

Adam Mickiewicz University
Faculty of Mathematics and Computer Science

GEOMETRY AND TOPOLOGY SEMINAR

1:45 PM, Thursday, October 18, 2018
B1-37, Collegium Mathematicum

Speaker: Rade T. Živaljević (Mathematical Institute, SASA, Belgrade)

Title: **Topology and combinatorics of unavoidable complexes**

Abstract:

The partition number $\pi(K)$ of a simplicial complex $K \subseteq 2^{[m]}$ is the minimum integer ν such that for each partition $A_1 \uplus \dots \uplus A_\nu = [m]$ of $[m]$ at least one of the sets A_i is in K . A complex K is *r-unavoidable* if $\pi(K) \leq r$. We say that a complex K is *almost r-non-embeddable* in \mathbb{R}^d if for each continuous map $f : |K| \rightarrow \mathbb{R}^d$ there exist r vertex disjoint faces $\sigma_1, \dots, \sigma_r$ of $|K|$ such that $f(\sigma_1) \cap \dots \cap f(\sigma_r) \neq \emptyset$. Motivated by problems of Tverberg-Van Kampen-Flores type we review several results (obtained in collaboration with Duško Jojić, Waław Marzantowicz and Siniša Vrećica) which link together the combinatorics and topology of these two classes of complexes. One of our central observations (see Theorem 4.6 in <https://arxiv.org/abs/1603.08472>), summarizing and extending results of G. Schild, B. Grünbaum and many others, is that interesting examples of (almost) r -non-embeddable complexes can be found among the joins $K = K_1 * \dots * K_s$ of r -unavoidable complexes. From a broader perspective unavoidable complexes are relevant for other mathematical fields as well, which will be illustrated by examples from cooperative game theory and polyhedral combinatorics.