# Digital Twins

## How high-performance computing is personalizing the future for complex systems

**Supercomputing Spotlights Webinar Series**

**Professor Karen E. Willcox**
Director, Oden Institute for Computational Engineering & Sciences
Professor, Aerospace Engineering & Engineering Mechanics
University of Texas at Austin

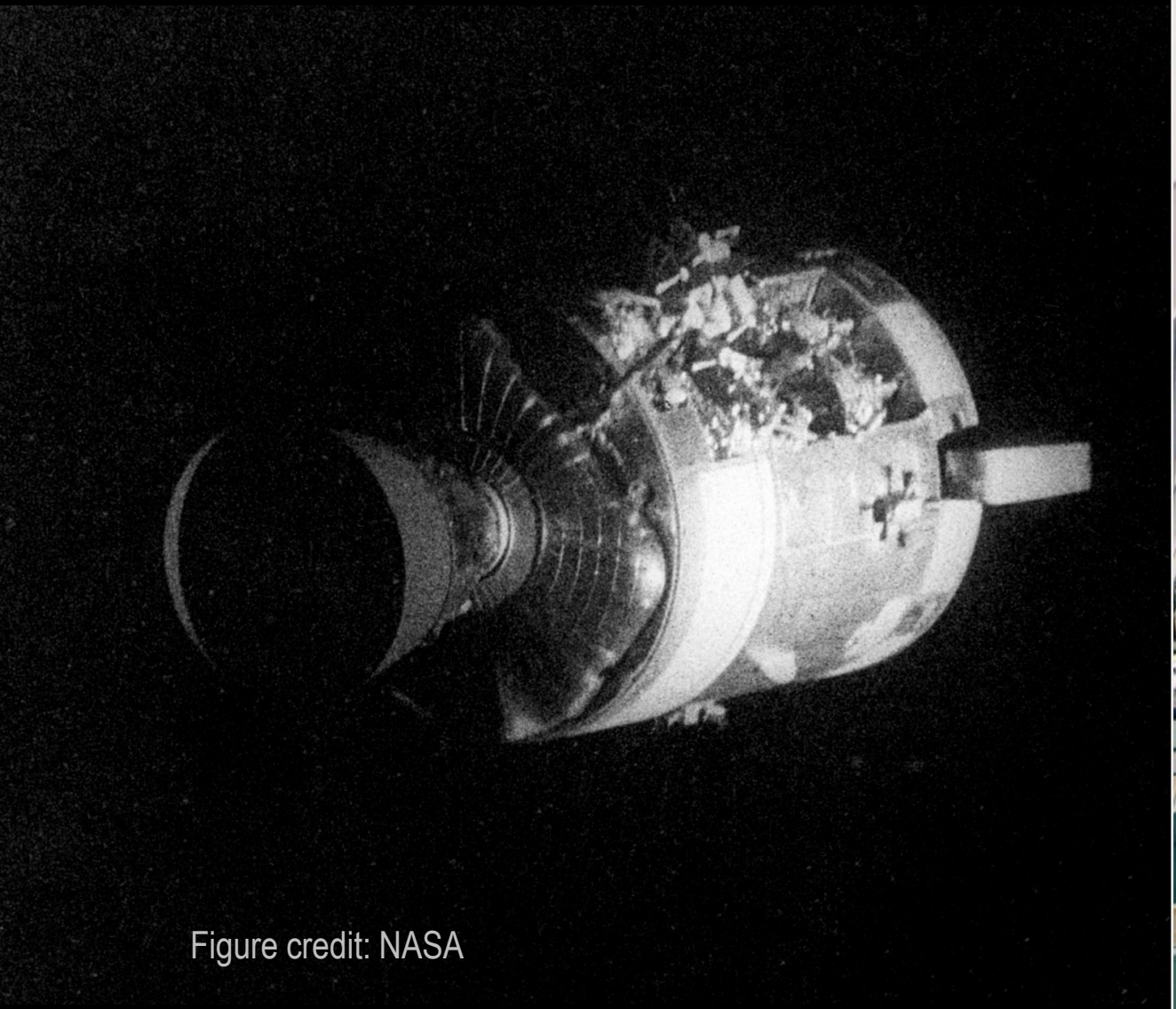
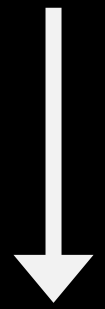
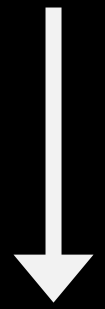


Figure credit: NASA

MODELS + DATA



DATA ASSIMILATION



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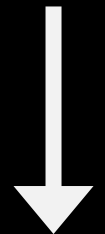

