



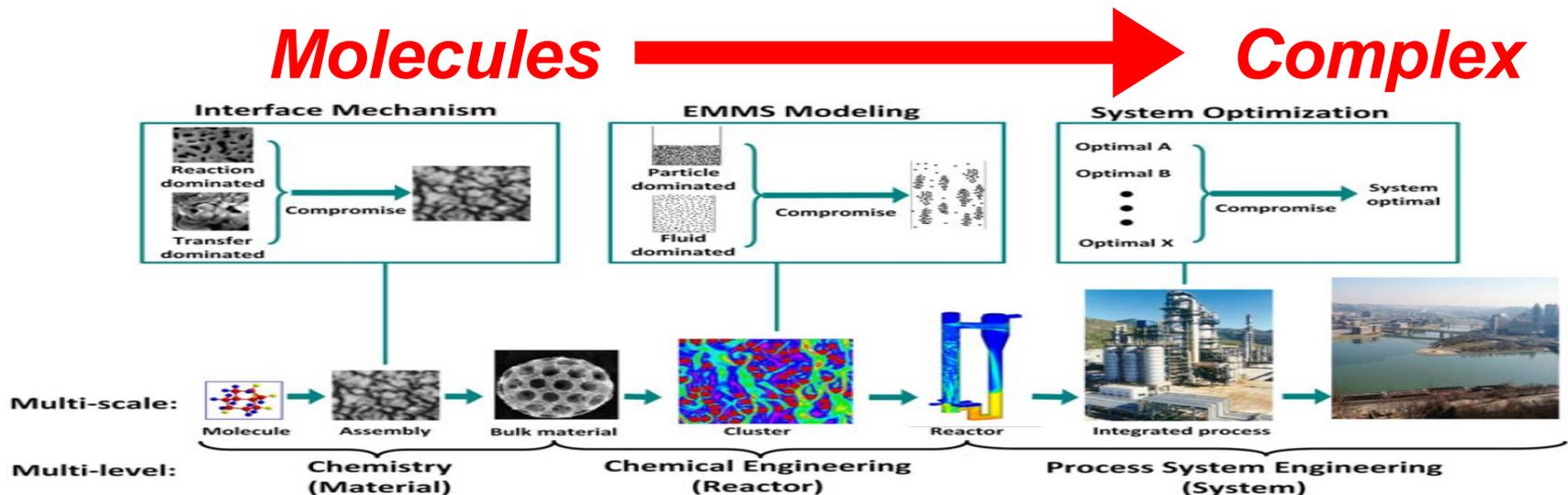
2018 Conference on the Fourth Industrial Revolution

“New and Emerging Technologies in Achieving Sustainable Development Goals”

23-24 October 2018, Hotel Bangi-Putrajaya, Putrajaya, Malaysia.

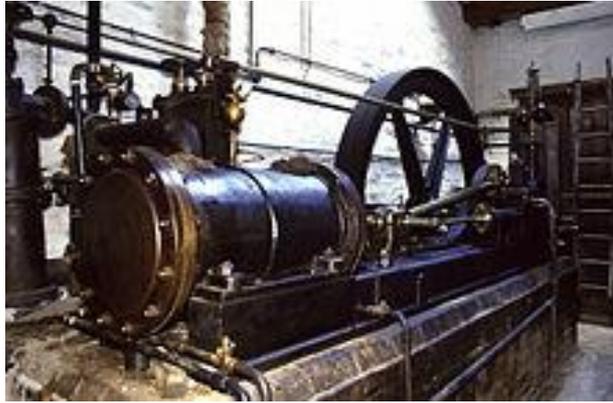
Intelligent Manufacturing in the Digital Age – Perspectives from China

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New Industrial Revolution Driven by Innovation



