University of Basel

Department of Biomedical Engineering

FACULTATIS MEDICINAE BASILIENSIS 1460

Department of Biomedical Engineering

Annual Report 2024

Guiding Principles

Our Vision
We contribute to a world where health care needs are met by innovative biomedical research and engineering solutions.

Our Mission
We translate basic science and engineering into medical knowledge and healthcare innovations.
We provide high-quality education and capacity building for academics, clinicians, and industrial partners.

Our Values
We adhere to the Code of Conduct of the University of Basel and promote an interdisciplinary culture of dialog, appreciation, respect, honesty, and tolerance.
We are committed to scientific integrity, reliability, transparency, and good scientific practice.
We value and foster enthusiasm and passion for science

Our Main Goals in Four Fields of Action
1. **Research, Problem Solving, Innovation & Translation:** The DBE provides practical innovative biomedical engineering solutions for clinical challenges and covers the whole translation process from bench to bedside by developing and validating clinical applications and supporting approval processes.

2. **Organization, Collaboration & Environment**: The DBE is a multidisciplinary network of research groups and clinicians and combines life sciences with complementary expertise. It is a research department that is embedded in the Faculty of Medicine, integrated in a clinical environment and part of an ecosystem of med-tech spin-offs, industry, and proximity to pharma and hospitals. In this constellation, the DBE is a unique platform in Switzerland and the EU.

3. **Talents & Education:** The DBE's motivated faculty provides excellent education, capacity building, and integrates our interdisciplinary students directly into ongoing research activities.

4. **Finances & Structural Resources:** The DBE is secured by solid structural funding by the University, resp. the Faculty of Medicine covering the core facilities, research-IT, safety, and administration. To stabilize it in the future, at least one permanent University professorship in every research cluster will be needed. The DBE is an interesting partner for innovative research and able to secure substantial third-party funding exceeding the structural funding approximately three to four times.

The implementation of our mission relies on the support of our founding institutions:

University of Basel

Universitätsspital Basel

UKBB
kompetent & menschlich

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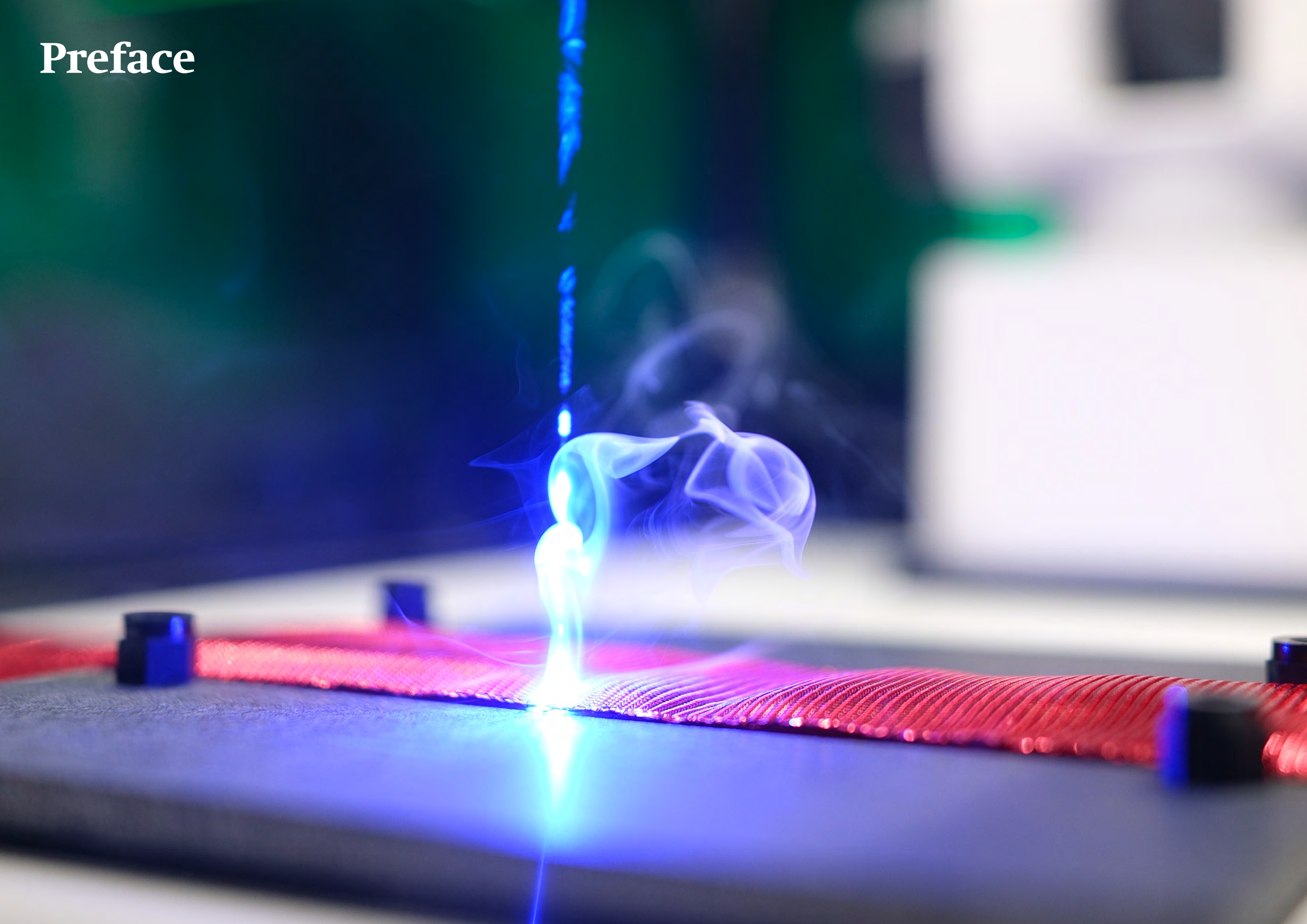
Preface



Yet Another “What a Year” for the DBE!

Celebrating our 10th anniversary in the new CADENCE lab: a Roman numeral 10 recorded by motion capture system (picture: CADENCE and R. Wendler)

The year 2024 has turned out to be even more dynamic and successful for us than 2023. Above all, we celebrated our 10th birthday: Ten years ago, in November 2014, the Department of Biomedical Engineering was founded. At the 10th DBE Research Day on 21 August 2024, the 10th birthday was celebrated, with Hans-Florian Zeilhofer, founding father and major inspiration, looking back and into the future. From its genuinely humble beginnings, the DBE took a steep rise and will continue to do so in the coming years.

From the very beginning, we wanted to involve clinicians in our research projects. Over the past year, we have seen that we are becoming more attractive to clinicians and that we are being taken seriously. Teaming up with clinicians, hospitals and other departments in the Faculty of Medicine is leading to more translational research projects, more spin-offs and even medical certifications. We are obviously able to meet the needs of clinicians and medical professionals.

The DBE has become a medical innovation hub for technical issues in medical and clinical applications. Our success is also evident on the student side: the number of master’s students has doubled since the launch of the joint program with the FHNW.

These and many more indicators, described in this Annual Report, show us that the DBE is a success story, a good place for ambitious research, a launchpad for truly successful translation, and home for innovative teaching at the cutting edge.

We are proud of what we have achieved and look forward to future endeavors. We would like to thank everyone who has contributed to this success story at the DBE.

Philippe Cattin & Daniela Vavrecka

Take a quick tour of the DBE:
https://youtu.be/mV8siyliRXY

The DBE in Numbers

12 Mio CHF funding

6.4 Mio SNF
0.8 Mio EU-/SERI
1.4 Mio Innosuisse
3.4 Mio Foundations

12
Spin-Offs since 2015

32 Research Groups

320 Members

170 University employed
135 Hospitals & IRM employed
15 Others

25
Patents since 2014

4
Core Facilities

11 PhD Graduates
62 PhDs since 2018

22 Master’s Graduates
83 Masters since 2020

11
Awards & Prizes

405
Peer Reviewed Publications
incl. **227** first/last author

140+
Collaborations

Looking Back on 10 Years of Growth

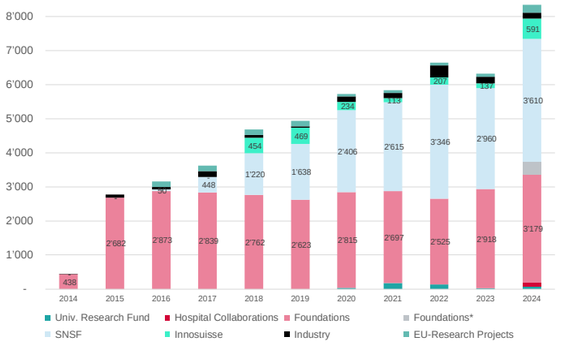


Figure 1: Funding of the DBE distributed across the years of deployment. Not shown are the years 2025–2028, for which CHF 20 million had already been secured by the end of 2024. Between 2014 and 2025, DBE members raised over CHF 70 million in total (graph: D. Vavrecka).

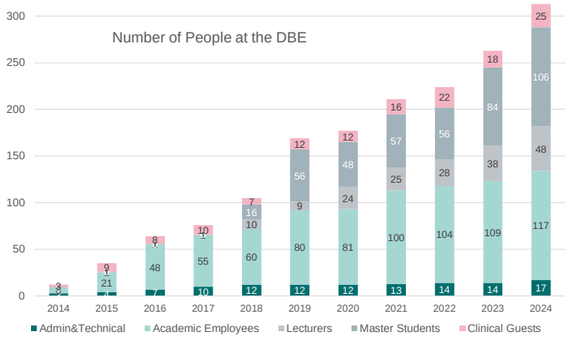


Figure 2: The number of people at the DBE has grown steadily since its foundation in 2014, especially the number of scientific staff and master's students. The only exception is support staff, which has remained relatively constant (graph: D. Vavrecka).

Nothing illustrates the success and growth of the DBE better than the research funding secured in 2024. In 2024 the third-party grants doubled compared to 2023, resulting in as much funding available for 2025 as was available in 2024—before the year even began.

In its first years after its foundation in 2014, research at the DBE was mainly based on the generous support of the Werner Siemens Foundation (WSS) and the Straumann, the Zaeslin and the Merian-Iselin foundations. Those laid the base for the future successful funding applications especially granted by the SNSF and increasingly also Innosuisse. To date, the DBE researchers have secured more than 70 million CHF research funding which secures the employment of our young, bright PhD students and postdocs for the next three years.

Already in 2023, the DBE was the champion at the University of Basel in terms of third-party funding: external funding sources exceeded the University's contributions sixfold (source: 2023 annual report of the University of Basel), for 2024, we expect a similar relation.

More means for research also means more employees in new projects, especially the number of PhD students and postdocs increased. Furthermore, our master's program has developed and together with the University of Applied Sciences North Western Switzerland (FHNW), the Joint Master in Biomedical Engineering has been set up, resulting in twice as many master students compared to the previous program (figure 2).

The increase in means and employees for research is the positive side of the coin – the challenge of this success is not proportionally growing research support. On the part of the University, structural research support is currently limited to 8% of the total employment at our department. Further, 5% are temporarily employed by means of the WSS, which acknowledges that research needs support from coordinators, IT & PR experts as well as administration. To guarantee a sustainable development of the entire DBE, 2025 the focus will be on an appropriate development of research support.

Highlights

Robot Cuts Red Ribbon: The New DBE Officially Inaugurated

Top: Thomi Jourdan, Prof. Philippe Cattin, and Prof. Andrea Schenker-Wicki pressing the button jointly. Bottom: guests at networking (pictures: R. Wendler).

On January 30, the DBE's new premises were inaugurated with a bang: The VIPs Thomi Jourdan, head of the Department of Economy and Health of Canton Basel Landschaft, Prof. Andrea Schenker-Wicki, Rector of the University of Basel, and Prof. Philippe Cattin, head of the Department of Biomedical Engineering, pressed the button.

The button set a laser robot in motion to cut the red ribbon, officially inaugurating the DBE's new facility. DBE researchers say their technology will not replace surgeons, but it easily took over the simple task from the VIPs to cut the red ribbon and even did it with a laser instead of scissors, just like our surgical robot does.

The ceremony, framed by speeches of the VIPs, was attended by more than a hundred representatives from politics, the hospitals of Basel-Landschaft and Basel, foundations, industry and the university. The guests had the opportunity to take tours of twelve different labs and learn how DBE is working to improve prevention, diagnosis, treatment and rehabilitation while reducing costs to the healthcare system. They enjoyed an apéro riche and talked about translational research between engineering, the clinic, the life sciences industry and the rapidly growing BaseLink innovation district.

Brand New Cutting Edge Facilities for CADENCE

New CADENCE Facility (pictures: C. Nüesch, C. Flierl, R. Wendler)

In 2024, CADENCE was equipped with cutting-edge technology and began operations. This infrastructure offers unique opportunities in Switzerland, combining expertise and disciplines in robotics, functional biomechanics, musculoskeletal modeling, virtual reality, orthopedics and neuroorthopedics, pediatrics, spine surgery, biochemistry and radiology. Beyond being a transdisciplinary consortium, CADENCE also serves as one of the four core facilities of the DBE.

CADENCE is run by a consortium of four groups: "Robot-assisted Theragnostics", "Functional Biomechanics", "Clinical Biomechanics and Musculoskeletal Modelling", and "Spine Biomechanics". Together, they develop novel systems and methods for diagnosis, outcome measurement, treatment and rehabilitation of pathologies and conditions of the neuromusculoskeletal system.

In a 210 m^2 laboratory with a capturing volume of 11m x 5m x 3m (L/W/H), CADENCE offers research opportunities in the best-equipped motion analysis research center in Europe. The facility can also serve as a teaching and training center for courses on diagnostic and therapeutic technologies in the field of motion analysis and rehabilitation robotics.

With CADENCE, the acquired results from basic research and technological developments can be translated directly into the clinical environments at the Center of Clinical Motion Analysis of the University Children's Hospital of Basel (UKBB) and at the University Hospital Basel (USB) (orthopaedics, traumatology, spine surgery, neurology) also in close collaboration with the first Surgical Outcome Research Center (SORC) Basel in Switzerland.

In 2024, the scientific advisory board of the DBE evaluated CADENCE and deemed the consortium to be an invaluable asset for the DBE, the University and the Medical Faculty.

Funding:

Swiss National Science Foundation

UKBB kompetent & menschlich

Universitätsspital Basel

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at UKBB: Dr. Friederike Prüfer (Radiology)
at ZHAW: Prof. Daniel Baumgartner
at ETH-Zürich: Prof. Stephen Ferguson, Prof. William Taylor, Dr. Dominika Ignasiak, Dr. Navrag Singh
at Universitätsklinikum Erlangen (D): Dr. Anna-Maria Liphard

Swiss Robotics Day 2024

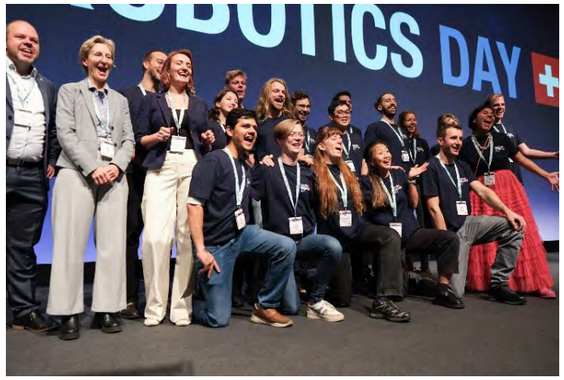

Figure 1: Organization team of the Swiss Robotics Day 2024 from University of Basel, EPFL, Innovation Booster Robotics (picture: R. Wendler).

Figure 2: Impressions from the Swiss Robotics Day 2025, (collage: G. Rauter, pictures: R. Wendler).

Swiss Robotics Day (SRD), Switzerland's most comprehensive exhibition on robotics for industry and research (1), took place for the first time in Basel and was a huge success.

The SRD brings together industry, researchers, investors, engineers, and students to exchange and share experiences, new ideas, and technologies. Matchmaking sessions facilitate collaborations and partnerships. Presentations by distinguished speakers focus on innovative technologies, new market trends for robots, logistics, the future of aerial robotics, and robots in healthcare.

The SRD is a one-day event initiated by the Swiss National Centre of Competence in Research (NCCR) in Robotics – a flagship project with EPFL as the leading house and ETH Zurich as a co-leading house. The 2024 edition was organized by Innovation Booster Robotics, the University of Basel (Dept. of Biomedical Engineering) and EPFL. On 1st November 2024, the SRD was held in Basel for the first time and even brought the Congress Center of Messe Basel to its capacity limits.

During the SRD 2024, the Swiss Robotics Association was founded as an association that connects academia, industry, NGOs, and politics around the topic of robotics (2,3).

Facts:

- 77 exhibitors,
- 1000 participants,
- 250kCHF costs for the event were covered by sponsorships, the Innovation Booster Robotics funded by Innosuisse, entry fees, and exhibition costs.

Funding:

Faulhaber, Maxon, Meta, Stäubli, helbling, itk, MathWorks, amazonrobotics, Hexagon, SBB CFF FFS, Schunk, Basel.ch, Beckhoff, Canton of Zuric, enterprise Europe network, ITU, S3C

Co-Organizer:
Prof. Georg Rauter
BIROMED-Lab

References:
(1) "SRD24," Swiss Robotics Day. Accessed: Feb. 19, 2025. [Online]. Available: https://swissroboticsday.ch/srd24

(2) Swiss Robotics Association." Accessed: Feb. 19, 2025. [Online]. Available: https://swiss-robotics.org/

(3) Tobias Bossard, "Weltneuheit am Swiss Robotics Day 2024," Tagesschau, Basel, Nov. 01, 2024. [Online]. Available: https://www.srf.ch/play/tv/tagesschau/video/weltneuheit-am-swiss-robotics-day-2024?urn=urn:srf:video:724784fe-a7bb-4473-81e1-be8bc7e2f25a

Global Impact of Julia Wolleb's Diffusion Model for Medical Anomaly Detection

Dr. Julia Wolleb (third from left) at CLINICCAI panel discussion, during the clinician's day at MICCAI 2024 (picture: Digital Surgery Lab).

Two years after its publication at the MICCAI 2022 conference in Singapore, Dr. Julia Wolleb's paper "Diffusion Models for Medical Anomaly Detection" has become one of the most influential papers in the field of Medical Image Analysis.

In her contribution, Wolleb introduced a new, weakly supervised anomaly detection method based on implicit denoising diffusion models. Contrary to previous models , which are often complicated to train or have difficulties in preserving fine image details, Wolleb's method generates highly detailed anomaly maps without requiring complex learning procedures.

With her paper, Wolleb started a growing global movement among researchers that resulted in about 20% of all MICCAI 2024 papers using her method. Consequently, her paper was elected among the three most influential papers at the "MICCAI 2024 Young Scientist Publication Impact Award".

Wolleb finished her PhD at Philippe Cattin's Center for medical Image Analysis & Navigation (CIAN) group and now works as postdoctoral researcher at the Yale Laboratory of Intelligent Global Health & Humanitarian Response Technologies (LiGHT).

Reference:
(1) Wolleb, J., Bieder, F., Sandkühler, R., Cattin, P.C. (2022). In: Wang, L., Dou, Q., Fletcher, P.T., Speidel, S., Li, S. (eds) Medical Image Computing and Computer Assisted Intervention – MICCAI 2022. Lecture Notes in Computer Science, vol 13438. Springer

3D-Printed Neurostimulator for Personalized Transcranial Electrical Stimulation and EEG Monitoring at Home

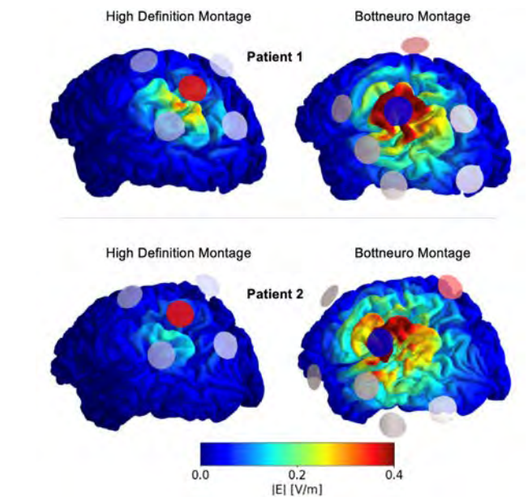

Figure 1: Personalized electrode positioning (right) improves stimulation accuracy and reduces inter-subject dose variation compared to conventional montages (left). Optimized montages are directly integrated into 3D-printed caps (picture: Bottneuro).

Figure 2: Patient specific, 3D-printed cap. The Miamind® Neurostimulator, registered with Swissmedic and MHRA, is tailored for each patient using 3D printing on the basis of MRI scans (picture: Bottneuro).

Transcranial electrical stimulation (tES) is an emerging technique for modulating brain function with high spatial and temporal precision, showing promise in treating a range of neurological and psychiatric conditions. Because each patient's skull and brain anatomy varies significantly, a personalized approach is essential for precise and effective stimulation. To address this need, Bottneuro AG, a DBE spin-off, develops tailored tES devices that improve stimulation accuracy and clinical outcomes.

