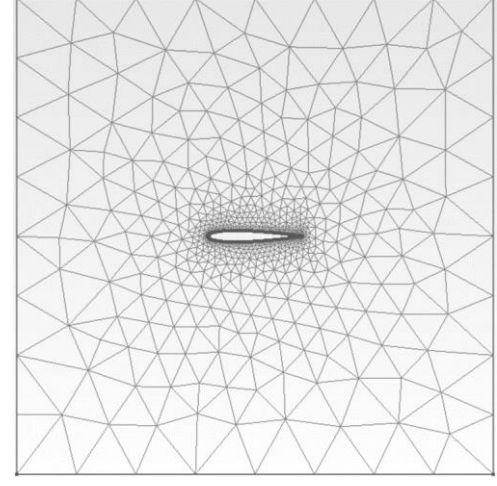


Trustworthy Physics-Informed AI for Aerospace

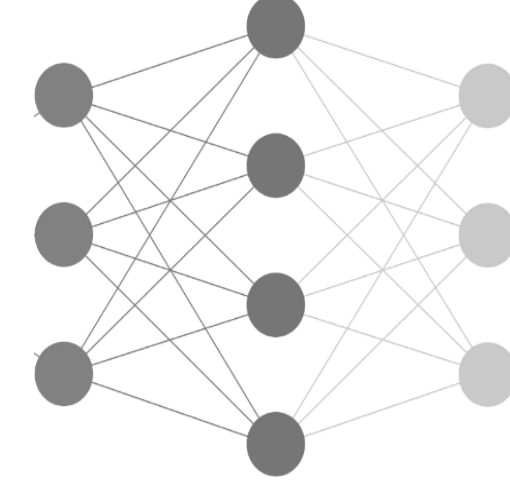
Katharina Rauthmann, Fabrice von der Lehr, Philipp Knechtges
DLR, Institute of Software Technology

Traditional physical approaches to simulation insufficient when



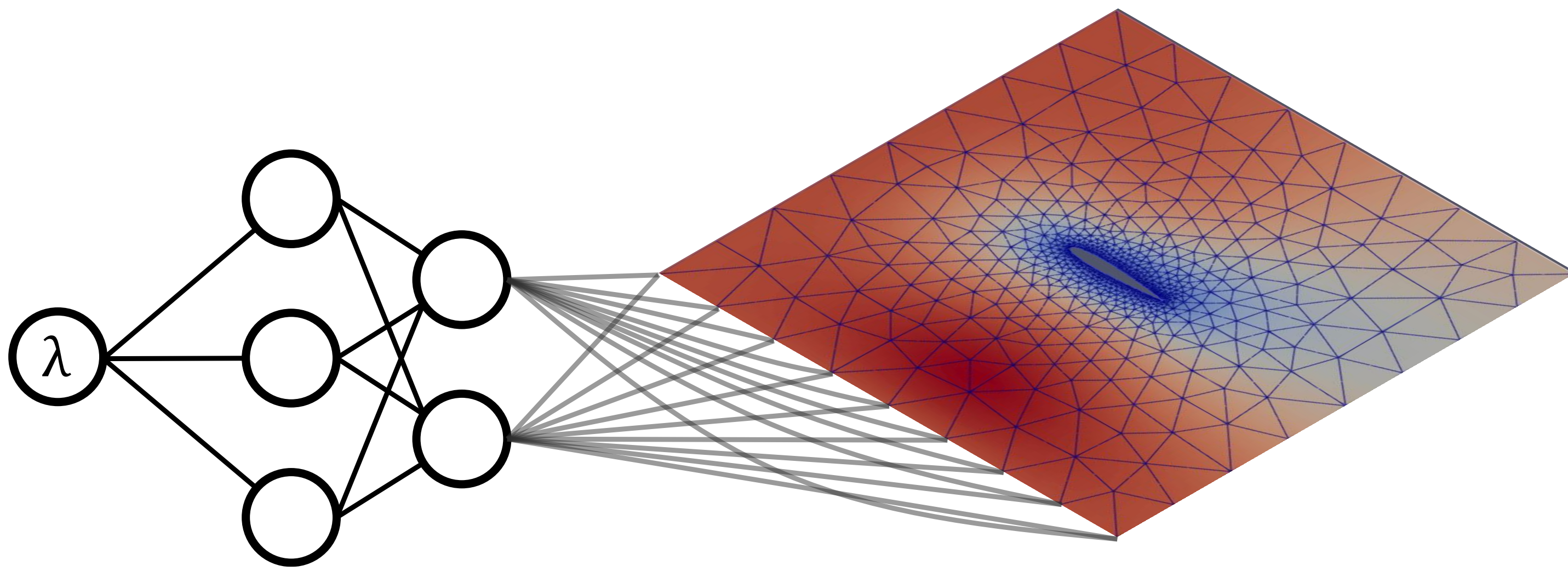
- computing capacity limited
- real-time capability needed

Why are data-driven neural networks not reliable?

