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KTH Datavetenskap och kommunikation inbjuder alla intresserade till en serie öppna föreläsningar där unga forskare berättar om sina vetenskapsområden och tillämpningar.

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sal E32, Lindstedtsvägen 5

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Precision and Stability in Computational Fluid Dynamics

Phenomena of fluid flow is constantly present in our everyday life; from the atmosphere determining our daily weather, to the flow of air around our car that we are driving or the airplane we are flying, to the blood flow in our arteries.

Fluid dynamics as a scientific discipline may be seen as starting in 1755 with Euler's equations for a frictionless fluid, and continuing with the Navier-Stokes equations formulated almost 100 years later for a fluid with friction. The analytic study of fluid flow as solutions to these equations has met with several paradoxes where the mathematical theory predicts phenomena not observed in experiments, and still today the basic mathematical questions of existence and uniqueness of solutions, formulated as one of the Clay \$1 million prize problems, stand without an answer.

Today the computer opens for Computational fluid dynamics, in which the equations are reformulated into algorithms for simulation of fluid flow by computing approximate solutions to the equations, which avoids some of the problems of the analytical methods but faces new challenges in the form of turbulence and an extreme computational cost.

In this lecture we recapture some of the steps in the development of the subject of Computational fluid dynamics, and connect the challenges of turbulence and paradoxes to the key concepts of precision and stability.

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