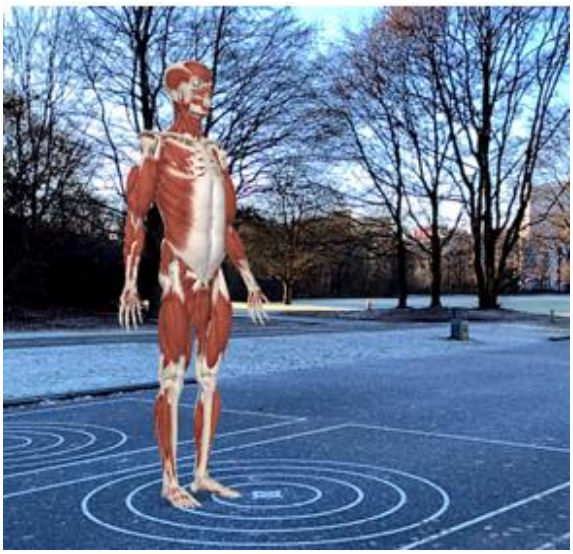
8th *Virtual* Winter Symposium
of the HUMAN MOTION PROJECT
10 MARCH 2021 | Virtually through Zoom

ABSTRACT BOOK



Human Motion in times of Corona: A booster for walking, the use of wearables in clinical trials and telemedicine in clinical practice?

http://www.thehumanmotioninstitute.org/sites/default/files/HUMO_Symposium8_2021_Flyer_Digital.pdf

SPEAKERS

(ordered by program appearance)

Martin Daumer

CV — Prof. Daumer studied physics at the Ludwig-Maximilians-Universität München (Diplom 1990: "The Phase Operator in Quantum Optics"), where he received his doctorate in mathematics in 1995 for his dissertation on "Scattering Theory from the Perspective of Bohmian Mechanics." After joining the TUM School of Medicine (Institute for Medical Statistics and Epidemiology, Klinikum rechts der Isar) and extensive research in "Online Monitoring in Medicine," he co-founded the company Trium Analysis Online GmbH (www.trium.de) in 2000 and a year later the non-profit research institute Sylvia Lawry Centre for Multiple Sclerosis Research e.V. (www.thehumanmotioninstitute.org).

Prof. Daumer's current research focuses on medical monitoring, wearables and clinical studies. "CTG Online" is a medical device for the global monitoring of maternity wards, while a new generation of target parameters for clinical studies based on the Ian MacDonald Database and the wearable www.actibelt.com is currently under development in cooperation with regulatory authorities (EMA, FDA).

Abstract — Welcome to the 8th Winter symposium of the Human Motion Project - https://peerj.com/preprints/257v2/, standing on the shoulders of the giants from previous winter symposia: http://www.actibelt.com/actibelt_files/resources/Winter_Symposia_Flyer.pdf based on the Höhenried meeting "acceleromics meets genomics" http://www.actibelt.com/acceleromics_meets_genomics_poster.pdf. The first expert panel meeting on

physical activity took place in Munich in 2007:
http://www.actibelt.com/Flyer_Physical_Activity_Expert_Panel_Meeting_071207.pdf

Shane O'Mara

CV — I am Professor of Experimental Brain Research in Trinity College Dublin, and am a Principal Investigator in, and currently the Director of, the Trinity College Institute of Neuroscience and a member of the academic staff of the School of Psychology.
I was an undergraduate and postgraduate at NUI Galway (BA, MA). I undertook my doctoral work (DPhil) at the University of Oxford. I am a Fellow of Trinity College, Dublin (FTCD) and a Fellow of the Association for Psychological Science (FAPS). I was also elected a Member of the Royal Irish Academy (MRIA).
Research Focus: My research focuses on the relations between cognition, synaptic plasticity and behaviour, in the context of brain aging and depression.
Research Interests: Biology of learning and memory; mechanisms of brain repair; drug action in CNS; synaptic plasticity; visualising in vivo neuronal activity; defining distribution of bioactive agents in CNS; imaging human brain during learning and memory; models of neurodegeneration; models of secondary depression and their treatment; organic disorders of memory.
I am also interested in public policy applications and counterfactual interpretations of neuroscience.
Research Support and Research Funding: My research work has been or currently is supported by the Wellcome Trust; Science Foundation Ireland; the Health Research Board; the European Commission; GlaxoSmithKline; Alkermes.
I blog shaneomara.wordpress.com, mostly on neuroscience-, psychology-, science- and public policy-related themes (and maybe the intersection of all of these themes, but sometimes on other things entirely). I tweet at @smomara1.
https://psyarxiv.com/au4kh/

