



Friedrich-Alexander-Universität  
Research Center for  
Mathematics of Data | MoD

## FAU MoD Lecture Series



# Data Driven Modeling for Scientific Discovery and Digital Twins

**Dongbin Xiu**

THE OHIO STATE UNIVERSITY



MOD.FAU.EU

#FAUMoDLecture

### WHEN

Monday **April 20, 2026**  
11:00H (Berlin time)

### WHERE

On-site / Online

Friedrich-Alexander-Universität  
Erlangen-Nürnberg (FAU).  
**Room H13 Johann-Radon-Hörsaal**  
Felix-Klein building  
Cauerstraße 11, 91058  
Erlangen. Bavaria, Germany

Live-streaming:

<https://www.fau.tv/clip/id/63064>

We present a data-driven modeling framework for scientific discovery, termed Flow Map Learning (FML). This framework enables the construction of accurate predictive models for complex systems that are not amenable to traditional modeling approaches. By leveraging data and the expressiveness of deep neural networks (DNNs), FML facilitates long-term system modeling and prediction even when governing equations are unavailable. FML is particularly powerful in the context of Digital Twins, an emerging concept in digital transformation. With sufficient offline learning, FML enables the construction of simulation models for key quantities of interest (QoIs) in complex Digital Twins, when direct mathematical modeling of the QoIs is infeasible. During the online execution of a Digital Twin, the learned FML model can simulate the QoIs without reverting to the computationally intensive Digital Twin simulation model. As a result, FML serves as an enabling methodology for real-time control and optimization for complex systems.