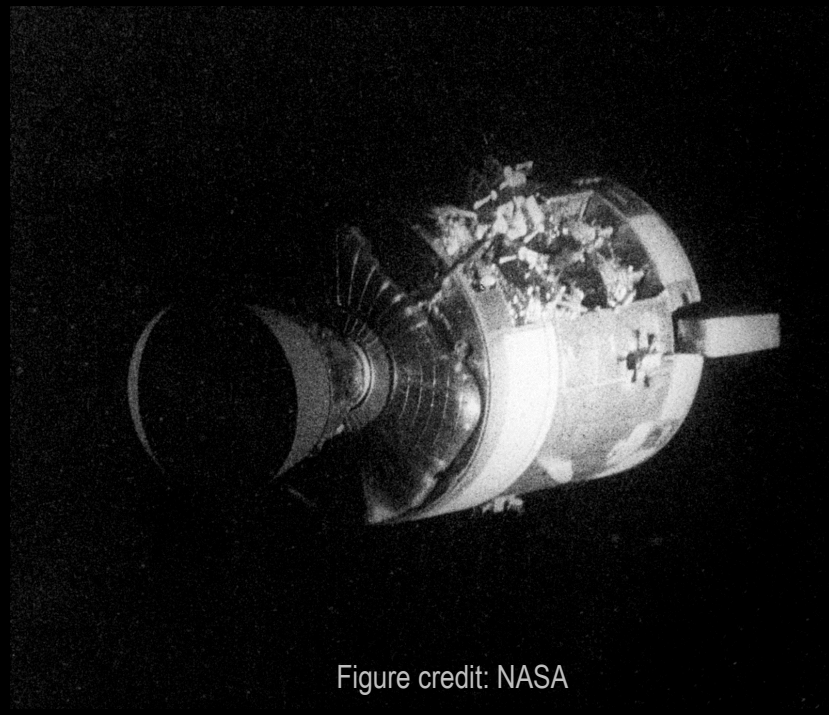

Figure credit: NASA

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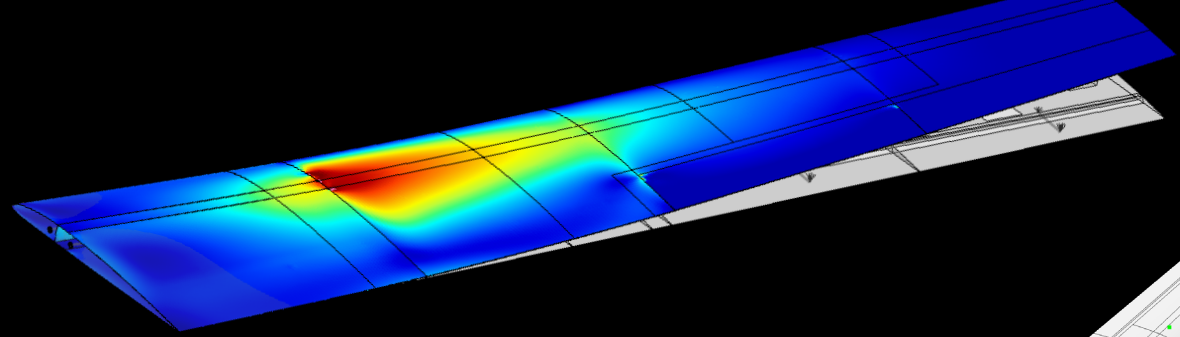

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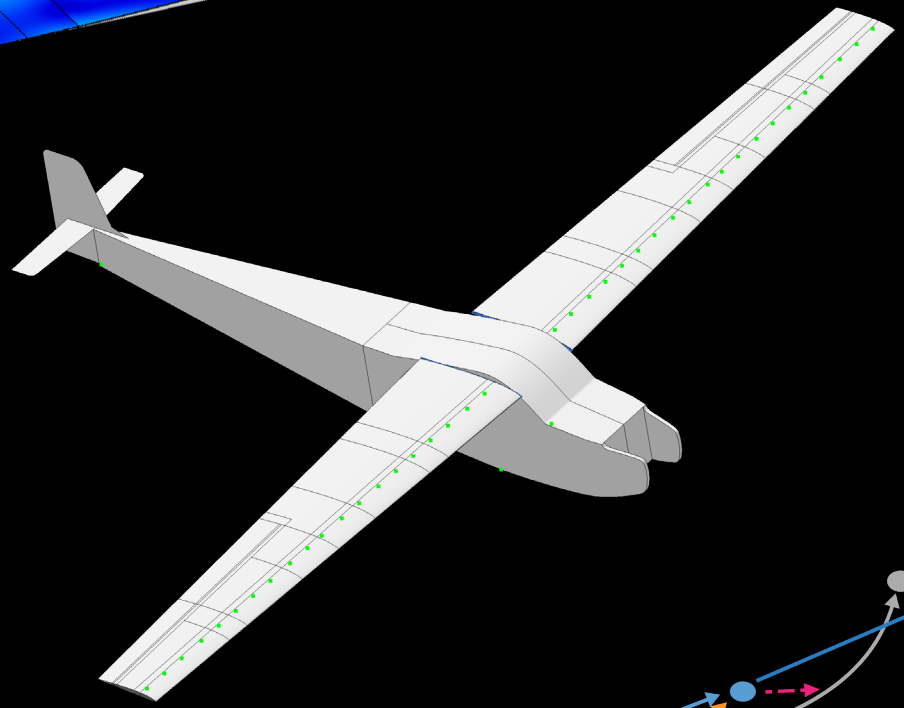