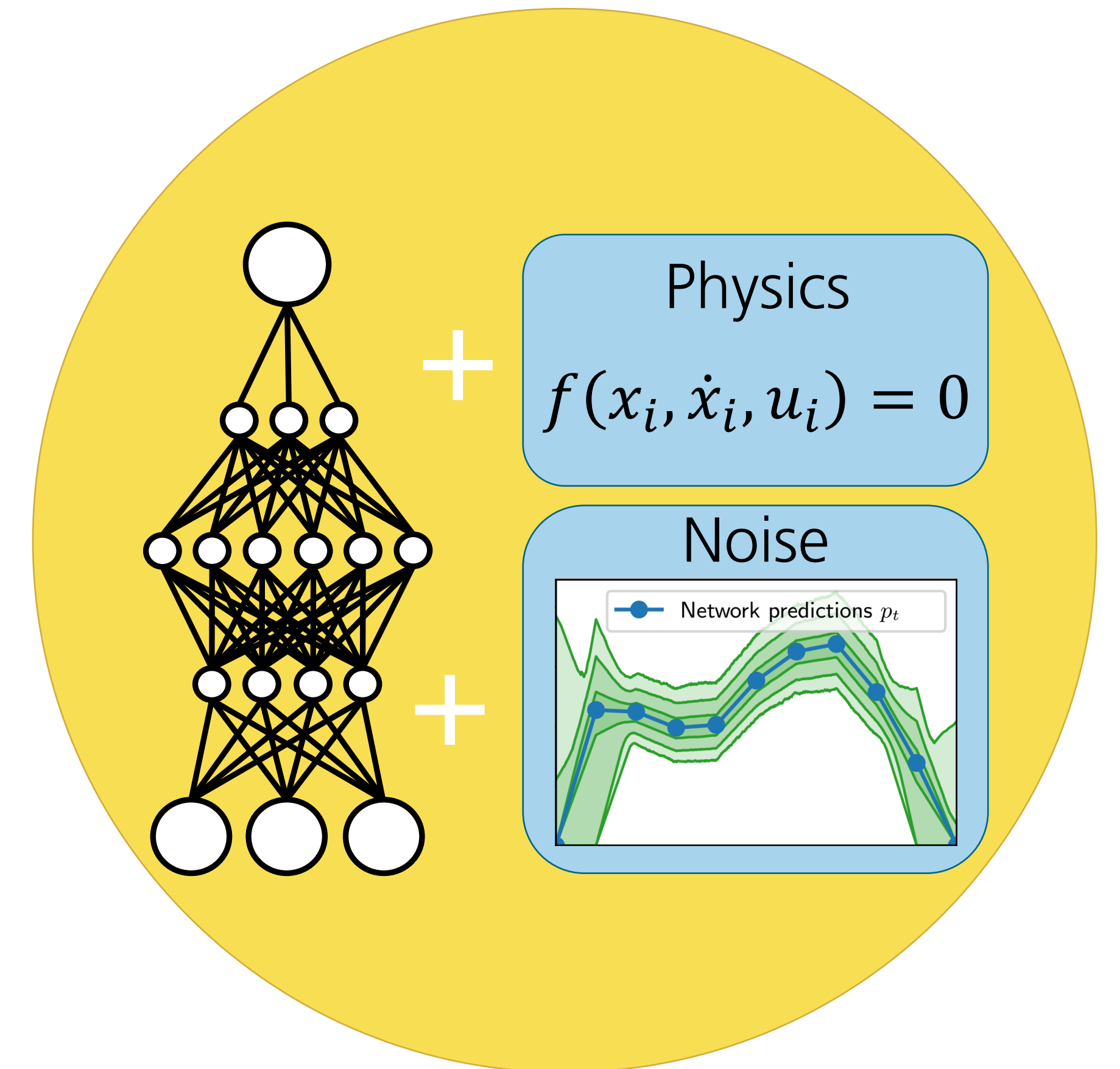


- can violate conservation laws
- no information about uncertainties

Get the best of both worlds:



