

**9th Virtual Winter Symposium of the
HUMAN MOTION PROJECT
16 MARCH 2022 | 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?

https://humanmotioninstitute.de/assets/documents/HUMO_Symposium9_2022_Final%20Program_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 9th 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

Tonio Walter (Keynote speaker)

CV — <https://www.uni-regensburg.de/rechtswissenschaft/strafrecht/walter/prof-dr-tonio-walter/index.html>

Manuscript instead of abstract:

Triage and Equality – only chance is fair

I. Introduction The 2004 film *I, Robot* is set in the future, and there robots are ubiquitous servants and helpers to humans. The main character of the film is Police Commissioner Del Spooner, played by Will Smith. Spooner is haunted by a traumatic event in his past: In an accident, his car and another car had crashed into a river. In the other car, a twelve-year-old girl was in danger of drowning; in his car, this fate threatened himself. A robot came, could only save either Spooner or the girl - and saved Spooner. For he had calculated that saving Spooner had a 45% probability of success, while saving the girl had only an 11% probability. Since then, Spooner has suffered from a guilty conscience. He is convinced that a human being would have decided differently than the robot. Is he right?

No, if you read what the German Interdisciplinary Association of Intensive Care and Emergency Medicine (DIVI) writes in the Corona crisis on so-called triage, i.e. on the case where a doctor has at least two patients who both need a certain treatment, but can only treat one. The Corona crisis is mainly about the allocation of intensive care units (ICUs) and ventilators. According to the will of DIVI, they are to be allocated pursuant to the patients' chances of success: Whoever has the greater chance of survival gets the place and the device. Most people think this is right. Because this rule helps to maximise the number of survivors. And the more survivors there are, the better - one would think.

But the guidelines of the Belgian Society of Intensive Care Medicine are different. They declare randomness to be the best and fairest decision-making criterion ("most useful and fair"), as well as the priority principle ("first come, first served") - which is little other than a special form of random decision-making, since it is based on randomness when someone falls ill and when they are admitted to hospital. The Belgian physicians rely on the results of a Canadian task force of Ethicists, Researchers and Intensivists, which had already been commissioned in 2009 to designate criteria for triage in an influenza pandemic, provided that treatment with an ICU appears equally urgent in each case. In Germany, an increasing number

of lawyers are also in favour of randomness as a triage criterion. This lecture will address the question of what to make of this idea.

This seems to be a topic whose relevance is declining today - because the SARS-CoV-2 pandemic is now dominated by the milder Omikron variant, because many have been vaccinated and because the pandemic is therefore considered to be over. But it is by no means certain that this is true. And even if it is, there will always be a risk of a new flu-like pandemic in the future. Moreover, there is the problem of scarcity of medical resources elsewhere, notably in organ donation, where there are always fewer donor organs available than are needed.

This lecture will first examine whether the triage criterion of survival probability can be convincingly justified. Since this is not the case if one wants to select exclusively according to the level of survival probability, the lecture will look at the alternative of a random decision (randomised triage).

I will leave out the question of so-called ex-post triage, i. e. the question of whether it is permissible to take the ventilator away from a ventilated patient and give it to a second patient if the triage parameters - whatever they may be - of the patients have changed in favour of the second. The possibility of ex-post triage is indeed considered important in practice. However, this is firstly due to the fact that the probability of survival is predominantly regarded as the only decisive triage criterion there; because the prognosis for the patients can change every hour. I will give this criterion a certain importance in the following, too, but - as already mentioned - I will refuse to triage exclusively according to survival probabilities. Secondly, there are such difficult further ethical questions associated with ex-post triage that there would be no time to discuss them in the context of this lecture.