Abstract — Human walking is a socially-embedded and shaped biological adaptation: it frees our hands, make our minds mobile and is deeply health-promoting. Yet, today, physical inactivity is an unsolved, major public health problem. However, globally, tens of millions of people annually undertake ancient, significant, and enduring traditions of physiologically- and psychologically-arduous walks (pilgrimages) of days-to-weeks extent. Pilgrim walking is celebrated, discussed, and analysed in important literary, historical, and religious works as a defining human activity: one requiring weighty commitments of time, action, and belief, as well as community support. Paradoxically, human walking is most studied on treadmills, not 'in the wild'. While mechanistically vital, treadmill studies of walking cannot, in principle, address why humans walk extraordinary distances together for abstract ends, or provide the means to bring much-needed physical activity back into our everyday lives. Pilgrim walkers provide a rich 'living laboratory' bridging literary, historical, and religious inquiries, to progressive theoretical and empirical investigations of human walking serving abstract ends. Pilgrims offer advantages for causal investigations: they vary demographically, and they undertake arduous journeys on precisely-mapped routes of tracked, titrated, doses and durations on terrain of varying difficulty, allowing controlled investigations from molecular to cultural levels of analysis. Here, using a novel, naturalistic, framework, we examine how pilgrim walking might shape personal, social, and transcendental processes, revealing potential mechanisms supporting the socially-embedded body and brain in motion, and beyond, to how pilgrim walking might offer some potential solutions for physical inactivity in society at large.

Jörn Rittweger

CV — After graduation in medicine I was intrigued by physiology, where I spent my first years as post-doc to work on brain stem. I then moved on to study muscle-bone interactions and vibration exercise. Today my interest is musculoskeletal mechanophysiology and metabolism, and how this affects our health - with regards to space, immobilization, and training across the lifespan.

Abstract — Muscles are important for our health because of their size, their involvement in energy metabolism and their importance for locomotion. Adequate selection of good endpoints is crucial for the successful design of many studies. At least 8 different muscle functions can be defined, namely

the mechanical functions of force exertion, speed, power, elastic storage and braking power, the two metabolic functions of substrate uptake (e.g. carbohydrates, lipids and amino acids) substrate provision (e.g. lactate and amino acids) and secretory functions. However, specific endpoint tests have only been validated for muscle strength and power. To date, walking speed and grip strength show good predictive value for hard clinical endpoints such as disability, loss of autonomy and death. Vertical jump power also has good ecological validity and construct validity, and it shows excellent test-retest reliability, which is an important advantage in terms of study performance. Assessment of muscle mass, e.g. by magnetic resonance imaging, dual-energy X-ray absorptiometry or bioelectrical impedance, should be considered as an important secondary endpoint to increase construct validity. Other secondary endpoints should always be included if they are likely to increase the plausibility of the study outcome, and assessment of test-retest reliability at baseline is always recommended. In summary, while there are some well-established methods to assess relevant muscular endpoints, there are several important functions for which there is no standardized approach in clinical trials. This is particularly true for the metabolic functions of muscle, but also for its role in the storage and dissipation of mechanical energy.

Ylva Hellsten

CV — Ylva Hellsten, Department of Nutrition, Professor of Cardiovascular and Exercise Physiology Exercise and Sports, University of Copenhagen, Denmark Dr.Med.Sc from The Department of Physiology, Karolinska Institute, Stockholm, Sweden Science: My vision is to contribute with scientific knowledge that motivates people to be physically active. My mission is to provide high quality scientific knowledge on how physical inactivity and activity influences cardiovascular function. My research area is in integrative physiology with a focus on cardiovascular function and microvascular growth in skeletal muscle in health and life style related disease and the role of physical activity. Our research and methods encompass both human integrative cardiovascular regulation and detailed cellular and molecular mechanisms.