The 1st Industrial Revolution:
Steam engines



The 2nd Industrial Revolution:
Large scale manufacturing



The 3rd Industrial Revolution:
Industrial automation

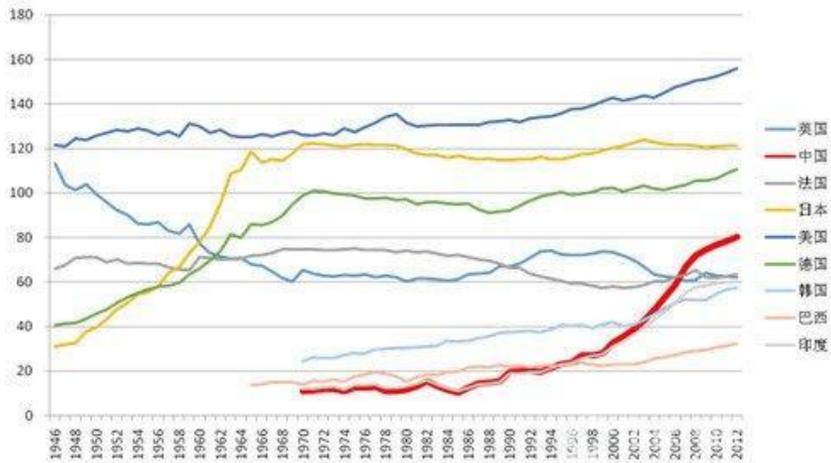


New Industrial Revolution

- Digitalisation
- informatisation
- Networking
- Intelligentisation
- **Industry 4.0**
- **China Manufacturing 2025**
- **Internet +**
- **AI+ ...**



China's "Three Step" Strategy to become a Leading Manufacturing Power by 2045



- Scale
- Structure
- Effectiveness
- Sustainability

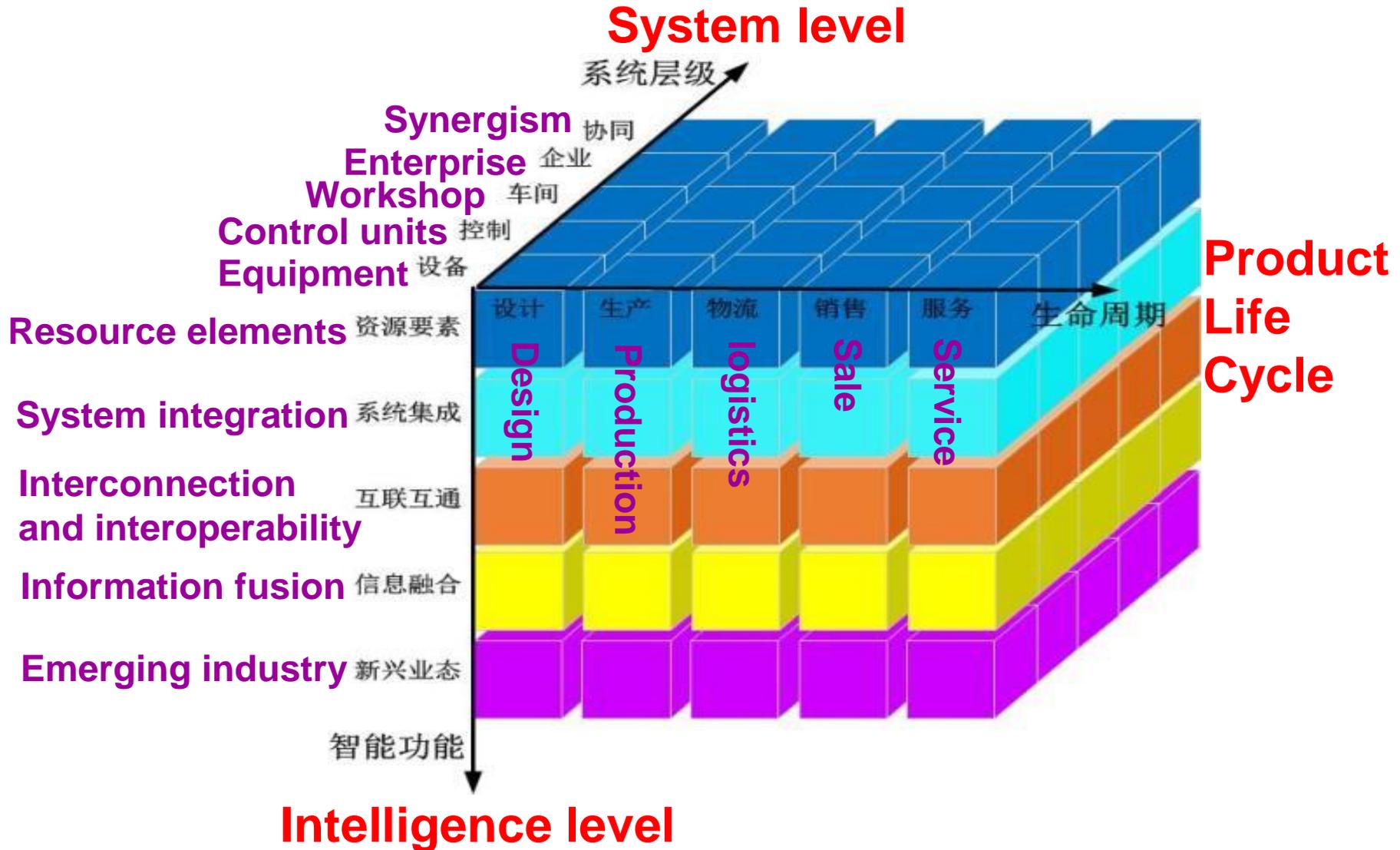
2045: to enter the first phalanx among the manufacturing power