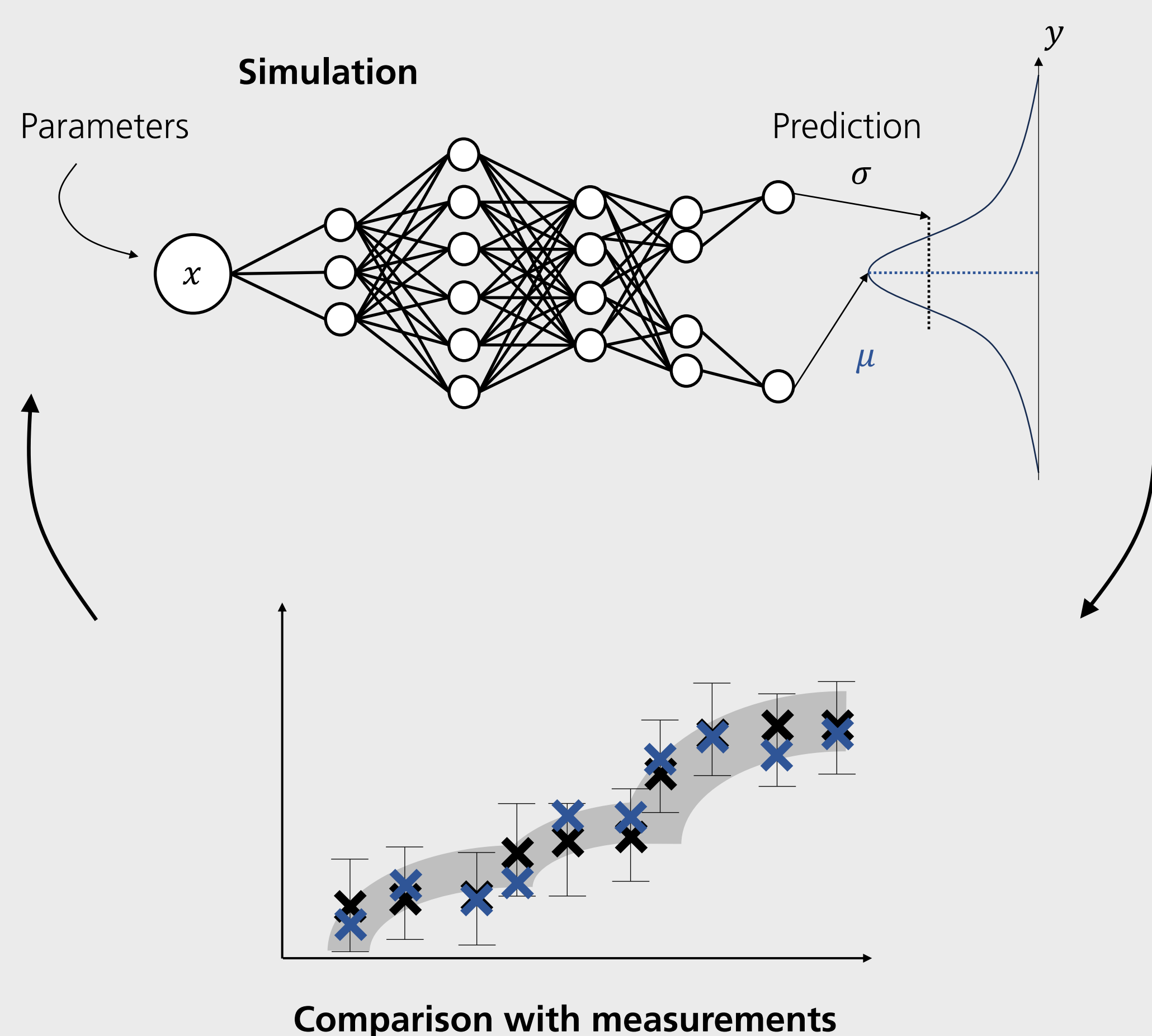
Representation of an FEM-based NN learning Stokes flow around an airfoil for different angles of attack λ , mesh and result from [1]



