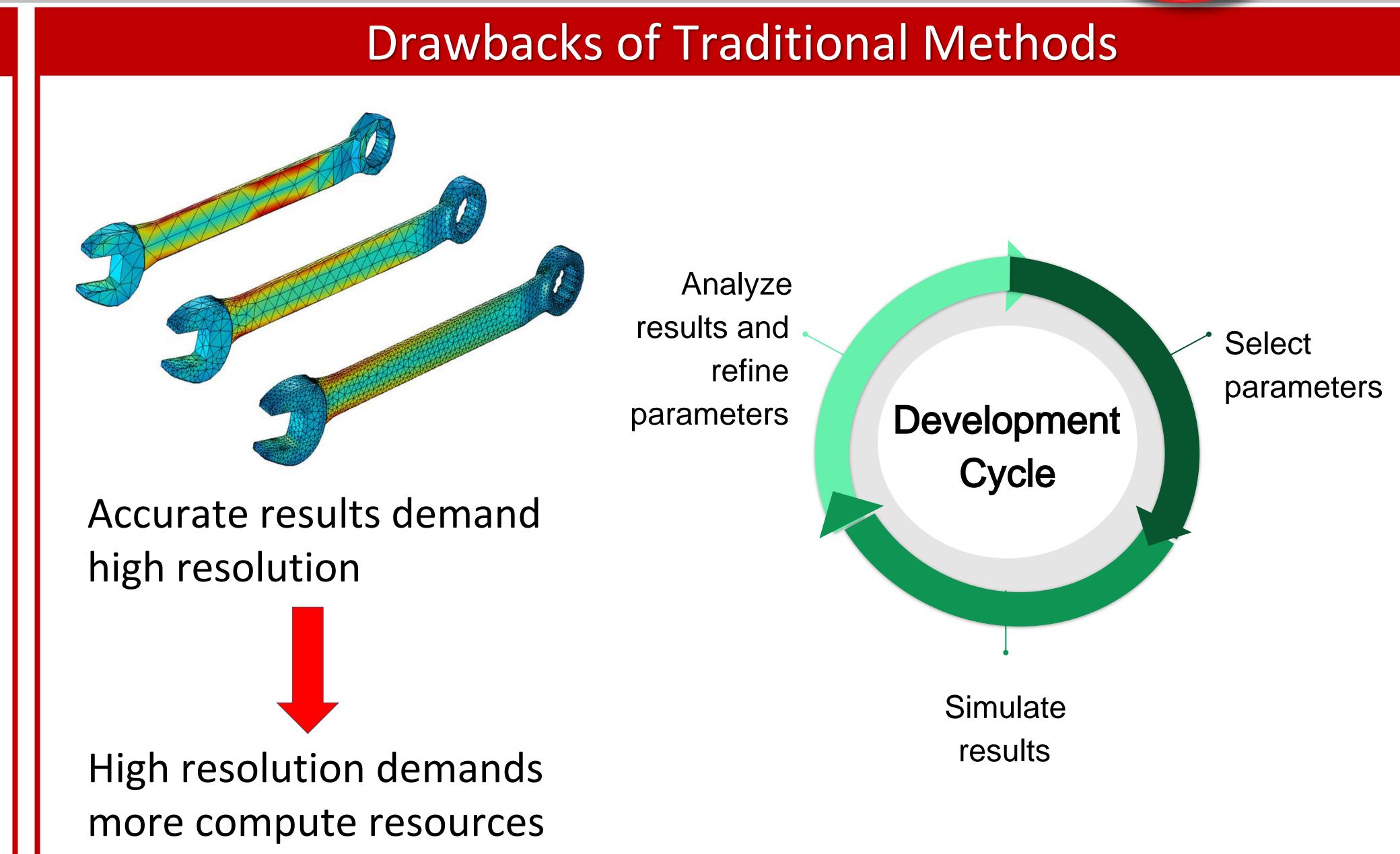
Accelerating Predictions with Neural Operators

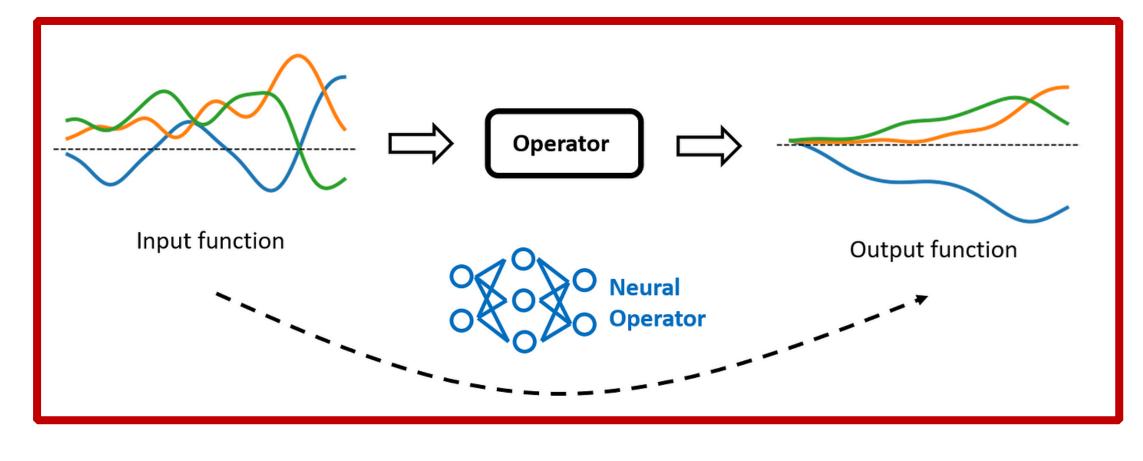
AI²: Artificial Intelligence, Adaptation, and Innovation Group