Currently, high variability in electrical field distributions within the brain due to individual anatomy leads to reduced clinical robustness of conventional tES treatments (1). Biophysical modeling from each patient's MRI, combined with finite element method simulations, allows for the planning of personalized electrode montages and stimulation parameters to precisely target specific brain areas while minimizing off-target effects (2), see figure 1. This approach reduces interpatient variability in clinical outcomes and ensures effective treatment for each patient.

Bottneuro's Miamind® Neurostimulator, registered with Swissmedic and MHRA, uses 3D-printed caps to guarantee a comfortable and precise fit, enabling personalized therapy plans to be delivered at home (3), see figure 2.

The neurostimulator is controlled via a secure tablet, allowing patients to independently manage therapy sessions. A recent clinical study conducted in collaboration with the University Hospital Basel demonstrated device safety and showed promising improvements in cognitive function among a healthy population.

Funding:

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra
Innosuisse – Schweizerische Agentur für Innovationsförderung

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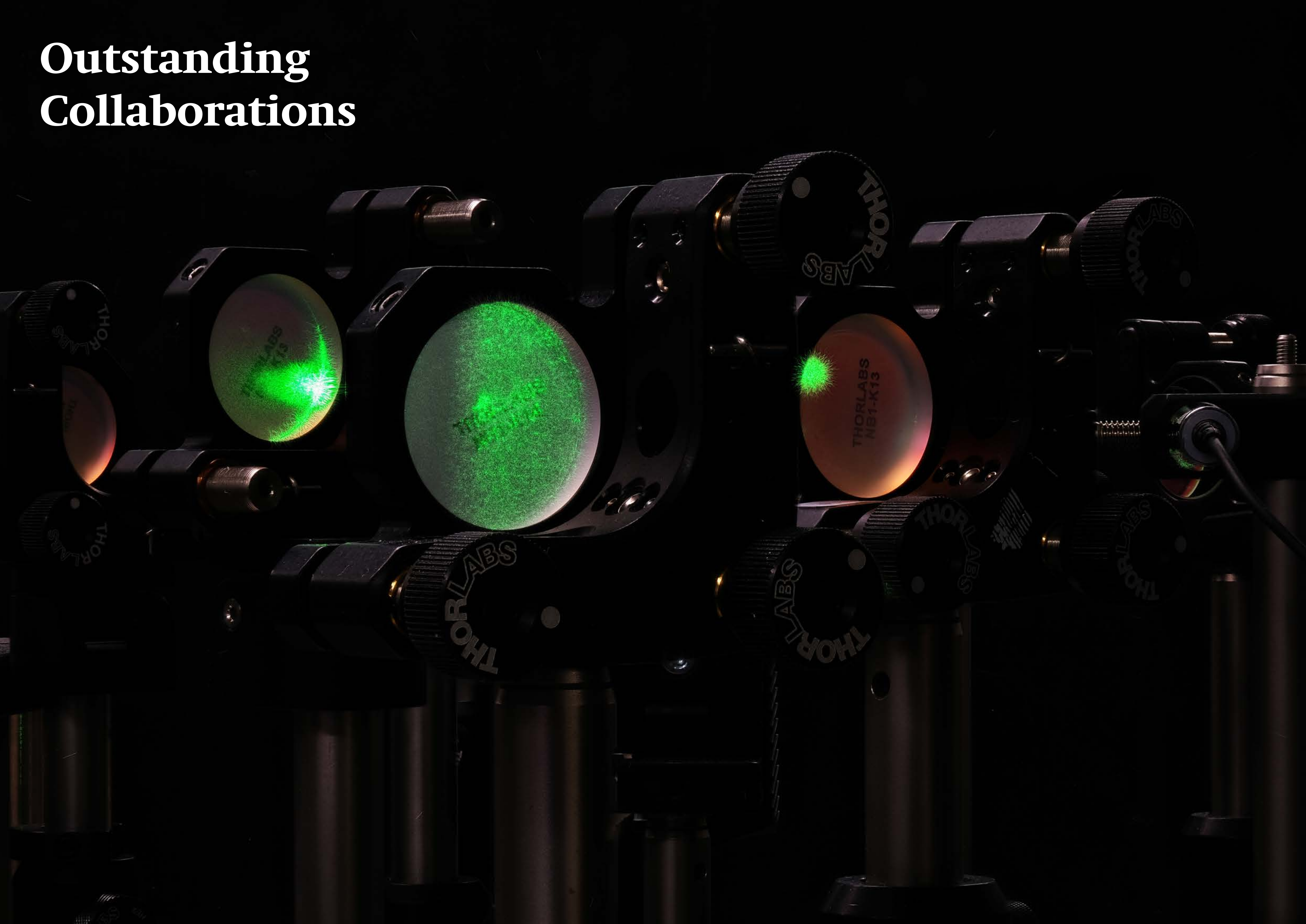
References:
(1) A. Optiz et al., "Determinants of the electric field during transcranial direct current stimulation", NeuroImage 109 (2015) 140-150.

(2) B. Osmani et al.: Computer-implemented method for enabling patient-specific electrostimulation of neuronal tissue and associated devices and software. Patent No. EP4204077B1 (2021).

(3) B. Osmani et al.: Electrode helmet for electrical recording and/or stimulation. Patent No. EP4282464B (2022).

Outstanding Collaborations



Clinical Introduction of Machine-Learning Software at University Hospital Basel

Figure 1: Project team, left to right: Cristina Granziera, Philippe Cattin, Johanna Lieb, Roland John, Shan Yang (picture: N. Bienbeck).

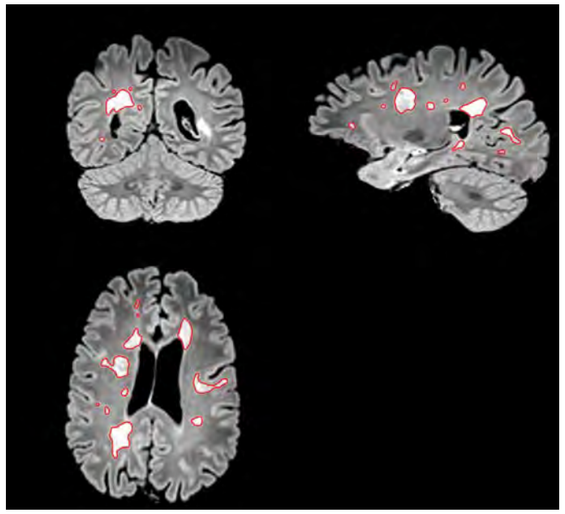


Figure 2: The MS-MD-GRU algorithm recognizes the MS-affected lesions in MR images of patients with multiple sclerosis and directly marks the affected areas on the scans. A neuroradiologist can control and adjust these masks directly (picture: Shan Yang).

A successful collaboration allowed the introduction of the MS-MD-GRU algorithm, developed at DBE, into clinical practice. This algorithm is capable of distinguishing healthy from MS-affected brain tissue and marks affected regions in MR scans.

This algorithm was initially designed to label brain structures in MR images, and then the original MD-GRU algorithm was trained for multiple sclerosis (MS) and became MS-MD-GRU. It was developed at the DBE by Prof. Philippe Cattin and his former PhD student Simon Andermatt. The MS training was performed in collaboration with Prof. Cristina Granziera (Neurology, USB), who provided imaging data from the Swiss Multiple Sclerosis Cohort, thus enabling MS-MD-GRU to distinguish healthy from MS-affected brain tissue and to mark affected regions in MR scans.

Tests show that MS-MD-GRU enhances MR interpretation accuracy compared to human analysis. Shan Yang (Radiology and Nuclear Medicine, USB) integrated MS-MD-GRU into the clinical workflow, allowing neuroradiologists to use pre-marked images that can be corrected as needed. This innovation boosts treatment quality for MS, surpassing current commercial solutions in efficiency and reliability.

MS-MD-GRU holds great potential for broader applications in AI-guided diagnosis, therapy development, and further progression toward fully automated diagnosis.

The implementation of Prof. Philippe Cattin's vision, to bring this algorithm into clinical practice was realized together with Roland John and Claudia Saupper (both DKF), who managed the ISO 13485 documentation, with the support of Dr. Bram Stieltjes (ICT), and with the clinical expertise from Prof. Cristina Granziera (Dept. of Neurology), Dr. Johanna Lieb and Prof. Oliver Bieri (Radiological Physics) and Shan Yang (Dept. of Neuroradiology). The process was validated by independent auditors from Effectum Medical AG.

Funding:
Stiftung zur Förderung der gastroenterologischen und allgemeinen klinischen Forschung sowie der medizinischen Bildauswertung Basel

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References:
(1) S. Andermatt, Automated Segmentation of Multiple Sclerosis Lesions Using Multi-dimensional Gated Recurrent Units, MICCAI Workshop, 10.1007/978-3-319-75238-9_3, 2018

PASSION for Dermatology: Bridging the Diversity Gap with Pigmented Skin Images

Figure 1: PASSION team in Madagascar (picture:PASSION).

Figure 2: Sample images of the dataset (picture: PASSION).

Africa faces a severe shortage of dermatologists, with fewer than one per million people, despite 80% of children suffering from untreated skin conditions. The PASSION project tackles this issue by creating the first open-source dataset of 4,901 images from 1,653 patients in Sub-Saharan Africa, focusing on pediatric skin diseases like eczema, fungal infections, scabies, and impetigo. It also offers a baseline AI model for teledermatology. Learn more at https://passionderm.github.io/.

Africa faces a severe healthcare worker shortage, with only 1.3% of the global workforce meeting 25% of the demand (1). Dermatology access is especially dire, with fewer than one dermatologist per million people, despite 87% of children experiencing skin conditions (2). While AI could be a potential solution, existing publicly available datasets lack pigmented skin (less than 10%) (3). The PASSION project addresses this gap by collecting 4,901 dermatological images from 1,653 patients across Sub-Saharan Africa, of common skin conditions, representing skin phototypes IV-VI. Data was acquired in telemedicine-like conditions and thoroughly anonymized and cleaned.

The study introduces a ResNet-50 model to classify skin conditions and detect impetigo, using a weighted cross-entropy loss and Adam optimizer. Evaluation includes cross-validation, unseen test sets, and demographic subgroups. Results highlight the model's generalization across centers, age groups, and skin types, emphasizing the fairness in the collected data.

The project aims to be a milestone toward better access to skincare in the Sub-Saharan population.

Funding:
fondation BOTNAR

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References:
(1) Naicker, S., et Al.: Shortage of healthcare workers in developing countries–Africa. Ethn Dis 19(1 Suppl 1), S1–60–4 (2009)

(2) Kiprono, S.K., et Al.: Skin diseases in pediatric patients attending a tertiary dermatology hospital in northern Tanzania: a cross-sectional study. BMC Dermatology 15, 16 (Sep 2015)

(3) Xie, et al.: A clinical image dataset of Asian race for skin disease aided diagnosis. In: MICCAIW. Springer (2019)

Collaborative Advances in Predicting and Preventing Anastomotic Leakage: Integrating AI and Clinical Insights.

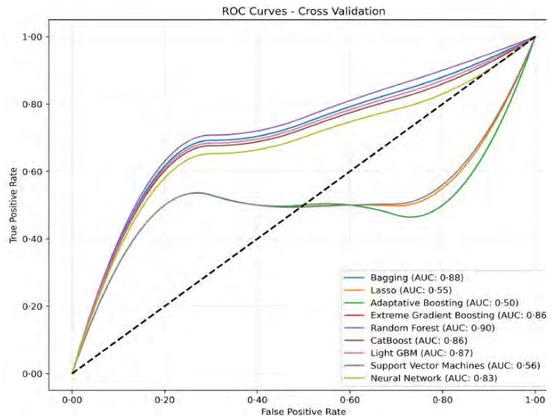

Figure 1: Area under the receiver operating characteristics curves (ROC-AUC) for the implemented models on the 10-fold cross-validation test set (mean values) (picture: V. Ochs).

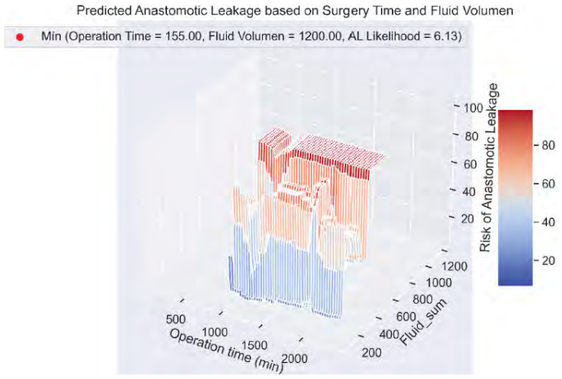

Figure 2: Surface Plot for Fluid sum and operation time on probability of anastomotic leakage (picture: V. Ochs).

Advances in Anastomotic Leakage Prediction and Prevention Through Collaborative Research.

Dr. Anas Taha, a member of Prof. Cattin's group Center for medical Image Analysis & Navigation (CIAN), has established a new collaboration with the European Society of Coloproctology (ESCP) cohort studies team. In this collaboration, data is shared with researchers to be used in an international multicenter study about "Development of a Machine Learning-Based Model to Optimize Anastomosis Configuration in Right Hemicolectomy for Minimizing Postoperative Anastomotic Leakage". The project focuses on developing predictive models and optimize surgical outcomes.

In particular, a novel AI-based model was developed to predict the likelihood of anastomotic leakage with high accuracy. This model integrates key clinical factors and surgical configurations, such as fluid sum and operation duration, to provide actionable insights for surgeons. A comparative analysis across participating clinics demonstrated that targeted adjustments to fluid management protocols significantly reduced anastomotic leakage incidence rates.

A major highlight of our work is the exploration of safe fluid thresholds and optimal operation durations, paving the way for evidence-based surgical guidelines. These findings were validated across diverse clinical settings, reinforcing their applicability in real-world scenarios.

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Leading the Way Internationally in Point-of-Care 3D-Printed Personalized Implants

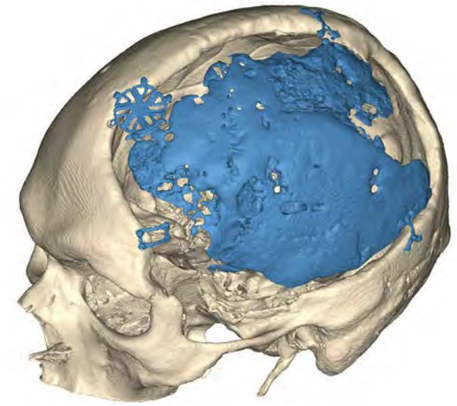

Figure 1: A typical case of cranial reconstruction illustrating a patient's resorbed bone (blue) requiring revision surgery with a personalized implant (picture: N. Sharma).

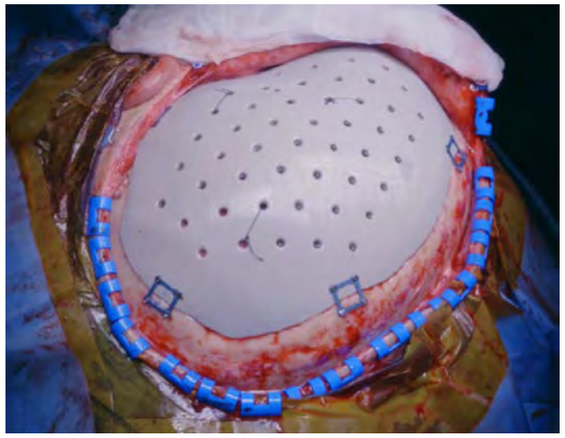

Figure 2: University Hospital Basel's first 3D-printed personalized Polyetheretherketone (PEEK) cranial implant (picture: Digital Content Team, USB).

In 2024, more than 60 patients benefited from personalized, point-of-care (POC) 3D-printed implants, enabled by the collaboration between the Medical Additive Manufacturing (Swiss MAM) research group at DBE, the 3D Print Lab with the Craniomaxillofacial Surgery and Neurosurgery departments at USB, and POC APP AG, ensuring MDR-compliant POC manufacturing.

Under the leadership of Prof. Florian Thieringer and Dr. Neha Sharma from the Medical Additive Manufacturing (Swiss MAM) research group, point-of-care (POC) 3D-printed implants have been successfully realized, including the first cranial implant in 2023 in collaboration with the Department of Neurosurgery at University Hospital Basel (USB). This milestone marked a key advancement in personalized cranial reconstruction, enhancing surgical precision and outcomes. The work received notable support from USB's Innovation Focus "Regenerative Surgery" and the Werner Siemens Foundation.

Building on this success, POC APP, a spin-off founded under the same leadership with external partners, has contributed to over 62 patients treated at USB and University Hospital Salzburg (Austria). This highlights the pivotal role of POC APP in personalized medical devices, ensuring Medical Device Regulation compliance in planning and manufacturing 3D-printed medical devices at the POC 3D Print Labs.

Additionally, the research group has signed a consortium agreement with international partners, including AM4Life Competence Center under Sweden's Innovation Agency in Uppsala. Clinics from Singapore, Sweden, and Hungary have approached the group to collaborate and establish similar advanced treatment services, including knowledge transfer, joint research, and POC 3D printing capabilities, further emphasizing the global impact and growing demand for personalized 3D-printed medical solutions.

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References:
(1) 3D-Druck: Der erste Patient hat ein am USB selbst hergestelltes Implantat erhalten.

(2) 3D Systems' Extrusion Technology to Produce Patient-specific PEEK Implants Supports Ground-breaking Cranial Surgeries at Leading European Hospitals

Micro- and Nanotomography – Outstanding High-Resolution 3D Images for Science

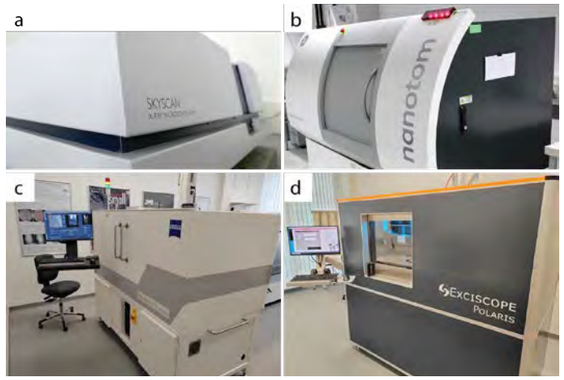

Figure 1: The equipment of MiNa: Skyscan 1275 (a), nanotom® m (b), xradia 610 Versa (c) and Polaris (d) (pictures: G. Schulz).

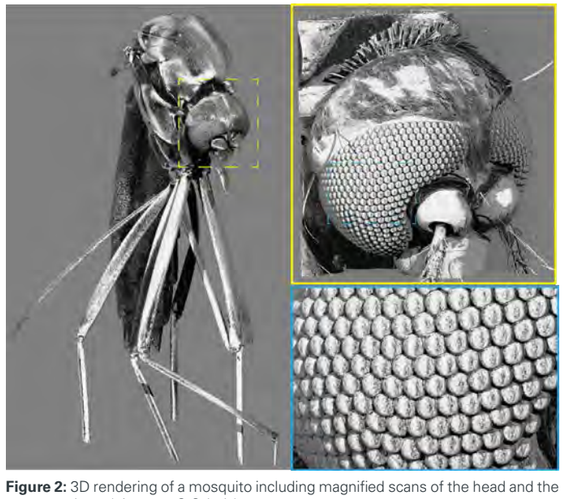

Figure 2: 3D rendering of a mosquito including magnified scans of the head and the compound eye (pictures: G.Schulz).

The Core Facility "MiNa" offers scientific services for X-ray-based non-destructive three-dimensional imaging for internal and external researchers as well as users from industry. The analyses can be carried out with isotropic voxel sizes between 0.1 and 50 µm.

Since 2016, MiNa has used two X-ray microtomography systems: Skyscan 1275 (Bruker, Fig. 1a) and nanotom® m (phoenix|x-ray, GE Measurement & Control, Fig. 1b) for investigations down to the micrometer range. Following a comparative study among three suppliers of next-generation microtomography systems in 2020 (1) and a successful SNSF R'Equip application in 2021, the Core Facility was expanded in 2023/2024. Now, the Xradia 610 Versa (Zeiss, Fig. 1c) and the Polaris system (Exciscope, Fig. 1d) for scans down to the sub-micrometer range are part of the Core Facility. The eight research projects of the consortium within the framework of the application include morphological changes in murine kidneys (J. Huwyler), diagnosis of vasculitis (S. Frank), regenerated nerves (R. Guzman), bone formation with cells from adipose tissue (A. Scherberich), visualization of cartilage (G. Schulz), stem cell-mediated distraction osteogenesis (B. Müller), annual layers in the cementum of teeth (G. Hotz) and mammalian inner ears (L. Costeur) from the Natural History Museum Basel (2).

Figure 2 shows a 3D rendering of a mosquito, which was recorded in collaboration with the Swiss TPH Basel with pixel sizes down to 180 nm (3). The data not only show electron microscopy-like surfaces but also the 3D eye lens shapes, allowing for the determination of the focus length. Therefore, it was awarded with the Paper Award for Optics and Photonics Applications at the conference 'Developments in X-ray tomography XV' in San Diego, USA.

