## Projection Based Approach

## Hybrid Approach: DisPINN

## Data-Driven Approach

Full Model:
PDEs, ODEs

$$F\left(D^k u(x),\ldots,Du(x),u(x),x,t,\mu\right)=0$$

$$F\left(x,u(x),\ldots,u^{(k)}\right)=0$$

FD, FVM, FEM

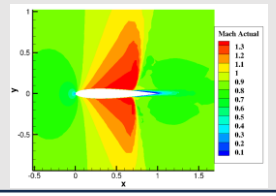
Full Order
Model Operator

$$\begin{pmatrix} A & B^T \\ B & 0 \end{pmatrix}\begin{pmatrix} u \\ p \end{pmatrix}=\begin{pmatrix} f \\ 0 \end{pmatrix}$$

Galerkin, LSPG

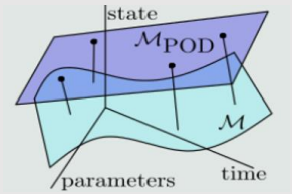
$A_N^q$ $Z^T$ $A^{N,q}$ $Z$

Full Order
Trajectories

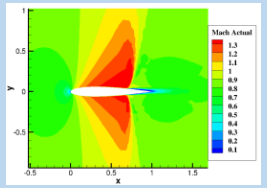


POD, RB, (Linear)
Auto Encoder (Non-Linear)

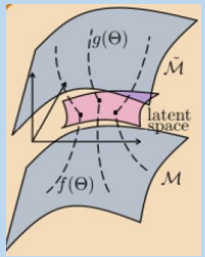
Reduced Space




Full Order
Trajectories



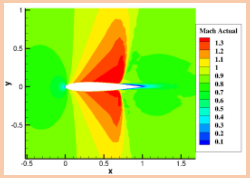
POD, RB, (Linear)
Auto Encoder (Non-Linear)



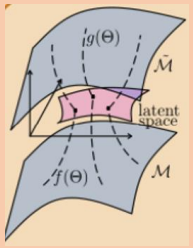

Reduced Space
Linear or Non-
Linear

PINN Network :
ANN, LSTM

Full Order
Trajectories



POD, RB, (Linear)
Auto Encoder (Non-Linear)




Reduced Space
Linear or Non-
Linear

Latent Dynamics
Approximation :
ANN, GPR, RBF, LSTM