Abstract — It is well known that the risk of cardiovascular disease in women is delayed compared to in men. A main underlying reason is that estrogen has several protective effects on the cardiovascular system and that, first when estrogen levels fall at menopause, their risk of cardiovascular disease is markedly increased. The role of testosterone on cardiovascular function is more complex but changes in levels with age are likely to contribute to the risk of cardiovascular events with ageing. Physical activity is known to activate numerous signaling pathways which lead to protective effects on the vasculature and physical activity is overall known to have substantial positive effects on cardiovascular health. However, one caveat is that there may be a synergistic effect of sex-hormones and physical activity; in women, the loss of estrogen at menopause and in men, the age-induced decline in testosterone, may attenuate trainability. This talk briefly covers the interaction between sex-hormones and adaptations to physical activity.

Peter Godsk Jørgensen

CV — I am cardiology resident with a background in cardiovascular and diabetes research. My main research expertise is mainly in electrocardiography and echocardiography. Regarding the former, I have focused on the prognostic implications of electrocardiographic changes in the general population and regarding the latter, I have examined the influence of different diseases and interventions on echocardiographic parameters. These include type 2 diabetes, which is my main area of expertise, but also the general population, heart failure, pre- and postmenopausal women and, as an exciting side project, the hibernating brown bear. Also, I am interested in valvular heart disease.
https://www.linkedin.com/in/peter-godsk-jørgensen-66b7439b/
https://research.regionh.dk/en/persons/peter-godsk-joergensen(feb67c23-5f81-4812-bb1c-f6a39530e048).html

Abstract — During six months of annual hibernation, the brown bear undergoes unique physiological changes to adapt to decreased metabolic rate. We compared cardiac structural and functional measures of hibernating and active bears using comprehensive echocardiography. We performed echocardiography on 13 subadult free-ranging, anaesthetised Scandinavian brown bears (Ursus arctos) during late hibernation and in early summer. Mean heart rate was 26 beats per minute

(standard deviation (SD): 8) during hibernation vs 71 (SD: 14) during active state. All left ventricular (LV) systolic and diastolic measures were decreased during hibernation: mean ejection fraction: 44.2% (SD: 6.0) active state vs 34.0 (SD: 8.1) hibernation, P=0.001; global longitudinal strain: -11.2% (SD: 2.0) vs -8.8 (SD: 3.3), P=0.03; global longitudinal strain rate: -0.82 (SD: 0.15) vs -0.41 (SD: 0.18), P<0.001; septal e': 9.8 cm/s (SD: 1.8) vs 5.2 (SD: 2.7), P<0.001. In general, measures of total myocardial motion (ejection fraction and global longitudinal strain) were decreased to a lesser extent than measures of myocardial velocities. In the hibernating brown bear, cardiac adaptation included decreased functional measures, primarily measures of myocardial velocities, but was not associated with cardiac atrophy. Understanding the mechanisms of these adaptations could provide pathophysiological insight of human pathological conditions such as heart failure.

Marcin Mider

CV — Professional Experience (Oct 2020–Present) Senior Software Developer/Engineer, Trium Analysis Online GmbH (Oct 2019–Sep 2020) Postdoctoral researcher at Max Planck Institute for Mathematics in the Sciences, Leipzig Education (Oct 2015–Sep 2019) PhD in Statistics (CDT OxWaSP), University of Warwick, UK (Oct 2015–Sep 2016) PhD Foundation year (CDT OxWaSP), University of Oxford, UK (Oct 2011–Jul 2015) Bachelor of Science, Master of Mathematics, Operational Research, Statistics and Economics, University of Warwick, UK Other (Feb 2018—Apr 2018) Visiting researcher at the Department of Mathematics, University of Copenhagen, Denmark

Abstract — In view of the growing awareness and concerns about data protection and introduction of regulations such as GDPR or CCPA, the topics of data privacy and anonymity are becoming more relevant then ever. For a business that produces devices that track human motion—often in a medical setting—and analyses the collected data, it is, unsurprisingly, a very complex issue and, if not approached with care, many mistakes can be made along the way. How can one make sure that collected data do not undermine patients' anonymity? How to utilize new technologies and add more sensors to the devices without breaching privacy regulations? One of the core principle of the actibelt platform is and has always been "privacy by design", so these and similar complex questions need to be addressed on a daily basis at Trium. In this talk I will discuss a problem of relative position tracking with RCT3 devices and explain how the pursuit of improved data collection methods needs to be carefully balanced with the concerns for data privacy.

