Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

Deep learning the spanwise-averaged turbulent wake of a circular cylinder[1] BERNAT FONT GARCIA, Univ of Southampton and Inst of High Performance Computing (A*STAR), GABRIEL WEYMOUTH, University of Southampton, VINH-TAN NGUYEN, Institute of High Performance Computing (A*STAR), OWEN TUTTY, University of Southampton — Numerical simulations of long and flexible cylindrical structures become prohibitive at high Reynolds regimes because of the wide range of spatial and temporal scales that need to be resolved. We propose a new flow decomposition based on the spanwise average of the local three-dimensional (3D) strip which provides a two-dimensional formulation with additional statistical terms accounting for the 3D fluctuations. The latter unclosed terms are modelled through a convolutional neural network (CNN) trained on a high-fidelity dataset. The CNN is designed as a multiple-input multiple-output autoencoder inspired on image recognition architectures. The convolution operation ensures translational invariance and different inputs are tested aiming to provide a Galilean invariant model. *A priori* results display 90% correlation of the predicted turbulent fields and current work involves the *a posteriori* analysis of the model plus the investigation of the model generalisation for different geometries and flow regimes.

[1]University of Southampton and Singapore Agency for Science, Technology and Research (A*STAR) Research Attachment Programme (ARAP)

Bernat Font Garcia
Univ of Southampton and Institute of High Performance Computing (A*STAR)

Date submitted: 01 Aug 2019 Electronic form version 1.4