2035: to become the front runner of the second phalanx among the manufacturing power

2025: to enter the second phalanx among the manufacturing power



A System Architecture of Intelligent Manufacturing





An Integrated Cyber Physical System for Intelligent Manufacturing



Physical Platform
Analytical and Measurement to reveal systems dynamics at various time and length scales, Distributed Manufacturing Systems



FULLY INTEGRATED Cloud HPC + AI PLATFORM

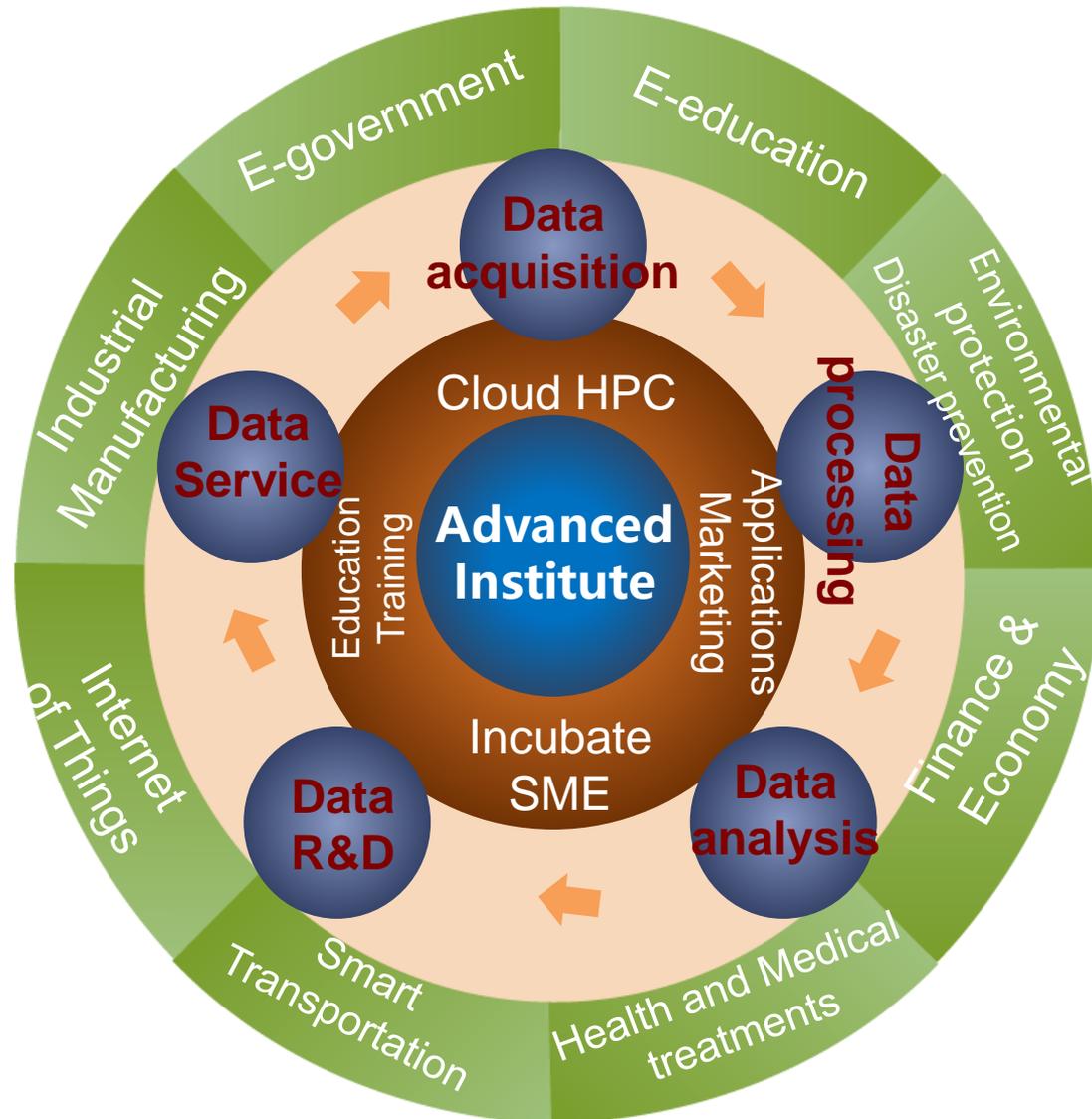
Simulation Platform
Modularized simulation tools for multiple scale modelling of complex systems with molecular, mesoscopic and continuum dynamics



Big Data + AI Platform
Data and text mining, Machine Learning, seamless data flow of various types between physical and simulation platform and big data analytics tools



An Integrated Ecosystem for Research and Innovation





AI and Robotic Technology

1. Fundamental theory and key technology of artificial intelligence