Jan-Patrick Stellmann

CV — Since 09/2019 MCU-PH / Assistant Professor at the Centre for Metabolic Exploration by Magnetic Resonance (CEMEREM), Center for Biological and Medical Magnetic Resonance (CRMBM), Aix Marseille University and at the Department of Diagnostic and Interventional Neuroradiology, Hospital de la Timone, APHM, Marseille 10/17-08/19 Senior physician in the Department of Neurology at the University of Hamburg, and head of the Imaging Research Group at the Institute of Neuroimmunology and Multiple Sclerosis (INIMS), Germany 09/16-09/17 DFG research year at CRMBM-CEMEREM, Aix-Marseille University 01/10-08/16 Neurologist and research fellow Department of Neurology and Institute of Neuroimmunology and Multiple Sclerosis (INIMS), University Hamburg 09/2011 Thesis: "Life and Work of the Neuropathologist Hermann Josephy (1887-1960): Including an introduction to the History of Neuropatholgy in Germany", University of Hamburg, Germany 12/2010 Certified neurologist, Hamburg, Germany

Abstract — Primary-progressive MS (PPMS) is considered to be the MS patient group with the fastest disease progression but individual diseases courses show a high heterogeneity. Conceptually, PPMS is the most promising MS patient group to study and develop new outcomes for disability progression in MS. Based on this assumption, the INIMS started in 2012 recruiting a cohort of primary progressive MS patients undergoing a multidimensional assessment on a yearly basis for up to 5 years. Annual assessments include MRI and standard disability outcomes: MSFC and EDSS. Moreover, participants undergo 7 days of real-life accereometry and perform additional mobility and walking assessments, a computer-adaptive test of contrast vision, a short neuropsychological assessment and several patient reported outcomes. By February 2021, we recruited 99 patients, 68 completed the first year and 37 subjects completed already five years of follow-up. Here we will provide an overview of first

longitudinal analyses and preliminary results covering neurodegeneration and progression in PPMS from real-life mobility to different imaging modalities.

Adam Cohen

CV — Physician with clinical attachment in nephrology. Emeritus Professor of Clinical Pharmacology Leiden University Medical Centre. Previously Vice-Chairman of the NL Trial Competent Authroity and Central Ethics Committee. Emeritus Editor-in Chief British Journal of Clinical Pharmacology. Currently consultant to biotech and device industry and to investors and active in media and scientific publication and active amateur musician.

Abstract — The concept of value-based medicine requires evaluation of health care interventions with methodology that indicates the value tot the patient. The current trials often rely upon 'hard' endpoints that are easy to measure like mortality. Whilst prevention of this obviously has value to most patients, there is more to be measured. This often involves new technology that requires validation. But what is this and how should it be done?

Olav Bjørn Petersen

CV — Clinical Professor, MD, PhD in fetal medicine and therapy at Copenhagen University Hospital, Rigshospitalet and University of Copenhagen, Denmark Research interest: Maternal & fetal medicine, translational research in Fetal Medicine, Genetics and Anthropology. Development, implementation and evaluation of telemedicine and home-monitoring of women with pregnancy complications. Author/co-author of 116 peer-reviewed scientific papers, 72 abstracts/posters and 8 book chapters. H-index: 28 Link to full CV: https://www.dropbox.com/s/6igoqlo9f7uw7d1/OBP-CV-Public.docx?dl=0

Abstract — With hospital resources, staff and number of beds being challenged by demographics and the constant increasing age of our population, and recently the Covid-19 pandemic, telemedicine and home/remote monitoring has received increasing interest. Women with pregnancy-complications is a special group, where young and normally healthy persons are hospitalized - sometimes for weeks and months, to enable safe surveillance of maternal and fetal health, but at the cost of often major and negative impact on family and personal life. At Aarhus University Hospital we developed an open source mobile device platform for home/remote monitoring of these women and their unborn child. To enable the mother to perform safe and thorough monitoring of her own and the unborn child's health, to support empowerment and ability to regain some control over own life Our experience and results of home-monitoring of 400 women with pregnancy complications will be presented

Vasileios Exadaktylos

CV — Vasileios Exadaktylos has been working since 2007 in the field of analysis of bioresponses using technology. He has held both academic and industrial positions leading to an output of more than 40 peer reviewed journal publications and 5 patents. Since 2019, he is the Product Manager Trial@Home at CHDR working on the creation of a platform that allows validated and reliable collection and interpretation of data using digital technologies to complement clinical trials with real-world information.

