multi-Scale Communications (during ICC 2025), Montreal, Canada, 2025 <u>Together with:</u> Prof. Andrew Eckford, Prof. Adam Noel, and Dr. Yansha Deng
Since 2024	<b>Associate Editor</b> – IEEE Transactions on Molecular, Biological and Multi-Scale Communications
2024	<b>Tutorial</b> on “Internet of Bio-Nano-Things - Challenges and Networking Solutions” at Global Communications Conference (Globecom), Cape Town, South Africa, 2024
2024	<b>TPC Chair</b> – 11 <sup>th</sup> ACM International Conference on Nanoscale Computing and Communication (NanoCom), Milan, Italy, 2024
2023	<b>Guest Editor</b> – Special Issue “The Internet of BioNanoThings – Applications, Components and Challenges” in IEEE Transactions on Molecular, Biological and Multi-Scale Communications <u>Together with:</u> Prof. Robert Schober (FAU), Prof. Falko Dressler (TU Berlin), Prof. Stefan Fischer (Uni Lübeck), Prof. Cyrus Khandanpour (University Hospital Schleswig-Holstein)
2023	<b>Guest Editor</b> – Special feature on the “7 <sup>th</sup> Workshop on Molecular Communications” in IEEE Transactions on Molecular, Biological, and Multi-Scale Communications
2023	<b>Panelist</b> - 10 <sup>th</sup> ACM International Conference on Nanoscale Computing and Communication (NanoCom), Coventry, UK, 2023
2023	<b>Session Chair</b> – 10 <sup>th</sup> ACM International Conference on Nanoscale Computing and Communication (NanoCom), Coventry, UK, 2023
2023 – present	<b>Educational Services Coordinator</b> – Technical Committee “Molecular, Biological and Multi-Scale Communications” of the IEEE Communications Society (ComSoc)
2023 – present	<b>Member of the Working Group “Chat GPT”</b> – Bavarian Research Institute for Digital Transformation (bidt)
2023	<b>Organizer</b> – 7 <sup>th</sup> Workshop on Molecular Communications (MolCom23), Friedrich-Alexander-Universität Erlangen-Nürnberg (FAU), Erlangen, Germany ( <a href="https://molecularcommunications.org/molcomm2023/">https://molecularcommunications.org/molcomm2023/</a> )
2023	<b>Guest Editor</b> – Special feature on the “6 <sup>th</sup> Workshop on Molecular Communications” in IEEE Transactions on Molecular, Biological, and Multi-Scale Communications
2022	<b>Guest Editor</b> – Special feature “Advances in Molecular Communication: Theory, Experiment, and Application”, in IEEE Transactions on Molecular, Biological, and Multi-Scale Communications
2022 – present	<b>Leader of the Working Group “Interdisciplinary Research”</b> – Bavarian Research Institute for Digital Transformation (bidt)
2022	<b>Keynote Chair</b> – 6 <sup>th</sup> Workshop on Molecular Communications, Coventry, UK
2021	<b>Session Chair</b> – IEEE Globecom, Madrid, Spain
2021	<b>Organizer</b> – 5 <sup>th</sup> Workshop on Molecular Communications (1-Day Online Event)
2021 – present	<b>Committee Member</b> – “Algorithms for Signal Processing and Machine Learning” of the German Information Technology Society (ITG)
2021 – present	<b>Steering Committee Member</b> – Workshop on Molecular Communications
2020 – present	<b>Committee Member</b> – “Musical Acoustics” of the German Acoustical Society
2019 – present	<b>Committee Member</b> – Technical Committee “Molecular, Biological and Multi-Scale Communications” of the IEEE Communications Society (ComSoc)
2019 – present	<b>TPC Member</b> , Workshop on Molecular Communications, IEEE ICC, IEEE Globecom, DAFx, ACM NanoCom, ISMICT
2016 - present	<b>Reviewer (Selected Journals):</b> IEEE Trans. Molecular, Biological and Multi-Scale Communications, IEEE Trans. NanoBioscience, IEEE Trans. Communications, IEEE Trans. Circuits and Systems, IEEE Communication Letters, Int. Journal on Multidimensional Systems and Signal Processing, Journal of the Audio Engineering Society

**Reviewer (Selected Conferences):** IEEE ICC, IEEE Globecom, IEEE ISMICT, IEEE WCNC, IEEE ISCAS, IEEE ICASSP, IEEE Waspaa, ACM NanoCom

