

# Future Directions in Computing

*Frontiers of Predictive Oncology II*  
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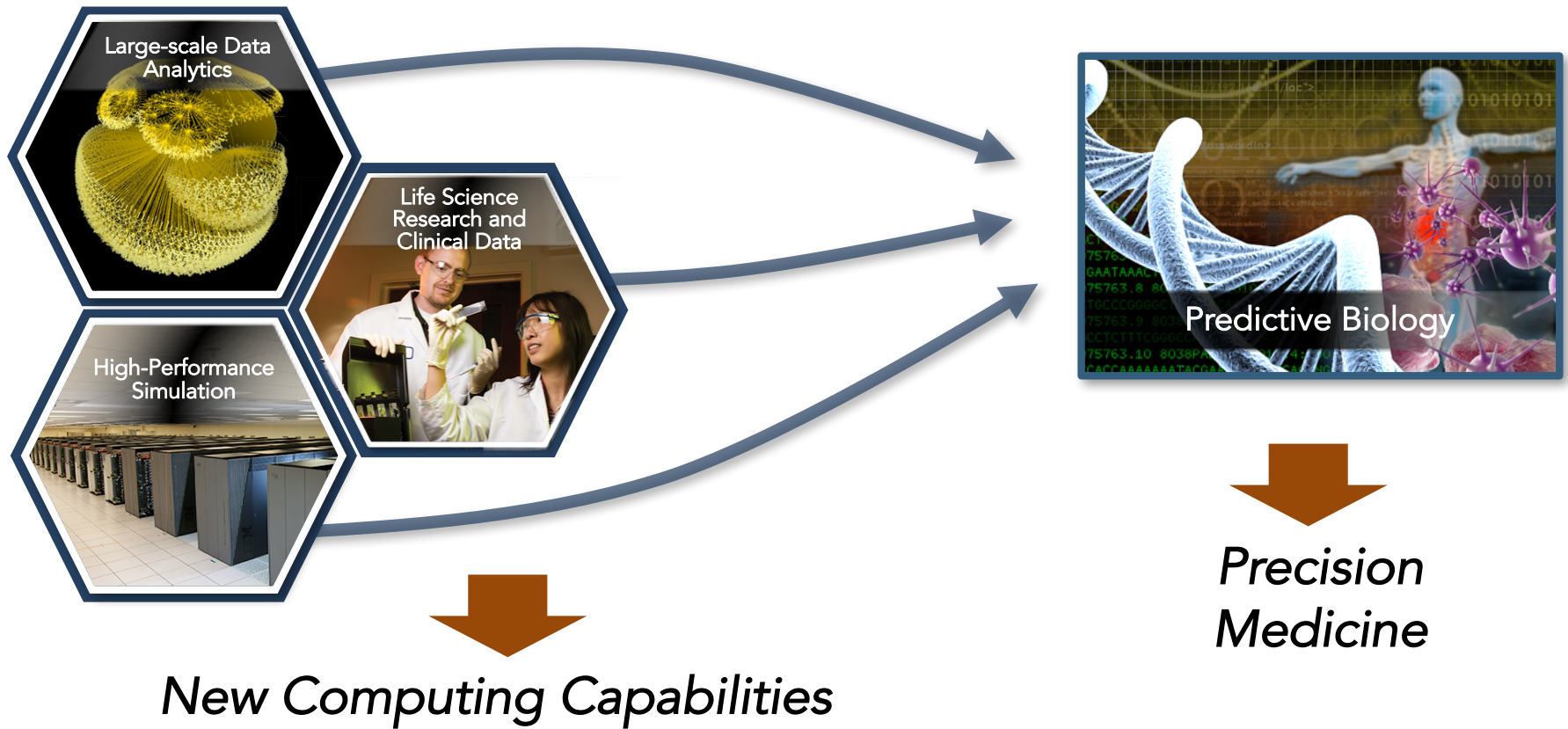