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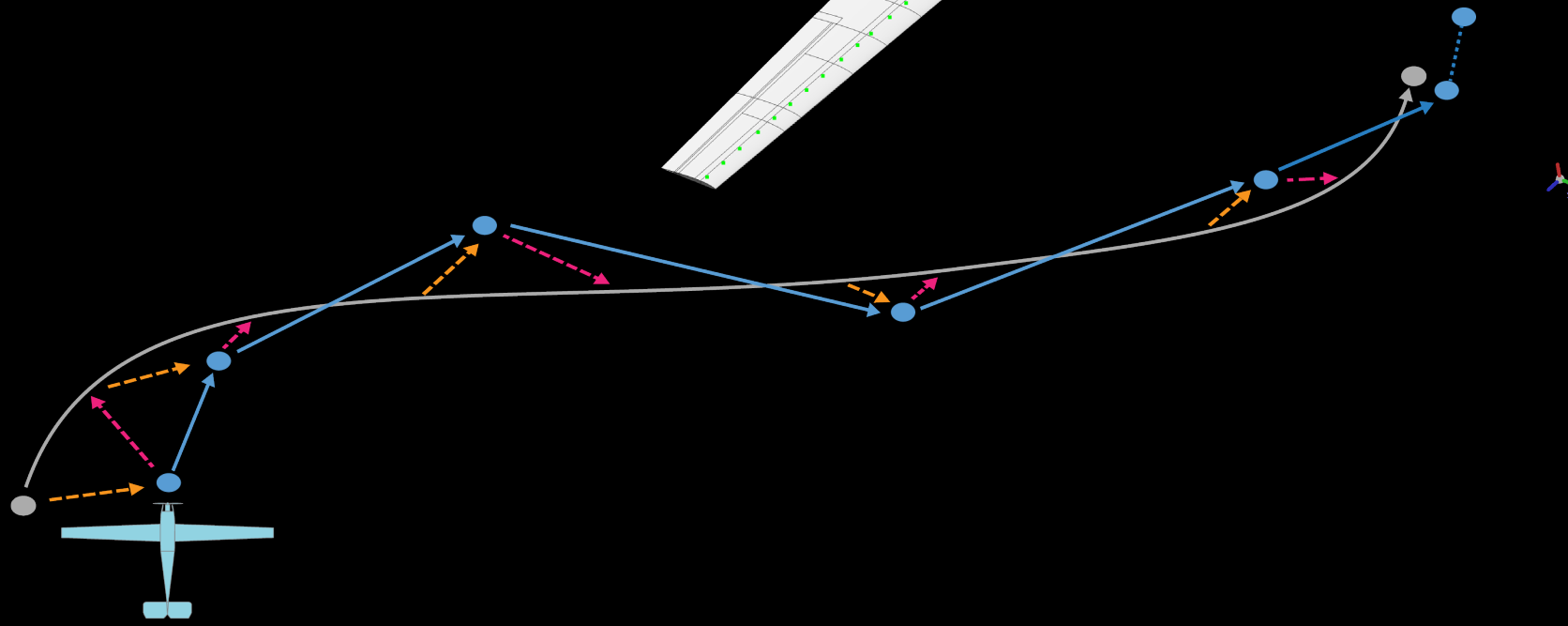

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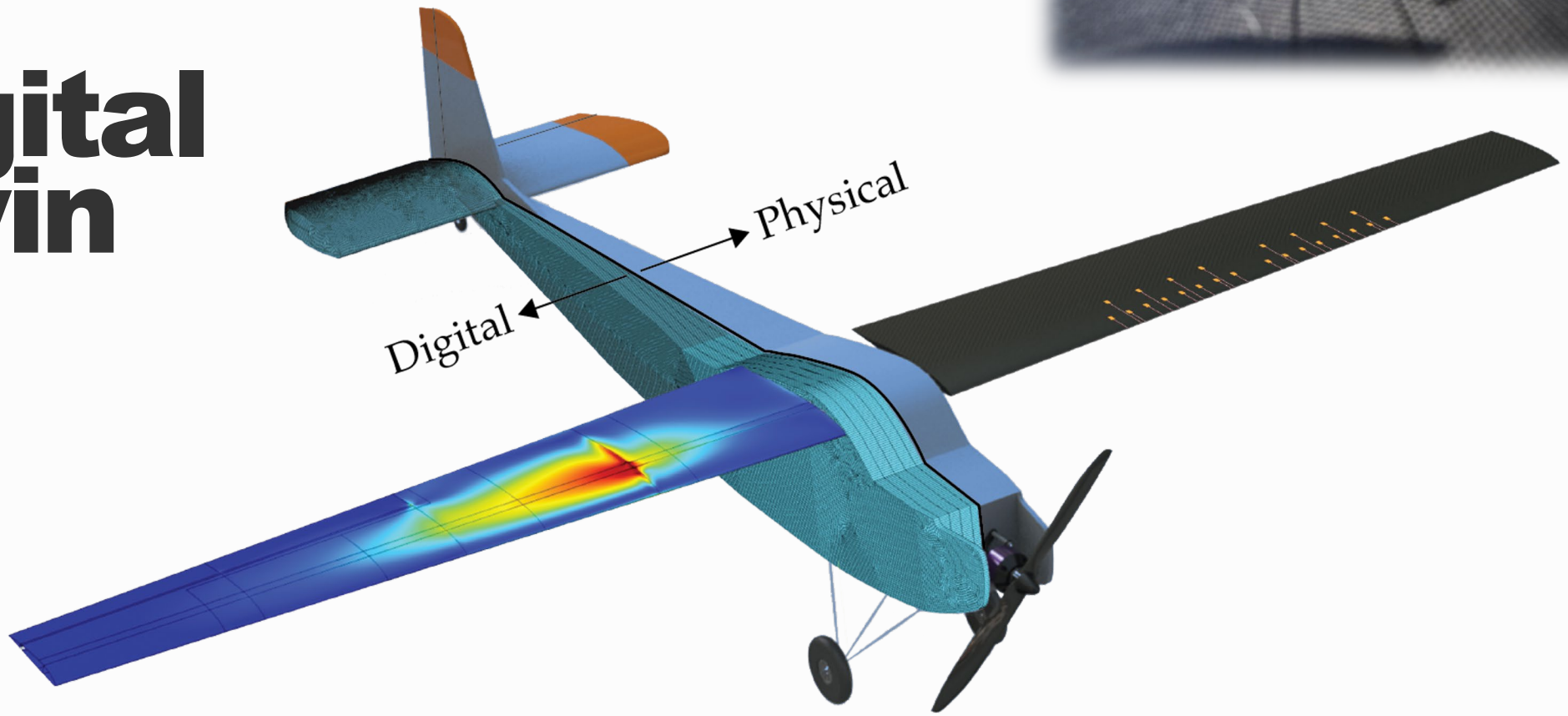