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## Invited Presentations

March 2025	<b>Invited Keynote</b> – Workshop on Post Shannon Theory, Molecular Communication and Semantic Communication, University of Braunschweig, Germany
March 2025	<b>Invited Tutorial</b> – 14 <sup>th</sup> International ITG Conference on Systems, Communications and Coding (SCC), Karlsruhe, Germany
June 2024	<b>Invited Lecture</b> – KuVS Summer School “Internet of BioNanoThings”, Hohwacht, Germany
April 2024	<b>Invited Presentation</b> – Workshop on Nanotechnologies for Healthcare, Berlin, Germany
February 2024	<b>Invited Presentation</b> – Workshop on Post Shannon Theory, Molecular Communication and Semantic Communication, University of Braunschweig, Germany
September 2023	<b>Invited Presentation</b> – University of Warwick, Coventry, UK
July 2023	<b>Invited Presentation</b> – 6G life Workshop on Molecular Communications, Technical University of Munich, Germany
June 2023	<b>Invited Presentation</b> – 21 <sup>st</sup> ACM International Conference on Mobile Systems, Applications, and Services, Helsinki, Finland
May 2023	<b>Invited Presentation</b> – Ambient Intelligence Group, Aalto University, Finland
March 2023	<b>Invited Presentation</b> – Acoustic Labs, Aalto University, Finland
March 2023	<b>Invited Presentation</b> – Institute for Bioprocess Engineering (BVT), FAU, Germany
July 2022	<b>Invited Tutorial</b> – 6 <sup>th</sup> Workshop on Molecular Communications, Coventry, UK
May 2020	<b>Invited Presentation</b> – Workshop “Reaction, Diffusion, and Molecular Communication”, Graz, Austria
February 2020	<b>Invited Presentation</b> – Johannes Kepler University Linz (JKU), Linz, Austria
May 2019	<b>Invited Presentation</b> – 1 <sup>st</sup> China-German Molecular Communication Workshop, Shanghai, China
October 2022, 2019, 2018	<b>Invited Presentation</b> – Annual meeting of the GITEC Association, Regensburg, Germany
March 2018	<b>Invited Presentation &amp; Paper</b> – Congress of the German Acoustical Society (DAGA), Munich, Germany

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## Teaching Experience

\*Summer Semester (SS), Winter Semester (WS)

2024/2025	<b>Mini Lectures</b> on “Molecular Communications” and “Signals and Systems I+II” for PhD students and PostDocs within the DFG Research Training Group 2950 at FAU
2024	<b>Tutorial</b> on “Internet of BioNanoThings – Challenges and Networking Solutions” at IEEE Global Communications Conference, Cape Town, South Africa
2024	<b>Seminar</b> for graduate students on “The Internet of BioNanoThings for Next Generation Health Care Solutions”, FAU, Germany
2024	<b>Invited lecture</b> “Modeling and Design of Molecular Communication Systems”, KuVS Summer School “Internet of BioNanoThings”, Germany, <b>Invited Lecturer</b>
Feb. 2024	<b>Basic Course Higher Education Didactics</b> , <i>Fortbildungszentrum Hochschullehre, FAU</i> „Zertifikat Hochschullehre der Bayerischen Universitäten“

2023/2025	<p><b><u>Author of two Textbooks</u></b> “<i>Multidimensional Signals &amp; Systems – Theory and Foundations</i>” [B1], and “<i>Multidimensional Signals &amp; Systems – Applications</i>” [B2], Springer.</p> <p>The textbooks are for graduate students, Ph.D. students, and senior researchers and cover the theory of multidimensional signal processing with applications to different fields of engineering such as transmission line modeling, acoustics and molecular communication. [B1] was published in August 2023, and [B2] will be published in 2025.</p>
2023	<b>Seminar</b> “Drittmittel- und Projektmanagement von Forschungsprojekten“, Zentrum für Wissenschaftsmanagement e.V. Speyer
2023	<b>Seminar</b> “Body language for scientists“, German Association of University Professors and Lecturers (Deutscher Hochschulverband)
2019 – present	<b>Music Processing Synthesis, Multimedia Communications and Signal Processing, FAU, <u>Course Lecturer and Examiner</u></b> (WS 2019, WS 2020, WS 2021, WS 2022, WS 2023, WS 2024)
2022 – present	<b>Module “Physics based Sound Synthesis“, Aalto University, Finland, <u>Permanent Guest Lecturer</u></b>
2021	<b>Guest lecture and Seminar, Aalto University, Finland</b> (Note: Within the ERASMUS+ Staff Mobility Program)
2020 – present	<b>Supervisor – MATLAB Course</b> for undergraduate students, <i>Institute for Digital Communications, FAU</i> (SS 2020, WS 2020, SS 2021, WS 2021, SS 2022, WS 2022, SS 2023, SS 2024)
2017	<b>Seminar – Machine Learning in Multimedia Signal Processing, Multimedia Communications and Signal Processing, FAU, <u>Organizer</u></b> (SS 2017)
2015 – 2019	<b>Music Processing Synthesis, Multimedia Communications and Signal Processing, FAU</b> , Tutorial instructor for lecture given by Prof. Rudolf Rabenstein (WS 2015, WS 2016, WS 2017, WS 2018)
2016 – 2019	<b>Mensch-Maschine Schnittstelle, Multimedia Communications and Signal Processing, FAU</b> , Tutorial instructor (SS 2016, SS 2017, SS 2018, SS 2019)
2015 – 2019	<b>Multidimensional Signals &amp; Systems, Multimedia Communications and Signal Processing, FAU</b> , Tutorial instructor and assistant lecturer (WS 2015, WS 2016, WS 2017, WS 2018)
2012 – 2013	<b>Grundlagen der Informatik, Chair of Visual Computing, FAU, <u>Leading Tutorial instructor</u></b> with responsibility over all instructors and exam creation (SS 2012, WS 2012, SS 2013, WS 2013)
2009 – 2012	<b>Grundladen der Informatik, Pattern Reconignition Lab, FAU</b> , Tutorial instructor (WS 2009, SS 2010, WS 2010, SS 2011, WS 2011)
2015 – present	<b>Supervisor</b> of approx. 50 Bachelor/Master theses and research internships (selection can be found below)