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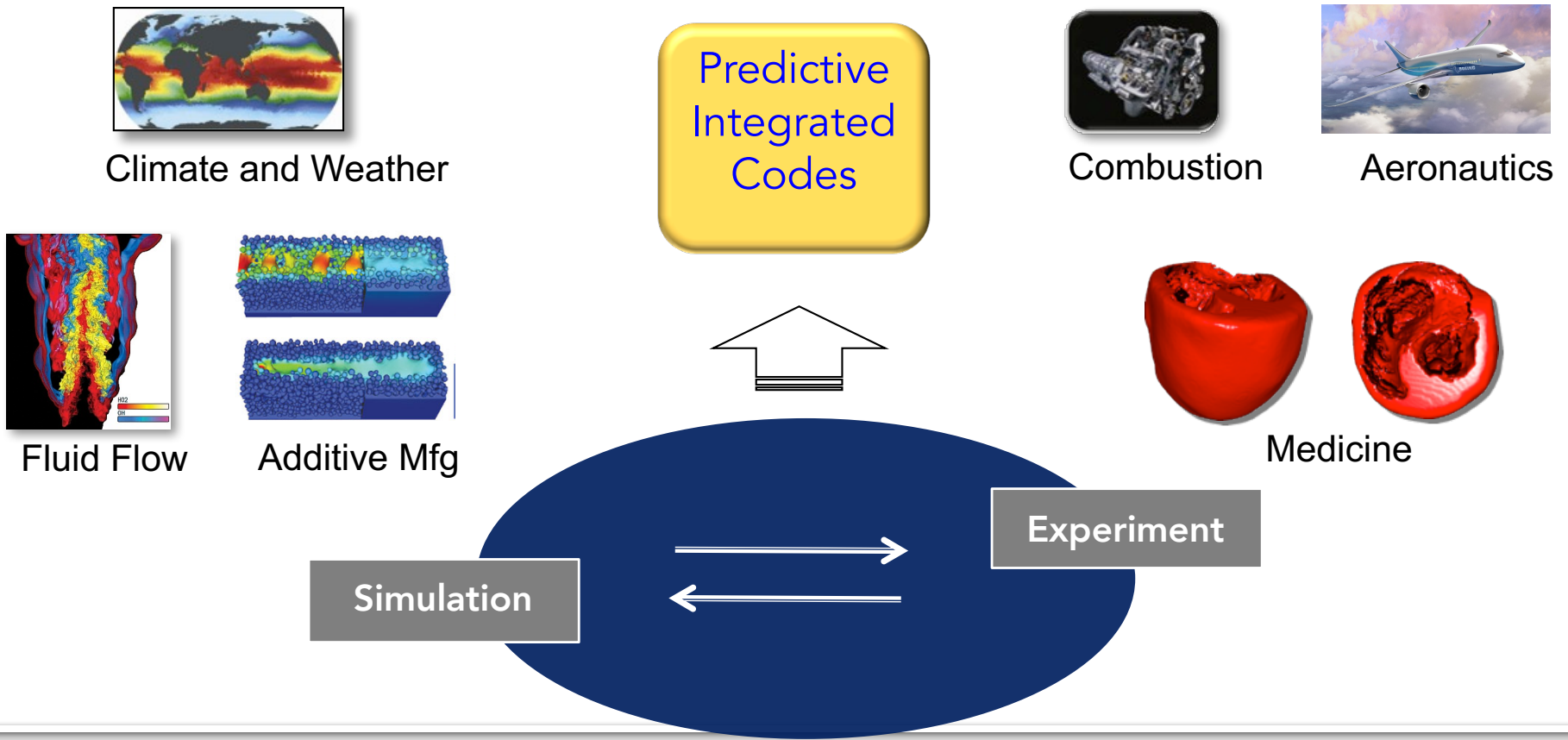
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# Computing is emerging as an important integrating element leading to predictive biology



# Partnership between computation and experiment delivers believable codes and actionable simulations



# This is a time of rapid technological change in computing

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Existing strategies for scaling are becoming unsustainable