II. The probability of survival as a triage criterion

1. the chance of survival as a prerequisite for intensive care treatment

A major misunderstanding threatens if one refuses to accept the probability of survival as the sole triage criterion, namely the misunderstanding that one would then also demand the treatment of patients who no longer have any chance of survival and for whom it could consequently only be a matter of prolonging death by a few hours and perhaps even days. But that is not the case. Rather, with regard to the probability of survival, two questions can be distinguished: the question of whether a patient has any chance of survival at all; and the question of how high this chance is - if it exists. And it is quite possible to demand the existence of a chance of survival as a prerequisite for intensive medical treatment - but then to refuse to let the level of this chance decide who gets the ventilator even among those patients who all still have a chance of survival. In the following, we will only deal with this second question, i. e. whether it is right to carry out a triage among those patients who all still have a chance of survival, even if it is small, solely on the basis of their probability of survival.

2. Pro arguments

a) The most common argument in favour of such triage is that it is the only way to maximise the number of survivors and, consequently, the only way to make the best use of resources. Before we look at this argument, it should first be noted that its premise is yet incomplete: The number of survivors is by no means maximised simply by treating those who promise the greatest chance of successful treatment. Rather, the resource consumption must also be taken

into account, i. e. the extent to which the patients will require the resources - in terms of quantity and time. In the allocation of ventilators, it is not a question of their quantity, but still of the duration of utilisation. Here is a calculation example. If three patients with ventilation have a 50% chance of survival and a fourth patient has an 80% chance, but the three patients will probably only need the ventilator for one week each, while the fourth patient will need it for three weeks - then the number of survivors is most likely to be maximised if the three patients with the 50% chance of survival are ventilated one after the other instead of giving the ventilator to the fourth patient: Three times 0.5 results in an expected value of 1.5, which is more than 0.8. Thus, in our example, if there were 30 patients with a 50% chance of survival and 10 with an 80% chance of survival, and if 10 ventilators were available, there would be 15 survivors after three weeks if only the 50% candidates were ventilated (each with a one-week treatment period); in contrast, there would only be 8 if the 10 80% candidates had been ventilated for three weeks.

If one wants to maximise the number of survivors, one must therefore not only consider the survival probabilities, but must also factor in the resource consumption of the respective treatment. For the following considerations, I assume that this happens. I thus assume a triage guideline whose adherence actually maximises the number of survivors.

b) Declaring this maximisation to be the goal seems ethically self-evident. But it is not. Rather, such a goal as an end in itself - maximisation for maximisation's sake - would only be ethically correct if the collective were more valuable than the individual; if, in other words, the good of the collective were more important than the good of the individual. Then one could ascribe a certain value to each human life, and the good of the collective would be the sum of these values - the more people, the better. It is different, however, if one looks at the individual and ascribes the same and highest conceivable value to each individual. For in this view, among the emergency patients who still have a chance of survival, there is no one who should be preferred to another. Rather, they all have the same right to treatment.

c) But also from the perspective of the individual, there is a way to ethically justify the goal of maximising the number of survivors. For if this number is maximised, ex ante the probability of survival is also maximised for the individual. And therefore, ex ante, he also has an individual interest in such a triage rule and would endorse it. If the rule later leads to him being left to die, he cannot complain: Only what he had previously agreed to is then practised. Overall, this seems to be a fair solution and thus also an ethically acceptable one.

But this is only true if the goal of maximising the number of survivors ex ante actually gives all individuals the highest chance of survival. And it only does so as long as one is still faced with - in the words of Ronald Dworkin - a dense "veil of ignorance", behind which it is impossible to see what chance of survival and resource consumption the individual will have in the triage. This is largely the case with sudden catastrophic events, such as a terrorist attack: no one knows if, where and to what extent he will be affected by such disasters. Accordingly, his probability of survival and the resource consumption of his treatment are unclear when he is actually hit and has to be triaged among the victims. However, some people can calculate in advance that they will have a worse chance of survival than others, even in the face of such catastrophes. This is the case if they are constitutionally weaker and more vulnerable; which particularly applies to old people and people with certain disabilities or chronic diseases.