- cognitive intelligence
- swarm intelligence
- Man-machine hybrid intelligence

2. Real time wireless communication and self organizing network technology

- Swarm real-time communication technology
- Self organizing network technology

3. Applications of intelligent unmanned system

- Cross domain collaboration of swarm unmanned system
- Intelligent unmanned agricultural machinery equipment
- Cooperative work of intelligent robots

Development of Operating System and Cooperative Work of Heterogeneous Swarm Robots





HPC Simulation of Complex Process

1. High precision numerical simulation platform

- High order numerical method
- Computational mechanics (HopeFOAM)

2. Intelligent optimization and design method for digital manufacturing

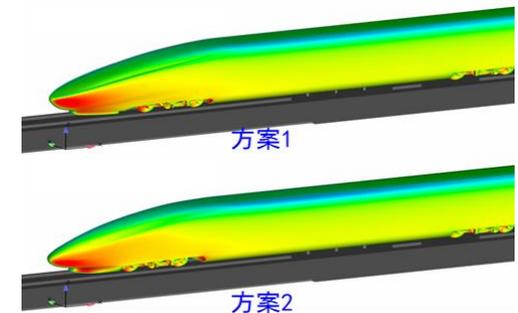
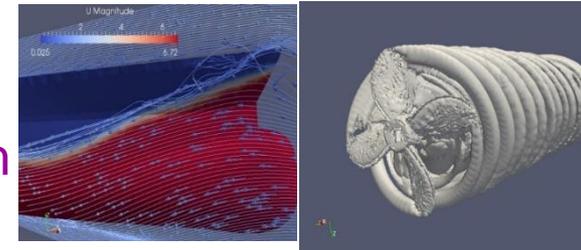
- Integration of design process
- Automation of simulation process
- Intelligent analysis and decision making