Abstract — Pediatric clinical trials are generally conducted in hospitals and study data is collected during visits in predefined time intervals. These visits capture no more than a snapshot of the burden of disease. Additional visits and invasive measurements are not possible because of the increase of the burden for subjects. In the case of pediatric pulmonary infections, information about physical activity, pulmonary function and patient reported outcomes collected via the CHDR Trial@home platform, could provide a more reliable overview of the burden of disease. This would allow for future interventional trials to be conducted completely at home. The aim of this study was to investigate the feasibility of digital technologies in pediatric trials and their ability to be used as indicators of disease severity and recovery.

Marcello Grassi

CV — Background in Sport Science and human bio-mechanics. Currently working on a PhD on the methodological aspects of using actibelt to quantify human motion.

Abstract — Aims: To assess children's acceptance to wear a 3D-accelerometer which is attached to the waist under real-world conditions, and also to compare gait speed during supervised testing with the non-supervised gait speed in every-day life. Methods: In a controlled observational, cross sectional study thirty subjects with cerebral palsy (CP), with level I&II of the Gross Motor Function Classification System (GMFCS) and 30 healthy control children (Ctrl), aged 3–12 years, were asked to perform a 1-min-walking test (1 mwt) under laboratory conditions, and to wear an accelerometric device for a 1-week wearing home measurement (1 WHM). Acceptance was measured via wearing time, and by a questionnaire in which subjects rated restrictions in their daily living and wearing comfort. In addition, validity of 3D-accelerometric gait speed was checked through gold standard assessment of gait speed with a mobile perambulator. Results: Wearing time amounted to 10.3 (SD 3.4) hours per day, which was comparable between groups (T = 1.10, P = 0.3). Mode for wearing comfort [CP 1, Range (1,4), Ctrl 1, Range (1,6)] and restriction of daily living [CP 1, Range (1,3), Ctrl 1, Range (1,4)] was comparable between groups. Under laboratory conditions, Ctrl walked faster in the 1 mwt than CP (Ctrl 1.72 ± 0.29 m/s, CP 1.48 ± 0.41 m/s, P = 0.018). Similarly, a statistically significant difference was found when comparing real-world walking speed and laboratory walking speed (CP: 1 mwt 1.48 ± 0.41 m/s, 1 WHM 0.89 ± 0.09 m/s, P = 0.012; Ctrl: 1mwt 1.72 ± 0.29, 1 WHM 0.97 ± 0.06, P < 0.001). Conclusion: 3D-accelerometry is well-enough accepted in a pediatric population of patients with CP and a Ctrl group to allow valid assessments. Assessment outside the laboratory environment yields information about real world activity that was not captured by routine clinical tests. This suggests that assessment of habitual activities by wearable devices reflects the functioning of children in their home environment. This novel information constitutes an important goal for rehabilitation medicine. The study is registered at the German Register of Clinical Trials with the title “Acceptance and Validity of 3D Accelerometric Gait Analysis in Pediatric Patients” (AVAPed; DRKS00011919).

Isabella Wiedmann

CV — https://orcid.org/0000-0002-9780-2688

Abstract — Background: Successful rehabilitation enables patients to perform activities of daily living (ADL) in their own home setting. Therefore, to monitor the success of rehabilitation will ultimately require assessments in the patient's home setting. In this respect, there is an obvious knowledge gap, as rehabilitation success is typically assessed in a clinical setting, which can only indirectly reflect the patients' functioning in their free-living environment. Children often have more difficulties in following verbal test instructions. It is therefore advisable in pediatrics to acquire information in an intuitive or implicit way. In the context of gait analysis, this could occur through 3D-accelerometric assessments of gait speed. Aims: To assess children's acceptance to wear a 3D-accelerometer which is attached to the waist under real-world conditions, and also to compare gait speed during supervised testing with the non-supervised gait speed in every-day life. Methods: In a controlled observational, cross sectional study thirty subjects with cerebral palsy (CP), with level I&II of the Gross Motor Function Classification System (GMFCS) and 30 healthy control children (Ctrl), aged 3–12 years, were asked to perform a 1-min-walking test (1 mwt) under laboratory conditions, and to wear an accelerometric device for a 1-week wearing home measurement (1 WHM). Acceptance was measured via wearing time, and by a questionnaire in which subjects rated restrictions in their daily living and wearing comfort. In addition, validity of 3D-accelerometric gait speed was checked through gold standard assessment of gait speed with a mobile perambulator. Results: Wearing time amounted to 10.3 (SD 3.4) hours per day, which was comparable between groups (T = 1.10, P = 0.3). Mode for wearing comfort [CP 1, Range (1,4), Ctrl 1, Range (1,6)] and restriction of daily living [CP 1, Range (1,3), Ctrl 1, Range (1,4)] was comparable between groups. Under laboratory conditions, Ctrl walked faster in the 1 mwt than CP (Ctrl 1.72 ± 0.29 m/s, CP 1.48 ± 0.41 m/s, P = 0.018). Similarly, a statistically significant difference was found when comparing real-world walking speed and laboratory walking speed (CP: 1 mwt 1.48 ± 0.41 m/s, 1 WHM 0.89 ± 0.09 m/s, P = 0.012; Ctrl: 1mwt 1.72 ± 0.29, 1 WHM 0.97 ± 0.06, P < 0.001). Conclusion: 3D-accelerometry is well-enough accepted in a pediatric population of patients with CP

