Program

Thursday May 8

11.00 – 13.00:	Lunch and registration
13.00 – 13.15:	Conference opening
13.15 – 14.00:	Invited talk — Chiara Amarino
14.00 – 14.25:	Contributed talk — Shan Shan
14.25 – 15.00:	Coffee
15.00 – 15.45:	Invited talk — Line Clemmensen
15.45 – 16.10:	Contributed talk — Blanca Gil Rosell
16.10 – 16.40:	Coffee
16.40 – 17.25:	Invited talk — Li Chen
17.25 – 17.50:	Contributed talk — ?
18.00:	Dinner
19.30:	Poster session

Friday May 9

9.00 – 9.45:	Invited talk — Sara Kališnik Hintz
9.45 – 10.30:	Invited talk — Tinne Hoff Kjeldsen
10.30 – 11.00:	Coffee
11.00 – 11.45:	Invited talk — Jing Qin
11.45 – 12.10:	Contributed talk — Yiqiu Dong
12.10:	Lunch and goodbye

Venue

Lunch and registration: Food Hub, Thomas Manns Vej 25, ground floor
Talks, coffee, and goodbye lunch: Fibigerstræde 15, 1.67 Aud. A
Dinner and poster session: Faculty Club, Thomas Manns Vej 25, top floor.

Invited talks

Chiara Amorino

Title: Statistical Inference Under Privacy Constraints

Abstract: Our research investigates the trade-off between preserving privacy and retaining statistical accuracy when working with multivariate data subject to componentwise local differential privacy (CLDP). Under CLDP, each component of the private data is released through an individual privacy channel, allowing for different levels of privacy protection across components or enabling each to be privatized by different entities with distinct privacy policies.

This framework also reflects practical scenarios in which joint privatization of all components is infeasible. We develop general techniques to establish minimax bounds that characterize the statistical cost of privacy in terms of the componentwise privacy levels $\alpha_1, \ldots, \alpha_d$ for d-dimensional data.

We showcase the power and flexibility of these methods through several statistical applications. In particular, the talk will focus on nonparametric density estimation, with and without

privacy constraints. We derive matching upper and lower bounds (up to constants) and propose a corresponding adaptive, data-driven procedure. Additionally, we present an in-depth analysis of the effective privacy level, examining how private characteristics of individuals may be inferred from publicly released features of the same individuals.

Li Chen

Title: Sobolev spaces on the Vicsek set

Abstract: The Vicsek set has both fractal and tree structure, whereas neither analogue of curvature nor obvious differential structure exists. In this talk, we introduce Sobolev spaces in that setting and prove several characterizations based on a metric, a discretization or a weak gradient approach. We also discuss general Poincaré inequalities and pointwise gradient bounds for the heat kernel. These properties have important applications in harmonic analysis like Sobolev inequalities and the Riesz transform.

Line Clemmensen

Title: Geometric diversity and physics informed constraints in AI

Abstract: TBA

Sara Kališnik Hintz

Title: On the Applications of Topology

Abstract: In recent years, techniques originating in topology have been adapted to the study of large and complex data sets. In this talk, I will provide a brief overview of two of the most prominent topological methods: persistent homology and mapper. I will also examine how these methods can be effectively integrated with traditional machine learning techniques. Along the way, I will showcase my contributions to the field, including my work on identifying tropical functions in the spaces of barcodes and its application to dental imaging data. Additionally, I will discuss my work on ellipsoid complexes and show how using them can strengthen topological signal when using persistent homology.

Tinne Hoff Kjeldsen

Title: Different kinds of factors influencing developments in mathematics illustrated by examples from 20th century

Abstract: In this talk, we will explore three episodes of research from the 20th century illustrating different kinds of factors that influence the development of mathematics. First, we will look into how Hermann Minkowski came to introduce the general concept of a convex body, exemplifying the significance of mathematical practice and the fruitfulness of interdisciplinarity within mathematics. The development of mathematics is also not immune to influences from society outside of mathematics, which will be illustrated by the second episode. Here we focus on the impact of the Second World War in the development of operations research and its move into research in mathematics departments. Finally, in the third example we will investigate some

of the troubles Nicolas Rashevsky faced when he tried to develop a physico-mathematical foundation of biology, creating the beginning of mathematical biology, an example of mathematics moving or migrating into other disciplines.

Jing Qin

Title: AcuteX: Understanding the impacts of extreme weather on emergency hospital activity via extreme value theory

Abstract: Extreme weather events can pose substantial challenges to public healthcare systems. Emergency departments (ED), as the places where most patients start their unplanned healthcare experience, are particularly vulnerable to these challenges. Precise assessment of how extreme weather events influence unplanned ED admissions is therefore a crucial first step to ensure that public healthcare systems can continue providing high-quality acute-care services. The classical statistical techniques generally focus on the ordinary everyday behavior and thus has little to say about extremes. Extreme Value Theory (EVT) is the right way to address these challenges given its capability of handling rare events. In this new project, we will develop new methods in EVT to predict ED admission patterns associated with extreme weather and thus enhance the preparedness and resilience of healthcare system.