Funding:
Swiss National Science Foundation

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References:
(1) A. Migga et al., Comparative hard x-ray tomography for virtual histology of zebrafish larva, human tooth cementum, and porcine nerve, Journal of Medical Imaging 9 (2022) 031507.

(2) B. Mennecart et al., Ruminant inner ear shape records 35 million years of neutral evolution, Nature Communica-tions 13 (2022) 7222.

(3) G. Schulz et al., Non-destructive imaging of internal structures of a mosquito with sub-micrometer resolu-tion, Proceedings of SPIE 13152 (2024) 131520M.

Hierarchical X-Ray Imaging of the Entire Human Brain

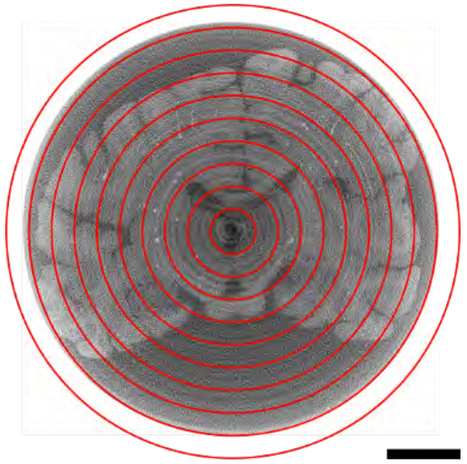

Figure 1: Extended field-of-view tomographic acquisition scheme for the entire human brain with (1.3 µm)3 voxels at the beamline P07 at DESY, Hamburg, Germany. The planning and illustration were based on data acquired at the DBE's MiNa Core Facility. The scale bar corresponds to 2 cm (picture: adapted from M. Humbel et al. (6)).

Figure 2: Volume rendering of an entire mouse brain, 3,000 times smaller than the human brain, imaged with 0.65-µm-wide voxels at the ANATOMIX beamline of Synchrotron SOLEIL, France (picture: adapted from G. Rodgers et al. (3)).

Imaging the 86 billion cells of the human brain poses many challenges. Magnetic resonance imaging lacks the required spatial resolving power, while optical microscopy of serial sections introduces preparation artifacts and only reaches the necessary resolution in two dimensions. Synchrotron radiation-based computed tomography with propagation-based phase contrast may bridge this gap, though the acquisition, processing, and dissemination of a petabyte-sized datasets must be developed.

In collaboration with the team of Prof. Magdalena Müller-Gerbl, the researchers of the Biomaterials Science Center have pushed microcomputed tomography of brain tissues to its limits. Successful tissue preparation is essential, as standard embedding leads to local deformation and shrinkage (1). We demonstrated the value of virtual histology for investigating cerebral disease models, e.g., temporal lobe epilepsy in mice (2). Field-of-view can be extended for entire brain imaging using a dedicated acquisition protocol, see figure 1. This approach was used for an entire mouse brain, see figure 2, which was imaged with 0.65 µm-wide voxels (3), registered to a reference atlas, and made publicly available via browser-based hierarchical viewers. We demonstrated the feasibility of this approach for the human brain with twenty times extended field-of-view (4). Prof. Bert Müller presented the achievements (5): We are on the cusp of imaging the 86 billion biological cells of the human brain and have secured SNSF funding for the next four years. The basic engineering challenge of petabyte data handling is a prerequisite to understand the anatomy and functionality of the healthy and diseased brain in the necessary detail. The ultimate goal is to support clinicians with detailed microanatomic data for related patient treatment.

Funding:
Swiss National Science Foundation
anatomix
SOLEIL SYNCHROTRON
Helmholtz-Zentrum hereon
DESY.

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References:
1) G. Rodgers et al., J. Neurosci. Meth. 365 (2022) 109385.

(2) G. Rodgers et al., Microsc. Microanal. 29 (2023) 1730-1745.

(3) G. Rodgers et al., Proc. SPIE 12242 (2022) 122421L.

(4) M. Humbel et al., Proc. SPIE 13152 (2024) 1315220.

(5) B. Müller, Proc. SPIE 13152 (2024) 1315202.

(6) M. Humbel et al., Proc. SPIE 13152 (2024) 1315211.

Engineered Skeletal Tissues

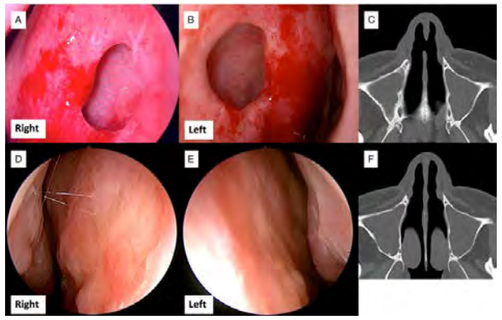

Figure 1: Preoperative (A-C) and postoperative (D-F) endoscopy and X-ray tomography (picture: adapted from Kaiser et al. (1)).

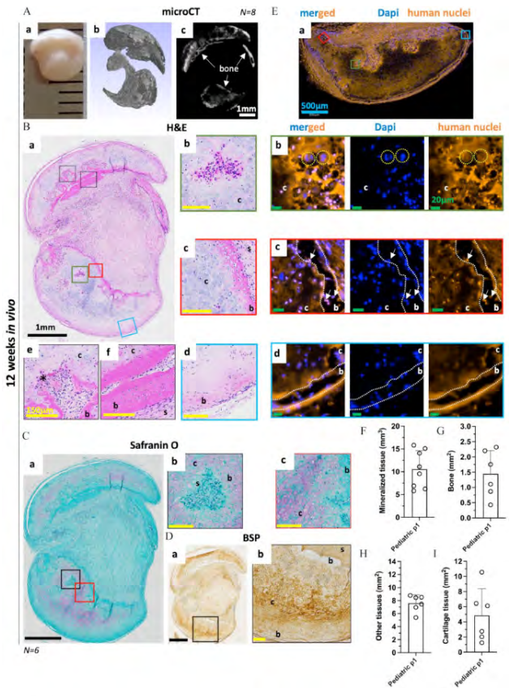

Figure 2: Pediatric hypertrophic cartilaginous grafts remodeled into bone tissue via endochondral ossification as shown macroscopically, by X-ray tomography or by histology (H&E staining) (picture: adapted from (4)).

Collaboration between the groups of Prof. Ivan Martin and Prof. Arnaud Scherberich has led to significant advances in the repair of bone and cartilage by regenerative surgery in 2024. In particular, the potential use of adipose-derived cells to generate pediatric bone organs and phalanx substitutes was validated in a preclinical model. Human cartilage organoids were developed to mimic osteoarthritis (OA) in vitro and a clinical validation of autologous nasal chondrocytes for the repair of nasal septal perforations was provided.

A phase I clinical trial assessed the use of autologous nasal chondrocyte tissue-engineered cartilage (called N-TEC) for functional repair of nasal septal perforations (NSP, (1)). This treatment was safe and feasible, as no severe adverse reaction and no challenges in graft manipulation were recorded. Subjective scoring and respiratory function were improved and healing was complete in several patients (as shown in figure 1).

A human organotypic model recapitulating OA pathological traits (hypertrophy, cartilage matrix mineralization, high catabolism and mechanical stiffening) was generated and validated by using an antagonist of inflammation (IL-1Ra, (4)).

Based on a preliminary proof of concept (3) that human adipose stromal cells (ASC) can generate hypertrophic cartilage tissue in vitro, able to remodel and recapitulate endochondral ossification (ECO) in vivo, we demonstrated that pediatric ASC can generate bone organs with the shape and size of a phalanx in a preclinical model ((4) and figure 2). An optimized, modular approach to generate such grafts is currently developed and showed promising results.

Funding:

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References:
(1) Kaiser B et al., Int J Surg. 110(10) :6573-6580 (2024)

(2) Dönges L et al., Biomaterials. 308 :122549 (2024)

(3) Chaaban M et al., Biomaterials. 303 :122387 (2023)

(4) Schaller R et al., J Tissue Eng. 15 :1-16 (2024)

Fluids and Barriers: Imaging the Central Nervous System in 4D (FABRIC4)

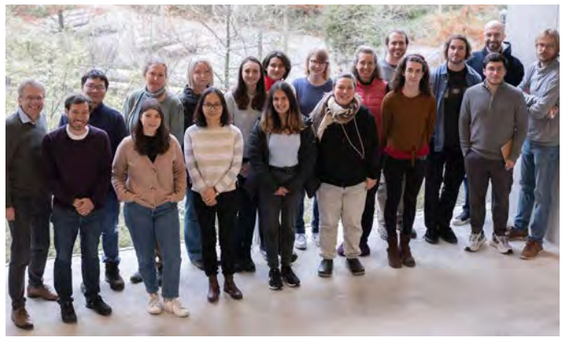

Figure 1: The regular team meetings, here in Allschwil, guarantee the scientific exchange between the partners. The Biomaterials Science Center was represented by Dr. Hans Deyhle, PhD student Mattia Humbel, Prof. Bert Müller, Dr. Dr. Daphne Schönegg, and Dr. Christine Tanner (picture: R. Wendler).

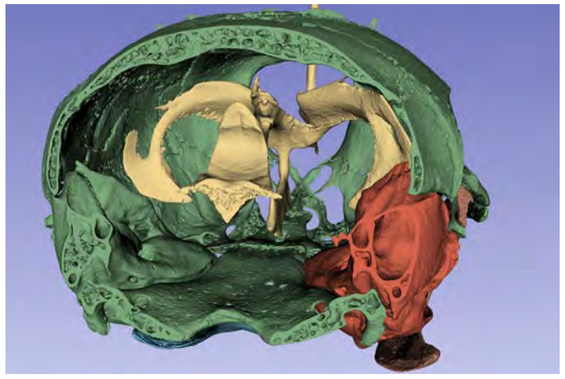

Figure 2: Three-dimensional rendering of the skull and ventricular spaces of a mouse, acquired using microtomography. The bone is shown in green and red, the cerebral ventricles in yellow. During a tomographic experiment, the ventricles were filled with a dedicated contrast agent by an injection through the skull dome (picture: M. Humbel).

As the prevalence of Alzheimer's disease and multiple sclerosis increases, we are searching for treatments on the basis of related microanatomy and physiology studies. Next to their hallmark neurodegeneration and neuroinflammation, the pathologies are characterized by changes in metabolite clearance and immune surveillance functions established by the cerebrospinal fluid (CSF) and brain barriers. The interdisciplinary team studies how CSF dynamics and brain barriers change with age, neuroinflammation, and neurodegeneration.

The project focuses on the production mechanisms, exit locations, driving forces, and flow routes of central nervous system (CNS) fluids. For this purpose, we employ in vivo synchrotron radiation-based microcomputed tomography for recently developed reporter mice. Computational modeling will consolidate the data acquired at synchrotron radiation facilities in France, Japan, Canada, and Australia. The team from the medical faculties in Basel, Bern, and Zurich provides the scientific community unrestricted access to hardware designs, experimental protocols, software, and data. Our work not only contributes to the understanding of the involvement of CNS fluids and barriers in establishing CNS homeostasis and immune privilege, but also of neuroinflammatory and neurodegenerative pathologies such as multiple sclerosis and Alzheimer's disease. It will also serve as a stepping stone for the scientific community towards the identification of targets for drugs and non-pharmacological interventions.

The team, see figure 1, has profound knowledge ranging from medicine to computational sciences and physics. The Sinergia project 213535 will run until April 2027. First results have been published (1), also see figure 2.

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Reference:
(1) M. Humbel, M. Girona Alarcón, W. Kuo, I. Spera, B. Bausch, L. Fardin, H. Deyhle, G. Rodgers, B. Engelhardt, S. Proulx, V. Kurtcuoglu, B. Müller, C. Tanner: Detection of cardiac-induced motion in murine cerebrospinal fluid space captured in vivo with synchrotron radiation-based microtomography, Proc. of SPIE 13152 (2024) 1315214, doi: 10.1117/12.3028460.

Computational Spine Biomechanics: in SEA2 SpineBot

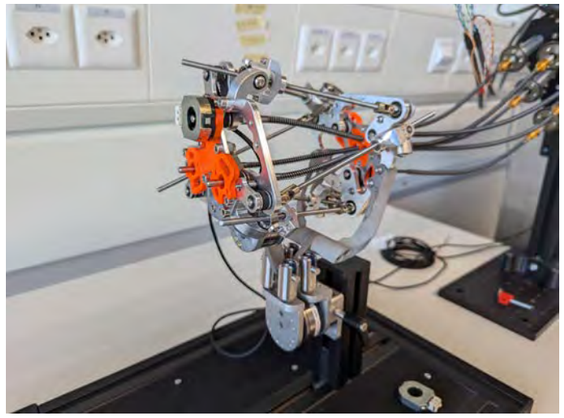

Figure 1: SpineBot 2.0 prototype. 6-Dof Hexapod acutated remotely by flexible shaft mounted on functional spinal unit phantom using pedicle screw interfaces (picture: R. Wendler).

Figure 2: SpineBot team members – names see below (pictures: UKBB and DBE).

The "in SEA2 SpineBot" project aims to acquire in vivo biomechanical data of functional spine units.

The project was reinitialized following a collaboration between the ARTORG Center for Biomechanical Engineering of the University of Bern and the University Children's Hospital Basel (UKBB) (1). The new project outline resulted in the additional collaboration with Prof. Georg Rauter from the BIROMED Lab at the Department of Biomedical Engineering, and received initial funding from the Christian Toggenburger Foundation in 2021, which could be used as kick-off funding for a PhD position. With additional funding from SNSF at the end of 2023, two new PhD positions and one postdoc position could be filled.

To further promote progress with the serial elastic actuator principle, a simpler robot (SpineBot 2.0) with a classic drive technology was created. Although this robot already has certain limitations, it allows us to carry out an initial evaluation of the concept, in which the robot is controlled by externally applied motors via flexible shafts.

The "in SEA2 SpineBot" represents the final concept, which will be implemented in 2025.

Funding:

Swiss National Science Foundation

University of Basel

Unternehmensstiftung Christian Toggenburger

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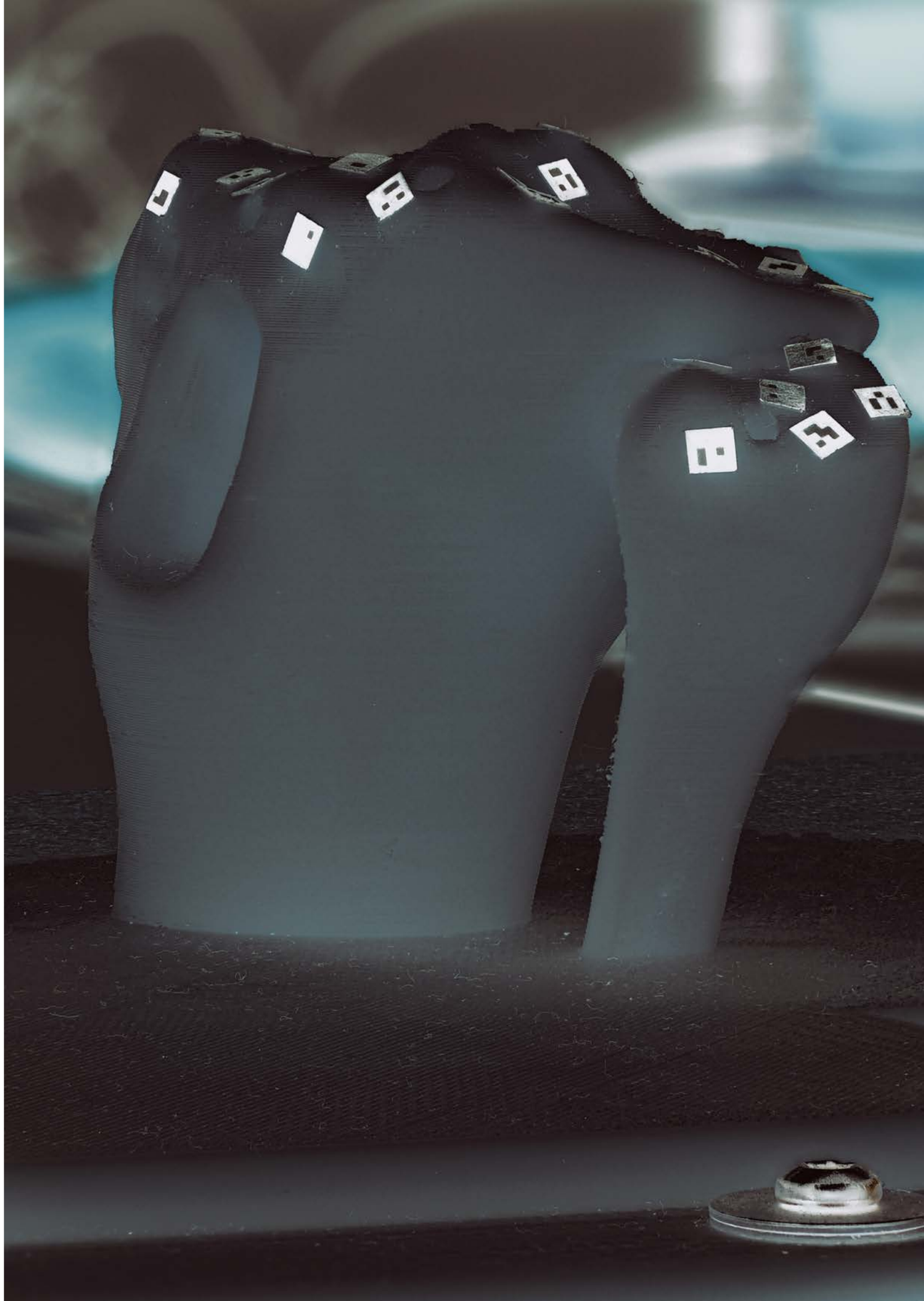
PD Dr. Daniel Studer
Dr. Nicolas Gerig
Felix Erb
Lauren Stephanie Wang
Till Vanderreijden
Aysegül Kilic

References:
(1) Büchler et al. The SpineBot – A Robotic Device to Intraoperatively Quantify Spinal Stiffness. J Med Devices, March 2021, Vol. 15.



Distinctions

Prizes & Conference Awards

Figure 1: From top to bottom: Dr. Céline Berger, Géraldine Borer and Elisabetta Giacomelli (pictures: R. Wendler).

Congratulations to:

Prof. Viktor Kölzer, Dr. Maxime Lafarge and the AIRMEC Research Consortium, which includes researchers from the DBE, the USB Pathology Department, the University of Zurich and ETH Zurich and the Leiden University Medical Center (LUMC) for the Team Science Award of the Dutch Research Council (NWO), endowed with 50,000 €.

Dr. Philippe Valmaggia who received the RetinAward 2024 from the Swiss VitreoRetinal Group for his groundbreaking research linking retinal blood flow to cardiovascular health. His innovative method combines OCT imaging with ECG data to measure the "Heart-Retina-Time," a potential new biomarker for heart health. Supported by Bayer and Roche, the 20,000 CHF prize advances his work, promising new tools for early diagnosis and treatment of circulatory disorders.

Prof. Andreas A. Müller, who received the SIWF Award. The Swiss Institute for Continuing Medical Education honored him with this award for his special commitment to continuing education and training.

Dr. Celine Berger, member of the Forensic Medicine and Imaging research group, for the PhD thesis award from the German Society of Legal Medicine (DGRM).

The Best Master's Thesis Award sponsored by the Zaeslin Teaching Grant was awarded ex-aequo to:

Géraldine Borer, Master's student of Dr. Valentina Basoli for her work "Development of self-assembled osteochondral construct using 4D technology"

and

Elisabetta Giacomelli, Master's student of Prof. Cristina Granziera and Dr. Ilaria Callegari for her work "Identification of 9.4T MRI sequences for enhanced cellular visualization of multiple sclerosis lesions".

Leon Schooff, Master's student in the Functional Biomechanics team for the AMTI Best Experimental Study Award at the 2024 Congress of the German Society of Biomechanics in Heidelberg with maximum scores in all categories.

Mattia Humbel, PhD student at Biomaterials Science Center for the Best Poster Award of the SPIE Optics+ Photonics, Developments in X-Ray Tomography XV Conference for his work: "A tomography slice through the entire human brain with less than three micrometer voxels".

Michaela Maintz, PhD student at SwissMAM for the Gold Poster Award at the 10th DBE Research Day for her poster "Challenging the Norm with Smart Implant Algorithms".

Jokin Zubizarreta, PhD student at SwissMAM for the Silver Poster Award and the Public Choice Award at the 10th DBE Research Day for his poster "Exploring Advanced Materials for 3D Printed Medical Implants".

Yukiko Tomooka, PhD student at the Bio-Inspired RObots for MEDicine-Lab for the Bronze Poster Award at the 10th DBE Research Day for her poster "Concepts of Miniature Intraoral Robots (MIR) for Minimally Invasive Dentistry".