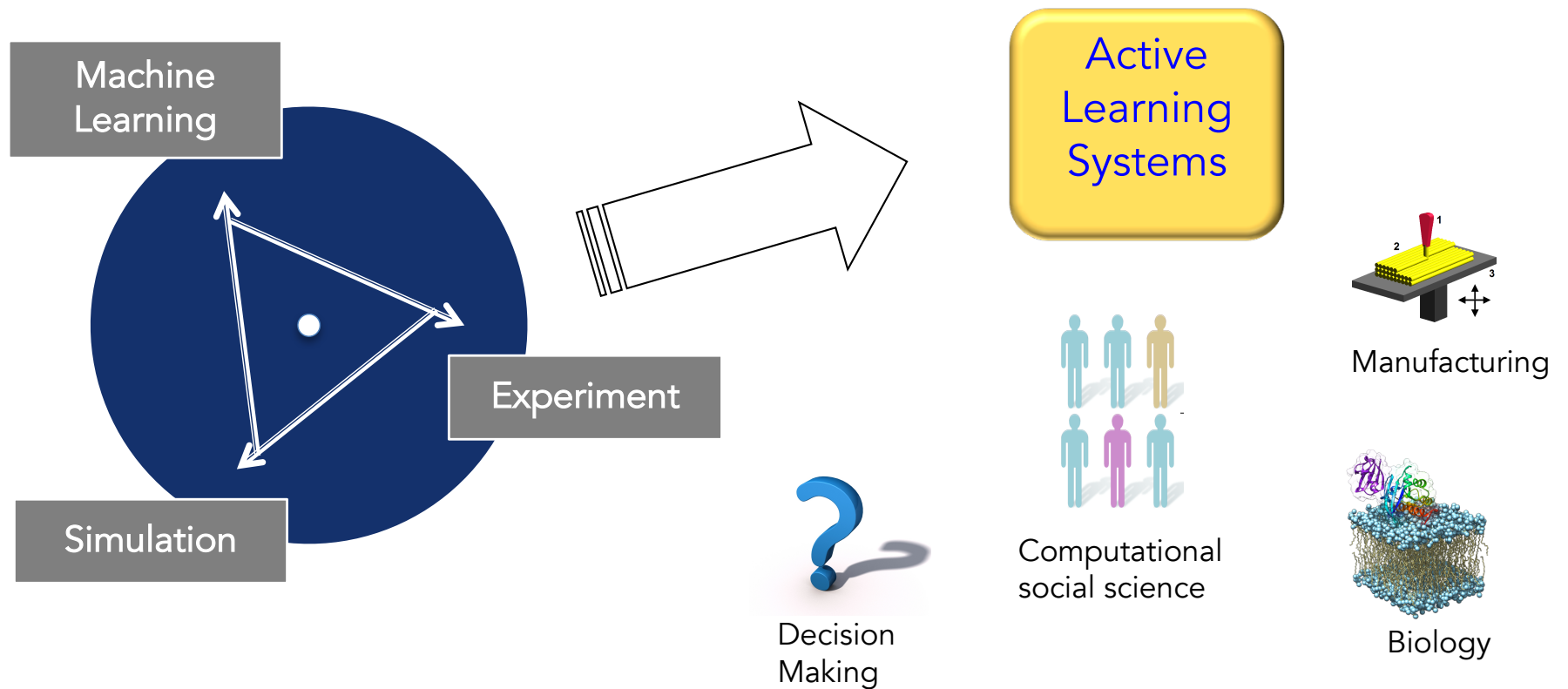
- Reaching limitations on Moore's Law scaling
- Limitations due to power requirements for data movement

Rise of data analytics applications

- Reach of machine learning is expanding
- Explosion (and availability!) of data
- It's where the money is—vendor roadmaps are focusing here

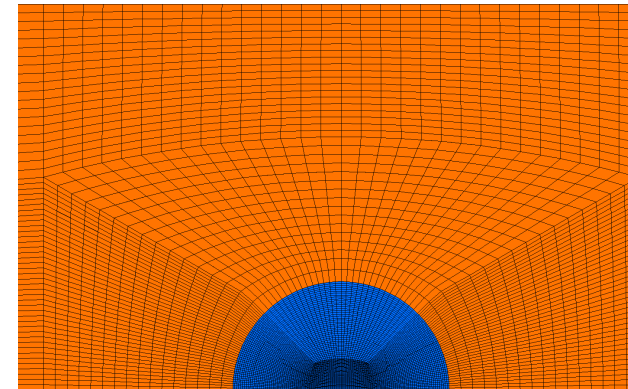
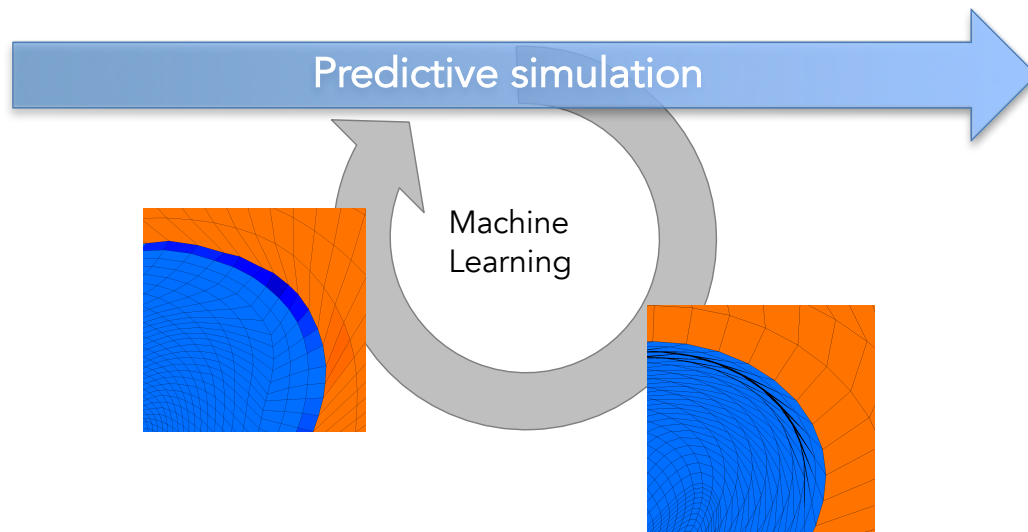
Can we leverage the data science advances that are proving to be game changers across the computing industry?

