Grußwort zur Eröffnung der „Stochastiktage“
17. German Probability and Statistics Days (GPSD)

11.03.2025, Prof. Dr. Rösen-Wolff, Prorektorin Forschung, TU Dresden

Dear Ladies and Gentlemen,

dear Colleagues,

esteemed Guests,

It is my pleasure to welcome you to the 17th edition of the **German Probability and Statistics Days** here in Dresden — a city where science and culture come together in a unique way. Back in March 2020, this conference was scheduled to take place in our city, but unfortunately, it had to be cancelled due to the pandemic. That makes it all the more gratifying for me, as the Vice President for Research at the University of Technology Dresden, to be able to greet you here today in such large numbers and in person.

Stochastics has undergone a rapid evolution from its beginnings to our digital age. In earlier times, stochastics was primarily regarded as a tool for quantifying uncertainties in everyday life and in early scientific inquiry. Even in its infancy, simple probability calculations were employed—for example, in dice games or in actuarial statistics—to formulate initial models of random events. These approaches laid the foundation for our understanding of complex random processes.

Today, however, the significance of stochastics has fundamentally transformed: it is ubiquitous and an integral part of numerous modern technologies. Consider the fields of Artificial Intelligence, Data Science, and Machine Learning—without robust statistical models, advancements in these areas would hardly be conceivable.

A current example is the use of stochastic models in bioinformatics, where they help analyze genetic data and thereby lead to new insights in medical research.

They are also applied in creating complex climate models that help us better understand and forecast the changes occurring on our planet. This transformation from simple calculations to highly complex, interdisciplinary applications underscores just how essential stochastics has become in meeting the challenges of our time.

The TUD looks back at an almost 200-year history during which mathematics and stochastics have always played a central role. Even in those early days, pioneering scientists developed fundamental methods for error estimation and statistical inference. These early approaches paved the way for many modern applications and stand as a testament to the deep understanding of the importance of mathematical methods.

In the 1960s and 1970s, TU Dresden experienced a phase of intense interdisciplinary collaboration — particularly among the departments of Mathematics, Physics, and Engineering. During that period, innovative statistical models emerged that proved to be of great significance not only in fundamental research but also in industrial practice. Examples include models for optimizing technical processes, as well as approaches used in materials research and in the development of new technologies.

The continuous support and further development of the mathematical disciplines is also reflected in the international recognition of this field of research. The awarding of Fields Medals as one of the highest honors in mathematics to outstanding stochasticians is a testament to the high value and innovative strength of this discipline.

To illustrate the transformation of stochastics with tangible examples, let us consider some concrete applications in various fields:

In **Medicine and Healthcare** modern diagnostic procedures rely on statistical models to identify patterns in large datasets and optimize treatment strategies. For instance, in personalized medicine, stochastic models are used to develop individualized treatment plans.

In **Finance and Risk Management s**tochastic methods are employed to assess risks and forecast market developments. Here, models that account for the random fluctuations of markets enable well-informed decision-making.

Complex stochastic simulations, which consider the interactions of numerous climatic factors, underpin **climate models**. These models are indispensable for forecasting future developments and planning climate protection measures.

Last but not least **Artificial Intelligence and Machine Learning:** Algorithms based on stochastic principles enable computers to learn from data and make predictions. Whether in image recognition or speech processing, statistical models have become indispensable to the development of modern technologies.

These examples vividly illustrate the extensive and versatile applications of stochastics today. They also demonstrate that the challenges of our time — from medicine to climate research — can only be overcome through interdisciplinary approaches and the targeted application of mathematical methods.

The 17th GPSD offer you, through a multifaceted scientific program, the opportunity to discover and discuss the latest developments and methods in stochastics. With 6 plenary lectures and 14 specialized sessions covering topics from pure theory to innovative applications, the conference serves as a showcase for current research in this dynamic field.

I would especially like to emphasize that the GPSD, as one of the most significant conferences of its kind in Germany and Europe, provide a unique platform that brings together both established experts and young, emerging talents. The interdisciplinary approach fosters dialogue between diverse fields—be it physics, biology, engineering, or economics—and makes it possible to harness synergies. In addition to the intensive scientific program, informal formats such as get-togethers, the poster session, and the joint conference dinner offer excellent opportunities to exchange ideas in a relaxed atmosphere, forge new contacts, and deepen existing networks.

Especially in a time when interdisciplinary collaboration and personal exchange are essential for scientific progress, these moments are of incalculable value.

As we reflect on the developments of recent decades, we can look forward to the future with anticipation. The steadily growing importance of data and its analysis is continually opening up new research fields and applications. In times of digital transformation, it is increasingly important not only to generate scientific insights but also to translate them into solutions that are relevant to society. In this context, stochastics plays a key role—serving as the foundation for understanding the complexity of modern systems and for making sustainable, data-driven decisions.

This upcoming conference offers the opportunity to actively shape that future. In the coming days, you will not only encounter innovative ideas and the latest research findings, but you will also gain inspiration for future collaborations and projects. I wish you inspiring lectures, exciting discussions, and enriching encounters.

Thank you very much, and I wish you every success!