Report on the "Kleine AG" Conference: Canonical Models of Shimura Varieties

Introduction

The "Kleine AG" conference was held at Wegelerstraße 10, 53115 Bonn, focusing on the theme *Canonical Models of Shimura Varieties*. This one-day workshop aimed to provide an accessible overview of the topic and serve as a meeting point for young researchers interested in Algebraic Geometry. The event brought together participants from various German universities, offering a space for both academic discussion and informal networking.

Overview of "Kleine AG"

The name *Kleine AG*, meaning 'small working group', reflects the initiative's focus on providing a dedicated space for Master's and PhD students to interact. The workshops provide an opportunity for people interested in Algebraic Geometry (recently skewed towards Arithmetic Geometry) to meet and engage with each other, share ideas, and learn about selected topics in a friendly and welcoming environment. The focus is on community-building, making it an ideal setting for early-career researchers, to get acquainted with the field and their peers. Such events, are valuable for nurturing the next generation of researchers and strengthening academic networks.

Conference Focus: Canonical Models of Shimura Varieties

Shimura varieties are higher-dimensional analogues of modular curves, constructed as quotients of Hermitian symmetric spaces associated with rational reductive groups. They function as moduli spaces for variations of Hodge structures, with conjectures suggesting that these structures arise from certain motives. For varieties of PEL type (Polarization, Endomorphism, Level Structure) or Hodge type, these Hodge structures correspond to abelian varieties, and more generally, for those of abelian type, they are associated with abelian motives.

The existence of canonical models for these complex varieties over number fields was initially demonstrated by Shimura, Miyake, and Shih. Later, Pierre Deligne provided a more general framework for constructing these models in his works *Travaux de Shimura* (1971) and *Variétés de Shimura: interprétation modulaire, et techniques de construction de modèles canoniques* (1979). These canonical models play a crucial role in understanding the arithmetic properties of Shimura varieties and have deep connections to the Langlands program and modern number theory. Focusing the workshop on such a significant topic provided attendees with valuable insights into a

central area of Arithmetic Geometry.

Logistical Details

The conference took place on **March 29, 2025**, at Wegelerstraße 10, 53115 Bonn. The sessions included:

- 10:00 10:15: Registration & Introduction
- 10:15 11:15: "Modular Forms, Elliptic Curves, and Hodge Structures" by Tomáš Perutka (University of Münster)
- 11:30 12:30: "Shimura Datum and Shimura Varieties" by Ruizhi Zhu (University of Bonn)
- 12:30 14:00: Lunch Break
- 14:00 14:30: Discussion on Next Kleine AG
- 14:30 15:30: "Variation of Hodge Structures and Types of Shimura Varieties" by Fabian Schnelle (University of Bonn)
- 15:45 16:45: "Canonical Models" by Mingyu Ni (University of Paderborn)
- 17:00 18:00: "Canonical Models of Shimura Varieties of Abelian Type" by Thiago Solovera e Nery (University of Duisburg-Essen)

Attendance Statistics

The conference successfully attracted participants from several German universities, demonstrating broad interest and reach within the community. The distribution of attendees was as follows:

- University of Bonn: 12 attendees
- University of Paderborn: 4 attendees
- Goethe University Frankfurt: 4 attendees
- University of Duisburg-Essen: 3 attendees
- University of Münster: 3 attendees
- University of Heidelberg: 1 attendee
- Total: 27 attendees



This diverse participation underscores the event's role in connecting researchers across different institutions.

Conclusion

The Kleine AG conference on Canonical Models of Shimura Varieties successfully provided an opportunity for young mathematicians, specifically Master's and PhD students, to get an overview of the topic and connect with others in the field. The event emphasized collaboration and networking, reinforcing the importance of such informal gatherings in fostering a sense of community and supporting the development of early-career researchers. We look forward to future editions of Kleine AG and hope to continue strengthening connections within the Algebraic Geometry community, demonstrating the continued value of this initiative.