INFOMAT

DESEMBER 2022

INFOMAT ØNSKER ALLE LESERE GOD JUL OG GODT NYTTÅR

Matematikkstudent Anne Brugårds og professor John Christian Ottem ved Univ. i Oslo har i desember presentert en matematikk-julekalender i podcast-format. Det har vært juleprat, morsomme mattenøtter og innføring i interessante konsepter som går utover vanlig pensum for en matematikkstudent. Alle podcastene er tilgjengelige på
https://www.mn.uio.no/math/tjenester/kunnskap/kalkjulus-med-anne-og-john-christian/

Til sammen mellom 6 og 7 timer med god romjulsunderholdning.

INFOMAT kommer ut med 11 nummer i året og gis ut av Norsk Matematisk Forening. Deadline for neste utgave er alltid den 15. i neste måned. Stoff til INFOMAT sendes til

arnebs at math.uio.no

Foreningen har hjemmeside http://www.matematikkforeningen.no/
Ansvarlig redaktør er Arne B. Sletsjøe, Universitetet i Oslo

Matematisk kalender

2023

Mars:

5.-9. Winter school: CARTAN GEOMETRY AND RELATED TOPICS, Geilo
<https://sites.google.com/view/cartan-geometry-geilo2023/>

22. ABELPRISKUNNGJØRING, DNVA, Oslo
<https://www.abelprisen.no>

Mai:

22. ABELPRISUTDELING, Oslo
<https://www.abelprisen.no>

Juni:

19.-23. OKA THEORY AND COMPLEX GEOMETRY CONFERENCE 2023, Nordfjordeid
<https://www.mn.uio.no/math/english/research/projects/granddrm/events/conferences/oka-theory-and-complex-geometry-2023/index.html>

22. ABELPRISUTDELING, Oslo
<https://www.abelprisen.no>

August:

17.-18. NORWEGIAN NATIONAL Ph.D. MEETING, Trondheim
< www.nnpm.no>

Nye doktorgrader

Sebastian Debus ved Univ. i Tromsø forsvarte 18. november 2022 sin avhandling *Combinatorics of Reflection Groups and Real Algebraic Geometry* for graden PhD.

Veiledere har vært Professor Cordian Riener, (hovedveileder), Associate professor Hugues Verdure, (biveileder), begge UiT.

Sammendrag:

Real algebraic geometry studies sets defined by a finite system of real polynomial equalities and inequalities. The algorithmic study of such semialgebraic sets provides also solutions to algorithmic problems arising in optimization, robotics, computer vision, automated theorem proving, and many more. A central topic in this area is the study of the cone of nonnegative polynomials. Verifying that a given polynomial is nonnegative is an NP-hard problem even for quartics. However, it turns out to be algorithmically much more feasible to verify if a given polynomial admits a representation into a sum of squares of polynomials, and such a decomposition provides a certificate for nonnegativity. Therefore, understanding the sets of sums of squares and nonnegative polynomials provides applications to various fields such as polynomial optimization and graph theory. The few cases of equalities between the sets of sums of squares and nonnegative polynomials in different numbers of variables and degrees have been classified already by Hilbert. Those do not necessarily transfer to equivariant situations, i.e., if the polynomials are invariant by the action of a group.

In this thesis, tropicalization and the combinatorics of reflection groups are exploited to examine the cones of invariant nonnegative forms and sums of squares forms, and to study invariant systems of equations.

Anton Yurchenko-Tytarenko ved Univ. i Oslo forsvarte 16. desember 2022 sin avhandling *Stochastic Volterra volatility models* for graden PhD.

Veiledere har vært Professor Giulia Di Nunno, Professor Salvador Ortiz-Latorre, begge UiO, Professor Yuliya Mishura, Taras Shevchenko National University of Kyiv.

Sammendrag:

Financial markets have extremely complex behavior that cannot be fully modeled using classical approaches. In particular, numerous empirical studies show that market volatility exhibits some form of long-range dependence and has time-varying Hölder regularity with prominent periods of *roughness* (i.e. of Hölder order ≈ 0.1). These two properties are far beyond the capabilities of classical Brownian diffusions and it is challenging to reproduce them simultaneously in one model.

In the present thesis, we suggest a novel volatility modeling framework that grasps this unconventional behavior and solves a number of technical problems that are typical for classical stochastic volatility models. Namely, our model comprises the following properties:

- flexibility in the noise: the suggested model accepts various drivers – from fractional Brownian motions with different Hurst indices to general Hölder continuous processes – to account for different option pricing phenomenons;
- control over the moments of the price: the model ensures the existence of moments of necessary orders for the corresponding price process;
- positivity: the volatility process is strictly positive and has inverse moments to ensure reasonable behavior of martingale densities.

We also present a variety of associated numerical methods and propose practically feasible algorithms for various applications, such as the pricing of contingent claims (including options with discontinuous payoffs) and mean-square hedging.

