Convolutional neural networks for identifying coherent turbulent structures ERIC JAGODINSKI, SIDDHARTHA VERMA, Florida Atlantic University — Identifying coherent structures and extreme events is key to understanding the physics of near-wall turbulent flows. Deep convolutional neural networks were originally developed for image recognition, but have immense potential for extracting features in multi-dimensional vector fields. Here, velocity fields extracted from Direct Numerical Simulations (DNS) of a periodic turbulent channel flow were input into a convolutional neural network in order to identify coherent structures and extreme events. The domain was reduced to a Minimal Flow Unit (MFU), as done in Jimenez (1991), and features were labeled for training the neural network using thresholding. Once trained, the network is able to correctly classify coherent structures and extreme events in the flow field.

Eric Jagodinski
Florida Atlantic University