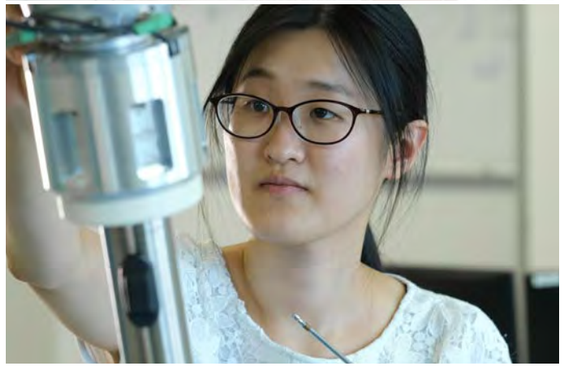


Figure 2: From top to bottom: Michaela Maintz, Jokin Zubizarreta and Yukiko Tomooka (pictures: R. Wendler).

Honors & Nominations

From top to bottom: Prof. Annegret Mündermann, Dr. Ferda Canbaz and PD Dr. Francesco Santini (pictures: R. Wendler).

Honors

Prof. Annegret Mündermann was honored as Outstanding Reviewer of the Year for the journal Osteoarthritis and Cartilage Open and was invited by the Osteoarthritis Research Society International to hold the highly regarded presentation "Osteoarthritis year in review 2024: Biomechanics".

Committee Nominations

Prof. Pablo Sinues was elected co-president of the Swiss Metabolomics Society (SMS), together with co-president Dr. Julijana Ivanisevic from the University of Lausanne. SMS is an official affiliate of the International Metabolomics Society (IMS).

Prof. Pablo Sinues was re-elected as a member of the Innosuisse Expert Board for another term until the end of 2025. With this decision, Sinues will enter his third consecutive term as Innosuisse expert.

Dr. Ferda Canbaz is a new board member of the Swiss Society for Biomedical Engineering (SSBE). As a member of the board, Canbaz will be responsible for the SSBE Awards.

PD Dr. Francesco Santini was nominated Program Chair for the annual congress of the European Society for Magnetic Resonance in Medicine and Biology (ESMRMB). This congress is aimed at multiple professional figures working in the field of magnetic resonance and takes place in October 2025 in Marseille.

Prof. Bert Müller was elected to the new SNSF Research Council for the period from April 1, 2025 to April 30, 2027.

Prof. Andreas A. Müller was elected as President of the Swiss Association for Cleft Lip and Palate and Craniofacial Surgery.

Changes in Personnel & Organization

Changes in the DBE Executive Board

From top to bottom: Prof. Eva Scheurer, Prof. Georg Rauter and Prof. Pablo Sinues (pictures: R. Wendler).

At the DBE Assembly in October 2024, Prof. Georg Rauter was elected as a new member of the DBE executive board. He follows Prof. Eva Scheurer who stepped down due to her new role as Dean of the Faculty of Medicine. Prof. Pablo Sinues was re-elected as Head of the DBE Teaching Commission.

Thank you, Prof. Eva Scheurer!

Eva Scheurer, Head of the Institute of Forensic Medicine at the University of Basel, was elected Dean of the Faculty of Medicine and will succeed Primo Schär, who follows Torsten Schwede as Vice Rector of Research. Due to her new role, Eva Scheurer resigned from the executive board of the DBE, where she contributed with her broad oversight and extensive network to bring the DBE to the next level of excellence.

Congratulations to Profs. Rauter and Sinues

The members of the DBE Assembly elected Georg Rauter into the DBE Executive Board in a gripping neck-and-neck contest with three other excellent candidates. Pablo Sinues was re-elected unanimously as head of the Teaching Commission, a clear expression of appreciation for his excellent work and resilient commitment.

Appointments & Promotions

New clinical professors at DBE. From top to bottom: Prof. Andreas M. Müller, Prof. David Berger and Prof. Felix Mahfoud (pictures: University of Basel).

This year, three clinical professors and an adjunct professor were appointed. Two of our researchers were granted the Venia Docendi.

Appointments

Prof. Marc Andreas Müller was appointed by the University Council as Clinical Professor of Orthopedics/Traumatology at the Faculty of Medicine. Prof. Müller is a member of the DBE CADENCE Consortium.

Prof. David Berger was appointed as Clinical Professor of Intensive Care at the Faculty of Medicine. Along with this appointment, he also became Head of Intensive Care at the USB. At the DBE, he is part of the Experimental Surgery Consortium.

Prof. Felix Mahfoud was appointed as Professor of Cardiology at the University of Basel and Chief of Cardiology at the University Hospital Basel. He is also Chairman of the University Heart Center Basel. At the DBE, he is part of the Experimental Surgery Consortium.

Prof. Cristina Granziera was appointed as Adjunct Professor of Neurology at the Faculty of Medicine. Since 2018, her research group "Translational Imaging in Neurology" (ThINk Basel) is an integral part of the DBE.

Promotions

PD Dr. Francesco Santini, Head of the research group Basel Muscle MRI (BAMM), was granted the Venia Docendi at the request of the Medical Faculty.

PD Dr. Benito Benitez was granted the Venia Docendi for oral and maxillofacial surgery at the request of the Medical Faculty. He lectures on craniofacial malformations at the University of Basel and also delivers lectures on craniofacial injuries to medical officers in the Swiss Armed Forces.

New Group: Digital Surgery Lab

Figure 1: Prof. Dr. Beat Müller, head, and Dr. Joël Lavanchy, deputy head of the Digital Surgery Lab (picture: R. Wendler)

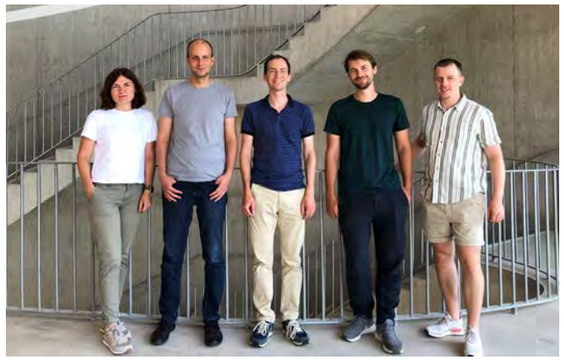


Figure 2: The Digital Surgery Lab: Julia Ruppel, Simon Pezold, Joël Lavanchy, Jérôme Kurylec, Jan Liechti, Janis Neumann (missing) (picture: Digital Surgery Lab)

The Digital Surgery Lab (1) at the Department of Biomedical Engineering is focused on advancing surgery through the application of surgical data science and deep learning for the analysis of multimodal surgical data. Established by Prof. Dr. Beat Müller, Head of Digestive Surgery, and Dr. Joël Lavanchy, Attending Surgeon at University Digestive Health Care Center Clarunis, the lab aims to model surgical interventions to develop effective treatments and improve postoperative outcomes.

Each year, over 4.2 million patients die within 30 days of surgery, making postoperative mortality the third leading cause of death, following stroke and ischemic heart disease (2). This highlights the urgent need for interventions to reduce postoperative complications.

As surgical instruments and devices become increasingly advanced, they generate vast amounts of data in the operating room, including endoscopic videos and data from surgical robots. Effectively collecting, analyzing, and making this data readily accessible is crucial. The Digital Surgery Lab is at the forefront of developing deep learning algorithms for processing and analyzing data throughout the preoperative, intraoperative and postoperative phases of care. Deep learning plays a pivotal role in harnessing surgical data, offering data-driven insights to improve surgical procedures, enhance decision-making for surgeons, and ultimately improve patient outcomes.

Funding:

Swiss National Science Foundation

Vontobel Stiftung

Novartis Foundation for medical-biological Research

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Dr. Joël Lavanchy
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References:
(1) https://digitalsurgerylab.ch

(2) Nogodiev et al. Lancet 2019

New Group: Experimental Pathology

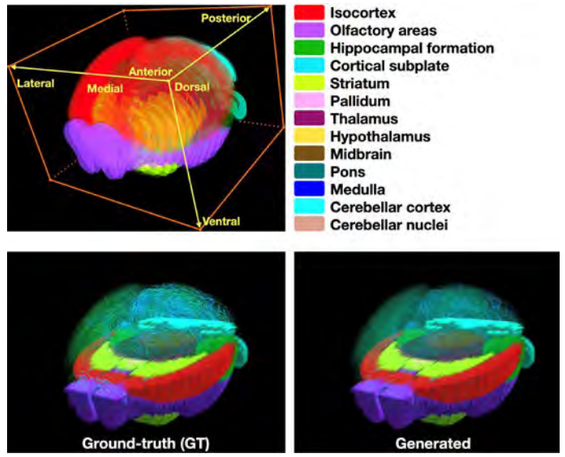

Figure 1: A generated teravoxel mouse brain including spatial transcriptomics and morphology data (Tera-MIND) (picture: J. Wu).

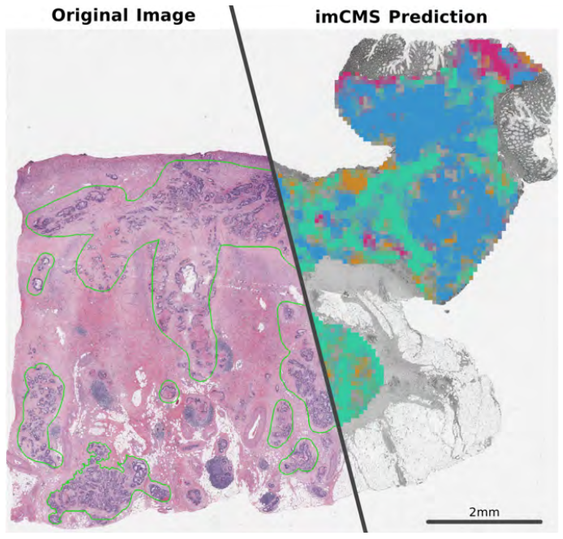

Figure 2: Illustration of the application of the imCMS classifier on a colorectal cancer tissue specimen, predicting molecular subtypes (right) from a diagnostic histopathological whole slide image. (Image-based Molecular Subtyping, imCMS) (picture: M. Lafarge).

The Computational and Translational Pathology (CTP) laboratory, led by Prof. Viktor Kölzer, combines expertise from the disciplines of clinical and molecular pathology with computer science and artificial intelligence. CTP focuses on foundational biomedical research and pioneers innovative diagnostic and bioanalytical strategies for translational research and clinical practice.

CTP develops innovative research approaches in collaboration between the Department of Biomedical Engineering and the Institute of Medical Genetics and Pathology (Medical Co-Director: Prof. Kölzer). The aim is to improve patient care through the development of new technologies for daily diagnostic practice and research. This includes the application of image analysis approaches to diagnostic patient samples, retrospective cohorts and clinical trials. CTP is at the forefront of technological development, including in situ genomic technologies, multi-modal data analysis and spatial biology. Prof. Kölzer is the PI and coordinator of the Swiss Digital Pathology Initiative (SDPI) in the SERI Roadmap for Research Infrastructures 2025 – 2028.

In pursuit of digitizing mammalian organisms for biomedical research, Dr. Jiqing Wu develops novel GenAI approaches that enable the simulation of virtual biological systems, disease states and organisms. This includes novel approaches to simulate the effects of treatment interventions and the simulation of complex functional networks in cell culture, animal models and human tissues.

Dr. Maxime Lafarge leads the applied computer vision research branch of the group with a focus on morpho-molecular classification problems. His research aims to discover unknown links between diseased tissue morphology captured in histopathology images and molecular data. The goal is to develop new diagnostic tools based on automated histopathology image analysis to improve patient stratification and further support treatment decisions.

Funding:

University of Basel
Universitätsspital Basel
Universität Zürich
HEMMI STIFTUNG
Swiss National Science Foundation

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New Group embedded in Clinical Biomechanics & Musculoskeletal Modeling: Computational Movement Analysis

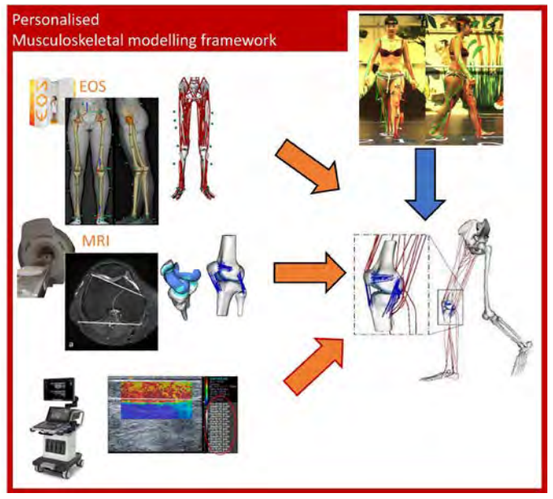

Figure 1: Musculoskeletal modeling framework for IDPAT, identifying the causes of patella instability (picture: M. Sangeux)

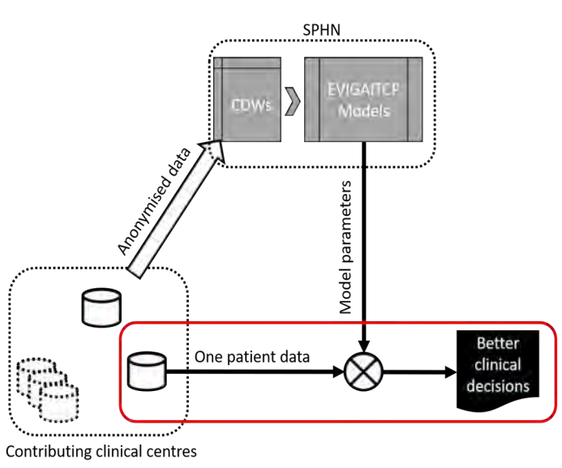

Figure 2: Foreseen implementation in clinical practice of the outcomes of EVIGAITCP, determining the effect of surgical treatments in children with cerebral palsy using causal inference form multicentric gait databases (picture: M. Sangeux)

The group focuses on three main areas: capturing movement, the biomechanical analysis of human movement and statistical learning from human movement.

Neuroscientist Daniel Wolpert states: "We have a brain for one reason and one reason only – that's to produce adaptable and complex movements." We are interested in the understanding of the neural control of movement and the biomechanical effect of movement to the human body. We have a particular interest in gait, because it is humans' main means of transportation, and posture. We focus on understanding pathological gait, whether it is due to neural or biomechanical causes. Most of our projects involve collaboration with clinicians at UKBB and other centers.

The group benefits from the support of two state-of-the-art motion capture facilities: the Clinical Movement Analysis Center at UKBB and CADENCE at the DBE.

We are currently involved in two main projects: understanding the causes of patella instability (IDPAT), which is funded by the SNSF, and determining the effect of surgical treatments in children with cerebral palsy using causal inference from multicentric gait databases (EVIGAITCP), which is funded by the Swiss Personalised Health Network (SPHN) and the Ralf Loddenkemper Stiftung.

Logo:

Funding:

Swiss National Science Foundation

SPHN Swiss Personalized Health Network

UKBB

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Mohammadreza Rezaie, PhD student
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Prof. Anne Mündermann (DBE, Unibas)
Prof. Cordula Netzer (DBE, Unibas)
Prof. Georg Rauter (DBE, Unibas)
Prof. Giusi Moffa (Dep. Maths, Unibas)
Prof. Uri Nahum (FHNW)
Prof. William R. Taylor (ETH Zürich)
Prof. Stéphane Armand (UNIGE – HUG)
Prof. Maxime Devanne (UHA (France))

New Group embedded in Swiss MAM: Biofabrication and Biosensor Unit

Figure 1: Bio 3D printer and Melt Electro writing 3D printer (picture: V. Basoli)

Figure 2: Portable Biosenspr set up (picture: V. Basoli)

As the biological unit of the Swiss MAM research group, our strength lies in bridging clinical projects and engineering innovations. We focus on developing biologically relevant technologies for use in operating rooms, including biosensors and 3D-printed micro-scaffolds, which hold potential as innovative medical devices.

Our research focuses on advancing musculoskeletal tissue engineering and regenerative medicine through innovative technologies, both in vitro and in vivo. We specialize in developing biological models (2D, 3D, and ex vivo) and Bio3D printing and melt electrowriting for cartilage and bone regeneration (1). Currently, we are involved in the development and integration of electrochemical and optical microsensors for real-time monitoring of in vitro cultures and patient applications (2). Additionally, we are developing in vitro organ-on-chip model for osteoarthritis and inflammation (3).

As part of Swiss MAM, the Biofabrication and Biosensor Unit provides biological and application-oriented support to research teams working in Laser, Robotic 3D Printing, DBM Cartilage, and Calorimetry. We have successfully established a functional BSL2 laboratory for the study and application of mammalian cells and tissues. Our expertise extends beyond conventional validation techniques to include toxicity studies, material science, cell biology and advanced validation methods. Equipped with specialized instrumentation including biological safety cabinets, microscopes, plate readers, ex vivo models, and 3D printing technologies, we support various research projects, with a particular focus on orthopedic and craniomaxillofacial applications, though our scope is not limited to these areas.

To optimize resources and avoid redundancy, we collaborate closely with the Department of Biomedicine, while ensuring access to both in-house equipment and emerging technologies, such as 3D bioprinting, high-voltage 3D printing, and advanced sensor systems.

Funding:

cost EUROPEAN COOPERATION IN SCIENCE & TECHNOLOGY

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Confederation

Federal Department of Economic Affairs, Education and Research EAER
State Secretariat for Education, Research and Innovation SERI

Swiss National Science Foundation

ETH zürich Leading House Asia

European Innovation Council

Horizon Pathfinder Open Award

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Cosimo Loffreda
Ruslan Soiunov
Oliver Waldvogel
Sara Lentz
Nadine Tran
Celine Tourbier

References:
(1) https://linkedin.com/company/m2m-project

(2) https://sensif.com

(3) https://phoenixooc.com

Former BLOG reborn as CIO under the Leadership of Dr. Ferda Canbaz

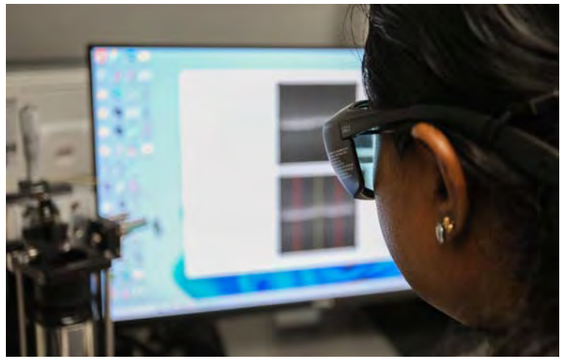

Figure 1: AI-assisted OCT for smart laser surgery (picture: R. Wendler).

Figure 2: Center for Intelligent Optics Group at Department of Biomedical Engineering (picture: CIO).

The Center for Intelligent Optics (CIO) leads cutting-edge research in the development of advanced optical and laser-based systems, with a focus on diagnosis, treatment, and intervention technologies as part of the Lasers and Robotics competence cluster. Our research spans innovative areas such as light manipulation, Fourier optics, light-tissue interactions, spectroscopy, imaging, and laser science. By incorporating machine learning, we are building smart, automated technologies that drive progress in medical procedures.

Our group in short CIO, previously known as Biomedical Laser and Optics Group (BLOG), has experienced continuous growth since its official establishment in March 2024, and consists of a diverse team of Master's students, four PhD students, and two postdoctoral researchers. Our main research focus is on three key projects:

- MIRACLE[II], a minimally invasive robotic laser system for bone surgery. It aims to improve upon current methods by offering high precision, reduced invasiveness, and faster recovery times. Our team is actively working on the design and development to miniaturize the optical system and integrate it into a compact endoscope for use in confined spaces.

- LASER-Blade (April 2024) aims to develop the world's first robotic handheld LASER-blade for joint replacement surgery, using fiber lasers and piezoelectric actuation to create a vibrating "overlapping" line beam, that increases cutting efficiency.

- LAROCARE (September 2024) is a large consortium of five research groups, proposing a minimally invasive robotic-assisted surgical procedure using a laser guided by Optical Coherence Tomography (OCT) for precise cartilage preparation. Additionally, LAROCARE explores the use of nasal chondrocytes to improve regeneration potential.

Logo:

Funding:

Swiss National Science Foundation
WSS
WERNER SIEMENS-STIFTUNG
MIRACLE
Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra
Innosuisse – Schweizerische Agentur für Innovationsförderung

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New Junior Group Leaders

Three of the new junior group leaders of the DBE. From top to bottom: Dr. Zarah Korb, Dr. Joël Lavanchy, Dr. Iris Schulz (pictures: R. Wendler).

Five DBE members have applied to become Junior Group Leaders and were granted this status by the DBE Executive Board:

Dr. Zarah Korb, Dynamic Biomaterials embedded within the Biomaterials Science Center, headed by Prof. Bert Müller.

Dr. Jöel Lavanchy, Multimodal Surgical Data Analysis embedded within the Digital Surgery Lab, headed by Prof. Beat Müller.

Dr. Bekim Osmani, Personalized, Bioinspired Neural Implants embedded within the Biomaterials Science Center, headed by Prof. Bert Müller.

PD Dr. Peter Maloca, Ophthalmic Imaging Group and Co-Head of the OCTLab in Basel.

Dr. Iris Schulz, heading the Forensic Genetics Research Group at the Institute of Forensic Medicine (IRM).