and a Ctrl group to allow valid assessments. Assessment outside the laboratory environment yields information about real world activity that was not captured by routine clinical tests. This suggests that assessment of habitual activities by wearable devices reflects the functioning of children in their home environment. This novel information constitutes an important goal for rehabilitation medicine. The study is registered at the German Register of Clinical Trials with the title “Acceptance and Validity of 3D Accelerometric Gait Analysis in Pediatric Patients” (AVAPed; DRKS00011919).

Daniel Rückert

CV — Professor Rückert’s (*1969) field of research is the area of Artificial Intelligence (AI) and Machine Learning and their application to medicine and healthcare. His research focuses on (1) the development of innovative algorithms for biomedical image acquisition, image analysis and image interpretation – especially in the areas of image reconstruction, registration, segmentation, traching and modelling; (2) AI for extracting clinically useful information from biomedical images – especially for computer-assisted diagnosis and prognosis. Since 2020, Daniel Rückert is Alexander von Humboldt Professor for AI in Medicine and Healthcare at the Technical University of Munich. He is also a Professor at Imperial College London. He gained a MSc from Technical University Berlin in 1993, a PhD from Imperial College in 1997, followed by a post-doc at King’s College London. In 1999 he joined Imperial College as a Lecturer, becoming Senior Lecturer in 2003 and full Professor in 2005. From 2016 to 2020 he served as Head of the Department of Computing at Imperial College. https://www.professoren.tum.de/en/rueckert-daniel

Abstract — The talk will focus on the use of deep learning techniques for the discovery and quantification of clinically useful information from medical images. More specifically, we will describe how deep learning can be used for the reconstruction of medical images from undersampled data, image super-resolution, image segmentation and image classification. It will also show the clinical utility of applications of deep learning for the interpretation of medical images in applications. Finally, it will be discussed how deep learning may change the future of medical imaging.

Morten Kyng

CV — Dr.scient. Morten Kyng is professor of pervasive computing at Aarhus University and scientific lead for Health IT at The Alexandra Institute. He has been director of the Danish National Centre for IT-research and together with the late Kristen Nygaard from Norway and Pelle Ehn from Sweden Morten has lead the development of the Scandinavian school of participatory design which has set the agenda for vast body of international research. In recognition of this work Morten was in 2001, as the first European, appointed to the ACM CHI Academy for leadership in the field of computer-human interaction. He is currently doing cross-disciplinary research within healthcare and welfare. He also works on experimental systems development, software ecosystems, open source software, microservice architectures and IT infrastructure.

Abstract — Telehealth systems both support and limits treatment regimes and more broadly human activity. Thus they should be grounded in a deep understanding of both treatment regimes and the surrounding activity and they should be able to develop together with the treatment they support as improved understanding paves the way for better treatment. In this talk we sketch a microservice-based alternative to monolithic health IT systems. The alternative supports co-creation involving health professionals, patients and IT professionals as well as ongoing improvements where new insight is easily implemented and deployed as new microservices.

Klaus Diepold

CV — Klaus Diepold is Professor for Data Processing at the Department of Electrical & Computer Engineering, Technische Universität München (TUM), Germany. Before the start of his academic

career at TUM in 2002 he spent more than ten years in the media industry as a researcher, manager and entrepreneur. During that time, he has been actively involved in MPEG standardization (compression of AV-data). His main research interests are in multimedia signal processing, machine learning and machine intelligence for robotics. His entrepreneurial origins are still active as a board member of the Center for Digital Technology and Management (CDTM), where he engages in training innovators of the future. He also supports student-driven high-tech start-ups. He is a Fellow for Innovation in University Education by the Stifterverband, where he lives out his passion for innovating university education. He holds a Dr.-Ing. degree from TUM.