# Addition of data analytics and machine learning tools can accelerate our ability to develop insight



# Two ways we envision using machine learning techniques along with predictive simulation

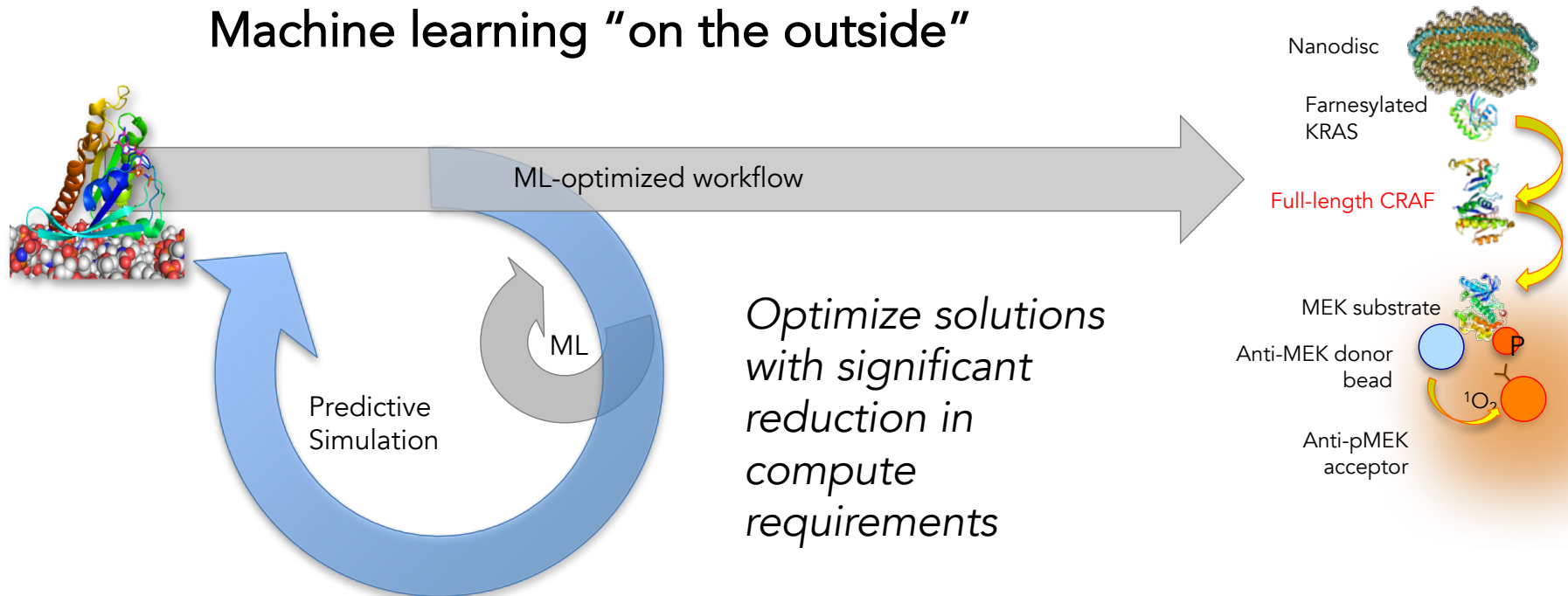
## Machine learning “on the inside”



