1151-35-167 **David Sondak*** (dsondak@seas.harvard.edu) and **Pavlos Protopapas** (pavlos@seas.harvard.edu). *Learning the Reduced Dynamics of the Kuramoto-Sivashinsky Equation with Autoencoders.*

Fluids play a central role in science and engineering. Understanding their behavior opens avenues to predict quantities (such as heat transport) that are important for designing physical systems. Fluid behavior is complicated by the phenomenon of turbulence. Although most fluid flows are turbulent, traditional techniques to probe turbulence have made slow progress, in large part due to its high dimensionality. In the present work, a machine learning approach is proposed for learning the low dimensional dynamics of a chaotic system. The system in question is the Kuramoto-Sivashinsky equation, which exhibits spatio-temporal chaos, but whose dynamics are known to fall on an inertial manifold. This talk will begin with a review of the key ideas of fluid mechanics and turbulence and then provide some background on machine learning and neural networks in particular. Following this, an autoencoder architecture with latent space penalization will be introduced and results on the Kuramoto-Sivashinksy equation will be presented. It is shown that the autoencoder is able to learn a finite-dimensional reduced space while reproducing the essential dynamics. The talk will close with a discussion of future work and thoughts on applications to real turbulent flows. (Received August 16, 2019)