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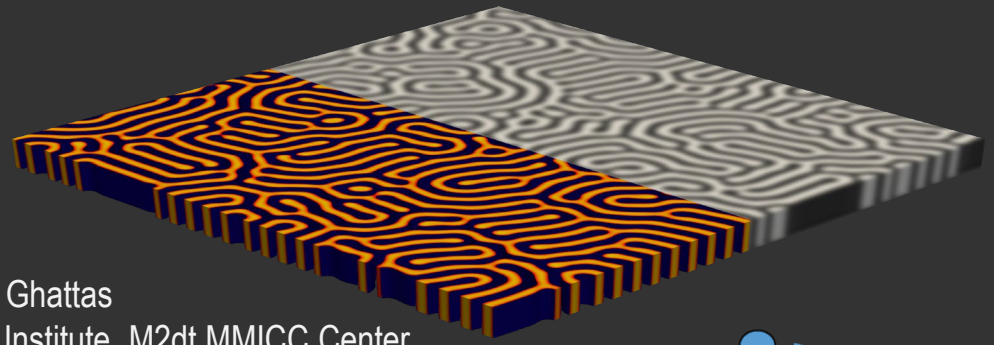
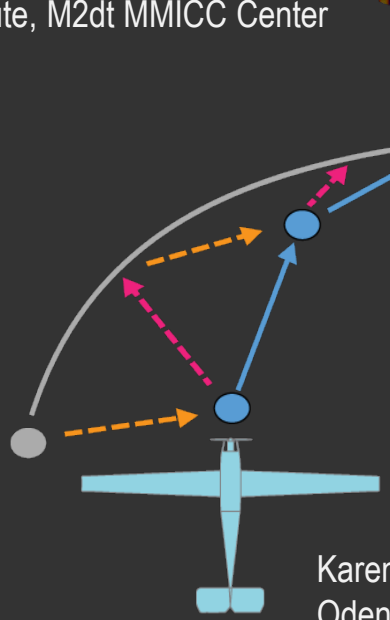
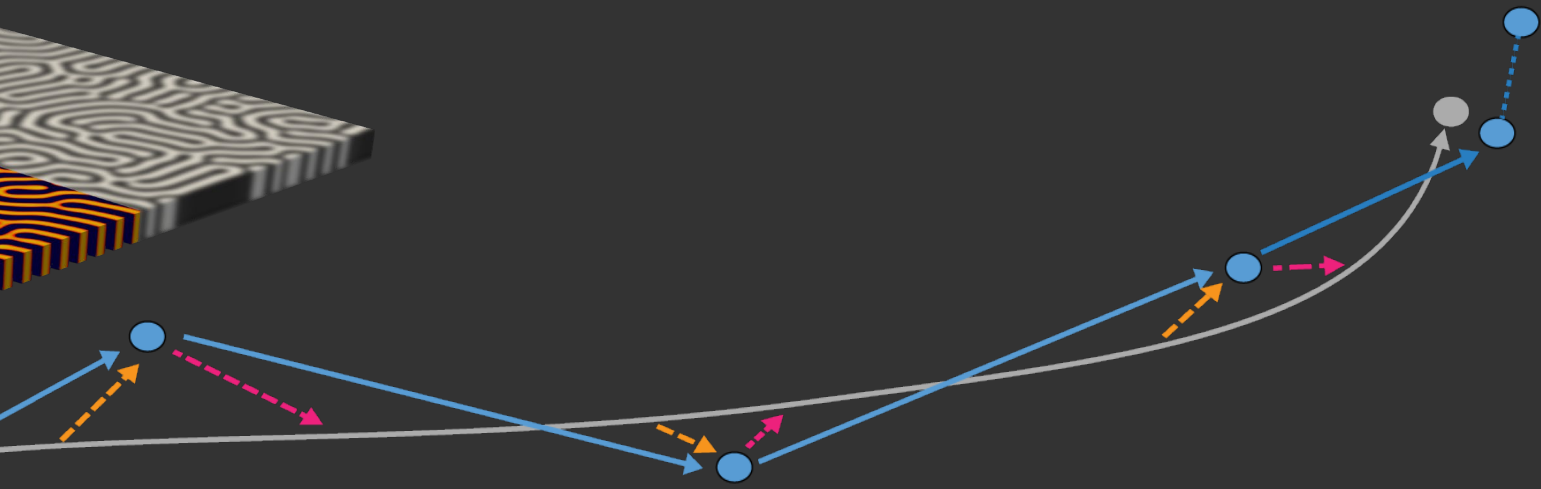
have the potential to **revolutionize decision-making** across science, technology and society.

