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

Mittwoch, 4. Oktober 2017, 10.00 Uhr

Ort: Seminarraum SR 046, Takustraße 9, 14195 Berlin

Disputation über die Doktorarbeit von

Herrn Christopher Kusch

Thema der Dissertation:
Problems in Positional Games and Extremal Combinatorics

Thema der Disputation:
The strong Cap Set Conjecture
and the Erdős-Szemerédi Sunflower Conjecture

Die Arbeit wurde unter der Betreuung von **Prof. T. Szabó, PhD** durchgeführt.

Abstract: In the first and main part of the talk we consider the strong Cap Set Conjecture. A subset $A \subseteq \mathbb{F}_3^n$ is called a *cap set*, if it does not contain a 3-term arithmetic progression, i.e. three distinct elements $a, b, c \in A$ with $a - 2b + c = 0$. The strong Cap Set Conjecture states that there exists an $\epsilon > 0$ such that if $A \subseteq \mathbb{F}_3^n$ is a cap set, then $|A| \leq (3-\epsilon)^n$. The previously best known upper bound on a cap set was $O(\frac{3^n}{n^{1+\epsilon}})$, due to Bateman and Katz (2013). Here, we will present the proof of the strong Cap Set Conjecture due to Ellenberg and Gijswijt (2016), which is based on the Polynomial Method.

In the remainder of the talk, we outline the proof of the Alon-Shpilka-Umans theorem, which states that the strong Cap Set Conjecture implies the so-called Erdős-Szemerédi Sunflower Conjecture. A 3-sunflower in $2^{[n]}$ consists of three distinct sets A_1, A_2, A_3 such that for every $i \neq j$ we have $A_i \cap A_j = \cap_{i=1}^3 A_i$. The Erdős-Szemerédi Sunflower Conjectures now states that there exists a $\delta > 0$ such that a family of subsets of $[n]$ without a 3-sunflower has size at most $(2-\delta)^n$.

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. T. Szabó, PhD