But this is even more true in a pandemic. There, at least some risk factors quickly emerge, such as lung disease in the case of SARS-CoV-2, as well as those factors that reduce the chances of success for almost all complex medical treatments and increase the risk of complications, such as old age, obesity and cardiovascular disease. People with such risk factors know long before they are triaged that they would not fare well if they were selected solely on the basis of survival probability. Therefore, they cannot agree to such a triage rule *ex ante*, because their individual chances would not be increased by this rule, but reduced. This leads to the first argument against the triage criterion of survival probability:

b) Another counter-argument is the great uncertainty with which forecasts are fraught in practice. Daniel Kahnemann already pointed this out in his classic "Thinking, Fast and Slow", as well as in his new book "Noise" (together with Olivier Sibony and Cass R. Sunstein). He has also pointed out that doctors themselves significantly overestimate their prognostic abilities. In a skin cancer study, for example, they overlooked the fact that 36% of the tissue samples were melanoma - with fatal consequences for the prognosis of the affected patients. There is similar evidence for the prognosis of multiple sclerosis. In a study with 17 recognised experts, there were differences of up to 27 years in the prognosis for one and the same patient as to when the patient would reach a certain degree of disability. And if a patient's data were assessed twice by the same expert - with a time gap and in such a way that he was not aware of the identity - his own prognoses differed by more than three years on average.

Comparable data are still lacking for forecasts on Covid 19 courses. But it is already clear that such prognoses have to contend with such great uncertainties that they cannot be reliable, not even in the foreseeable future. Indications of this are, for example, the scattering of studies on the consequences of artificial respiration, the short life of current algorithmic prognosis tools for Covid-19 - and not least the lively mutation of the virus. I have experienced a drastic example of Covid mispredictions in my Swiss circle of acquaintances, where doctors repeatedly advised the relatives of an intubated patient to have the ventilation switched off because nothing more could be done and the patient would no longer have any quality of life even in the practically excluded case of his survival - but which he now has again almost undiminished, since he has fully recovered. And triage based on survival probability alone is about the even more difficult comparative prognoses for different but often very similar patients. Moreover, what if these prognoses are the same?

c) Another practical problem - and thus an argument against the triage criterion of survival probability - is the susceptibility of medical decisions to all those errors, or biases, which have been proven to occur in human decisions; I can again refer to Kahnemann's books. Most of them remain unconscious, such as the tendency to help someone with whom one has subjectively important similarities (age and gender, profession and appearance, political party, religion, football club ...). But some doctors are even prepared to deliberately manipulate - as in the Göttingen organ donation scandal, in which at least one doctor lied several times about blood values and therapeutic measures for the benefit of his patients. And even among doctors - as among all people - there can be those who allow themselves to be bribed.

III. Randomised triage

1. Urgency as a precondition of the decision dilemma - not as a criterion for overcoming it

One often reads that a good triage criterion is the urgency of treatment ("sickest first" principle). In fact, however, it is not a triage criterion, but a precondition for triage to become

necessary. Only if patients - in the case of the Corona pandemic - are equally urgently in need of a ventilator are they in competition with each other for treatment, which must be resolved by means of triage. If, on the other hand, one patient has an emergency indication - the patient will soon die without treatment - and the other has only a simple indication or a vital but not yet an emergency indication, the emergency patient must be treated first. This is a generally recognised principle of medical treatment, which is also approved by lawyers and ethicists. The question of a triage criterion only arises when (at least) two patients have the same level of indication. In the corona pandemic, however, this is generally the case with regard to artificial respiration. Artificial respiration is usually indicated for all patients to the same extent and with the same urgency.

