# Blind Deconvolution of Turbulent Flows using Neural Networks

## CSCI - 5622 (Machine Learning, Spring '18)
## Team Project

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# Background: Turbulent flow field

- Filter
  - Gaussian kernel

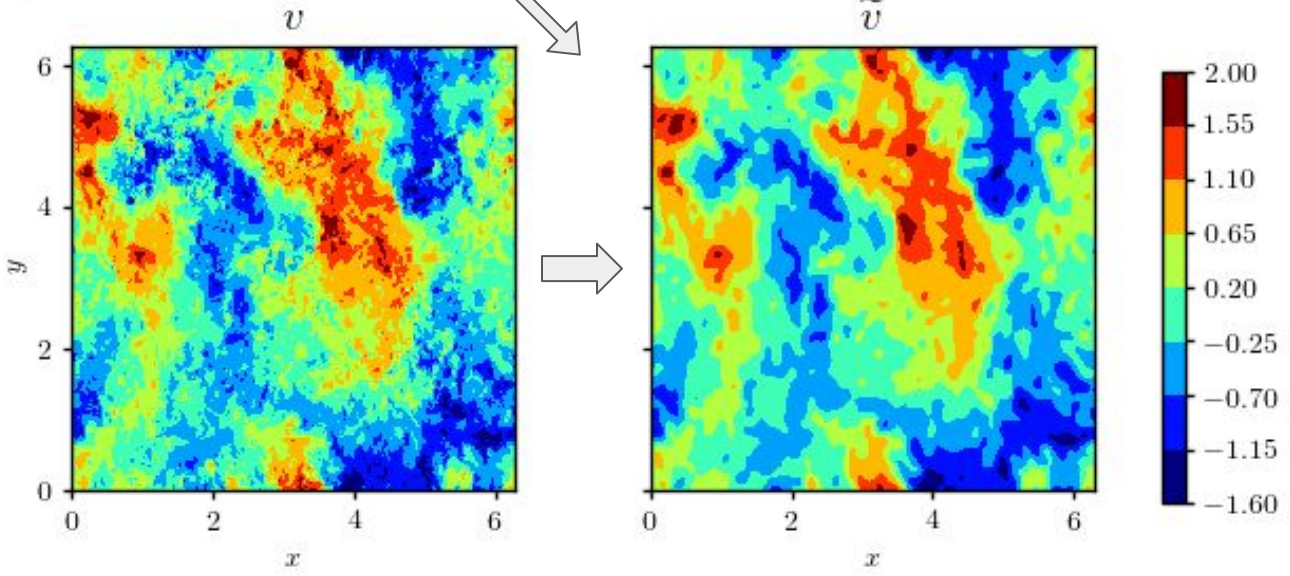
$$G(\boldsymbol{x};\sigma) = \frac{1}{(\sqrt{2\pi}\sigma)^d} \exp\left(-\frac{|\boldsymbol{x}|^2}{2\sigma^2}\right)$$

  - Low-pass

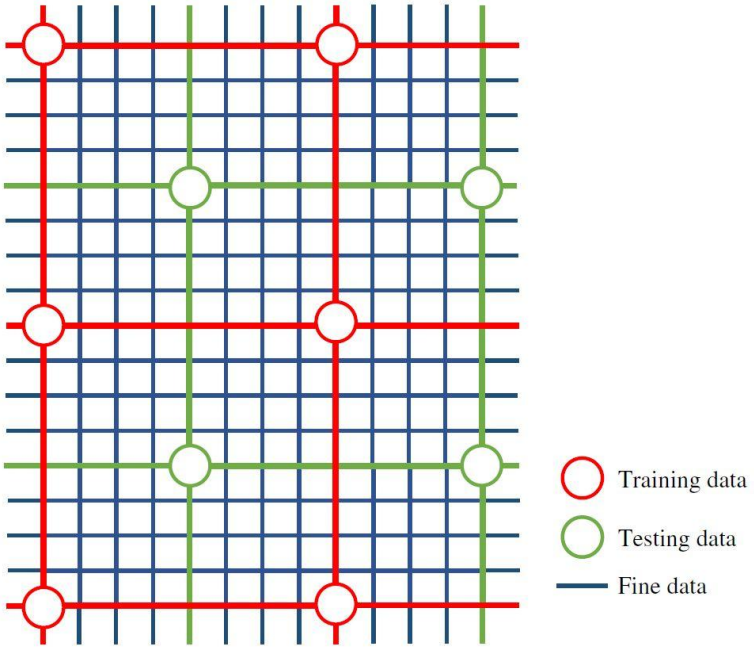
$$G(x) * v(x) \overset{\text{def}}{=} \underbrace{\int_{-\infty}^{\infty} v(\tau) G(x-\tau)\, d\tau}_{(v*G)(x)}$$

- Noise

$$u_i' = u_i + \mu\kappa$$



# Representation of the data (Testing and Training)




**Spatial shifting strategy for generating the training and testing data**

- ★ 2048 x 2048 pixels
- ★ Coarse-grained to 256 x 256
- ★ 63 different examples
- ★ Training set and 3 test sets
- ★ Spatial shifting strategy

# Neural Networks for Deconvolution

- Artificial Neural Networks (ANN)
- Single Layer
- Feed-forward