Michael Zwick

CV — Michael Zwick is a lecturer for Programming and Computer Science at the Department of Electrical & Computer Engineering, Technische Universität München (TUM). He is member of the faculty council and speaker of the scientific staff. He is currently involved in the TUM migration from departments to schools, focusing on the digitalisation of management and teaching. His research interests are in the area of processor design, the hardware software interface and processor architectures for machine learning. He holds a Dr.-Ing. degree from TUM.

Abstract — The pandemic has forced all educational institutions to fundamentally change the way how they educate and train young people. On the surface, this is accomplished by adopting various forms of information infrastructure, e.g., to deliver live lectures or pre-recorded videos to the students. However, reformatting traditional forms of frontal teaching and learning to use in distance learning frameworks is only part of the story. New channels of delivering education also offer new opportunities and entirely new formats for education, which educators, as well as learners need to explore to find new and effective ways of communicating effectively. Of course, this also has a technical side, as we all experience these days. It takes some effort, patience and ingenuity to devise new tools and methods to innovate teaching into the 21st century.

Markus Walther

CV — Prof. Dr. med. Markus Walther is Head of the Department of Foot and Ankle Surgery at the Orthopaedic Hospital Munich Harlaching and Medical Director of Schön Klinik München Harlaching and FIFA Medical Centre Munich. He has published over 50 papers on sports medicine, foot and ankle surgery, hospital management, and he has received multiple scientific awards, including the Arthur-Vick-Award, the DEGUM-Award, and the Michael-Jaeger-Award. Prof. Walther was a member of the board of the Society of Orthopaedic Sports Medicine for several years. He was an International Fellow of the American Foot and Ankle Society (AOFAS) and is an active member of the German, the European, the American, and the International Foot and Ankle Society. He is also a member of GRECMIP/MIFAS (Minimally Invasive Foot and Ankle Surgery Society) and the ICRS (International Cartilage Repair Society). He is Professor for Orthopaedic Surgery at the University of Wuerzburg, Germany, and is ranked as one of the top foot and ankle specialists in the country. 2018 to 2020, he was honored as Visiting Professor by the Peking University People's Hospital and the Foshan TCM University Hospital in China.

Abstract — The last 12 months have affected all of our lives more than most of us ever had expected. Maybe some who have attended epidemiology lectures might have anticipated what was about to come when they heard about the new wireless in China in January 2020. But life goes on, and patients are getting injured independent of infection rates. Running one of the largest orthopedic hospitals in Germany, the talk will deal with the significant challenges of treating musculoskeletal diseases during the pandemic. We had to deal with the problem the trauma cannot be planned, and lockdown is not a concept. Patients come when they get injured or when they are in pain. Treating those patients during the pandemic, you have to face the following tasks: 1) Prevent your staff from getting infected. 2) Prevent your patient from getting infected. 3) Identify infected patients and get them as safe as possible through the treatment process. Many employees have been scared by the news of seeing overcrowded hospitals, especially in Italy and France. Hardly anybody was prepared to deal with the situation that we are no longer able to provide every patient the amount of medical care appropriate for his disease. Especially in the very beginning, every patient was considered a

substantial threat to any employee's health. The need for personal protection devices was high. In the beginning, it wasn't easy to get face shields, masks, or protection cloths. We had only limited test capacity during the first months, and only patients with significant Covid symptoms qualified for PCR testing. The major challenge was to separate any potentially infected patients from others. Death rates in Covid patients needing general anesthesia have been reported to be more than 50%. That means that the Covid infection acquired before orthopedic surgery would be a life-threatening disease. We have separated the hospital into areas. We had areas for non-Covid patients, areas for potentially infected patients, and areas for Covid patients. The pathways of those patients should never cross. We had hardly any transmissions in the hospital. That includes patients as well as employees. But that was also the confirmation that the concept of distance, wearing a mask, and necessary hygienic behavior significantly reduces the risk of Covid infection. Meanwhile, we have established a security concept for patients and employees. Every inpatient and every patient having any surgery needs a negative PCR test not older than two days. Depending on the risk of exposure, employees are tested once a week or every second week for the potential, undiscovered Covid infection. All patients have to wear medical masks, as well as the employees. Currently, I'm a hundred percent convinced that the hospital is one of the safest places in Munich. Especially compared to public transport, public places, or many homes, where people meet like Covid doesn't exist.