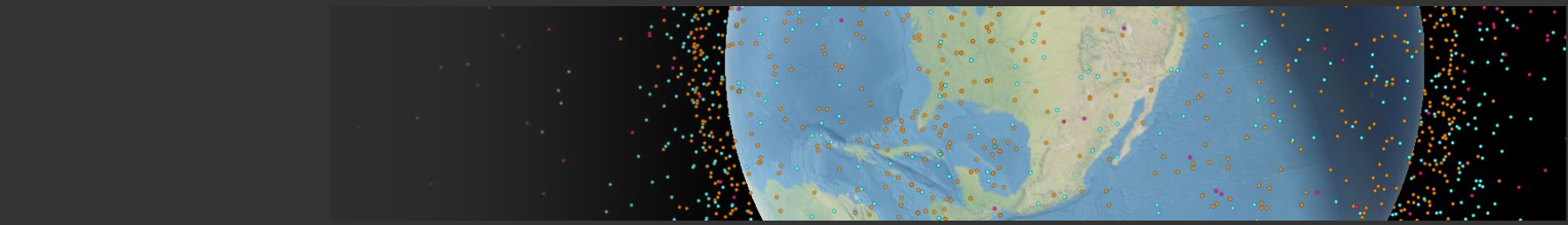


Omar Ghattas
Oden Institute, M2dt MMICC Center



Karen Willcox
Oden Institute, Center for Scientific Machine Learning





Moriba Jah
