Abstract Submitted
for the SES20 Meeting of
The American Physical Society

Using Convolutional Neural Networks to Segment Images of Packed Epithelial Cell Layers for Inferring Cellular Forces NILAI VEMULA, M. SHANE HUTSON, Vanderbilt University, Department of Physics and Astronomy — Cellular force inference is a powerful tool that provides insights into the growth and morphogenesis of epithelial cell layers. To infer intercellular tensions and pressures between cells, it is mandatory to first segment a microscope image of the packed epithelial cell layer with its cell borders marked, for example by using a fluorescent protein such as E-cadherin-GFP. Current procedures depend on guided watershed algorithms. Here we present, CS-Net, a novel convolutional neural network based on a modified U-Net structure to transform a raw microscope image to a mask of pixels defining cell boundaries and cell interiors. Our neural network has an accuracy of 90% with an AUC-ROC of 0.86. CS-Net is made accessible through an accessible web API, and it is designed to be used in conjunction with a Python-based cellular force inference tool.

Nilai Vemula
Vanderbilt University, Department of Physics and Astronomy

Date submitted: 19 Oct 2020 Electronic form version 1.4