2. Chance as a triage criterion

a) First of all, the concept of chance must be defined. This is to be done here simply by the criterion of unpredictability: Chance is what humans cannot calculate in advance. An exception is to be made for human decisions. Admittedly, according to the still prevailing view, they are also indeterminate and therefore cannot be predicted with certainty. Nevertheless, we do not call them random and do not treat them as if they were.

b) Giving chance the power to decide over life and death is considered offensive by many. A death lottery? This aversion does not only stem from the fact that such things seem disreputable. We humans have become accustomed to controlling the world and our lives, that is, to planning and calculating. When something goes wrong, for example people die in a storm tide, we are no longer prepared to accept that as fate or even God's will. Rather, we look for someone who is to blame: who forgot to provide higher dikes; or for the fact that the flood victims had not been warned. We have eliminated chance. So it seems particularly absurd to give it power again when it comes to our most precious good, life.

c) And yet there are arguments in favour of doing this in a triage. It should be emphasised again that this is only about triage among patients who all still have a chance of survival. - First of all, it should be pointed out that a random decision is always the only ethically correct solution if there are completely equivalent alternatives. For with such alternatives, no other solution could be explained; any other solution would inevitably lead to the question: "But why this very criterion?" And in the case of completely equivalent alternatives, it could never be answered convincingly. Seen in this light, a random decision in triage is merely the inevitable consequence of always assigning the same value to every human life - and the choice of a different criterion shows that one actually does not do this, but considers some people more worth saving than others.

The second advantage of a random decision in triage is that it minimises the effects of unavoidable medical prognostic errors as well as all biases to which doctors may be subject in their decisions and actions. However, it must be conceded that prognostic errors and biases are not completely neutralised. For they still have an effect when deciding whether a patient has a realistic chance of survival at all. On the one hand, this is a weakness of the model proposed here. On the other hand, it is at the same time a compromise with the counter-model of triage (exclusively) according to survival probabilities. And this could make it easier for doctors in particular to become friends with the proposal here.

This is also because a random decision has the further advantage for them of alleviating the pangs of conscience they may feel if they are uncertain in their prognosis regarding the level

of a survival probability or if it even turns out in retrospect that their prognosis was wrong and they have therefore deprived one person of the chance of being saved in favour of another to whom they should not actually have allocated the ventilator. - A random decision is also likely to meet the needs of clinical practice in that it can be brought about more quickly than a possibly time-consuming quantitative prognosis of survival probabilities, for which in cases of doubt several doctors have to work together and/or one after the other.

From a doctor's point of view, another argument in favour of the random principle could be that it is familiar from the rules for clinical trials: they must be randomised, i. e. for them, the patients who receive the new drug and those who receive a placebo in a comparison group must be randomly determined. This is not only to get a representative sample, i. e. to increase the scientific value of the study; but also for the ethical reason that the chance of a positive effect of the new drug should be distributed just as fairly as the risk of undesirable side effects. And that is exactly what triage is about: a fair chance.

IV. Summary and outlook This brings me to the end of this lecture. I hope to have shown that the criterion of survival probability in triage cannot be applied as naturally as many think. For even if one also takes into account the resource consumption of the patients and thus actually tries to maximise the number of survivors, such a procedure firstly comes into conflict with the ethical postulate of humanism that every human life is of equal value and therefore none may be considered more worth saving than another. Secondly, in practice it has to contend with the serious difficulties of making reliable prognoses.

In contrast, the random principle ensures true equality of opportunity for patients. There is no fear of wasting resources if only patients who have a chance of survival - albeit a weak one - are admitted for triage. Further advantages of a random decision are that it can be made quickly and can free the treating physicians from the conflicts of conscience that may arise if triage depends solely on their prognoses.

Of course, I have left some things open; especially how exactly random decisions would be made in practice. I have not elaborated on this for two reasons. Firstly, because I cannot answer a number of detailed questions myself, at least not yet. And secondly, there was not enough time in this lecture for the rest. However, I will be happy to answer questions about this in a moment, as far as I am able. Thank you all for your attention!