Oden Institute, Computational Astronautics
Science & Technology Group

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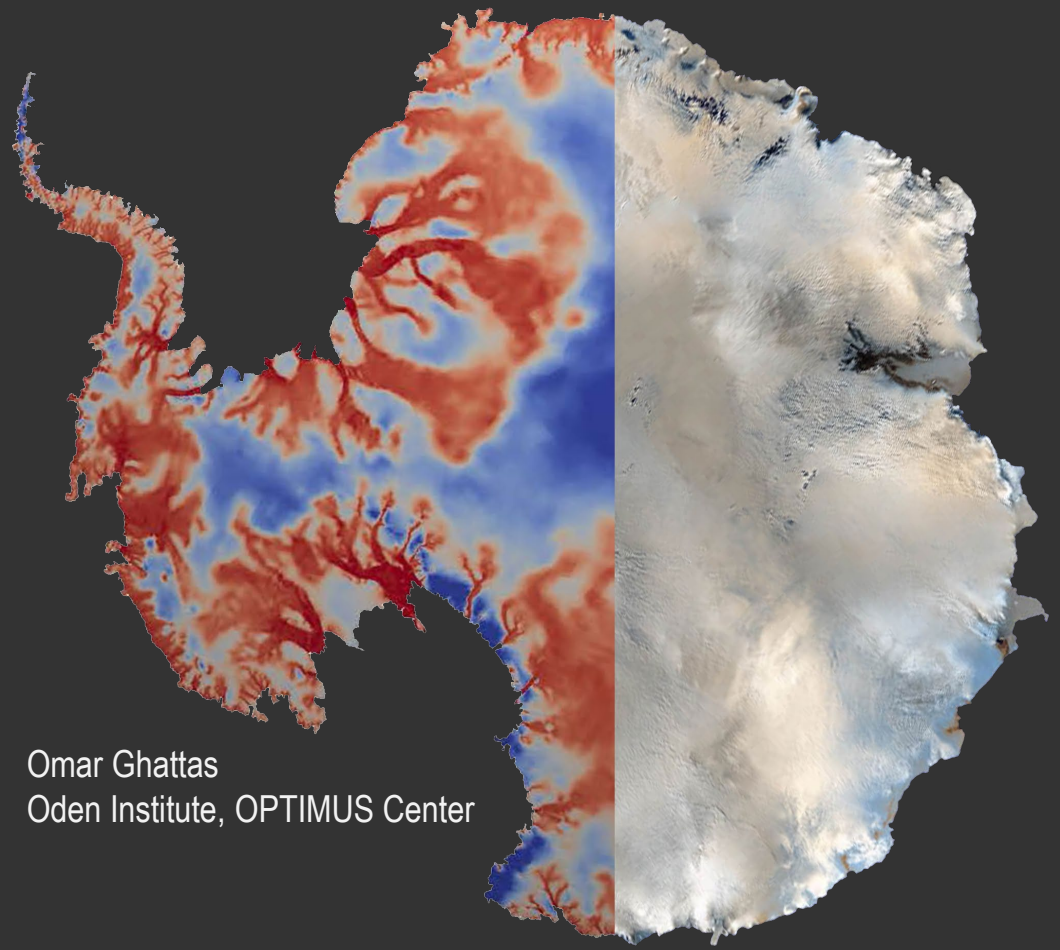
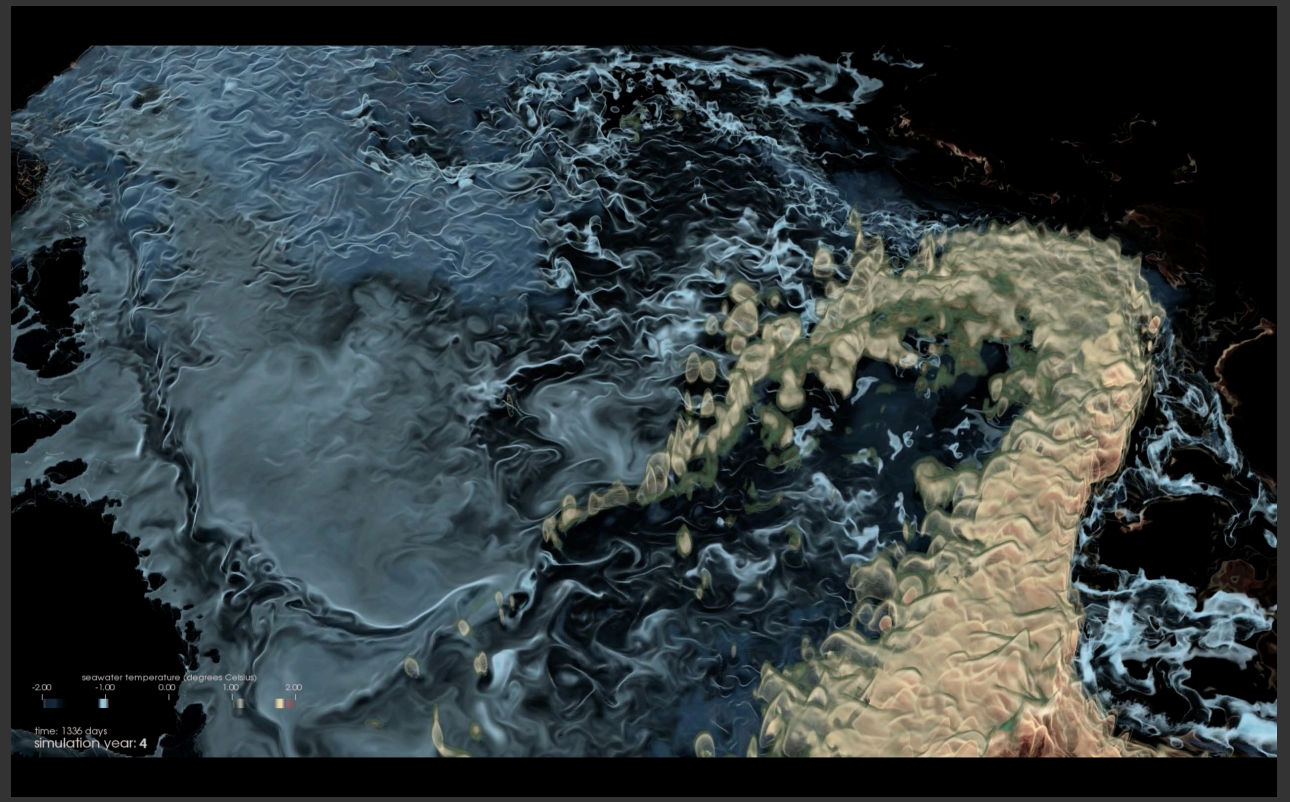