Outreach

Events & Outreach Activities

Figure 1: Impressions of the 10th DBE Research Day (pictures: R. Wendler).

The DBE contributed to several events to exchange ideas with our peers and raise our profile among the general public and potential future students.

University Master's Info Evening

After several editions in a virtual format, in March 2024, we were delighted to welcome our future students in person at our booth in the Kollegienhaus for the Master's Info Evening. They had the opportunity to talk to former students of the program, to test our virtual reality software and to attend a presentation by Prof. Pablo Sinues about the contents of our Master's program.

4th DBE PhD Day

Thirty PhD students from various research groups had the opportunity to network in a relaxed atmosphere during the 4th PhD Day in May 2024. Apart from workshops on "Science Communication", a team of students organized games, a treasure hunt and a barbecue at the end of the day for their peers.

DBE Summer School 2024

The DBE Summer School 2024 revolved around "Scientific Writing & Publishing". Held in the beautiful village Wattwiller in Alsace, France, twenty-five students from the two PhD programs in Biomedical Engineering and Health Sciences participated in an intensive writing workshop.

Visit from the Finance Department

In June, the Finance Department of the University of Basel visited the DBE. Around 35 visitors gained insights into the different fields of expertise of the DBE and could engage in discussions with researchers.

10th DBE Research Day

This year, 210 participants attended 24 presentations on topics ranging from rehabilitation robots and pharmacogenetics in forensic science to the integration of tissue engineering and 3D printing. As the largest DBE Research Day so far, the 10th edition very well represented the rise of Biomedical Engineering as a new discipline in Basel.

15th Swiss Robotics Day

Prof. Georg Rauter and Prof. Aude Billard (EPFL) co-organized the 15th edition of the Swiss Robotics Day with a focus on medical Robotics and welcomed more than a thousand participants and more than seventy exhibitors. An impressive line-up of speakers introduced the audience to the state of the art and the future of robotics in Switzerland and beyond (see page 16).

Swiss MAM organizes a 2-in-1 event

The 'Symposium on 3D Printing in Life Sciences' was dedicated to 3D bioprinting and 3D printing at the point of care in hospitals. Prof. Florian Thieringer's research group organized this double event at the beginning of September 2024 in Muttenz. The 'European Healthcare Forum for Additive Manufacturing' aimed to utilize the enormous potential of additive manufacturing for the healthcare sector in Europe.

National Future Day

On the occasion of the National Future Day, twenty-three curious children aged eleven to thirteen visited the DBE in November to take a deep dive into the world of biomedical engineering research. They immersed themselves in the human body using Virtual Reality, learned about the state of the art in Artificial Intelligence in medicine, dived into a laser maze, X-rayed a chocolate surprise egg to see what was hidden inside without opening it and designed their own 3D printed key ring.

University Bachelor Info Day

In November, the DBE also participated in the Bachelor Info Day held at the Biozentrum. In addition to welcoming many potential future students to our stand, Dr. Claudia Lenz presented our Master's program in a 45-minute talk to an audience of over seventy people.

Figure 2: Impressions of the 15th Swiss Robotics Day (pictures: R. Wendler).

Media Coverage

Figure 1: Pablo Sinues analyzes a breath sample from a sampling bag (picture: C. Flierl, University Basel).

Figure 2: Bottneuro is developing a personalized treatment helmet – the Miamind neurostimulator (picture: Bottneuro).

Focus on the DBE inauguration in BZ

The Basler Zeitung (BZ) has published an article on the relocation and inauguration of the DBE entitled: "Institute moves to Allschwil: Where the unknown wants to be discovered".

Breathtaking progress for Prof. Sinues' group

Building on their incredible work, the Translational Breath Research group continues to move forward:

- The Swiss National Science Foundation has published a feature on the research of Prof. Pablo Sinues' Translational Medicine Breath Research (TMBR) group and their system for breath analysis through mass spectrometry, which they have established at the University Children's Hospital and elsewhere. SNSF especially highlights the fascinating options provided by newly developed bags containing patients' breath.

- Prof. Pablo Sinues was interviewed by UNI NOVA about his work in developing a breath analysis platform that identifies molecules in exhaled air to create a "metabolic fingerprint." The article also covers Sinues' academic journey, the start-up Deep Breath Intelligence, and a brief outlook on the future.

Mind-blowing advances for Bottneuro

Bottneuro takes Alzheimer's treatment a step further:

- Uni News devoted an article to the personalized neurosimulator developed by Bottneuro, a DBE spin-off. Thanks to targeted cerebral electrostimulation, this innovative device should have a positive effect on the progression of illnesses such as Alzheimer's disease.

- ETH Zurich website also highlighted DBE's spin-off in an article entitled: How SMEs benefit from ETH Zurich.

PASSION dermatology for ethnic diversity

Uni News published an article about the PASSION project of the Digital Dermatology team of Prof. Alexander Navarini who worked with colleagues from Madagascar, Malawi and Guinea to create a foundation for using artificial intelligence (AI) to support dermatological diagnostics in these regions.

MIRACLE^{II} researchers in the spotlight

The research conducted at DBE as part of the MIRACLE^{II} project has again attracted the attention of the press:

- KI Campus, a German learning platform for artificial intelligence, has released a documentary video on AI in surgery. It showcases the AI-related work of Swiss-MAM and CIAN in design and 3D printing of cranial implants with the help of artificial intelligence.

- Swiss Radio and Television SRF visited the DBE to find out why Switzerland is so successful in medical technology innovation. Prof. Georg Rauter and Prof. Philippe Cattin provided shared insights and presented examples from robotics and artificial intelligence in a podcast and an article.

- In a conversation in "3D Adept Mag" (page 11) Prof. Florian Thieringer talks about the necessity of advanced technology for complex trauma injuries, about intracorporeal printing and the future of personalized patient care.

- In an article for the AO Foundation's CMF guest blog, Prof. Florian Thieringer reports on current developments in 3D printing technologies applied to oral and maxillofacial surgery.

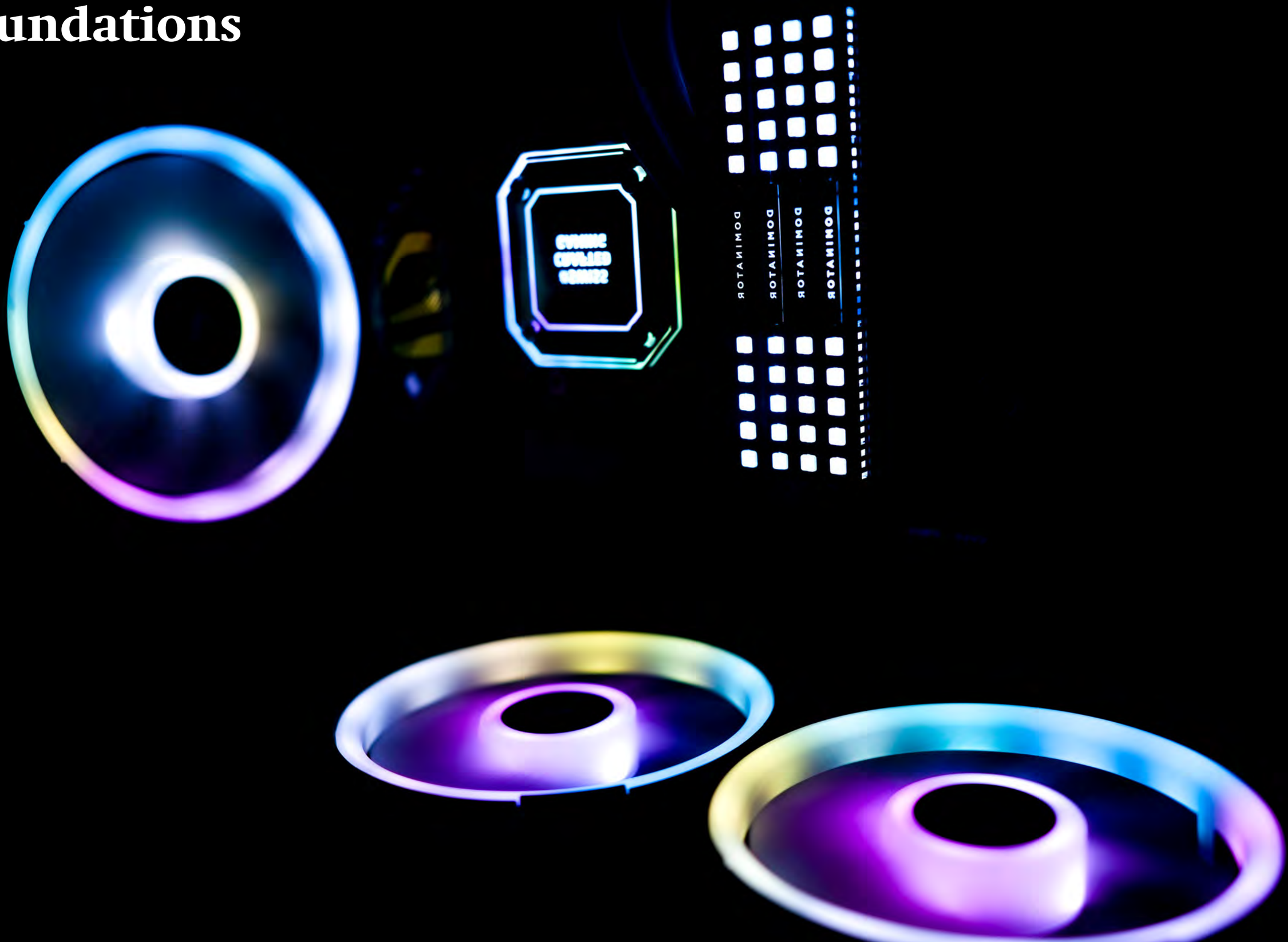
- In an interview with the title "A new era in knee surgery will begin", for the Istanbul based channel tv100, Dr. Ferda Canbaz introduces the MIRACLE^{II} System and the different roles of the lasers and feedback systems developed by CIO.

*some article titles have been translated.

Figure 3: Planning surgery using AI (picture: https://www.youtube.com/watch?v=1ERtCUMDqBA&t=987s)

Figure 4: Florian Thieringer reporting on the current developments of 3D printing technologies applied to oral and maxillofacial Surgery (picture: USB)

Funding Through Grants & Foundations



11,7 Million CHF Funding for Research Secured!

CHF	PI: Project title (funding source)
3’196’469	Rauter G, Barbero A, Canbaz F, Schulz G: LAROCARE (SNSF)
2’500’000	Cattin PC, Friederich NF, Müller MA: Trans-atlantic Capacity Building in Orthopaedic Sports Medicine (Zaeslin Foundation)
1’146’706	Canbaz F: LASER-Blade (Innosuisse with Smith & Nephew AG)
999’916	Müller Bert: X-ray imaging of the entire human brain with 1 µm resolution (SNSF)
800’000	Granziera C: iLLUMINATe-MS: A Large-scale, Longitudinal, and MolecUlar investigation of IMagINg Biomarkers of Repair ActTvity in Multiple Sclerosis (SNSF)
733’610	Barbieri M: Multiparametric Evaluation of osteosarcopeniA diSease Using magnetic Resonance ImagiNG (MEASURING) (SNSF Ambizione)
657’356	Sangeux M: Identifying the causes of patellar instability (SNSF)
540’880	Basoli V: A bioprinting platform for the rapid, reliable, controlled and quantifiable patterning of cellular aggregates and microtissues into macroscale regenerative grafts with programmable architectures (EU Collaborative - Basoli Part)
288’717	Mündermann A, Mauch M, Nüesch C: MOWA - Objective orthosis fittings as new standard of care through mobile, sensor-based 3D gait analysis system and patient monitoring.(Innosuisse)
271’493	Rauter G: AERIALIST - Doctoral Network on Assistive Health Technology in Unsupervised/Home Settings (SERI / EU - Horizon)

CHF	PI: Project title (funding source) continued
200’000*	Emergency Department 2.0 - Improving Medical Care with Machine Learning (PhD project Prof. R. Bingisser, USB)
160’778	Suter B.: Bilateral Neuronal Coordination (anonymous foundation)
60’307	Taha A: Development of machine learning models for the prediction of BMI and complications after Bariatric surgery (CABS-Study) (Vontobel Foundation)
50’000	Braissant O: Microcalorimetry Research (Donation of Alta Uro AG)
39’033	Taha A & Taha-Mehlitz S: P-Study project - Comparing outcomes between robotic, laparoscopic and open colorectal surgery: A multicenter study (Intuitive Foundation)
32’500	Rauter G, Canbaz F, Kissling T, Schicklin C: Plate Explorer – Mobile robotic microscope for cell culture inspection in incubators (Innosuisse)
32’300	Basoli V & Marin E: High precision 3D printing for temporomandibular regeneration using Origami self- assembling 4D approach – TMJ-ORIGAMI (SNSF)
20’000	Rauter G, Takeda R, Tomooka Y: Structural and modal analysis of the novel miniature intraoral robot and experimental evaluations (FAG)
11’530’065	**CHF SNSF and third-party funding awarded in 2024 (compared to 5’545’258 CHF in 2023)**
+200’000*	**CHF contributed by partners at the hospitals (foundations) to DBE researchers.**

Funding Institutions

University of Basel

Innosuisse - Swiss Innovation Agency
Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

WISSENSCHAFT. BEWEGEN
GEBERT RÜF STIFTUNG

Osteology Foundation

Berner Fachhochschule
Haute école spécialisée bernoise
Bern University of Applied Sciences

propatient
Forschungsstiftung
Universitätsspital Basel

sgms

AGA
Gesellschaft für Arthroskopie und Gelenkchirurgie

WSS
WERNER SIEMENS-STIFTUNG

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Confederation

Federal Department of Economic Affairs, Education and Research EAER
State Secretariat for Education, Research and Innovation SERI

fondation BOTNAR

HMZ

AO Research Institute Davos

FAG
Freiwillige Akademische Gesellschaft Basel
seit 1835

VELUX STIFTUNG

swiss orthopaedics

Swiss National Science Foundation

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Eidgenössisches Departement des Innern EDI
Bundesamt für Gesundheit BAG

BRCCH Basel Research Centre for Child Health

Horizon 2020
European Union Funding for Research & Innovation

NOVARTIS

MERIAN ISELIN
Klinik für Orthopädie und Chirurgie

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Deutsche Arthrose-Hilfe e.V.
DAH

Claudine und Hans-Heiner Zaeslin-Bustany-Stiftung

Stiftung Wolf

Jacobson-Goldschmidt Stiftung

Alta Uro

MIAC Stiftung

Education

PhD at the Department Biomedical Engineering

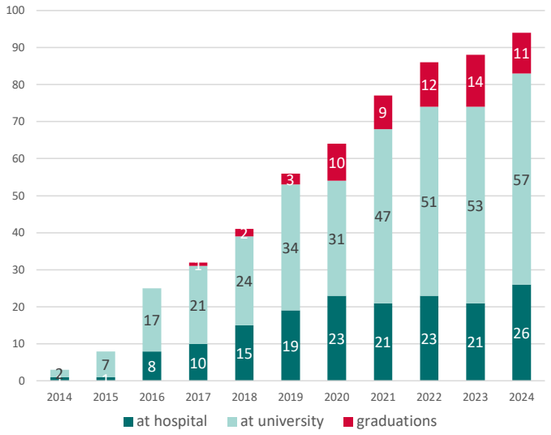

Figure 1: Evolution of the number of PhD students at DBE since 2014, schowing the proportion of students affiliated at the university and partner hospitals as well as the number of graduations per year (graph: D. Vavrecka-Sidler).

Figure 2: Summer School participants at Domaine du Hirtz in Wattwiller, France (picture: S. Freund).

The total number of students who are affiliated with our department and have Biomedical Engineering (BME) as their PhD subject has been rising over the last ten years.

At the end of 2024, after 11 of our PhD students defended during the year, we had 83 PhD students at the DBE, 57 affiliated with the university and 26 to our partner hospitals. Some 80% of these 83 PhD students are additionally enrolled in our PhD Program BME.

Among other activities, they were able to take part in a Summer School dedicated to "Scientific Writing". In the form of lectures and workshops, participants learned from experts, wrote a lot, shared experiences with their peers, and enjoyed getting together. For the first time, the Summer School was booked out with 25 participants from the PhD Programs BME and Health Science (PPHS) in less than 48 hours, forcing us to plan a Winter School on the same subject for January 2025.

We also launched a new seminar series: Latest Breakthroughs in Biomedical Engineering Research, with the idea of making it a flagship event at our department. The seminars take place weekly in the DBE Science Lounge and are followed by a networking platform, where seminar participants can chat in a relaxed atmosphere. Each semester, up to 10 research groups invite and host a national or international expert of their choice to speak at the seminar series. Given the diverse backgrounds of DBE students and researchers, experts' presentations are designed to be accessible to a non-specialist audience, with an emphasis on translational research.

In parallel to our teaching activities, we continued to collaborate with PPHS to develop the Graduate School Medical and Health Sciences (GSMHS), a joint initiative of the Faculty of Medicine and the Faculty of Science. From September 2025, the GSMHS will welcome all Biomedical Engineering students, as well as candidates in Medicine Development, Epidemiology and Public Health, Infection Biology, Clinical Research, Medical Ethics, Nursing Science, Sport Science, and Insurance Medicine.

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Study Coordinator:
Dr. Sara Freund
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Completed Doctoral Degrees

Studying biomedical engineering at DBE's Center for Intelligent Optics (picture: R. Wendler).

In 2024, 11 DBE PhD students defended their thesis and took the next career step. A summary of their PhD research work can be found here.

Dr. Florentin Bieder, PhD student at CIAN group of Prof. Philippe Cattin, defended his thesis on "Memory-efficient deep learning methods for brain image analysis"

Dr. Xinjie Chen, PhD student at ThINk Basel group of Prof. Cristina Granziera, defended his thesis on "Advanced magnetic resonance imaging in multiple sclerosis: Disentangling aging and pathology effects".

Dr. Balazs Faludi, PhD student at CIAN group of Prof. Philippe Cattin, defended his thesis on "Volume rendering for surgical planning in virtual reality".

Dr. Lorin Fasel, PhD student at BIROMED-Lab of Prof. Georg Rauter, defended his thesis on "Bio-inspired compliant actuation for safer robotic neurosurgeries".

Dr. Riccardo Galbusera, PhD student at ThINk Basel group of Prof. Cristina Granziera, defended his thesis about "Unraveling the heterogeneity of multiple sclerosis pathology in the brain through quantitative MRI".

Dr. Mohammad Khair Nahhas, PhD student at BIROMED-Lab of Prof. Georg Rauter, defended his thesis on "HEAR-BRUX: HEARable for handling BRUXism".

Dr. Murali Karnam, PhD student at BIROMED-Lab of Prof. Georg Rauter, defended his thesis on "Intuitive control for hand-guiding surgical tools with macro-robots".

Dr. Jessica Schäper, PhD student at Magnetic Resonance Physics & Methodology group of Prof. Oliver Bieri, defended her thesis on "Multi-parametric brain tissue characterization using magnetic resonance imaging".

Completed Doctoral Degrees (2)

Studying biomedical engineering at Institut of Forensic Medicine (picture: R. Wendler).

Dr. Janine Schulte, PhD student at the Forensic Genetics group of Dr. Iris Schulz, defended her thesis on "Challenges of mixture deconvolution using DEPArray™ technology – Establishing single-cell analysis in forensics".

Dr. Philippe Valmaggia, PhD student at CIAN group of Prof. Philippe Cattin, defended his thesis on "Eye and heart synchronisation: Development of time-resolved optical coherence tomography with electrocardiographic coupling".

Dr. Jiafa Zeng, PhD student at TMBR group of Prof. Pablo Sinues, defended his thesis on "Therapeutic monitoring in a pediatric clinical setting via breath analysis by high resolution mass spectrometry".

Master of Science in Biomedical Engineering

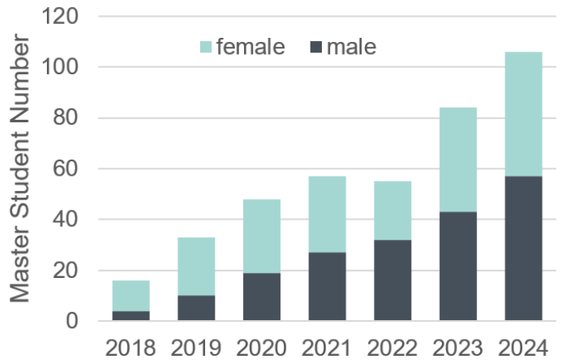

Figure 1: The growing number of new students in the Master's program in Biomedical Engineering (graph: G. Oser).

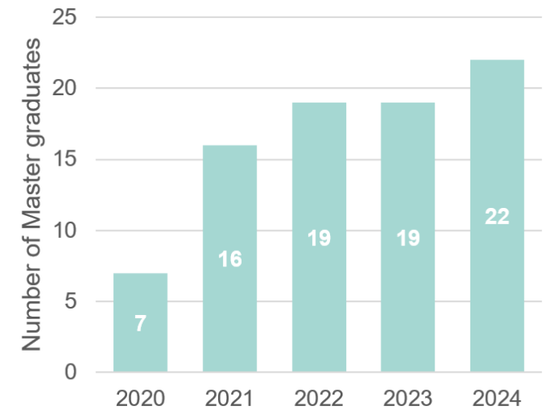

Figure 2: Number of graduated Master's students in each year (graph: G. Oser).