Gholamhossein Bagheri

CV — Dr. Gholamhossein (Mohsen) Bagheri studied mechanical engineering at the Perisan Gulf University (BA) and the Shahid Bahonar University (MSc) (Iran), before completing his PhD at the University of Geneva (Switzerland). During his PhD, he conducted experimental and numerical studies on the dynamics of irregular particles in laminar and turbulent flows, for which he was awarded a PhD in 2015. Shortly after, he received an 18-month grant from the Swiss National Science Foundation to join the MPI-DS as a visiting scientist and is now a group leader. His current research interests include the experimental study of cloud microphysics and atmospheric turbulence with the Max Planck CloudKites, the characterisation of respiratory particle emission and airborne disease transmission, and the numerical/experimental study of the dynamics of non-spherical particles.

Abstract — There is ample evidence that masking and social distancing are effective in reducing severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) transmission. However, due to the complexity of airborne disease transmission, it is difficult to quantify their effectiveness, especially in the case of one-to-one exposure. Here, we introduce the concept of an upper bound for one-to-one exposure to infectious human respiratory particles and apply it to SARS-CoV-2. To calculate exposure and infection risk, we use a comprehensive database on respiratory particle size distribution; exhalation flow physics; leakage from face masks of various types and fits measured on human subjects; consideration of ambient particle shrinkage due to evaporation; and rehydration, inhalability, and deposition in the susceptible airways. We find, for a typical SARS-CoV-2 viral load and infectious dose, that social distancing alone, even at 3.0 m between two speaking individuals, leads to an upper bound of 90% for risk of infection after a few minutes. If only the susceptible wears a face mask with infectious speaking at a distance of 1.5 m, the upper bound drops very significantly; that is, with a surgical mask, the upper bound reaches 90% after 30 min, and, with an FFP2 mask, it remains at about 20% even after 1 h. When both wear a surgical mask, while the infectious is speaking, the very conservative upper bound remains below 30% after 1 h, but, when both wear a well-fitting FFP2 mask, it is 0.4%. We conclude that wearing appropriate masks in the community provides excellent protection for others and oneself, and makes social distancing less important.

Shane O'Mara

CV — Shane O'Mara is Professor of Experimental Brain Research at the School of Psychology and Institute of Neuroscience, Trinity College Dublin - the University of Dublin. He is a graduate of the National University of Ireland, Galway (BA, MA) and of Oxford University (DPhil/PhD). He is a Fellow of the Association for Psychological Science (USA), and an elected Member of the Royal Irish Academy. His research work has been supported by the Wellcome Trust, Science Foundation Ireland, the European Commission, and industry. He has published some 150 peer-reviewed papers, many edited books and journals, and three single author monographs/books. His latest book concerns how and why we humans talk to each other, and extends to the vast, shared, collective realities – the extended cultural and cognitive artefacts – that are our nations. It will be published in early 2023. His best-selling book 'In Praise of Walking: A New Scientific Exploration' was chosen by the editors at Amazon.com as one of the best science books of 2020 (translated; French, Dutch, Spanish, Norwegian, Russian, Chinese, Greek, German, Polish, Italian, Slovenian, Romanian). Social Media: IG: @shanewriter | Twitter: @shaneomara3 ; | newsletter: brainpizza.substack.com

Abstract — Memory research remains focused on a few brain structures – in particular, the hippocampal formation (hippocampus and entorhinal cortex). Standard models of episodic memory focus on hippocampal–parahippocampal interactions, with the neocortex supplying sensory information and providing a final repository of mnemonic representations. Three key discoveries promote this hippocampal focus: bilateral hippocampal damage results in anterograde amnesia; the plasticity hippocampal formation synapses; and hippocampal formation place, head-direction, and grid cells. However, hippocampal formation or medial diencephalic damage is consistently associated with anterograde amnesia. We know little

