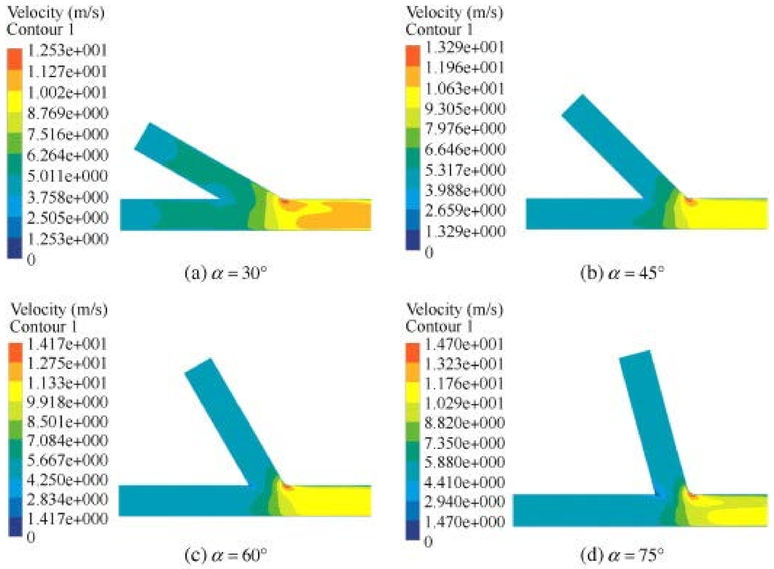
Accelerating Predictions with Neural Operators

AI^2: Artificial Intelligence, Adaptation, and Innovation Group

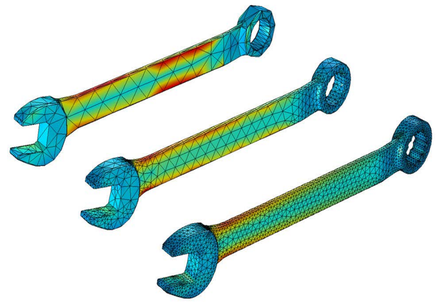
Why Care About Multitask Partial Differential Equations?

Aircraft hydraulic pipe system



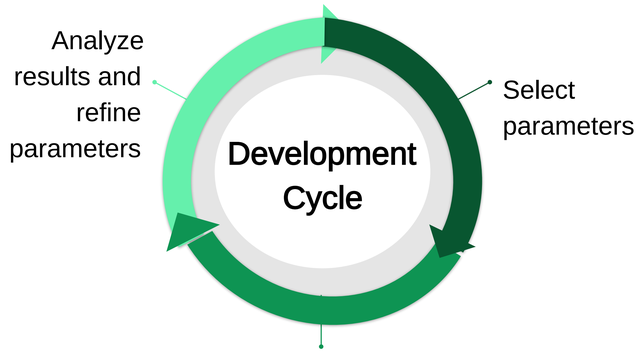
- Change in angle leads to different results
- To get results for each case, a simulation run is required
- Neural operators can learn this mapping and give results for different scenarios quickly

Drawbacks of Traditional Methods

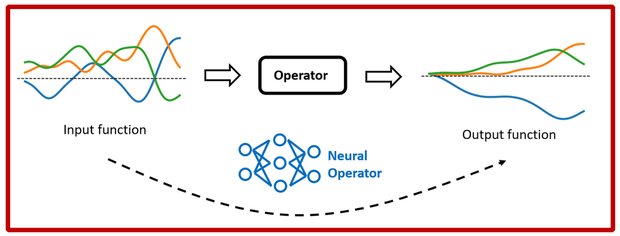


Accurate results demand high resolution

High resolution demands more compute resources

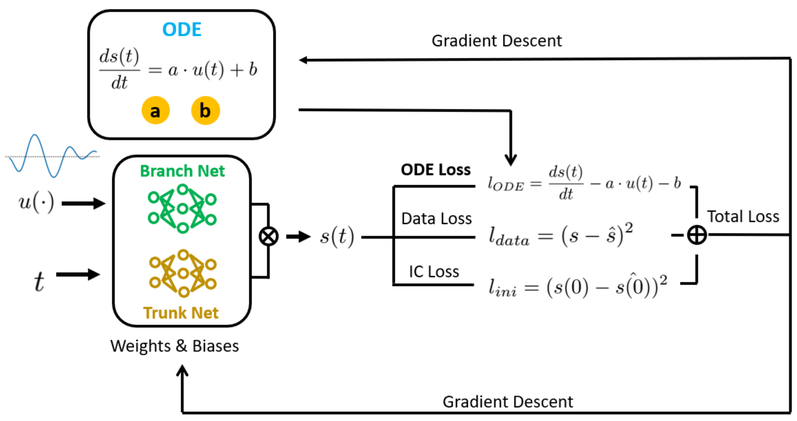


Deep Operator Networks (DeepONets)

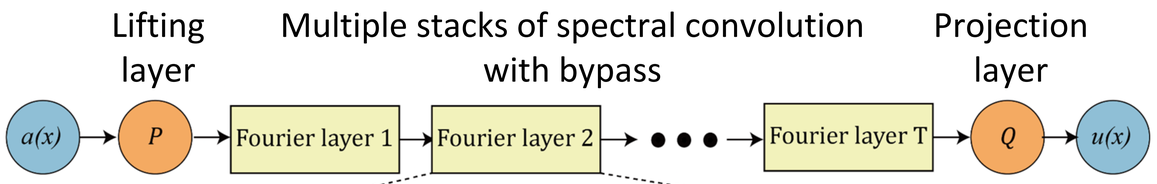


Operator learning is a way for function-to-function mapping

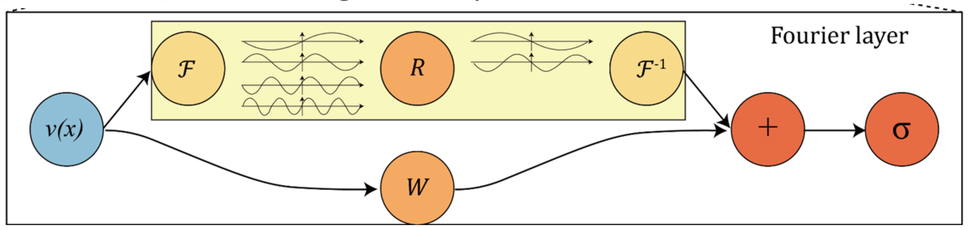
DeepONets are a neural network based architecture to perform operator learning



Fourier Neural Operators (FNOs)



Fourier transform — Weight multiplication — Inverse Fourier transform



Standard 1x1 Convolution