Why Care About Multitask Partial Differential Equations? Aircraft hydraulic pipe system Velocity (m/s) 1.329e+001 1.253e+001 Change in angle leads to 1.196e+001 1.127e+001 1.063e+001 1.002e+001 9.305e+000 different results 8.769e+000 7.976e+000 7.516e+000 6.646e+000 6.264e+000 5.317e+000 5.011e+000 3.988e+000 3.758e+000 To get results for each case, a 2.659e+000 2.505e+000 1.329e+000 1.253e+000 simulation run is required (b) $\alpha = 45^{\circ}$ Velocity (m/s) Velocity (m/s) Contour 1 Neural operators can learn this 1.417e+001 1.470e+001 1.275e+001 1.323e+001 mapping and give results for 1.133e+001 1.176e+001 9.918e+000 1.029e+001 8.501e+000 8.820e+000 different scenarios quickly 7.084e+000 7.350e+000 5.667e+000 5.880e+000 4.250e+000 4.410e+000 2.834e+000 2.940e+000 1.417e+000 1,470e+000 (d) $\alpha = 75^{\circ}$ (c) $\alpha = 60^{\circ}$

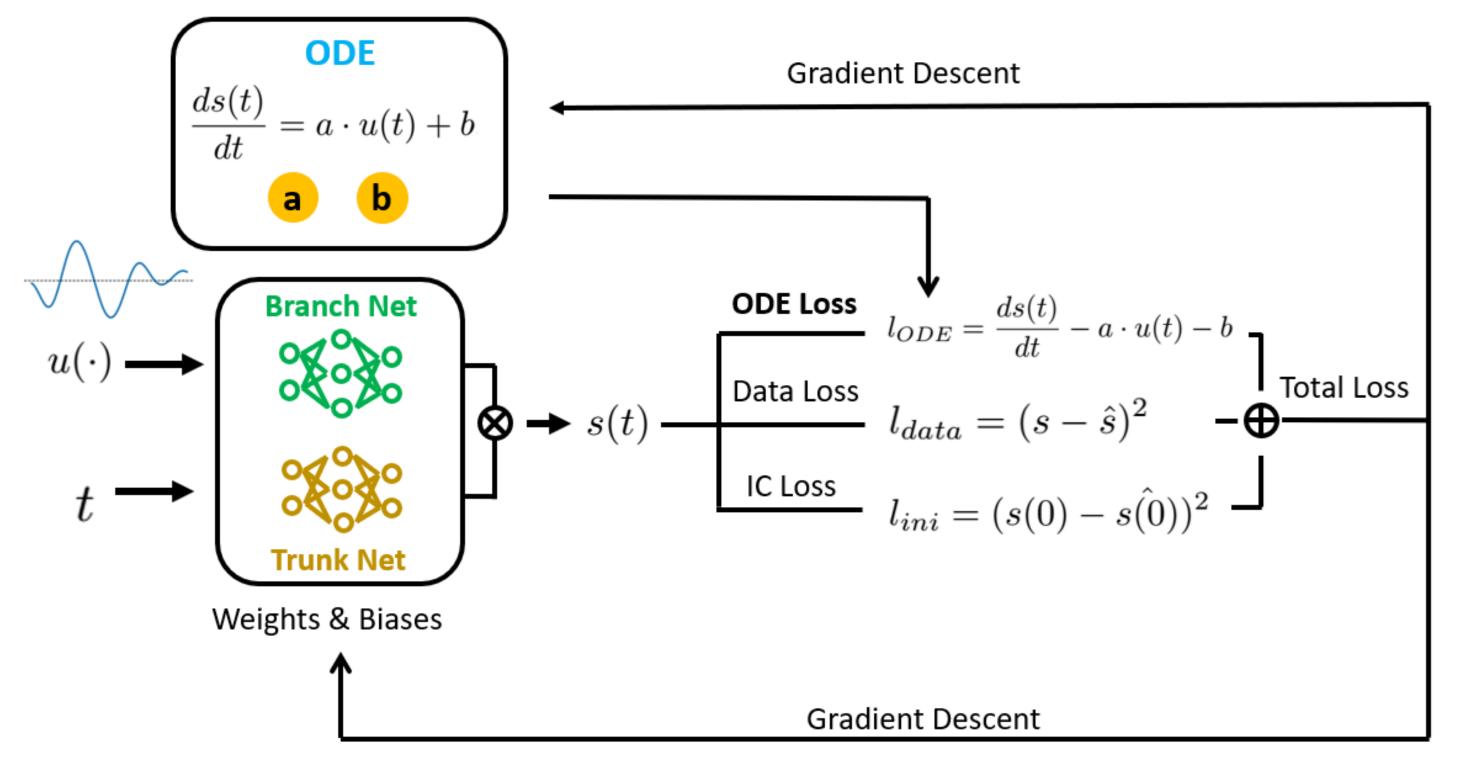


Deep Operator Networks (DeepONets)



Operator learning is a way for function-to-function mapping

DeepONets are a neural network based architecture to perform operator learning



Lifting Multiple stacks of spectral convolution Projection layer with bypass layer Fourier transform Weight multiplication Inverse Fourier transform Fourier layer Fourier layer



