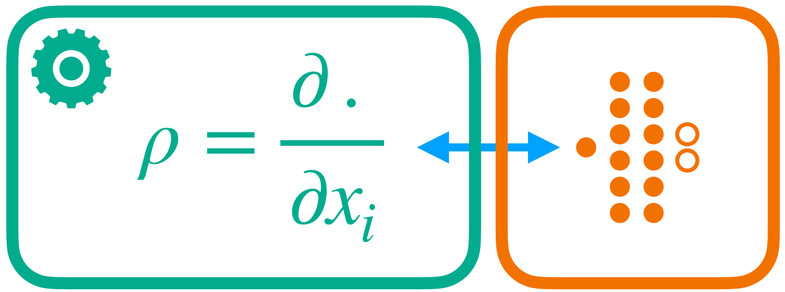
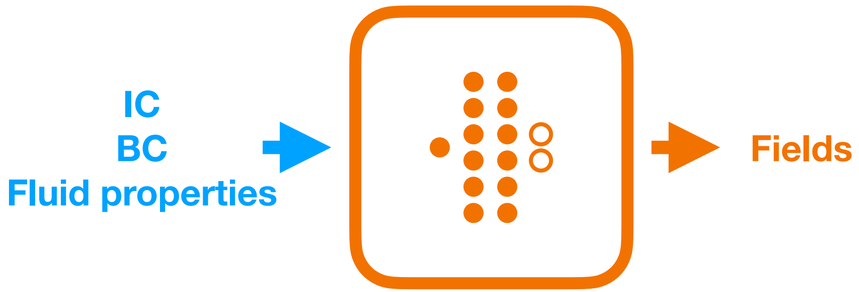
AI Substitution Plan

A 2-step vision



Coupled

The Solver still resolves part of the Physics, is then coupled with the neural inference engine which completes the missing bits. It might bring, still, instabilities



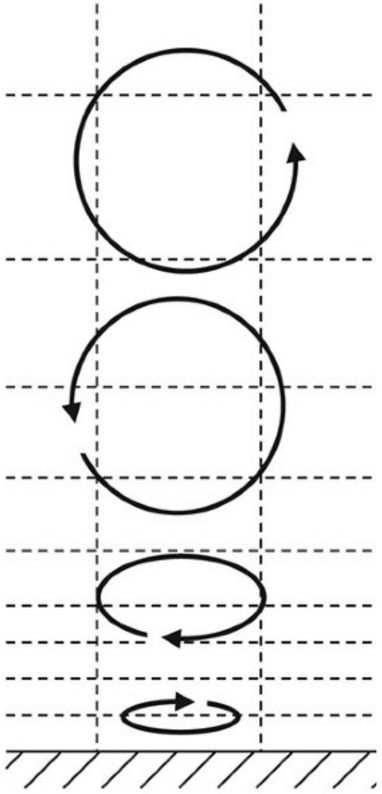
End-to-end

The neural engine solves the Physics without relying on an equation, because it has be trained to capture it.

MUCH HARDER PROBLEM ALERT

The Case of Sub-Grid Scale Modeling

Turbulence Kinetic Energy scheme



- In Turbulent regime, eddies in high scale tend to be unstable, and break down into smaller eddies. **Energy transfers from high scale to small scale**, until the viscosity is such that it dissipates the reminder energy
- Small eddies smaller than the grid resolution are **modeled with a viscosity term** (sub-grid scale model)
- Sub-grid scale models are fairly simple. Physics deserves a better replacement

https://rmets.onlinelibrary.wiley.com/doi/10.1002/qj.2548