3. Highly efficient parallel computing method for batch operation

- Batch job management and scheduling technology
- Efficient solution methods for solving large linear systems
- Large-scale parallel and optimization techniques for complex process simulation

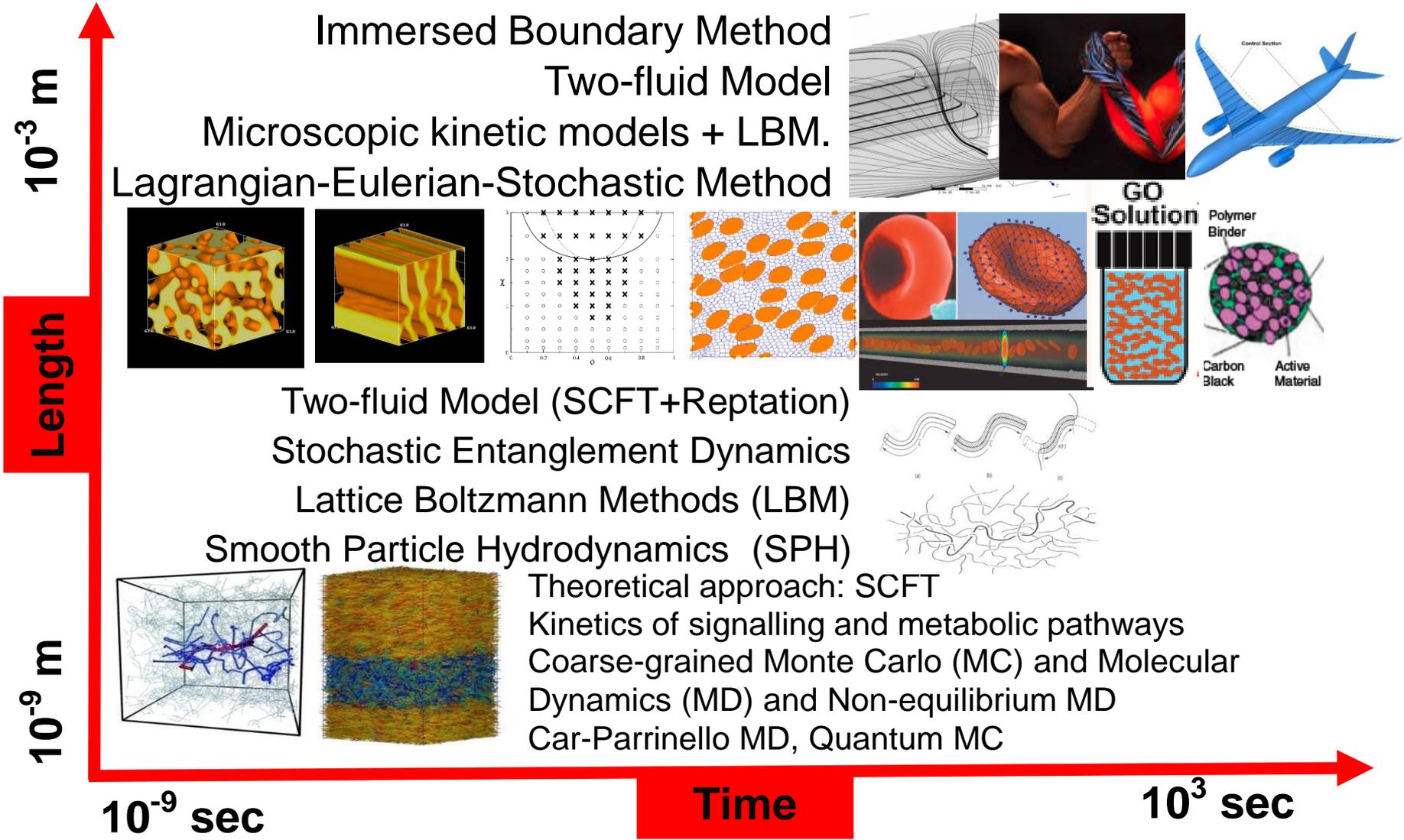
4. Applications of complex process simulation