Omar Ghattas
Oden Institute, OPTIMUS Center




Patrick Heimbach
Oden Institute, Computational Research in Ice & Ocean Systems Group

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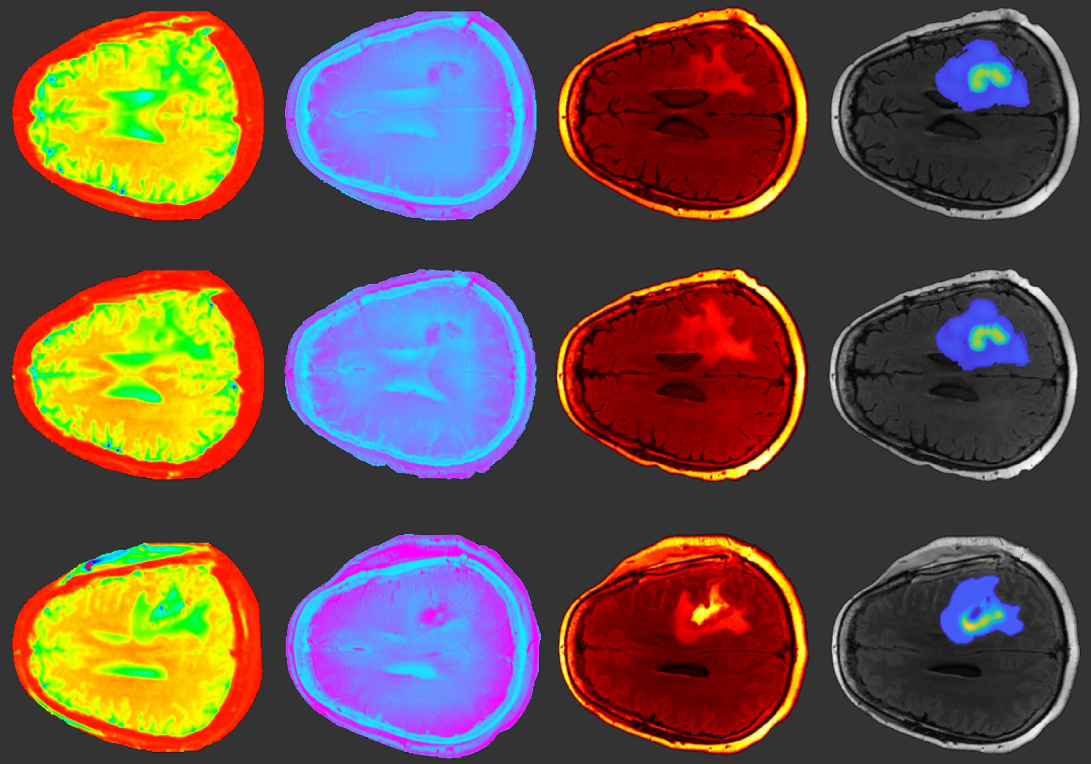
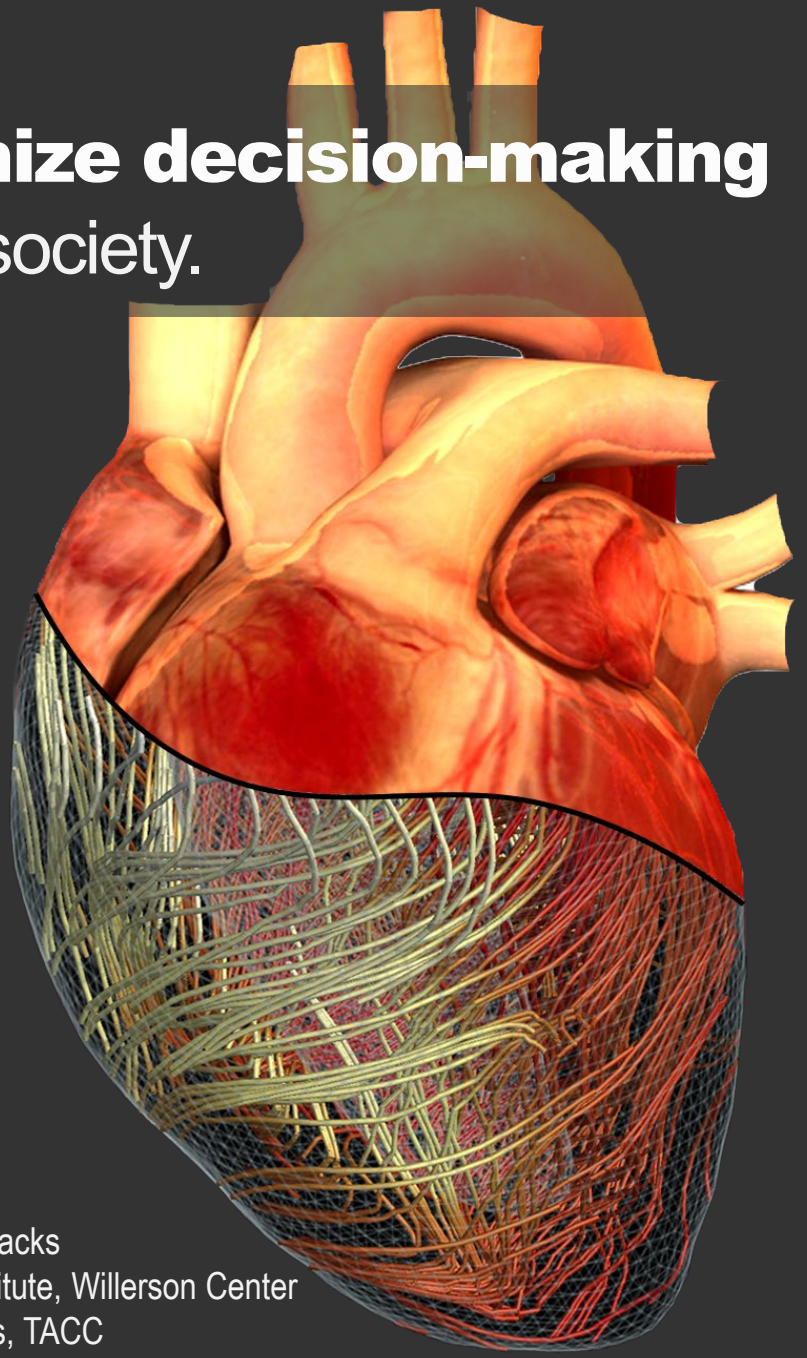


David Hormuth & Thomas Yankeelov
Oden Institute, Center for Computational Oncology



