PDEs: Infinite dimensional model

a, Ω — **Often impossible** → w, Ω

Encoding to finite dimension
Finite element/volume/difference method

Finite to infinite dimension
Polynomial interpolation, Galerkin basis, etc.

High fidelity model

$\mathbf{a}_N, \Omega_N$ — **Slow** → $\mathbf{w}_N, \Omega_N$

Solve ODE, AE, DAE

Encoding to subspace
POD/SVD
Reduced bases: $\mathbf{\Psi}^T$

Decoding to finite dimensional space
$\mathbf{\Psi}$

Reduced order model

$\mathbf{a}_n, \Omega_n$ — **Fast** → $\mathbf{w}_n, \Omega_n$ $\quad n << N$

Solve ODE, AE, DAE