After the launch in 2023, the joint degree Master's program in Biomedical Engineering, in partnership with the FHNW School of Life Sciences, welcomed 48 new students in its second year. Together with the students from the previous cohort and the former Master's program, the Department of Biomedical Engineering now has more than 100 registered Master's students.

Over the past 7 years, we have observed a growing interest in studying Biomedical Engineering: In 2018, we started the Master's Program with 16 Master's students and today we have 100 Master's students (Figure 1). In 2023, when the joint degree Master's program together with the School of Life Science of FHNW was launched, we nearly doubled the number of new students. On average, the Master's students stayed 3 – 4 semesters in the previous Master's Program and the new joint degree Master's program lasts 4 semesters.

Autumn semester 2024 was the last semester in which the study regulations of the previous Master's program was still valid. The majority of the students succeeded in finishing the Master's degree. A few students (6) decided to transfer to the new joint degree master program and 2 students decided to quit the Master's program without a Master's degree. In conclusion, 83 Master students graduated under the 2017 study regulation (Figure 2).

These 83 graduates have built and are about to build successful careers across academia, healthcare, and industry, reflecting the strength and versatility of our master's program. From a postdoctoral researcher at the Institute of Forensic Medicine to an ophthalmologist at the University Hospital Basel, alumni contribute to advancements in medicine and research. Others have secured roles at leading companies such as Roche, Novartis, and Medartis, excelling in software engineering, product development, as well as product and quality engineering. With positions in Switzerland and beyond, our program continues to prepare professionals for impactful careers in biomedical engineering.

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Study Coordinator:
Dr. Gabriel Oser
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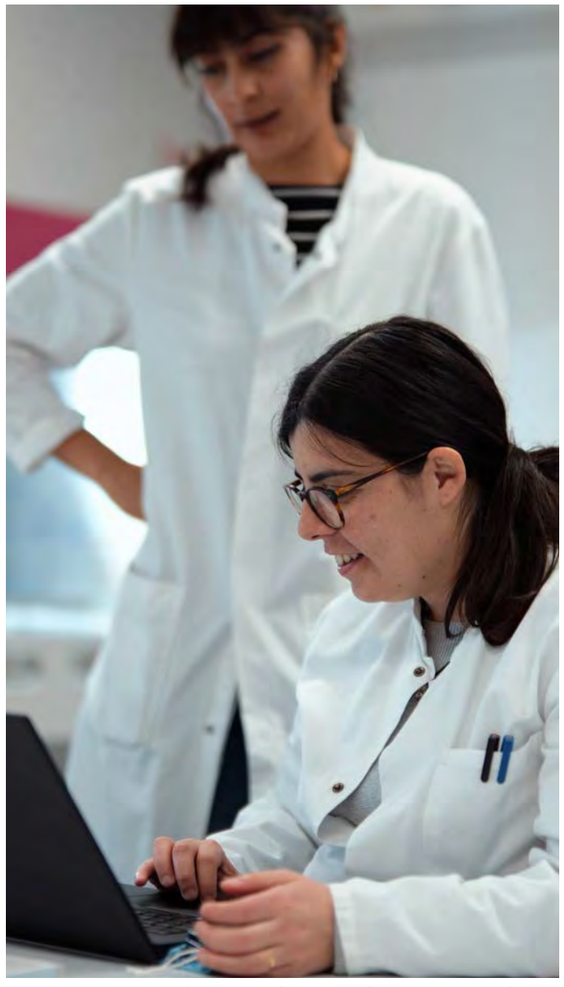
Completed Master's Degrees



Mentoring students at the Department of Biomedical Engineering (picture: R. Wendler).

In 2024 numerous Master's students completed their education, the DBE. A summary of their Master's thesis can be found here.

Aaisha Bah "Investigating the relationship between the morphometric data of MS patients and a selected cognitive game", supervised by Dr. Po-Jui Lu and Prof. Cristina Granziera, ThINk Basel.

Géraldine Borer "Development of a self-assembled osteochondral construct using 4D technology", supervised by Dr. Valentina Basoli and Prof. Florian Thieringer, Swiss MAM.

Thomas Braunwarth "Associations between paraspinal muscle fatigue, paraspinal muscle endurance and patient-reported function in patients with lumbar spinal stenosis", supervised by Prof. Anne Mündermann, PD Cordula Netzer, Dr. Corina Nüesch, David Koch and Prof. Thorsten Stein.

Nicola Büttiker "Dynamic compensation in spinopelvic alignment in patients with symptomatic lumbar spinal stenosis", supervised by Prof. Anne Mündermann, PD Cordula Netzer, Dr. Corina Nüesch, David Koch and Prof. Stephen Ferguson.

Won Wook Chung "Comparison of shoulder kinematics during arm abduction between inertial measurment unit-based and marker-based motion capture", supervised by Prof. Anne Mündermann and Dr. Eleonora Croci.

Abdessamad Falhi "Artificial neural networks for the detection of lung functional abnormalities in preterm infants", supervised by Prof. Edgar Delgado-Eckert and Prof. Urs Frey, Computational Physiology & Biostatistics lab.

David Ferré López "High-resolution spectrograms as a decision support system for clinicians without background in sleep medicine", supervised by Prof. Pablo Sinues and Dr. Sebastian Keller, at Rekonas GmbH.

Ximena Forero "Optimization of nanoghosts (NG) loading and cell delivery for gene therapy applications", supervised by Dr. Olga Krupkova and Prof. Dr. Andrea Barbero, Cartilage Engineering.

Silvan Furrer "Flip angle optimization for MP-RAGE", supervised by PD Dr. Grzegorz Baumann and Prof. Oliver Bieri, Magnetic Resonance Physics & Methodology.

Elisabetta Giacomelli "Identification of 9.4T MRI sequences for enhanced cellular visualization of MS lesions", supervised by Dr. Med. Ilaria Callegari and Prof. Cristina Granziera, ThINk Basel.

Martino Giorgi "A deep-learning approach for navigated anterior cruciate ligament surgeries", supervised by Paul Friedrich, Dr. Julia Wolleb and Prof. Philippe Cattin, CIAN.

Aikaterina Grava "Smart OCT system as a tool for time-resolved dehydration detection in biological tissues: Investigating the potential and limitations", supervised by Dr. Arsham Hamidi and Dr. Ferda Canbaz, CIO.

Juval Gutknecht "Deep learning for automatization of video-analysis for malaria vector behavioral studies", supervised by Natalia Mañas Chavernas, Dr. Julia Wolleb and Prof. Philippe Cattin, CIAN.

Maxine Gygax "Association between severity of stenosis, fat infiltration of the paraspinal muscles and trunk flexion during gait in patients with lumbar spinal stenosis", supervised by Prof. Anne Mündermann, PD Cordula Netzer, Dr. Corina Nüesch, David Koch and Prof. Stephen Ferguson.

Christoph Künzel "Comparison of shoulder kinematics between marker-based and marker-less motion capture", supervised by Prof. Anne Mündermann and Dr. Eleonora Croci.

Sébastien Muheim "Large language model approach for analysing medical information from the internet", supervised by Vincent Ochs, Dr. Julia Wolleb and Prof. Philippe Cattin, CIAN.

Ataberk Ozsoy "3D printed bone-like realistic anatomical models for surgical simulation", supervised by Dr. Neha Sharma and Prof. Florian Thieringer, Swiss MAM.

Daphne Schönegg "Three-dimensional hard X-ray micro-tomographic imaging of the human paltal anatomy and gracilic muscle", supervised by Prof. Bert Müller, Dr. Hans Deyhle, Dr. Georg Schulz and Prof. Andreas A. Müller.

Ksenia Sovdagarova "Evaluation of OA synovium's response to anti-inflammatory cytokines and NC-IL-1Ra chondrogenic potential", supervised by Atharva Damle and Prof. Dr. Andrea Barbero, Tissue Engineering.

Lea Schweiker "Tibiofemoral joint contact forces in ACL injured and uninjured legs — Implementation of the OpenSim workflow and pilot comparisons", supervised by Prof. Anne Mündermann and Dr. Simon Herger.

Pascal Rudolf von Rohr "Predicting the ground reaction force from pressure data", supervised by PD Dr. Morgan Sangeux.

Eva Winnips "Diffusion models for contrast harmonization of whole head magnetic resonance images", supervised by Alicia Durrer, Dr. Julia Wolleb and Prof. Philippe Cattin, CIAN.

Publications

Selected Publications 2024

***Peer-reviewed publications (227), where the first or last author is at DBE.**

Akinci D'Antonoli T, Rudie JD (2024): 'Achieving More with Less: Combining Strong and Weak Labels for Intracranial Hemorrhage Detection'; Radiology: Artificial Intelligence.

Akinci D'Antonoli T, Cavallo AU, Vernuccio F, Stanzione A, Klontzas ME, Cannella R, Ugga L, Baran A, Fanni SC, Petrash E, Ambrosini I, Cappellini LA, van Ooijen P, Kotter E, Pinto Dos Santos D, Cuocolo R, EuSoMII Radiomics Auditing Group (2024): 'Reproducibility of radiomics quality score: an intra- and inter-rater reliability study'; European Radiology.

Akinci D'Antonoli T, Cuocolo R, Baessler B, Pinto dos Santos D (2024): 'Towards reproducible radiomics research: introduction of a database for radiomics studies'; European Radiology.

Akinci D'Antonoli T, Stanzione A, Bluethgen C, Vernuccio F, Ugga L, Klontzas ME, Cuocolo R, Cannella R, Koçak B (2024): 'Large language models in radiology: fundamentals, applications, ethical considerations, risks, and future directions'; Diagnostic and Interventional Radiology.

Alexander N, Cip J, Brunner R, De Pieri E (2024): 'Effect of femoral derotational osteotomy in patients with idiopathic increased femoral anteversion on joint loading and muscular demands'; Journal of Children's Orthopaedics.

André-Lévigne D, Pignel R, Boet S, Jaquet V, Kalbermatten DF, Madduri S (2024): 'Role of Oxygen and Its Radicals in Peripheral Nerve Regeneration: From Hypoxia to Physoxia to Hyperoxia'; International Journal of Molecular Sciences.

Anliker-Ort M, Rodieux F, Ziesenitz V,ia C, Atkinson A, Bielicki JA, Erb TO, Gürtler N, Holland-Cunz S, Duthaler U, Rudin D, Haschke M, van den Anker J, Pfister M, Gotta V, (2024): 'Pharmacokinetics-Based Pediatric Dose Evaluation and Optimization Using Saliva – A Case Study'; The Journal of Clinical Pharmacology.

Armand S; Sawacha Z; Goudriaan M; Horsak B; van der Krogt M; Huenaerts C; Daly C; Kranzl A; Boehm H; Petrarca M; Guiotto A; Merlo A; Spolaor F; Campanini I; Cosma M; Hallemans A; Horemans H; Gasq D; Moissenet F; Assi A; Sangeux M (2024): 'Current practices in clinical gait analysis in Europe: A comprehensive survey-based study from the European society for movement analysis in adults and children (ESMAC) standard initiative'; Gait and Posture.

Arnold K; Gómez-Mejia A; de Figueiredo M; Boccard J; Singh KD; Rudaz S; Sinues P; Zinkernagel AS (2024): 'Early detection of bacterial pneumonia by characteristic induced odor signatures'; BMC Infectious Diseases.

Astasov-Frauenhoffer M; Marot L; Sanchez F; Steiner R; Lohberger B; Bornstein MM; Wagner RS; Kühl S; Mukaddam K (2024): 'Effects of nanomodified titanium surfaces considering bacterial colonization and viability of osteoblasts and fibroblasts'; Journal of Biomedical Materials Research - Part A.

Awchi M, Singh KD, Brenner S, Bachmann Burckhardt MA, Hess M, Zeng J, Datta AN, Frey U, Zumsteg U, Szinnai G, Sinues P (2024): 'Metabolic trajectories of diabetic ketoacidosis onset described by breath analysis'; Frontiers in Endocrinology.

Bajrami D, Zubiaga A, Renggli T, Kirsch Ch, Spano F, Fehr D, von Schulthess P, Lindhorst-Peters A, Huber S, Roider E, Rossi RM, Navarini AA, Bonmarin M (2024): 'Variations of skin thermal diffusivity on different skin regions'; Skin Research and Technology.

Barakovic M; Weigel M; Cagol A; Schaedelin S; Galbusera R; Lu PJ; Chen X; Melie-Garcia L; Ocampo-Pineda M; Bahn E; Stadelmann C; Palombo M; Kappos L; Kuhle J; Magon S; Granziera C (2024): 'A novel imaging marker of cortical "cellularity" in multiple sclerosis patients'; Scientific Reports.

Bauer M, Hollenstein C, Lieb J,a Maria, Grassegger S, Haas T, Egloff L, Berger C, Scheurer E, Lenz C (2024): 'Longitudinal visibility of MRI findings in living victims of strangulation'; International Journal of Legal Medicine.

Benitez BK; Brudnicki A; Tache A; Wieprzowski L; Surowiec Z; Nalabothu P; Lill Y; Mueller AA (2024): 'Comparative study on cleft palate morphology after passive presurgical plate therapy in unilateral cleft lip and palate'; Journal of Plastic, Reconstructive and Aesthetic Surgery.

Benitez BK, Rasadurai A, Boccalatte LA, Mueller AA,(2024): 'Pre-Epiglottic Baton Plate in Newborns With Pierre Robin Sequence: Revisiting the Practical Workflow'; Laryngoscope.

Bernecker GA; Nowakowski AM (2024): 'Addressing Intraoperative Complications: Cementless Modular Revision Stem via Direct Anterior Approach for Iatrogenic via Falsa in Short Stem Arthroplasty'; Conference Paper.

Bieri O, Pusterla O, Bauman G (2024): 'Erratum to "Free-breathing half-radial dual-echo balanced steady-state free precession thoracic imaging with wobbling Archimedean spiral pole trajectories" [Z Med Phys 33 (2023) 220–229 (S0939388922000034) (101016/jzemedi202201003)]'; Zeitschrift fur Medizinische Physik.

Bieri O, Weidensteiner C, Ganter C (2024): 'Robust T<inf>2</inf> estimation with balanced steady state free precession'; Magnetic Resonance in Medicine.

Bonkat G, Wagenlehner F, Kranz J (2024): 'Keep it Simple: A Proposal for a New Definition of Uncomplicated and Complicated Urinary Tract Infections from the EAU Urological Infections Guidelines Panel'; European Urology.

Braunwarth T, Koch D, Nüesch C, Schären S, Mündermann A, Ferguson S, Netzer C (2024): 'Paraspinal muscle endurance is related to paraspinal muscle fatigue in patients with lumbar spinal stenosis: A preliminary analysis'; Conference Paper.

Bühl L, Müller S, Nüesch C, Egloff C, Mündermann A (2024): 'Leg mechanics during single leg hop landing 2 years after InternalBrace-augmented ACL repair compared with ACL reconstruction and controls'; Conference Paper.

Bühl L, Nüesch C, Müller S, Egloff C, Mündermann,A (2024): 'Running biomechanics 2 years after ACL surgery: augmented repair versus reconstruction'; Conference Paper.

Bühl L, Romkes J, Sangeux M, Viehweger HE, Widmer M (2024): 'Pilot evaluation of changes in motor control after a CrossFit® intervention in adolescents with unilateral cerebral palsy'; Conference Paper.

Bühl L, Sangeux M, Viehweger HE, Romkes J, Widmer M, & Bracht-Schweizer K (2024): 'Walking on uneven ground did not change motor control differences between children with cerebral palsy and typically developing children'; Conference Paper.

Bühl L, Sangeux M, Viehweger HE, Romkes J, Widmer M, Bracht-Schweizer K (2024): 'Motor control in children with cerebral palsy during walking on flat and uneven ground compared to typically developing children'; Gait & Posture.

Bühl L; Müller S; Nüesch C; Egloff C; Mündermann A (2024): 'Analyse biomécanique des membres inférieurs pendant la réception de saut 2 ans après une augmentation de la suture du ligament croisé antérieur et après une reconstruction du ligament croisé antérieur'; Conference Paper.

Cagol A, Benkert P, Melie-Garcia L, Schaedelin SA, Leber S, Tsagkas C, Barakovic M, Galbusera R, Lu PJ, Weigel M, Ruberte E, Radue EW, Yaldizli Ö, Oechtering J, Lorscheider J, D'Souza M, Fischer-Barnicol B, Müller S, Achtnichts L, Vehoff J, Disanto G, Findling O, Chan A, Salmen A, Pot C, Bridel C, Zecca C, Derfuss T, Lieb JM, Remonda L, Wagner F, Vargas MJ, Isabel, Du Pasquier R A, Lalive PH, Pravatà E, Weber J, Cattin PC, Absinta M, Gobbi C, Leppert D, Kappos L, Kuhle J, Granziera C (2024): 'Association of Spinal Cord Atrophy and Brain Paramagnetic Rim Lesions With Progression Independent of Relapse Activity in People With MS'; Neurology.

Cagol A, Cortese R, Barakovic M, Schaedelin S, Ruberte E, Absinta M, Barkhof F, Calabrese M, Castellaro M, Ciccarelli O, Cocozza S, De Stefano N, Enzinger C, Filippi M, Jurynczyk M, Maggi P, Mahmoudi N, Messina S, Montalban X, Palace J, Pontillo G, Pröbstel AK, Rocca MJA, Ropele S, Rovira A, Schoonheim MM, Sowa P, Strijbis E, Wattjes MP, Sormani MJP, Kappos L, Granziera C, Sastre-Garriga J, Gasperini C, Vrenken H, Yousry T (2024): 'Diagnostic Performance of Cortical Lesions and the Central Vein Sign in Multiple Sclerosis'; JAMA Neurology.

Cagol A; Ocampo-Pineda M; Lu PJ; Weigel M; Barakovic M; Melie-Garcia L; Chen X; Lutti A; Calabrese P; Kuhle J; Kappos L; Sormani MP; Granziera C (2024): 'Advanced Quantitative MRI Unveils Microstructural Thalamic Changes Reflecting Disease Progression in Multiple Sclerosis'; Neurology: Neuroimmunology and NeuroInflammation.

Cagol A; Tsagkas C; Granziera C (2024): 'Advanced Brain Imaging in Central Nervous System Demyelinating Diseases'; Neuroimaging Clinics of North America.

Cai M, Jacob MA, Marques J, Norris DG, Duering M, Esselink RAJ, Zhang Y, de Leeuw FE, Tuladhar AM (2024): 'Structural Network Efficiency Predicts Conversion to Incident Parkinsonism in Patients With Cerebral Small Vessel Disease'; Journals of Gerontology - Series A Biological Sciences and Medical Sciences.

Caimi A, Stefanini E, Koch D, Nüesch C, Mündermann A, Netzer C, Ferguson S, Ignasiak D (2024): 'Spinal loads at L5-Sacrum intervertebral joint associated with subject-specific sagittal alignment during standing and gait'; Conference Paper.

Chen X, Ocampo-Pineda M, Lu P-J, Ekerdt C, Weigel M, Jansen MG, Cagol A, Chan K-S, Schädelin S, Zwiers M, Oosterman JM, Norris DG, Bayer JMM, Marquand AF, Menks WM, Kuhle J, Kappos L, Melie-Garcia L, Granziera C, Marques JP (2024): 'Unveiling Normative Trajectories of Lifespan Brain Maturation Using Quantitative MRI'; Conference Paper.

Coppola G, Hänggi D, Cassina G, Verna C, Gkantidis N, Kanavakis G (2024): 'Three-dimensional video recordings: Accuracy, reliability, clinical and research guidelines – Reliability assessment of a 4D camera'; Orthodontics and Craniofacial Research.

Costeur L, Friesenhagen T, Schulz G (2024): 'X-ray microtomography of fossil types in natural history collections'; Conference Paper.

Costeur Loïc; Friesenhagen Thore; Schulz Georg (2024): 'X-ray microtomography of fossil types in natural history collections'; Conference Paper.

Croci E, Genter J, Nüesch C, Baumgartner D, Mündermann A, Müller AM (2024): 'Load-induced scapular rotation correlates with muscle activity in shoulders with and without rotator cuff tears'; Conference Paper.

Croci E, Hess HP, Genter J, Baum C, Kovacs BK, Nüesch C, Baumgartner D, Gerber K, Müller AM, Mündermann A (2024): 'Severity of rotator cuff disorders and additional load affect fluoroscopy-based shoulder kinematics during arm abduction'; Journal of Orthopaedics and Traumatology.

Croci E, Nüesch C, Baumgartner D, Müller AM, Mündermann A (2024): 'Load-induced scapular rotation in rotator cuff tears: marker-based motion capture vs fluoroscopy'; Conference Paper.