Michael Sacks
Oden Institute, Willerson Center
Greg Foss, TACC

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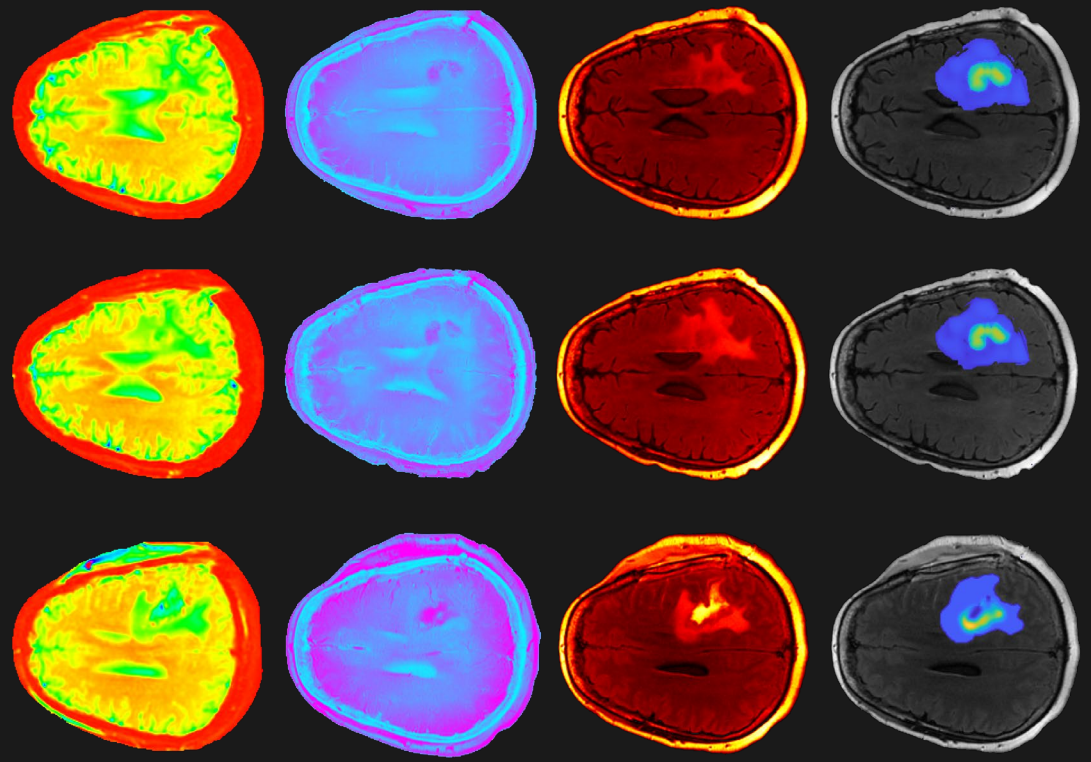
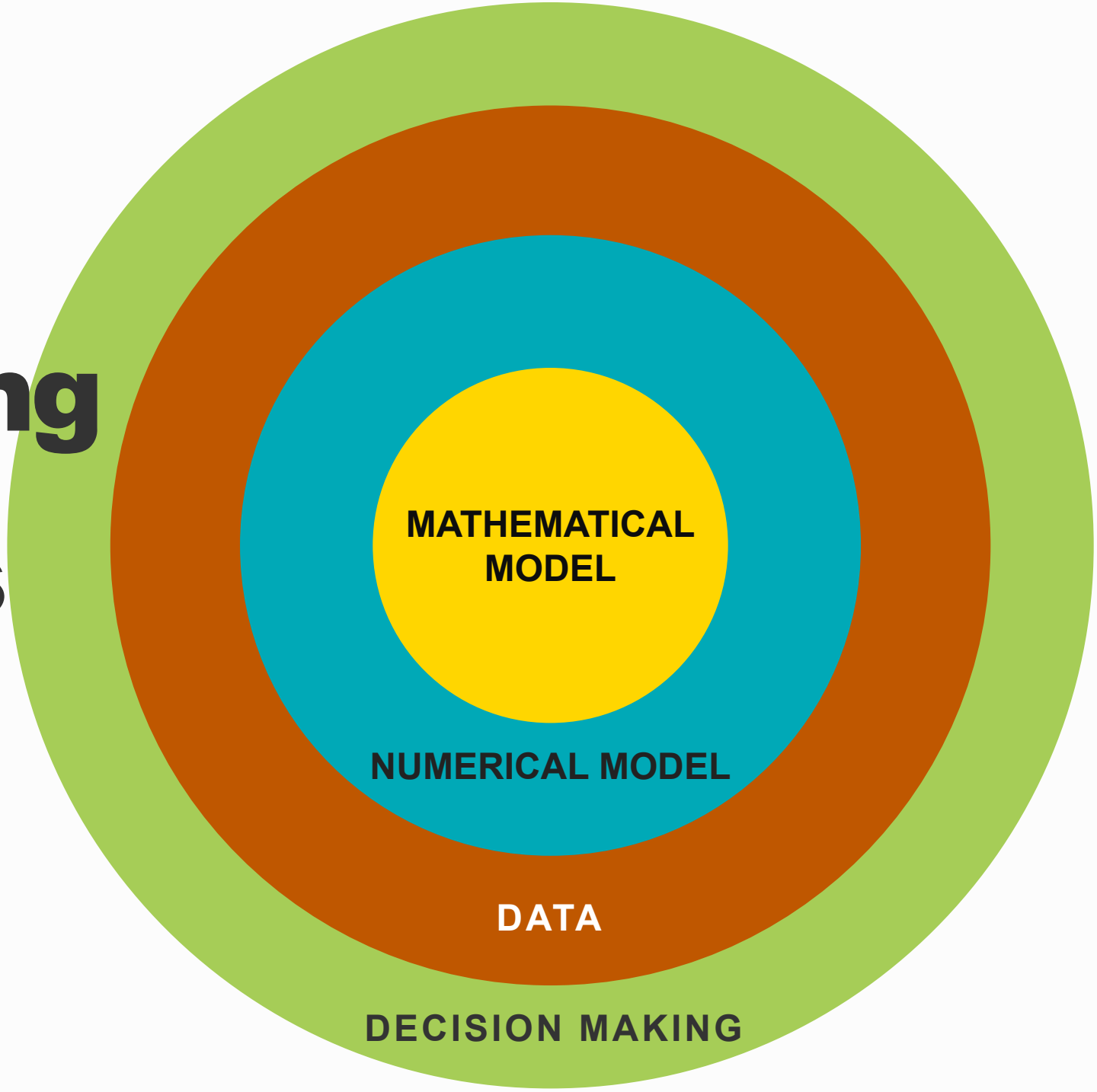


David Hormuth & Thomas Yankeelov
Oden Institute Center for Computational Oncology

# Supercomputing
# +
# Mathematics
# +
# Physics



DOMAIN KNOWLEDGE

PREDICTIVE PHYSICS-BASED MODELING & SIMULATION

UNCERTAINTY QUANTIFICATION

OPTIMIZATION & CONTROL

HIGH-PERFORMANCE COMPUTING

EDGE COMPUTING

SURROGATE MODELING

INVERSE PROBLEMS

DATA ASSIMILATION

ARTIFICIAL INTELLIGENCE

SCIENTIFIC MACHINE LEARNING

# Digital Twins

A scientific grand challenge building on next-generation **mathematical modeling** & **high-performance computing**

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advancing computational science to address society's grand challenges

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