

A U S H A N G

FREIE UNIVERSITÄT BERLIN

Fachbereich Mathematik und Informatik

Promotionsbüro, Arnimallee 14, 14195 Berlin

D I S P U T A T I O N

Montag, 7. April 2025, 13:00 Uhr

Ort: Seminarraum 031

(Fachbereich Mathematik und Informatik, Arnimallee 6, 14195 Berlin)

Disputation über die Doktorarbeit von

Xingjian Zhang-Schneider

Thema der Dissertation:

**Fast solvers for heterogeneous saddle point problems arising from
phasefield-models**

Thema der Disputation:

**Connecting Archimedes and Modern Algorithms: The Computation
of Pi**

Die Arbeit wurde unter der Betreuung von **Prof. Dr. C. Gräser** durchgeführt.

Abstract: The computation of pi, a problem that has fascinated humanity for millennia, is explored in this talk. We trace its evolution from the geometric methods of Archimedes to their adaptation in modern algorithmic approaches.

From a modern perspective, the approximation of a circle's circumference using regular polygons can be understood as a slowly converging algorithm based on the harmonic-geometric mean. This mean is closely related to the arithmetic-geometric mean (AGM), and by exploiting the connection of the AGM to elliptic integrals, a significantly faster-converging algorithm was discovered by Salamin and Brent in the mid-1970s.

We will show that the Brent-Salamin algorithm surprisingly produces iterations identical to those of the second-order algorithm introduced by the Borwein brothers in the mid-1980s, despite being derived from fundamentally distinct theoretical frameworks. Both algorithms are recognized as among the most computationally efficient methods for pi computation and have been employed to set multiple world records in high-precision calculations."

Die Disputation besteht aus dem o. g. Vortrag, danach der Vorstellung der Dissertation einschließlich jeweils anschließenden Aussprachen.

Interessierte werden hiermit herzlich eingeladen

Der Vorsitzende der Promotionskommission

Prof. Dr. C. Gräser