Dammeyer C, Nüesch C, Visscher RMS, Kim YK, Ismailidis P, Wittauer M, Stoffel K, Acklin Y, Egloff C, Netzer C, Mündermann A (2024): 'Classification of inertial sensor-based gait patterns of orthopaedic conditions using machine learning: A pilot study'; Journal of Orthopaedic Research.

Dammeyer C; Nüesch C; Visscher RMS; Kim Y K; Ismailidis P; Wittauer M; Stoffel K; Acklin Y; Egloff C; Netzer C; Mündermann A (2024): 'Classification of inertial sensor-based gait patterns of orthopaedic conditions using machine learning: A pilot study'; Journal of Orthopaedic Research.

de Macêdo Santos JW, Benitez BK, Baumhoer D, Schönegg D, Schrepfer T, Mueller AA, Thieringer FM (2024): 'Intraosseous myofibroma mimicking an odontogenic lesion: case report, literature review, and differential diagnosis'; World Journal of Surgical Oncology.

Selected Publications 2024 (2)

Degenhardt M, Wittauer M, Nüsch C, Egloff C, Acklin Y, Mündermann A (2024): 'Inter-joint coordination in the affected and contralateral leg of patients with severe knee osteoarthritis before and 6 months after knee arthroplasty compared to healthy controls'; Conference Paper.

Delbrück H, Gehlen Y, Hildebrand F, Brunner R, (2024): 'Redisplacement rate after bony hip reconstructive surgery in nonambulatory patients with cerebral palsy: a systematic review and meta-analysis'; EFORT Open Reviews.

Dogny C, André-Lévigne D, Kalbermatten DF, Madduri S (2024): 'Therapeutic Potential and Challenges of Mesenchymal Stem Cell-Derived Exosomes for Peripheral Nerve Regeneration: A Systematic Review'; International Journal of Molecular Sciences.

Dönges L, Damle A, Mainardi A, Bock T, Schönenberger M, Martin I, Barbero A (2024): 'Engineered human osteoarthritic cartilage organoids'; Biomaterials.

Ettori SLM, Fasel L, Gerig N, Rauter G (2024): 'Force feedback reduces test time and interaction forces in telemanipulated palpation using a robotic endoscope with series elastic actuated joints'; Current Directions in Biomedical Engineering.

Facchini Nevio; Wernli Lukas; Rieken Malte; Bonkat Gernot; Wirz Dieter; Braissant Olivier (2024): 'Again and Again—Survival of Candida albicans in Urine Containing Antifungals'; Pharmaceutics.

Filippi M, Ciccarelli O, Barkhof F, Sastre-Garriga J, Tur C, Calabrese M, De Stefano N, Eshaghi A, Gasperini C, Sormani MJ, Pia, Granziera C, Toosy AT, Kappos L, Rocca MJA, Rovira À (2024): 'Using the Progression Independent of Relapse Activity Framework to Unveil the Pathobiological Foundations of Multiple Sclerosis'; Neurology.

Filippon Ignacio; Tanner Christine; von Jackowski Jeannette A; Schulz Georg; Töpper Tino; Müller Bert (2024): 'Determining Aligner-Induced Tooth Movements in Three Dimensions Using Clinical Data of Two Patients'; Oral.

Friedrich P; Frisch Y; Cattin PC (2024): 'Deep Generative Models for 3D Medical Image Synthesis'; arXiv.

Galbusera R, Bahn E, Weigel M, Cagol A, Lu PJ, Schaedelin SA, Franz J, Barakovic M, Rahmanzadeh R, Dechent P, Nair G, Brück W, Kuhle J, Kappos L, Stadelmann C, Granziera C (2024): 'Characteristics, Prevalence, and Clinical Relevance of Juxtacortical Paramagnetic Rims in Patients With Multiple Sclerosis'; Neurology.

Genter J, Croci E, Eckers F, Oberreiter B, Gascho D, Müller AM, Mündermann A, Baumgartner D (2024): 'The biomechanics of shoulders with rotator cuff tears are influenced by the critical shoulder angle: an in situ simulator study'; Conference Paper.

Genter J, Croci E, Müller AM, Mündermann A, Baumgartner D (2024): 'Influence of Critical Shoulder Angle and Rotator Cuff Tear Type on Load-Induced Glenohumeral Biomechanics: A Sawbone Simulator Study'; Applied Bionics and Biomechanics.

Genter J, Croci E, Müller AM, Mündermann A, Baumgartner D (2024): 'Understanding muscle forces in weight-bearing shoulders with rotator cuff tears'; Conference Paper.

Genter J, Croci E, Oberreiter B, Eckers F, Bühler D, Gascho D, Müller AM, Mündermann A, Baumgartner D (2024): 'The influence of rotator cuff tear type and weight bearing on shoulder biomechanics in an ex vivo simulator experiment'; Journal of Biomechanics.

Genter J; Croci E; Müller AM; Mündermann A; Baumgartner D (2024): 'Understanding muscle forces in weight-bearing shoulders with rotator cuff tears'; Conference Paper.

Genter J; Croci E; Müller AM; Mündermann A; Baumgartner D (2024): 'Influence of Critical Shoulder Angle and Rotator Cuff Tear Type on Load-Induced Glenohumeral Biomechanics: A Sawbone Simulator Study'; Applied Bionics and Biomechanics.

Genter J; Croci E; Oberreiter B; Eckers F; Bühler D; Gascho D; Müller AM; Mündermann A; Baumgartner D (2024): 'The influence of rotator cuff tear type and weight bearing on shoulder biomechanics in an ex vivo simulator experiment'; Journal of Biomechanics.

Gottfrois P, Gröger F, Andriambololoniaina FH, Amruthalingam L, Gonzalez-Jimenez A, Hsu C, Kessy A, Lionetti S, Mavura D, Ng'ambi W, Ngongonda DF, Pouly M, Rakotoarisaona MF, Rapelanoro Rabenja F, Traoré I, Navarini AA, (2024): 'PASSION for Dermatology: Bridging the Diversity Gap with Pigmented Skin Images from Sub-Saharan Africa'; Conference Paper.

Gottfrois P, Zhu J, Steiger A, Amruthalingam L, Kind AB, Heinzelmann V, Mang C, Navarini AA, Mueller SM (2024): 'AI -powered visual diagnosis of vulvar lichen sclerosus: A pilot study'; Journal of the European Academy of Dermatology and Venereology.

Greselin M; Lu PL; Melie-Garcia L; Ocampo-Pineda M; Galbusera R; Cagol A; Weigel M; de Oliveira Siebenborn N; Ruberte E; Benkert P; Müller S; Finkener S; Vehoff J; Disanto G; Findling O; Chan A; Salmen A; Pot C; Bridel C; Zecca C; Derfuss T; Lieb JM; Diepers M; Wagner F; Vargas MI; Du Pasquier R; Lalive P H; Pravatà E; Weber J; Gobbi C; Leppert D; Kim OCH; Cattin PC; Hoepner R; Roth P; Kappos L; Kuhle J; Granziera C (2024): 'Contrast-Enhancing Lesion Segmentation in Multiple Sclerosis: A Deep Learning Approach Validated in a Multicentric Cohort'; Bioengineering.

Gröger F, Gottfrois P, Amruthalingam L, Gonzalez-Jimenez A, Lionetti S, Soenksen Martinez L R, Navarini AA, Pouly M (2024): 'Towards Scalable Foundation Models for Digital Dermatology'; Conference Paper.

Gröger F, Lionetti S, Gottfrois P, Gonzalez-Jimenez A, Amruthalingam L, Groh M, Navarini AA, Pouly M (2024): 'Intrinsic Self-Supervision for Data Quality Audits'; Conference Paper.

Guebeli A, Thieringer FM, Honigmann P, Keller M (2024): 'In-house 3D-printed custom splints for non-operative treatment of distal radial fractures: a randomized controlled trial'; Journal of Hand Surgery: European Volume.

Guzman R, Soleman J (2024): 'Pituitary germinoma after resection of a mature third ventricular teratoma: illustrative case'; Journal of Neurosurgery: Case Lessons.

Hager B, Juras V, Zaric O, Szomolanyi P, Trattnig S, Deligianni X (2024): 'The Variable Echo Time (vTE) Sequence'; MRI of Short and Ultrashort -T_2 Tissues.

Hallenberger TJ, Rychen J, Soleman J, Fernandez-Miranda JC, Brand Y, Mariani L, Roethlisberger M (2024): 'Management of Recurrent Cerebrospinal Fluid Rhinorrhea Caused by Sequential, Anatomically Separated Skull Base Defects—A Case-Based Systematic Review'; World Neurosurgery.

Herger S, Nüesch C, Liphardt AM, Egloff C, Mündermann A (2024): 'Effect of older age and/or ACL injury on the dose–response relationship between ambulatory load magnitude and immediate load-induced change in serum cartilage oligomeric matrix protein'; Journal of Sport and Health Science.

Herger S, Wirth W, Eckstein F, Nüesch C, Egloff C, Mündermann A (2024): 'Anterior cruciate ligament (ACL) injury and age affect knee cartilage T2 but not thickness'; Osteoarthritis and Cartilage.

Herger S; He Y; Thudium C; Bay-Jensen A.C; Liphardt A.-M; Nüesch C; Imhoff F; Egloff C; Mündermann A (2024): 'Differentiation of biomarkers of articular cartilage metabolism with respect to their sensitivity to physical activity'; Conference Paper.

Herger S; McCulloch S; Liphardt A.-M; Mobasheri A; Egloff C; Imhoff F; Mündermann A (2024): 'ACL injury and established knee osteoarthritis modulate the in vivo mechanosensitivity of metabolites relevant to articular cartilage metabolism: a preliminary metabolomic analysis'; Conference Paper.

Honigmann P, Thieringer FM, Sharma N, Keller M (2024): 'Patient-Specific Treatment in Hand Surgery: Smart Innovations and Rapid Translation into the Point of Care'; Innovation in Life Sciences.

Honigmann Philipp; Thieringer Florian M; Sharma Neha; Keller Marco (2024): 'Patient-Specific Treatment in Hand Surgery: Smart Innovations and Rapid Translation into the Point of Care'; Conference Paper.

Huisman M, Akinci D'Antonoli T (2024): 'What a Radiologist Needs to Know About Radiomics, Standardization, and Reproducibility'; Radiology.

Humbel M; Alarcón MG; Kuo W; Spera I; Bausch B; Fardin L; Deyhle H; Rodgers G; Engelhardt B; Proulx Steven; Kurtcuoglu Vartan; Müller Bert; Tanner Christine (2024): 'Detection of cardiac-induced motion in murine cerebrospinal fluid space captured in vivo with synchrotron radiation-based microtomography'; Conference Paper.

Humbel M; Beckmann F; Moosmann J; Deyhle H; Schulz G; Tanner C; Rodgers G; Müller B (2024): 'A tomography slice through the entire human brain with less than three micrometer voxels'; Conference Paper.

Humbel M; Tanner C; Rodgers G; Deyhle H; Schulz G; Müller B (2024): 'Comparison of large-volume imaging approaches using computed tomography'; Conference Paper.

Ismailidis P, Neopoulos G, Egloff C, Mündermann A, Halbeisen FS, Nüesch C, Appenzeller-Herzog C, Müller SA (2024): 'Simultaneous patellar tendon and anterior cruciate ligament rupture: a systematic review, meta-analysis and algorithmic approach'; Archives of Orthopaedic and Trauma Surgery.

Jakimiuk A, Maintz M, Müller-Gerbl M, Thieringer FM, Keller M, Guebeli A, Honigmann P (2024): '3D-printed patient-specific implants made of polylactide (PLDLLA) and β-tricalcium phosphate (β-TCP) for corrective osteotomies of the distal radius'; 3D Printing in Medicine.

Karnam M, Rychen J, Guzman R, Cattin PC, Rauter G, Gerig N (2024): 'Robot-Assisted Neuroendoscopy: Surgeon's Third Hand-A Proof of Concept Study'; Conference Paper.

Keller M, Rohner M, Honigmann P (2024): 'The potential benefit of artificial intelligence regarding clinical decision-making in the treatment of wrist trauma patients'; Journal of Orthopaedic Surgery and Research.

Keller M, Rueegg J, Haefeli M, Honigmann P (2024): 'Three-Dimensional Analysis of the First Metacarpal Axes in Healthy Individuals and Early-Stage Thumb Carpometacarpal Osteoarthritis Patients—Potential Implication on First Metacarpal Corrective Osteotomy'; Journal of Clinical Medicine.

Keller M; Thieringer FM; Honigmann P (2024): 'Artificial Intelligence in Musculoskeletal Medical Imaging'; Innovation in Life Sciences.

Kisel W, Datzmann T, Kramer J, Dreimann M, Müller-Broich JD, Netzer C, Schaser KD, Disch A, The Tumor Study Group, Spine Section of the German Society of Orthopaedic Trauma Surgeons (DGOU) (2024): 'Interculturua adaption of the SOSGOQ20 questionnaire to the German version and it`s multicentric validation'; Conference Paper.

Kocak B, Keles A, Akinci D'Antonoli T (2024): 'Self-reporting with checklists in artificial intelligence research on medical imaging: a systematic review based on citations of CLAIM'; European Radiology.

Koch D, Nüesch C, Caimi A, Ignasiak D, Schären S, Ferguson S, Mündermann A, Netzer C (2024): 'Muscle fatigue in patients with lumbar spinal stenosis is associated with muscle endurance and spinopelvic alignment but not with patient-reported outcome'; Conference Paper.

Koch D, Nüesch C, Ignasiak D, Aghlmandi S, Caimi A, Perrot G, Prüfer F, Harder D, Santini F, Schären S, Ferguson S, Mündermann

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A, Netzer C (2024): 'The role of muscle degeneration and spinal balance in the pathophysiology of lumbar spinal stenosis: Study protocol of a translational approach combining in vivo biomechanical experiments with clinical and radiological parameters In proceedings of the Annual Congress of the European Spine Society'; Conference Paper.

Koch D, Nüesch C, Ignasiak D, Schären S, Mündermann A, Ferguson S, Netzer C (2024): 'Pelvic tilt, body mass index and kinesiophobia explain paraspinal muscle endurance in patients with symptomatic lumbar spinal stenosis'; Conference Paper.

Koch D, Nüesch C, Schären, Mündermann A, Netzer C (2024): 'Pelvic tilt and body mass index explain paraspinal muscle endurance in patients with symptomatic lumbar spinal stenosis (sLSS)'; Conference Paper.

Kranz J, Bartoletti R, Bruyère F, Cai T, Geerlings S, Köves B, Schubert S, Pilatz A, Veeratterapillay R, Wagenlehner FME, Bausch K, Devlies W, Horváth J, Leitner L, Mantica G, Mezei T, Smith WJ, Bonkat G (2024): 'European Association of Urology Guidelines on Urological Infections: Summary of the 2024 Guidelines'; European Urology.

Kranz J, Bonkat G (2024): 'Reply to Kuo-Chin Hung and Chia-Ter Chao's Letter to the Editor re: Jennifer Kranz, Riccardo Bartoletti, Franck Bruyère, et al European Association of Urology Guidelines on Urological Infections: Summary of the 2024 Guidelines Eur Urol; European Urology.

Künstle N et al (2024): 'The association of increased pre- and postnatal NO2 and PM25 exposure with the infant nasal microbiome composition and respiratory symptoms'; Environ Res.

Lavanchy JL, Padoy D (2024): 'Anwendungen Künstlicher Intelligenz (KI) in der minimalinvasiven Chirurgie'; International Journal of Computer Assisted Radiology and Surgery.

Lavanchy JL, Ramesh S, Dall'Alba D, Gonzalez C, Fiorini P, Müller-Stich BP, Nett PC, Marescaux J, Mutter D, Padoy D (2024): 'Challenges in multi-centric generalization: phase and step recognition in Roux-en-Y gastric bypass surgery'; International Journal of Computer Assisted Radiology and Surgery.

Lill Y, Cespedes WV, Benitez BK, Eckstein-Halla NC, Leitmeyer KS, Gürtler N, Stieger C, Mueller AA (2024): 'Screening for congenital hearing impairment with brainstem evoked response audiometry in isolated orofacial cleft'; International Journal of Oral and Maxillofacial Surgery.

Lohss R, Winter R, Göpfert B, Visscher RMS, Sangeux M, Zentai N, Viehweger E (2024): 'Biomechanical gait parameters change with increasing virtual height in a child with spastic cerebral palsy: A case report'; Clinical Case Reports.

Louey MGY, Harvey A, Passmore E, Grayden D, Sangeux M (2024): 'Kinematic upper limb analysis outperforms electromyography at grading the severity of dystonia in children with cerebral palsy'; Clinical Biomechanics.

Lyko Beate; Gravert Stephan-Daniel; Katzschmann Robert K; Müller Bert (2024): 'In vitro testing of an

Maintz M, Desan N, Sharma N, Beinemann J, Beyer M, Seiler D, Honigmann P, Soleman J, Guzman R, Cattin PC, Thieringer FM (2024): 'Fronto-orbital advancement with patient-specific 3D-printed implants and robot-guided laser osteotomy: an in vitro accuracy assessment'; International Journal of Computer Assisted Radiology and Surgery.

Maintz M, Tomooka Y, Eugster M, Gerig N, Sharma N, Thieringer FM, Rauter G (2024): 'In situ minimally invasive 3D printing for bone and cartilage regeneration - a scoping review'; Current Directions in Biomedical Engineering.

Maintz M, Tourbier C, de Wild M, Cattin PC, Beyer M, Seiler D, Honigmann P, Sharma N, Thieringer FM (2024): 'Patient-specific implants made of 3D printed bioresorbable polymers at the point-of-care: material, technology, and scope of surgical application'; 3D Printing in Medicine.

Maloca PM, Pfau M, Janeschitz-Kriegl L, Reich M, Goerdt L, Holz FG, Müller PL, Valmaggia P, Fasler K, Keane PA, Zarranz-Ventura J, Zweifel S, Wiesendanger J, Kaiser P, Enz T-J, Rothenbuehler SP, Hasler PW, Juedes M, Freichel C, Egan C, Tufail A, Scholl HPN, Denk N (2024): 'Human selection bias drives the linear nature of the more ground truth effect in explainable deep learning optical coherence tomography image segmentation'; Journal of Biophotonics.

Manavi Roodsari S; Freund S; Angelmahr M; Seppi C; Rauter G; Schade W; Cattin PC (2024): 'Deep learning-based approach for high spatial resolution fibre shape sensing'; Communications Engineering.

Mandelli F, Zhang Y, Nüesch C, Ewald H, Aghlmandi S, Halbeisen F, Schären S, Mündermann A, Netzer C (2024): 'Gait function assessed using 3D gait analysis in patients with cervical spinal myelopathy before and after surgical decompression: a systematic review and meta-analysis'; The Spine Journal.

Mandelli F; Nüesch C; Mündermann A; Schären S; Urbanschitz L; Netzer C (2024): 'Do Patients with Symptomatic Cervical Spinal Stenosis without Signs of Myelopathy Have Balance Impairment?'; Conference Paper.

Mandelli F; Nüesch C; Mündermann A; Schären S; Urbanschitz L; Netzer C (2024): 'Assessement of balance impairment in patients with symptomatic cervical spinal stenosis with and without myeolopathy'; Conference Paper.

Mauch M, Nüesch C, Bühl L, Chocholac T, Mündermann A, Stoffel K (2024): 'Reconstruction of proximal hamstring ruptures restores joint biomechanics during various walking conditions'; HIP International.

Mauch Marlene; Nüesch Corina; Bühl Linda; Chocholac Tomas; Mündermann Annegret; Stoffel Karl (2024): 'Reconstruction of proximal hamstring ruptures restores joint biomechanics during various walking conditions'; HIP International.

McGrath C, Bieri O, Kozerke S, Bauman G (2024): 'Self-gated cine phase-contrast balanced SSFP flow quantification at 055 T'; Magnetic Resonance in Medicine.

Meyer S, Benitez BK, Thieringer FM, Mueller AA (2024): 'Three-Dimensional Printable Open-Source Cleft Lip and Palate Impression Trays: A Single-Impression Workflow'; Plastic and Reconstructive Surgery.

Michèle Widmer; Alice Minghetti; Jacqueline Romkes; Martin Keller; Ramon Gysin; Cornelia Neuhaus; Bastian Widmer; Morgan Sangeux; Elke Viehweger (2024): 'Group-based progressive functional, high-intensity training in adolescents and young adults with unilateral cerebral palsy – a tool to improve gross motor function, endurance and gait? – a pilot study'; Developmental Neurorehabilitation.

Minghetti A; Widmer M; Viehweger E; Roth R; Gysin R; Keller M (2024): 'Translating scientific recommendations into reality: a feasibility study using group-based high-intensity functional exercise training in adolescents with cerebral palsy'; Disability and Rehabilitation.

Monti MC, Bauer M, Koch K, Scheurer E, Schlotterbeck G (2024): 'Evaluation of ATR–FTIR, HPLC–DAD, GC–MS, and GC–IR for the Analysis of 145 Street Drug Samples From Drug Checking Services'; Drug Testing and Analysis.