Contributed talks

Yiqiu Dong

Title: Sampling Strategies in Sparse Bayesian Inference

Abstract: Regularization is a common tool in variational inverse problems to impose assumptions on the parameters of the problem. One such assumption is sparsity, which is commonly promoted using lasso and total variation-like regularization. Although the solutions to many such regularized inverse problems can be considered as points of maximum probability of well-chosen posterior distributions, samples from these distributions are generally not sparse. In this talk, we will present a sampling strategy for an implicitly defined probability distribution that combines the effects of sparsity imposing regularization with Gaussian distributions. It extends the randomize-then-optimize (RTO) method to sampling from implicitly described continuous probability distributions. We will study the properties of these regularized distributions theoretically and numerically.

Blanca Gil Rosell

Title: Subconvex bounds for $\mathrm{SO}(n+1) \times \mathrm{SO}(n)$

Abstract: In 2023 Yueke Hu and Paul Nelson, in their paper "Subconvex bounds for $\mathrm{U}(n+1) \times \mathrm{U}(n)$ in horizontal aspects", established a subconvex bound valid in certain horizontal aspects for L-functions attached to automorphic representations of unitary groups $\mathrm{U}(n+1) \times \mathrm{U}(n)$. My current work concerns establishing a subconvex bound for L-functions attached to orthogonal groups $\mathrm{SO}(n+1) \times \mathrm{SO}(n)$. Since this is still work in progress, I will explain how the unitary and the orthogonal cases are different, what are our approaches to prove the orthogonal case,

and focus on the "triple product case", which relates $\mathrm{SO}(4) \times \mathrm{SO}(3)$ to $\mathrm{SL}(2) \times \mathrm{SL}(2) \times \mathrm{SL}(2)$ via the exceptional isomorphism.

Shan Shan

Title: Towards Useful Quantum Computers through Gaussian Boson Sampling

Abstract: Quantum computers promise to outperform classical computers on certain problems, but realizing practical usefulness remains a major challenge. In this talk, I will give a brief overview of the current state of quantum computing. I will then focus on a photonic model called Gaussian Boson Sampling (GBS) and discuss how it can be used for practical applications, such as accelerating Monte Carlo simulations. I will highlight a few mathematical tools—such as Concentration inequalities and Cauchy's residue theorem—used in the design of these algorithms and in proving their speedup.

Posters

Tanja Kortsen Bugajski

Title: Modeling Blood Glucose and Insulin Dosages in Type 2 Diabetes: A Comparative Analysis of ARMAX and LSTM Approaches with Time-of-Day Partitioning

Abstract: Accurate blood glucose forecasting is crucial for managing Type 2 Diabetes (T2D), as it facilitates the prediction of glucose fluctuations and mitigates the risks associated with hypoglycaemia and hyperglycaemia. This study compares ARMAX (Auto-Regressive Moving Average with Exogenous Inputs) and LSTM (Long Short-Term Memory) models for blood glucose forecasting, with time-of day partitioning approach to capture glucose patterns linked to daily activities. A grid search was applied to optimise the ARMAX model parameters. Results demonstrate that ARMAX outperforms LSTM in terms of Mean Squared Error (MSE), achieving reductions of up to 75.5%, with an average decrease of 63.5% over a forecast spanning 7 days. The analysis highlights the potential of fine grained temporal partitioning for real-world applications.

Elisabeth Sommer James

Title: Convex NMF and its applications in recovering mutational signatures

Abstract: Mutational signatures are characteristic patterns of genetic mutations found in cancer genomes, that can be attributed to a cause or process. Uncovering these signatures from mutational count data using non-negative matrix factorization (NMF) methods can thus give insight into the mutagenic processes associated with cancers.

Convex NMF (C-NMF) recovers the mutational counts data in the form of the matrix product of the signatures and their exposures, where the signatures can be written as convex combinations of the columns of the data matrix. NMF algorithms minimise an error function between the true and reconstructed data. This error function corresponds to an assumption made about the underlying model in the data and the noise. We propose a C-NMF algorithm for Tweedie distributed data, and observe differences in how sparsity reproduction and clustering perform

in C-NMF as opposed to classical NMF methods where fewer restrictions are placed on the signature matrix.

Marie Kaltoft

Title: Bounds on positive solutions of polynomial systems

Olivia Kvist

Title: The Effect of News from COP28 on Green and Brown Stocks: A High-Frequency Analysis

Abstract: The latest report by the Intergovernmental Panel on Climate Change acknowledges that funding must significantly increase to meet climate objectives. Consequently, additional research on climate finance is essential. This paper adds to the literature by analysing the effect of news events surrounding the 28th United Nations Climate Change Conference on the performance of green and brown stocks. The conference marked the first time the parties agreed to transition away from fossil fuels in energy systems. We analyse whether the news and announcements around the COP28 were accompanied by jumps in green and brown stocks. The study employs high-frequency trading data to separate the various, occasionally opposing, signals associated with the conference. We consider 30 stocks: 15 green stocks and 15 brown stocks. The stocks are selected from the European energy market. We motivate the choice by noting that the notion of green versus brown is better understood in the energy sector. Moreover, the European market is considered one of the leaders in climate policies. Our results indicate that the news around COP28 had an effect on the financial performance of the selected stocks, signaling a potential reaction of investors to the event. The results are of interest to firms in the energy sector, governments, and policy makers in light of the increased importance that green finance has in achieving the goals set in the Paris Agreement. Policymakers and central banks can use these insights to support an orderly energy transition.