Student presentations of the TUM lecture Clinical Applications of Computational Medicine (CACOM)

“Analysis of the flexible strip flexeal”

CV — Helga Ritzl (Hungarian), TUM Master Electrical Engineering, 1st Semester, Bachelor in Electrical Engineering
Dennis Gölitz (German), TUM Master Electrical Engeering, 3rd Semester, Bachelor in Electrical Engineering
Franziska Stöckeler (German), TUM Master Electrical Engineering, 2nd Semester, Bachelor in Electrical Engineering
Samira Balbach (German), TUM Master Electrical Engineering, 1st Semester, Bachelor in Electrical Engineering
Jakob Pfohl (German), TUM Master Electrical Engineering , 3rd Semester, Bachelor in Electrical Engineering

Abstract — flexeal is a self-adhesive, reusable, flexible strip that is used to better fix a mouth-nose covering. Its usage offers advantages like a better mouth and nose protection, higher comfort. It is reusable, washable and it stops glasses from steaming up. During the project, we built a website, designed, and conducted a survey, and used our acquired knowledge to improve the flexeal strips. In addition we have made videos that illustrate these advantages and simplify the use of flexeal.

"Development of a DIY air purifier for reducing the risk of coronavirus transmission in a low and high budget version"

CV — Leon Mayer (German), TUM Electrical Engineering, 1. Semester Master, Bachelor in Electrical Engineering
Claudia Hofmann (German), TUM Electrical Engineering, 2. Semester Master, Bachelor in Biomedical Engineering)

Abstract — During the ongoing coronavirus crisis, affordable and easy-to-implement mitigation methods have come into focus. While social distancing and masks have gotten lots of publicity and play an important part, other methods to reduce the transmission risk should not be neglected.

In this project, starting from easily and cheaply available materials, an air purifier was built which combines a simple home fan with low-cost filter elements. Two different versions were constructed and compared to both a professional air purifier and a no-filter control experiment by measuring the reduction in PM2.5 and PM10 particles in the air. Also, the airflows and pressure differences generated by the filters were investigated. The testing and research show that the models were easily able to outperform the control tests, even though they could not match the professional purifier. Overall, the DIY air filters are a promising approach to reducing the coronavirus transmission risk, especially when more sophisticated measures are not available, and should be investigated further.

“Gait: a new fingerprint?”

CV — Aydin Uzun, (Turkish), TUM electrical engineering, 2nd semester, Bachelor in Electrical & Electronic Engineering and Mathematics
Oussama Skhiri (Tunisian), TUM electrical engineering, 3rd semester, Bachelor in Electrical Engineering

Abstract — Gait refers to a person’s manner of walking and it is one of the many physical traits that can be used to identify an individual. The scientific literature on gait analysis for human recognition has grown dramatically recently. The modalities for gait analysis include computer vision-based, pressure-based and accelerometer-based methods. In our work, we used the actibelt device -a high-tech 3D-accelerometer hidden in a belt buckle- from Trium Analysis Online GmbH which is currently used to evaluate the changes in real-world walking speeds in patients with multiple sclerosis. After collecting the accelerometer data, we plotted the result of averaging multiple steps taken by different individuals and from different measurements. As acceleration information is a direct function of the combined forces and masses involved in gait generation, we tried to interpret this dynamic information

presented on our plots and answer the question of why our gait is so unique and can be used for human recognition and authentication purposes.

“Towards an accurate diagnostic of cyclists’ endofibrosis”

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Abstract — Elite athletes’ or more specifically cyclists‘ career is threatened by an asymptomatic cardiovascular pathology which is in most cases poorly diagnosed. The external iliac artery endofibrosis or EIAE is affecting the endurance of high-performance athletes. Therefore, the aim of this project is to study, simulate the pathology and compare different diagnostic methods for their accuracy based on patients‘ data and outcomes. To do so, Computational Fluid Dynamics and Finite Element Analysis were adopted in order to simulate a healthy and an endofibrotic artery and to compare both models on the level of blood flow essentially.
Results showed a decrease in the blood flow by the endofibrotic artery as well as other phenomena that can induce other diseases and complications. Therefore, an accurate diagnosis is crucial in order to prevent further complications and diseases. Using statistical data analysis, different diagnostic methods were evaluated for their accuracy.