about interactions between hippocampal formation and diencephalic memory systems. I describe our experiments focused on the subiculum, as the sole hippocampal formation region directly interconnected with the diencephalon. Following permanent thalamic lesions, the diverse spatial signals normally found in the subiculum (including place cells, grid cells, and head-direction cells) all disappeared. Anterior thalamic lesions had no discernible impact on hippocampal CA1 place fields. Thus, spatial firing activity within the subiculum requires anterior thalamic function, as does successful spatial memory performance. Our findings provide a key missing part of the much bigger puzzle concerning why anterior thalamic damage is so catastrophic for spatial memory in rodents and episodic memory in humans. We argue for a core, tripartite memory system, comprising a ‘temporal lobe’ stream (hippocampal-centered) and a ‘medial diencephalic’ stream (anterior thalamic-centered) that together act on shared cortical areas. (Supported by a Wellcome Trust Joint Investigator Award to John Aggleton and Shane O’Mara).

Ylva Hellsten

CV — Education 1993 Dr.Med.Sci, Department of Physiology, Karolinska Institute, Stockholm, Sweden 1987 Bachelor of Arts, Hampshire College, Amherst, MA, USA
Positions Since 2015 Full Professor, Dept. of Nutrition, Exercise and Sports, University of Copenhagen 2009-2015 Professor MSO, Dept. of Nutrition, Exercise and Sports, University of Copenhagen 1994-2009 Assoc. Professor, Dept. of Exercise and Sport Sciences, University of Copenhagen

Scientific Focus Main research area is in 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 — Regular physical activity is known to have a number of beneficial effects on cardiovascular health including a strong effect on microvascular endothelial function. In fact, although aging per se leads to a decline in vascular function, it is particularly an inactive lifestyle over many years that results in a marked decline in vascular health. A positive aspect is, however, that even short term training in middle-aged and older individuals have significant beneficial effects. Poor vascular health can result in formation of arterial blood clots (thrombosis) leading to events such as myocardial infarction and stroke. Although epidemiological evidence show that physical inactivity is an important risk factor for arterial thrombosis, our knowledge on the effect of physical activity on markers of arterial thrombosis, such as platelet reactivity and clot microstructure, is somewhat limited. Our research group has for many years studied the influence of exercise training on skeletal muscle microvascular function and growth in humans but we have also, during recent years, examined the effect of exercise training and acute exercise on markers of arterial thrombosis. Our studies so far show that regular exercise training can lower platelet reactivity and alter the microstructure of an incipient blood clot, however, we also find that physical exertion can induce an immediate pro-thrombotic environment. Factors causing the acute pro-thrombotic

environment likely include circulating catecholamines and vascular shear stress. Of importance is, however, that the exercise induced susceptibility to arterial thrombosis appears to be lower in exercise conditioned- compared to sedentary individuals.

Antoniya Georgieva

CV — Assoc. Prof. Georgieva has developed the career in biomedical research, building on her expertise in machine learning, computing, and mathematics, but specialising in intrapartum (in labour) fetal monitoring. She obtained a BSc (Hons) in Applied Mathematics from the Technical University of Sofia (Bulgaria) and a Ph.D. in Computer Science from Portsmouth University (UK). She joined the Nuffield Department of Obstetrics & Gynaecology and the Institute of Biomedical Engineering at Oxford for a post-doctoral position in 2007. In 2012, she founded as the Scientific Director the Oxford Centre for Fetal Monitoring Technologies, recently rebranded to "Oxford Labour Monitoring". In 2016, she was awarded an National Institute of Health Research (NIHR) Career Development Fellowship (£559,468), became a Research Fellow at Wolfson College (Oxford) and joined the newly formed Big Data Institute at Oxford. She became an Associate Professor in 2020 and is currently leading two interdisciplinary grants by NIHR (£1.1M) and Engineering and Physical Sciences Research Council (£600,060) developing and implementing data-driven decision-support software at the bedside. She is uniquely positioned to achieve this by working with the world's largest and most complete birth cohort of routine labour data (100,000 deliveries). <https://www.wrh.ox.ac.uk/team/antoniya-georgieva>