Monti MC, De Vrieze LM, Vandeputte MM, Persson M, Gréen H, Stove CP, Schlotterbeck G (2024): 'Detection of N-desethyl etonitazene in a drug checking sample: Chemical analysis and pharmacological characterization of a recent member of the 2-benzylbenzimidazole "nitazene" class'; Journal of Pharmaceutical and Biomedical Analysis.

Msallem B, Vavrina JJ, Beyer M, Halbeisen FS, Lauer G, Dragu A, Thieringer FM (2024): 'Dimensional Accuracy in 3D Printed Medical Models: A Follow-Up Study on SLA and SLS Technology'; Journal of Clinical Medicine.

Msallem B, Veronesi L, Beyer M, Halbeisen FS, Maintz M, Franke A, Korn P, Dragu A, Thieringer FM (2024): 'Evaluation of the Dimensional Accuracy of Robot-Guided Laser Osteotomy in Reconstruction with Patient-Specific Implants—An Accuracy Study of Digital High-Tech Procedures'; Journal of Clinical Medicine.

Müller Bert (2024): 'On the cusp of x-ray tomographic mapping of the human brain and its 10 11 cells'; Conference Paper.

Müller Bert (2024): 'Recent advancements in microtomography'; Developments in X-Ray Tomography XV.

Müller Bert (2024): 'Tribute to Ulrich Bonse: his doctoral thesis on x-ray imaging of strain fields around dislocations in germanium single crystals'; Conference Paper.

Müller J, Lu PJ, Cagol A, Ruberte E, Shin HG, Ocampo-Pineda M, Chen X, Tsagkas C, Barakovic M, Galbusera R, Weigel M, Schaedelin SA, Wang Y, Nguyen T D, Spincemaille P, Kappos L, Kuhle J, Lee J, Granziera C (2024): 'Quantifying Remyelination Using χ-Separation in White Matter and Cortical Multiple Sclerosis Lesions'; Neurology.

Müller J, Roos i, Kalincik T, Lorscheider J, Galli E, Benkert P, Schädelin S, Sharmin S, Einsiedler M, Hänni P, Schmid J, Kuhle J, Derfuss T, Granziera C, Ziemssen T, Siepmann T, Yaldizli Ö (2024): 'Escalating to medium- versus high-efficacy disease modifying therapy after low-efficacy treatment in relapsing remitting multiple sclerosis'; Brain and Behavior.

Müller S, Bühl L, Nüesch C, Mündermann A, Egloff C (2024): 'Persistent differences in muscle activity but not joint mechanics during running 2 years after ACL surgery with augmented repair or with reconstruction'; Conference Paper.

Müller S, Bühl L, Nüesch C, Pagenstert G, Mündermann A, Egloff C (2024): 'Favorable Patient-Reported, Clinical, and Functional Outcomes 2 Years After ACL Repair and InternalBrace Augmentation Compared With ACL Reconstruction and Healthy Controls: Response'; The American journal of sports medicine.

Mündermann A, Nüesch C, Ewald H, Jonkers I (2024): 'Osteoarthritis year in review 2024: biomechanics'; Osteoarthritis and Cartilage.

Mündermann A, Nüesch C, Herger S, Liphardt AM, Chammartin F, De Pieri E, Egloff Ch (2024): 'Load-induced blood marker kinetics in patients with medial knee compartment osteoarthritis are associated with accumulated load and patient reported outcome measures'; F1000Research.

Mündermann A; Herger S; De Pieri E; Liphardt A.-M; Egloff C; Nüesch C (2024): 'Changes in ambulatory load after high tibial osteotomy affect the mechanoresponse of articular cartilage blood markers'; Conference Paper.

Mündermann A; Herger S; De Pieri E; Liphardt A.-M; Egloff C; Nüesch C (2024): 'Selective changes in load-induced cartilage blood marker kinetics are associated with changes in ambulatory knee load after high tibial osteotomy'; Conference Paper.

Mündermann A; Schooff L; Nüesch C; Eckstein F; Imhoff F; Egloff C; Herger S (2024): 'ACL injury affects the association between articular cartilage composition and ambulatory load magnitude and distribution'; Conference Paper.

Nahhas MK, Gerig N, Cattin PC, Wilhelm E, Türp J, Christoph, Rauter G (2024): 'Reviewing the potential of hearables for the assessment of bruxism Litareturrecherche zur Eignung von Hearables für die Erkennung von Bruxismus'; At-Automatisierungstechnik.

Nahhas MK, Türp J, Christoph, Cattin PC, Gerig N, Wilhelm E, Rauter G (2024): 'Toward Wearables for Bruxism Detection: Voluntary Oral Behaviors Sound Recorded Across the Head Depend on Transducer Placement'; Clinical and Experimental Dental Research.

Nahhas Mohammad Khair; Türp Jens Christoph; Cattin Philippe; Gerig Nicolas; Wilhelm Elisabeth; Rauter Georg (2024): 'Toward Wearables for Bruxism Detection: Voluntary Oral Behaviors Sound Recorded Across the Head Depend on Transducer Placement'; Clinical and Experimental Dental Research.

Nahum U, Gorlanova O, Decrue F, Oller H, Delgado-Eckert E, Böck A, Schulzke S, Latzin P, Schaub B, Karvonen AM, Lauener R, Divaret-Chauveau A, Illi S, Roduit C, von Mutius E, Frey U (2024):

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'Symptom trajectories in infancy for the prediction of subsequent wheeze and asthma in the BILD and PASTURE cohorts: a dynamic network analysis'; The Lancet Digital Health.

Neopoulos G; Egloff C; Mündermann A; Halbeisen F; Nüesch C; Appenzeller-Herzog C; Müller S.A; Ismailidis P (2024): 'Evidence-based Management of Concurrent Patellar Tendon and Anterior Cruciate Ligament Ruptures: Insights from a Systematic Review and Meta-Analysis'; Conference Paper.

Nüesch C, Bühl L, Müller S, Egloff C, Mündermann A (2024): 'Single leg hop landing biomechanics 2 years after InternalBrace-augmented ACL repair or ACL reconstruction compared to controls'; Conference Paper.

Nüesch C, Koch D, Schmitter F Mauch M, Mündermann A, Stoffel K, Ismailidis P (2024): 'Muscle strength, muscle activation and joint moments in patients 1 year after total knee arthroplasty or total hip arthroplasty compared to healthy controls'; Conference Paper.

Nüesch C, Koch D, Schmitter F, Mauch M, Stoffel K, Ismailidis P, Mündermann A (2024): 'Muscle activation patterns during walking in patients 1 year after total knee arthroplasty or total hip arthroplasty compared to healthy controls'; Conference Paper.

Nüesch C; Hürlimann S; Mandelli F; Mündermann A; Schären S; Netzer C (2024): 'Ankle kinematics during walking differ from healthy controls in patients with cervical spinal stenosis with myelopathy but not in those without myelopathy'; Conference Paper.

Ochs V, Saad B, Taha-Mehlitz S, Staubli S, Neumann K,rina, Fischer L, Honaker MD, Lamm S, Rosenberg R, Taha A, Cattin PC (2024): 'An analysis of virtual reality in abdominal surgery—A scoping review'; The International Journal of Medical Robotics and Computer Assisted Surgery.

Ochs V; Tobler A; Wolleb JuliJa; Bieder F; Saad B; Enodien B; Fischer LE; Honaker MD; Drews S; Rosenblum I; Stoll R; Probst P; Müller MK; Lavanchy JL; Taha-Mehlitz S; Müller BP; Rosenberg R; Frey DM; Cattin PC; Taha A (2024): 'Development of predictive model for predicting postoperative BMI and optimize bariatric surgery: a single center pilot study'; Surgery for Obesity and Related Diseases.

Oliveira ML, Schaub S, Dagassan-Berndt D, Bieder F, Cattin PC, Bornstein MM (2024): 'Development and evaluation of a deep learning model to reduce exomass-related metal artefacts in cone-beam CT: an ex vivo study using porcine mandibles'; Dentomaxillofacial Radiology.

Papadopoulou A, Pfister A, Tsagkas C, Gaetano L, Sellathurai S, D'Souza M, Cerdá-Fuertes N, Gugleta K, Descoteaux M, Chakravarty MM, Fuhr P, Kappos L, Granziera C, Magon S, Sprenger T, Hardmeier M (2024): 'Visual evoked potentials in multiple sclerosis: P100 latency and visual pathway damage including the lateral geniculate nucleus'; Clinical Neurophysiology.

Papageorgiou S N, Seehra J, Cobourne MT, Kanavakis G (2024): 'Does Current Evidence Support the Discussion Around the Guidance Theory? A Systematic Review and Meta-Analysis on the Association Between Maxillary Lateral Incisor Agenesis and Displacement or Impaction of the Permanent Canine'; Orthodontics & Craniofacial Research.

Pusterla O, Willers C, Sandkühler R, Andermatt S, Nyilas S, Cattin PC, Latzin P, Bieri O, Bauman G (2024): 'An automated pipeline for computation and analysis of functional ventilation and perfusion lung MRI with matrix pencil decomposition: TrueLung'; Zeitschrift für Medizinische Physik.

Reichardt E, Shyp V, Alig L, Verna C, Kulik EM, Bornstein MM (2024): 'Antimicrobial effect of probiotic bacteriocins on Streptococcus mutans biofilm in a dynamic oral flow chamber model – an in vitro study'; Journal of Oral Microbiology.

Rocca MA; Preziosa P; Barkhof F; Brownlee W; Calabrese M; De Stefano N; Granziera C; Ropele S; Toosy A T; Vidal-Jordana A; Di Filippo M; Filippi M (2024): 'Current and future role of MRI in the diagnosis and prognosis of multiple sclerosis'; The Lancet Regional Health - Europe.

Rychen J, Hallenberger T, Oetliker Ch, Brand Y, Mariani L, Röthlisberger M (2024): 'PosESS Study (Positioning in Endoscopic Endonasal Skull Base Surgery): Semi-Sitting (30°) Versus Supine Position: A Randomized Controlled Trial'; Journal of Neurological Surgery Part B: Skull Base.

Saemann A, De Rosa A, Zubizarreta Oteiza j, Sharma N, Thieringer FM, Soleman J, Guzman R (2024): 'Innovating neurosurgical training: a comprehensive evaluation of a 3D-printed intraventricular neuroendoscopy simulator and systematic review of the literature'; Frontiers in Surgery.

Saemann A, de Wilde D, Rychen J, Roethlisberger M, Zelechowski M, Faludi B, Cattin PC, Psychogios MN, Soleman J, Guzman R (2024): 'Assessment of Interrater Reliability and Accuracy of Cerebral Aneurysm Morphometry Using 3D Virtual Reality, 2D Digital Subtraction Angiography, and 3D Reconstruction: A Randomized Comparative Study'; Brain Sciences.

Sanabria-Diaz G; Cagol A; Lu PL; Barakovic M; Ocampo-Pineda M; Chen X; Weigel M; Ruberte E; Siebenborn N de Oliveira S; Galbusera R; Schädelin S; Benkert P; Kuhle Jens; Kappos L; Melie-Garcia L; Granziera C (2024): 'Advanced MRI J of Myelin and Axon Volume Identify Repair in Multiple Sclerosis'; Annals of Neurology.

Sangeux M, Viehweger E, Romkes J, Bracht-Schweizer K (2024): 'On the clinical interpretation of overground gait stability indices in children with cerebral palsy'; Scientific Reports.

Sangeux Morgan; Viehweger Elke; Romkes Jacqueline; Bracht-Schweizer Katrin (2024): 'On the clinical interpretation of overground gait stability indices in children with cerebral palsy'; Research Square Platform LLC.

Santinha J, Pinto dos Santos D, Laqua F, Visser JJ, Groot Lipman K, B W, Dietzel M, Klontzas ME, Cuocolo R, Gitto S, Akinci D'Antonoli T, (2024): 'ESR Essentials: radiomics—practice recommendations by the European Society of Medical Imaging Informatics'; European Radiology.

Santini F (2024): 'The scientific system must bend to avoid breaking'; European Radiology.

Santini F, Pansini M, Deligianni X, Caligiuri MJ, Eugenia, Oei EHG (2024): 'ESR Essentials: advanced MR safety in vulnerable patients—practice recommendations by the European Society for Magnetic Resonance in Medicine and Biology'; European Radiology.

Schaller R, Moya A, Zhang G, Chaaban M, Paillaud R, Bartoszek E M, Schaefer DJ, Martin I, Kaempfen A, Scherberich A (2024): 'Engineered phalangeal grafts for children with symbrachydactyly: A proof of concept'; Journal of Tissue Engineering.

Schaller R, Moya A, Zhang G, Chaaban M, Paillaud R, Bartoszek EM, Schaefer DJ, Martin I, Kaempfen A, Scherberich A (2024): 'Engineered phalangeal grafts for children with symbrachydactyly: A proof of concept'; Conference Paper.

Schäper J, Bauman G, Bieri O (2024): 'Improved gray-white matter contrast using magnetization prepared fast imaging with steady-state free precession (MP-FISP) brain imaging at 055 T'; Magnetic Resonance in Medicine.

Schäper J, Bieri O (2024): 'Myelin water imaging at 055 T using a multigradient-echo sequence'; Magnetic Resonance in Medicine.

Schicker M, Tu Ha T, Luder Y, Morawska M, Röthlisberger M (2024): 'Feasibility and accuracy of CARLO © guided optic canal unroofing'; Current Directions in Biomedical Engineering.

Schicklin C, Rauter G, Cattin PC, Eugster M, Braissant O (2024): 'Method to Generate Chlorine Dioxide Gas In Situ for Sterilization of Automated Incubators'; Pathogens.

Schmitter F; Nüesch C; Koch D; Stoffel K; Ismailidis P; Mündermann A (2024): 'Difference in gait kinematics and kinetics between patients 1 year after total hip or knee arthroplasty and healthy controls'; Conference Paper.

Schoenholzer K, Sellathurai S, Villena FB, Papadopoulou A (2024): 'Hemimacular Thinning Due to Lesions in the Lateral Geniculate Nucleus in 2 Patients with Neuroinflammatory Diseases'; Neurology Neuroimmunology & Neuroinflammation.

Schoenpflug LA, Koelzer VH (2024): 'SoftCTM: Cell Detection by Soft Instance Segmentation and Consideration of Cell-Tissue Interaction'; Conference Paper.

Schoenpflug LA, Nie Y, Sheikhzadeh F, Koelzer VH (2024): 'A review on federated learning in computational pathology'; Computational and Structural Biotechnology Journal.

Schönegg D, Deyhle H, Schulz G, Tanner Ch, Ahmed S, Atwood R, Mueller A A, Müller-Gerbl M, Mezey S, Lieber R L, Khounsary A, Müller B (2024): 'Three-dimensional hard X-ray micro-tomographic imaging of the human palatal anatomy and gracilis muscle'; Conference Paper.

Schönegg D; Deyhle H; Schulz G; Tanner C; Ahmed S; Atwood R; Mueller AA; Müller-Gerbl M; Mezey S; Lieber RL; Khounsary A; Müller B (2024): 'Three-dimensional hard X-ray micro-tomographic imaging of the human palatal anatomy and gracilis muscle'; Conference Paper.

Schönegg D; Essig H; Al-Haj HA; Weber F E; Valdec S (2024): 'Patient-specific beta-tricalcium phosphate scaffold for customized alveolar ridge augmentation: a case report'; International Journal of Implant Dentistry.

Schröder JH, Barandun GA, Leimer P, Morand R, Göpfert B, Rutz E (2024): 'Novel Modular Walking Orthosis (MOWA) for Powerful Correction of Gait Deviations in Subjects with a Neurological Disease'; Children.

Schröder JH; Barandun GA; Leimer P; Morand Rafael; Göpfert B; Rutz E (2024): 'Novel Modular Walking Orthosis (MOWA) for Powerful Correction of Gait Deviations in Subjects with a Neurological Disease'; Children.

Schulte J, Hotz G, Szinnai G, Christ E, Foderà G, Krüsi K, Nussberger P, Kron S, Schulz I (2024): 'Exploring the potential of genetic analysis in historical blood spots for patients with iodine-deficient goiter and thyroid carcinomas in Switzerland and Germany (1929–1989)'; BMC Medical Genomics.

Schulte J; Caliebe A; Marciano M; Neuschwander P; Seiberle I; Scheurer E; Schulz I (2024): 'DEPArray™ single-cell technology: A validation study for forensic applications'; Forensic Science International: Genetics.

Schulz G, Spörri E, Gschwind M, Deyhle H, Müller B (2024): 'Non-destructive imaging of internal structures of a mosquito with sub-micrometer resolution'; Conference Paper.

Schulz I, Schulte J, Wand D (2024): 'Zygotic-splitting after in vitro fertilization and prenatal parenthood testing after suspected embryo mix-up – a case report'; International Journal of Legal Medicine.

Segeroth M, Winkel Dj, Kaufmann BA, Strebel I, Yang S, Cyriac J, Wasserthal J, Bach M, Lopez-Ayala P, Sauter A, Mueller C, Bremerich J, Zellweger M, Haaf P (2024): 'Noninvasive Assessment of Cardiopulmonary Hemodynamics Using Cardiovascular Magnetic Resonance Pulmonary Transit Time'; International Journal of Biomedical Imaging.

Segeroth Martin; Winkel David J; Vosshenrich Jan; Breit Hanns-Christian; Giese Daniel; Haaf Philip; Zellweger Michael J; Bremerich Jens; Santini Francesco; Pradella Maurice (2024): 'Cardiac Cine MRI Using a Commercially Available 0.55-T Scanner'; Radiology: Cardiothoracic Imaging.

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Seifert LB, Beyer M, Czok V, Aigner A, Abazi S, Thieringer FM, Sader R (2024): 'Comparative Accuracy of Stationary and Smartphone-Based Photogrammetry in Oral and Maxillofacial Surgery: A Clinical Study'; Journal of Clinical Medicine.

Sellathurai S, Hardmeier M, Papadopoulou A (2024): 'Investigations of the visual system for the diagnosis and prognosis of neuroinflammatory diseases: Relevance to everyday clinical practice'; Klinische Neurophysiologie.

Senst A, Bonsiepe H, Kron S, Schulz I (2024): 'Application of the Agilent 2100 Bioanalyzer instrument as quality control for next-generation sequencing'; Journal of Forensic Sciences.

Sola-Martínez RA, Zeng J, Awchi M, Gisler A, Arnold K, Singh KD, Frey U, Díaz M, Cánovas, de Diego Puente T, Sinues P (2024): 'Preservation of exhaled breath samples for analysis by offline SESI-HRMS: proof-of-concept study'; Journal of Breath Research.

Spagnolo F; Gobbi S; Zsoldos E; Edde M; Weigel M; Granziera C; Descoteaux Maxime; Barakovic Muhamed; Magon Stefano (2024): 'Down-sampling in diffusion MRI: a bundle-specific DTI and NODDI study'; Frontiers in Neuroimaging.

Sporns PB, Fischer U, Katan M, Ospel JM, Brehm A, Tsogkas I, Holodinsky JK, Kamal N, Fiehler J, Psychogios MN (2024): 'Simulation of transportation of acute stroke patients in border regions'; Scientific Reports.

Steinberg R, Moeller A, Gisler A, Mostacci N, Hilty M, Usemann J (2024): 'Longitudinal effects of elexacaftor/tezacaftor/ivacaftor on the oropharyngeal metagenome in adolescents with cystic fibrosis'; Journal of Cystic Fibrosis.

Steiner L, Tscherter A, Henzi B, Branca M, Carda S, Enzmann C, Fluss J, Jacquier D, Neuwirth Ch, Ripellino P, Scheidegger O, Schlaeger R, Schreiner B, Stettner GM, Klein A (2024): 'Chronic Pain in Patients with Spinal Muscular Atrophy in Switzerland: A Query to the Spinal Muscular Atrophy Registry'; Journal of Clinical Medicine.

Stocker R, Wittauer M, Kvarda P, Nüesch C, Appenzeller-Herzog C, Halbeisen F, Mündermann A, IsmailidisP (2024): 'Hip Abductor Muscle Strength in Patients After Total Knee Arthroplasty: A Systematic Review and Meta-analysis'; The Journal of Arthroplasty.

Stocker R; Wittauer M; Kvarda P; Nüesch C; Halbeisen F; Mündermann A; Ismailidis P (2024): 'Looking beyond the index joint: hip abductor muscle strength in patients after TKA'; Conference Paper.

Stocker Roman; Wittauer Matthias; Kvarda Peter; Nüesch Corina; Appenzeller-Herzog Christian ; Halbeisen Florian ; Mündermann Annegret; Ismailidis Petros (2024): 'Hip Abductor Muscle Strength in Patients After Total Knee Arthroplasty: A Systematic Review and Meta-analysis'; The Journal of Arthroplasty.

Studer D; Hasler CC (2024): 'Diagnostic and therapeutic strategies in early onset scoliosis: A current concept review'; Journal of Children's Orthopaedics.

Taha A; Saad B; Taha-Mehlitz S; Ochs V; El-Awar J; Mourad MM; Neumann K; Glaser C; Rosenberg R; Cattin PC (2024): 'Analysis of artificial intelligence in thyroid diagnostics and surgery: A scoping review'; American Journal of Surgery.

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