"Modeling of Turbulent Flows: Physical and Data-Driven Methods"
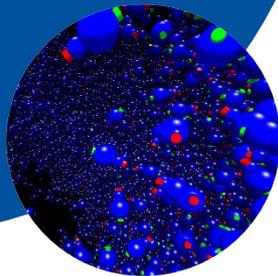
Graduate Academy SimTech

GS Seminar by Prof. Heng Xiao and Dr.-Ing. Xu Chu

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Language: English

Date: To be discussed

Time: To be discussed

SWS: 4

ECTS: 6

Proof of attendance: Regular presence, presentation and interview

Please register via Campus [Module number: 107360].

Description:

Having completed this course, students will be able to:

Derive the exact equations governing turbulent flows

Understand different modeling approaches (RSTM, LEVM, RANS)

Implement 1- and 2-equation RANS models in a CFD code (programming)

Perform RANS simulations with OpenFOAM

Understand the limitations of linear eddy viscosity models and the sources of modeling error

Understand how to analyze data from a turbulent-flow simulation (RANS)

Familiar with the recent developments in data-driven turbulence modeling

Understand the strengths and weakness of various approaches in data-driving modeling (neural networks, symbolic regression, decision-tree models)

Specific course contents include:

Introduction to turbulence flows and their modeling approaches

Derivation of RANS equations and the closure problem

Algebraic models

One- and two-equation models

Reynolds stress transport models

Origin of uncertainties in turbulence models and methods to quantify them

Neural networks for learning models

Learning models from sparse data

Modeling of Turbulent Flows: Physical and Data-Driven Methods

lectures (3.0 SWS)

tutorials (1.0 SWS)

Participants have to complete:

- Presentation at end of course (15 min) (40%)
- One-on-one interview at end of course (15 min) (60%)

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