Abstract — This talk will introduce the main research focus of the Oxford Labour Monitoring group which is to determine the relationship between cardiotocography (CTG) and fetal health during labour, by analysing 'big' routinely collected datasets of maternity data. Specifically, we are developing data-driven CTG+clinical risk factors system/software to continuously assess fetal wellbeing at the onset of and during term labour. The prototype system under development is derived from a large birth cohort (approaching 100,000 term deliveries) by systematic analysis of computer-based CTG features and clinical risk factors in relation to perinatal outcomes. A tablet app runs OxSys in real-time data, analysing CTGs as they are taken and requiring information from the user about risk factors if present, which modify the CTG analysis accordingly. Further successful developments in these technologies could prevent injury of babies during labour and delivery, caused by lack of oxygen in utero - rare but devastating events. This work will potentially benefit families, clinicians and healthcare systems by reducing brain injuries, perinatal deaths and unnecessary interventions.

Olav Bennike Bjørn Petersen

CV — MD, PhD, Clinical Professor in fetal medicine at Copenhagen University Hospital, Rigshospitalet and University of Copenhagen, Denmark Research interest: Maternal & fetal

medicine, translational research in fetal medicine, genetics, computer science and anthropology. Development, implementation and evaluation of telemedicine and remote/mobile monitoring of women with pregnancy complications. Author/co-author of 126 peer-reviewed scientific papers, 76 abstracts/posters and 10 book chapters. H-index: 31 Full CV can be found at: <https://www.dropbox.com/s/xlmg95oe2gv4qgl/OBP-CV-Public.pdf?dl=0>

Abstract — Hospital resources, particularly staff personnel, were (and continue to be) challenged during the Covid-19 pandemic. Furthermore, the "demographic pandemic," which includes our population's steady increase in age and a reduction in healthcare workers, is a perfect storm that will effect us all. As a result, we must reconsider how and where we provide healthcare. Pregnant women with complications are young "patients," with the majority of them being healthy before being struck by pregnancy complications that sometimes necessitate hospitalization for weeks or months, a terrible situation for these women with major and negative effects on their family and personal lives. It's also a patient group with a history of strong compliance and a large proportion of proficient IT users (with their children often providing superb home IT support ;-)). Pregnant women were not regarded to be at high risk of adverse maternal or fetal outcomes at the start of the Covid-19 epidemic. However, with the delta mutation a four-fold increase in the risk of fetal or neonatal death was seen, and hence a rapid increase in pregnant women requiring fetal monitoring. During more than 10 years, remote/mobile monitoring of women with pregnancy complications has been developed in Denmark and implemented as standard of care at Aarhus University Hospital for selected patients in 2015. The results of the first 400 patients has just been published. But implementation on a national basis has of different reasons been slow. The current Covid-19 pandemic is a new and obvious indication for mobile- and home monitoring of pregnant women with Covid-19. Experience and results from Denmark will be presented

Caroline Borup Roland

CV — <https://www.linkedin.com/in/caroline-borup-roland-832b4691/>

Abstract — **BACKGROUND:** Maternal exercise during pregnancy improves maternal and offspring health, but more than 60% of Danish pregnant women do not comply with physical activity (PA) recommendations. **AIM:** To investigate the effects of structured supervised exercise training (EXE) and motivational counselling supported on physical activity (MOT) on moderate-to-vigorous-intensity physical activity (MVPA) during pregnancy. **METHODS:** Healthy inactive pregnant women (n=220) were included before 15 weeks of gestation and randomized to EXE, MOT, or standard care (CON). Participants allocated to EXE (n=87) were assigned to exercise at moderate intensity three times a week and those in the MOT group (n=87) were assigned to four individual and three group motivational counselling sessions and one weekly SMS-reminder to increase PA. MVPA was assessed continuously during pregnancy using a wrist-worn activity tracker. **RESULTS:** The average MVPA from randomisation to the 29th gestational week was 33 [95% CI, 18;47] min/week in CON, 50