*Machine learning to identify bottlenecks and optimize running simulations*

# Two ways we envision using machine learning techniques along with predictive simulation

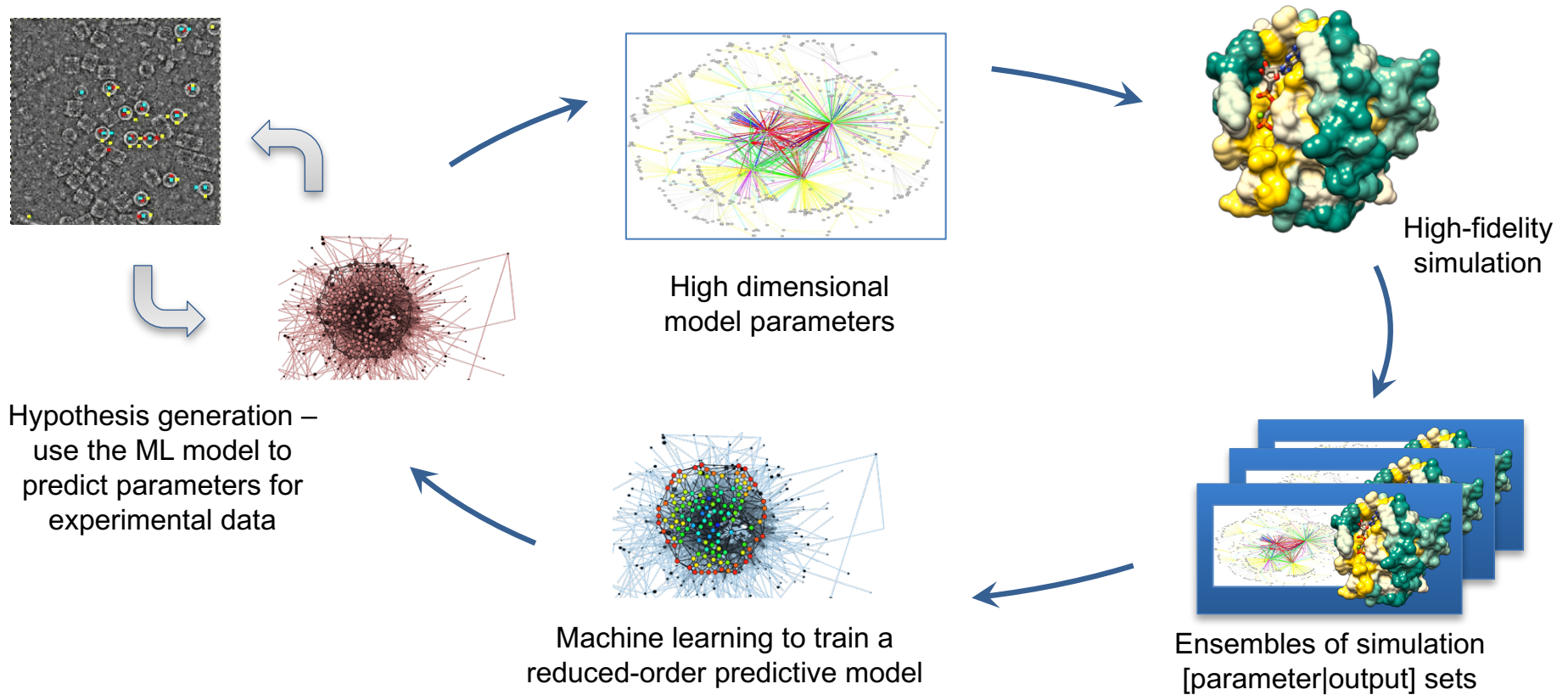
## Machine learning "on the outside"



*Optimize solutions  
with significant  
reduction in  
compute  
requirements*

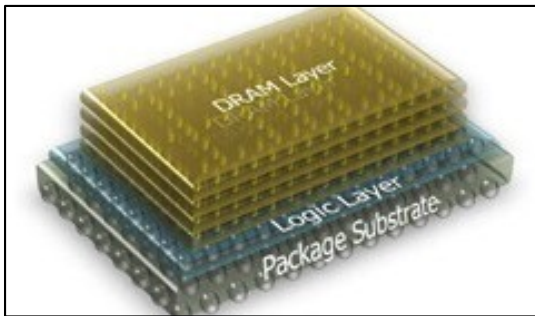
**Integrated workflows develop insight faster**

# Automated hypothesis generation and dynamic validation





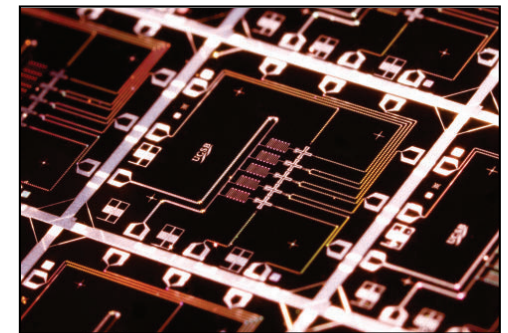
# Many new technology directions are being explored for next generation computing



New memory technologies and architectures



Neuromorphic systems and accelerators



Quantum information systems

These technologies are beginning to show up in advanced architectures, and are harbingers of the complexity that will be future computing