Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

On Connection Between Topology and Memory Loss in Sheared Granular Materials[1] LENKA KOVALCINOVA, New Jersey Inst of Technology, MIRO KRAMAR, Tohoku University, Japan, KONSTANTIN MISCHAIKOW, Rutgers University, LOU KONDIC, New Jersey Inst of Technology — We present combined results of discrete element simulations and topological data analysis that allows us to characterize the geometrical properties of force networks. Our numerical setup consists of the system of cylindrical particles placed inside rectangular box with periodic boundary conditions along the horizontal direction. System dynamics is driven by constant shearing speed of the top and bottom walls (in the opposite directions) and pressure applied on the top wall in a dense flow regime. Our study reveals the origin of memory loss in granular systems through local rapid changes in force networks. To understand these rapid events we analyze the evolution of the largest Lyapunov exponent in a simpler case of granular system without inter-particle friction and explore a correlation with topological measures. Surprisingly, our results suggest that the memory loss is driven mainly by *pressure* even in the case of fixed inertial number. We conclude that the interplay between physical properties of the granular system and force network geometry is a key to understand the dynamics of the sheared systems.

[1]This research was supported by NSF Grant No. DMS-1521717 and DARPA No. HR0011-16-2-0033.

Lenka Kovalcinova
New Jersey Inst of Technology

Date submitted: 06 Nov 2016 Electronic form version 1.4