Data acquisition
Measurements with uncertainties



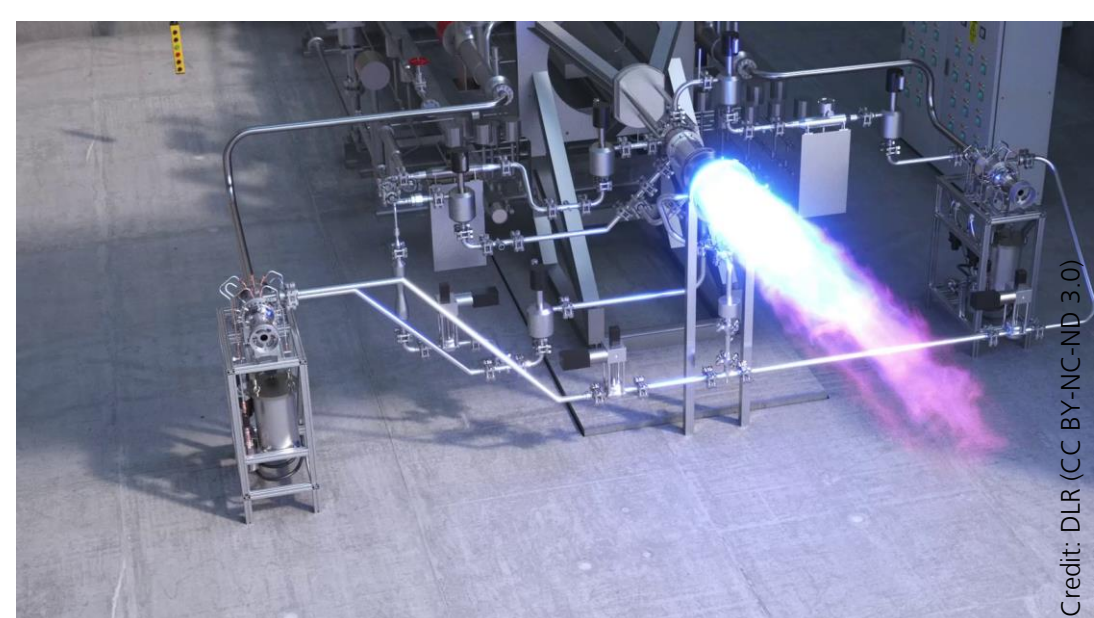
KNOW YOUR SYSTEM
KNOW YOUR RISKS



Successful Mission!



