

## ***LOGIC SEMINAR***

**Guest Speaker: Artem Chernikov**  
**UCLA**



**Date:** Tuesday, September 1, 2020

**Time:** 2:00 PM

**Location:** Zoom

**Zoom URL:** [notredame.zoom.us/j/763507156](https://notredame.zoom.us/j/763507156)

***Lecture Title:***

**Incidence counting and trichotomy in o-minimal structures**

***Abstract***

Zarankiewicz's problem in graph theory asks to determine the largest possible number of edges  $|E|$  in a bipartite graph  $G = (E, V_1, V_2)$  with the parts  $V_1$  and  $V_2$  containing  $m$  and  $n$  vertices, respectively, and such that  $G$  contains no complete bipartite subgraphs on  $k$  vertices. Graphs definable in o-minimal (or more generally distal structures) enjoy stronger bounds than general graphs, providing an abstract setting for the Szemerédi-Trotter theorem and related incidence bounds. We obtain almost optimal upper and lower bounds for hypergraphs definable in locally modular o-minimal structures, along with some applications to incidence counting (e.g. the number of incidences between points and boxes with axis parallel sides on the plane whose incidence graph is  $K_{\{k,k\}}$ -free is almost linear). We explain how the exponent appearing in these bounds is tightly connected to the trichotomy principle in o-minimal structures. Joint work with Abdul Basit, Sergei Starchenko, Terence Tao and Chieu-Minh Tran.