Ledige stillinger

Institutt for foretaksøkonomi ved NHH har lyst ut PhD-stillinger med søknadsfrist 15. januar 2023. Oppstartsdato er august 2023. Utlysningen kan finnes her:
https://www.jobbnorge.no/en/available-jobs/job/235714/phd-research-scholar-positions-department-of-business-and-management-science

Institutt for foretaksøkonomi er et tverrfaglig institutt, og tilbyr to spesialiseringer:

Business Economics

- Core courses in econometrics, microeconomics, scientific methods
- Elective courses in economics, finance, or optimisation
- Dissertation on a topic in business economics, industrial organisation, public finance, asset management, risk analysis, shipping economics, or the economics of natural resources

Management Science

- Core courses in optimisation, microeconomics, scientific methods
- Elective courses in operations research, optimisation, statistics, data science
- Dissertation on a topic in logistics, operations management, utilisation of natural resources, shipping, predictive modelling, or climate risk

Interesserte eller nysgjerrige studenter oppfordres til å ta kontakt med Øyvind Thomassen, enten på epost (oyvind.thomassen@nhh.no) eller tlf. (55 95 94 71).

Arrangementer

CARTAN GEOMETRY AND RELATED TOPICS, Winter School in Geilo, March 5-9, 2023

We are arranging a winter school for 3 full + 2 half days. Three main lecturers are: **Karen Habermann**, **Ben McKay** and **Josef Šilhan**, and there will be additional contributed talks. For more information, please see the website below:
https://sites.google.com/view/cartan-geometry-geilo2023/
Registration deadline: **January 15, 2023**. (Early registrations are appreciated.)

We have some funds to support participants, especially from Norway, with accommodation and meals at the conference hotel. Travel costs are not supported by the conference. For students not too familiar with Cartan Geometry, there will be an introduction lecture on Sunday evening (March 5). On Monday-Wednesday, there will be breaks in the afternoon, allowing time for discussions or skiing, as part of the program. We especially encourage Norwegian advanced Master and PhD students to participate.

The winter school is supported by the project Pure Mathematics in Norway, funded by the Trond Mohn Foundation and Tromsø Research Foundation.

Conference Organizers:
Erlend Grong (Bergen), Boris Kruglikov (Tromsø), Eivind Schneider (Tromsø), Dennis The (Tromsø)

HEIDELBERG LAUREATE FORUM, 2023

Call for Applications: Participation in the 10th Heidelberg Laureate Forum for Outstanding Young Researchers in Mathematics and Computer Science.

Young researchers in mathematics and computer science from all over the world can apply for one of the 200 exclusive spots to participate in the Heidelberg Laureate Forum (HLF), an annual networking conference. The HLF offers all accepted young researchers the unique opportunity to interact with the laureates of the most prestigious prizes in the fields of mathematics and computer science. Traditionally, the recipients of the Abel Prize, the ACM A.M. Turing Award, the ACM Prize in Computing, the Fields Medal, the IMU Abacus Medal and the Nevanlinna Prize engage in cross-generational scientific dialogue with young researchers in Heidelberg, Germany.

The application period for the 10th HLF runs from November 11, 2022, until February 11, 2023, midnight at the dateline. Young researchers at all phases of their careers (Undergraduate/Pre-Master, Graduate PhD or Postdoc) are encouraged to complete and submit their applications via the following link: http://application.heidelberg-laureate-forum.org

The 10th HLF will take place from September 24 to 29, 2023 (with young researcher registration taking place on September 23). This prominent, versatile event combines scientific, social and outreach activities in a unique atmosphere, fueled by comprehensive exchange and scientific inspiration. Laureate lectures and discussions as well as various interactive program elements are some of the Forum's fundamental elements, which are delivered in an environment that provides the space and time for unfettered exchange.

Over the course of the weeklong event, young researchers will have the chance to network and exchange Ideas with their peers 200 of the brightest minds from mathematics and computer science. They will also be given the exclusive opportunity to profoundly connect with their scientific role models and gain valuable insights by interacting with laureates in an unmediated and informal setting. As one young researcher put it: *Meeting the humans behind some of the most formidable inventions and discoveries of our time was phenomenal. What was unexpected, perhaps, was how warm and approachable these individuals turned out to be. I am grateful to have been given this opportunity, and to have shared it with peers who I hope to soon call colleagues, collaborators and friends.*

All applications that are completed and submitted by the deadline are meticulously reviewed by an international committee of experts to ensure that the most qualified candidates are invited. There are 100 spaces available for researchers from both mathematics and computer science, respectively. All applicants will be notified by the end of April 2023 about whether or not they have been selected.

For questions regarding the requirements and the application process, please contact Young Researchers Relations at: yr@heidelberg-laureate-forum.org

For more information, please visit: www.heidelberg-laureate-forum.org

NORWEGIAN NATIONAL Ph.D. MEETING, Trondheim, August 17-18

We are organizing a Norwegian National Ph.D. meeting in Trondheim from the 17th to the 18th of August 2023. It will be accessible to all Ph.D. students in mathematics in Norway: that is, pure, applied, statistics and didactics. Based on the successful Ph.D. day at the National Mathematicians Meeting in Tromsø, this event shall be an opportunity to share experiences, connect research groups across Norway and give insight into career options after the Ph.D.

We aim to cover full board and accommodation expenses, possibly including travel expenses. You will find more information and the registration form on our webpage: www.nnpm.no