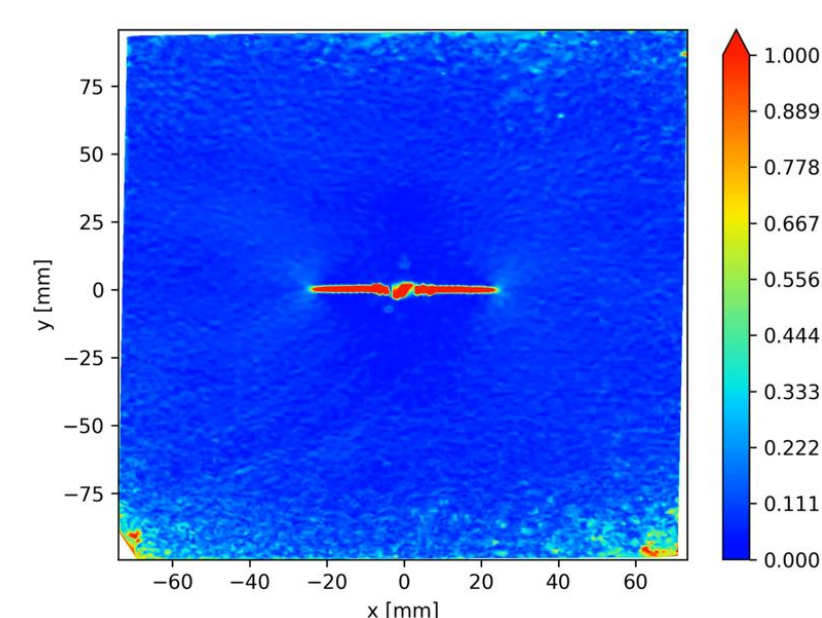
Our applications



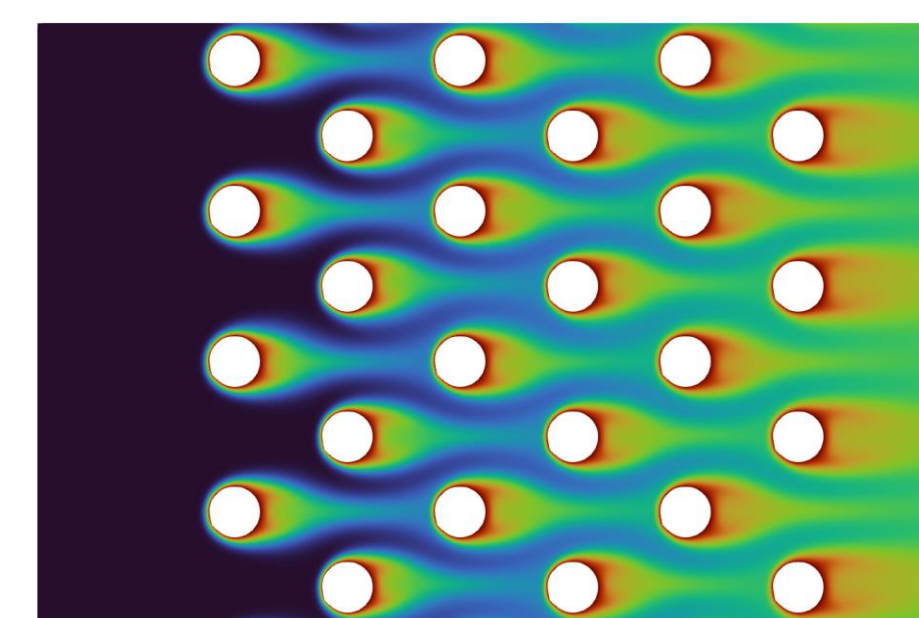
Rocket engine optimal control



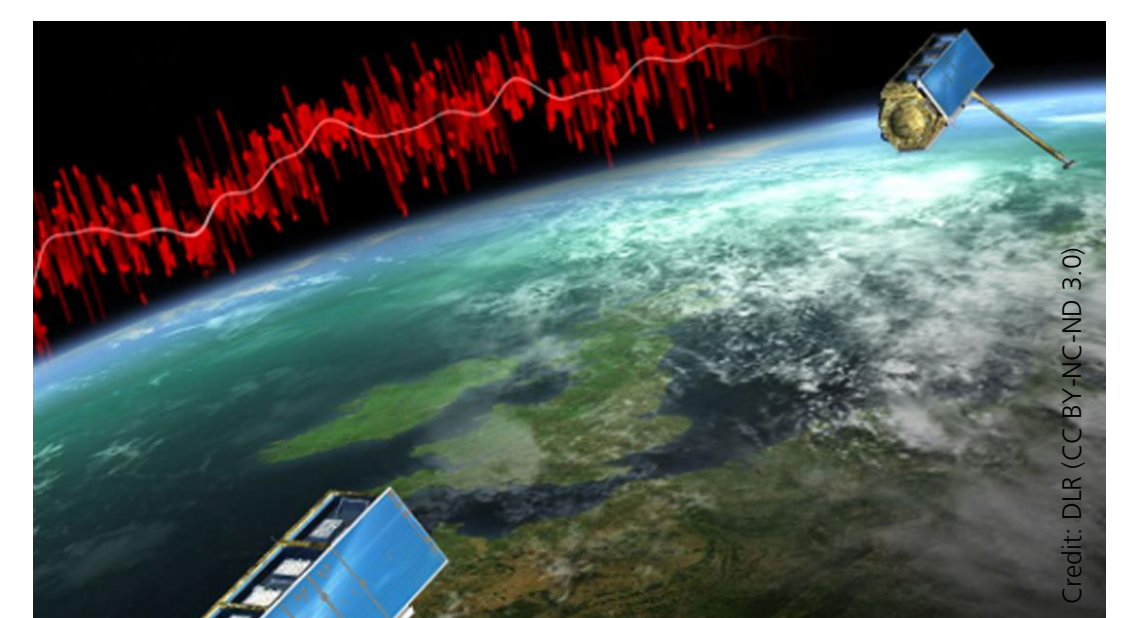
Aircraft rapid design iterations



Crack propagation



Flow fields in cooling ducts



Satellite telemetry prediction



TIARA project website:
tiara.dlr.de

Reference:
[1] Gries, Franziska, et al. "Preconditioned FEM-based neural networks for solving incompressible fluid flows and related inverse problems." Journal of Computational and Applied Mathematics 469 (2025): 116663.