[39;60] min/week in EXE and 40 [30;51] min/week in MOT. When adjusted for baseline MVPA, participants in EXE performed 20 [4;36] min/week more MVPA than participants in CON ($p=0.016$). MOT was not more effective than CON, and EXE and MOT also did not differ. CONCLUSION: Offering structured supervised exercise training was more effective than standard care to increase MVPA among pregnant women, whereas offering motivational counselling on PA was not. MVPA in the intervention groups did not reach the recommended level in pregnancy.

Alexander Keppler

CV — Dr. Alexander M. Keppler Medical studies in Freiburg, Dresden and Munich, since 2017 residency training at the Department for Orthopedic and Trauma Surgery, Musculoskeletal University Center Munich LMU Munich. Main areas of interest: orthogeriatric, knee surgery, acute traumatology including polytrauma and pelvis/spine trauma.

Abstract — More and more elderly patients are treated with fractures. Here, orthogeriatric care plays an increasing role in order to treat these patients adequately. The goal of orthogeriatric treatment is a quick and rapid mobilization to avoid complications and to get the patients mobile again. Here, in addition to an interdisciplinary approach, a rapid and stable fracture treatment is to be desired.

Marcin Mider

CV — Dr Marcin Mider studied Mathematics, Operational Research, Statistics & Economics at the University of Warwick (graduated with M.Sc. in 2015). In 2015 he was admitted to an OxWaSP graduate programme, run jointly by the University of Oxford and the University of Warwick and graduated from it with the degree of Doctor of Philosophy in Statistics in 2019, with the thesis titled "Simulation of Conditioned Diffusions". He held a post-doctoral position at the Max Planck Institute for Mathematics in the Sciences in Leipzig in 2019-2020. Since 2020 he has been working at Trium as a software developer, primarily on the actibelt team.

Abstract — At the time of choosing a suitable statistical tool for a specific data analysis task, it is always a good idea to first visualize the data in order to look for and understand patterns, test if any heuristics could be used for pre-processing or feature selection and spot any irregularities or outliers. This step is particularly important when analyzing data from wearables, as they are generated by human motion—well understood physical processes. By visualizing signals from wearables it is, on one hand, possible to posit hypotheses based on our physical understanding of motion and quickly test them by verifying if suitable fingerprints are present in the data; and, on the other hand, spot patterns in the plotted signal, to then, try to understand the underlying physical processes that led to their manifestation.

This back-and-forth between the data and our understanding of the underlying physics allows for development of powerful, robust and explainable analysis algorithms; however, this process hinges upon one crucial component: an efficient tool for visualizing the data. In this talk, I will present to you some of the visualization tools that are used at the actibelt team for gaining different views into data from wearables. With their help, I will show you some of the core data patterns that are representative of walking.

Oliver Alexy

CV — <https://www.ie.mgt.tum.de/en/ent/team/oliver-alexyl>

Abstract — The inherent uncertainty of entrepreneurial endeavors may often seem daunting - in fact, so daunting that people with valuable ideas refrain from becoming entrepreneurs. In this short talk, I will try to highlight a few principles that aspiring entrepreneurs may draw on to take control of their entrepreneurial journey. While such control does not imply that their entrepreneurial venture will be a guaranteed success, these principles should highlight that individuals can be in full control of their own entrepreneurial journey, and avoid quite a few of the mistakes they might be afraid of making.

Ries, E. 2011. The lean startup: How today's entrepreneurs use continuous innovation to create radically successful businesses. New York: Crown Business. Eisenmann, T., Ries, E., & Dillard, S. 2013. Hypothesis-driven entrepreneurship: The lean startup. Harvard Business School Background Note 812-095.