Simulation of digital control and machining





An Integrated Multiple Scale Simulation Platform





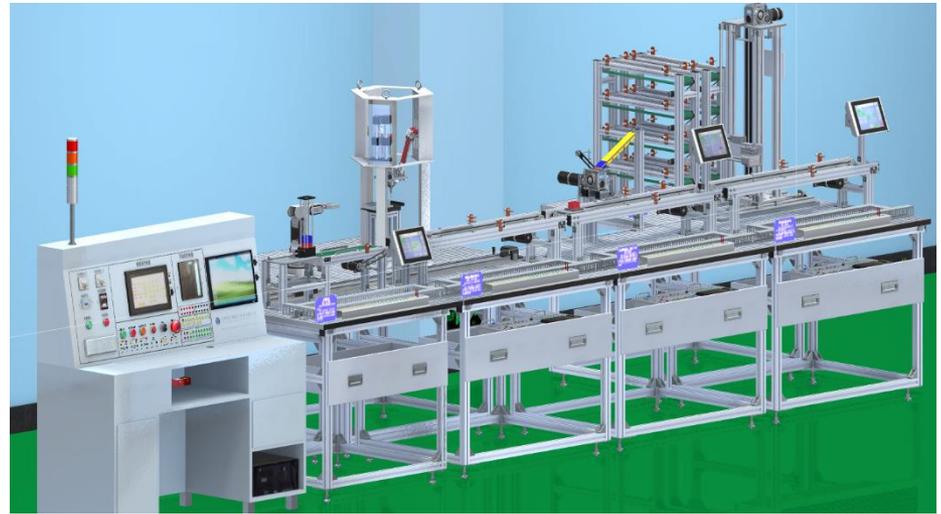
R³ (VR•AR•ER) Technology

- Data processing before and after visualization
- Visualization analysis of real time data
- Interactive real-time design

Virtual digital factory



Virtual intelligent system for mechanical manufacturing

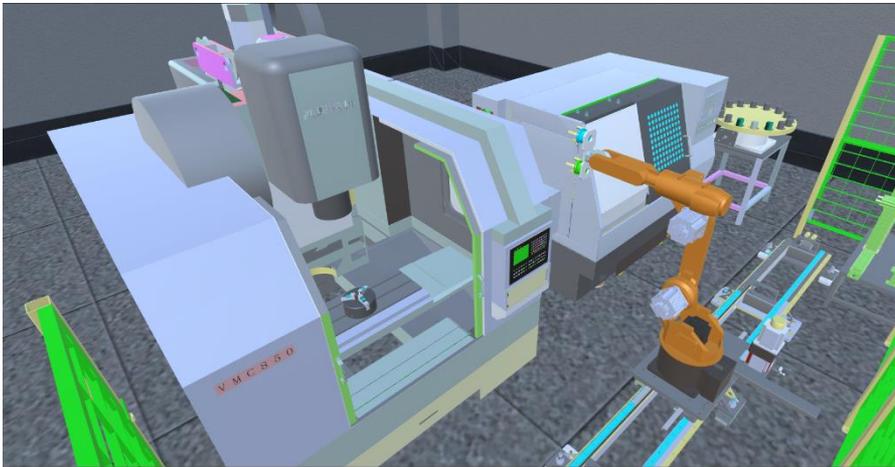




Industrial IoTs Technology

1. System design of industrial big data
2. Big data management and application
3. Correlation control of intelligent manufacturing process
4. Industrial Applications

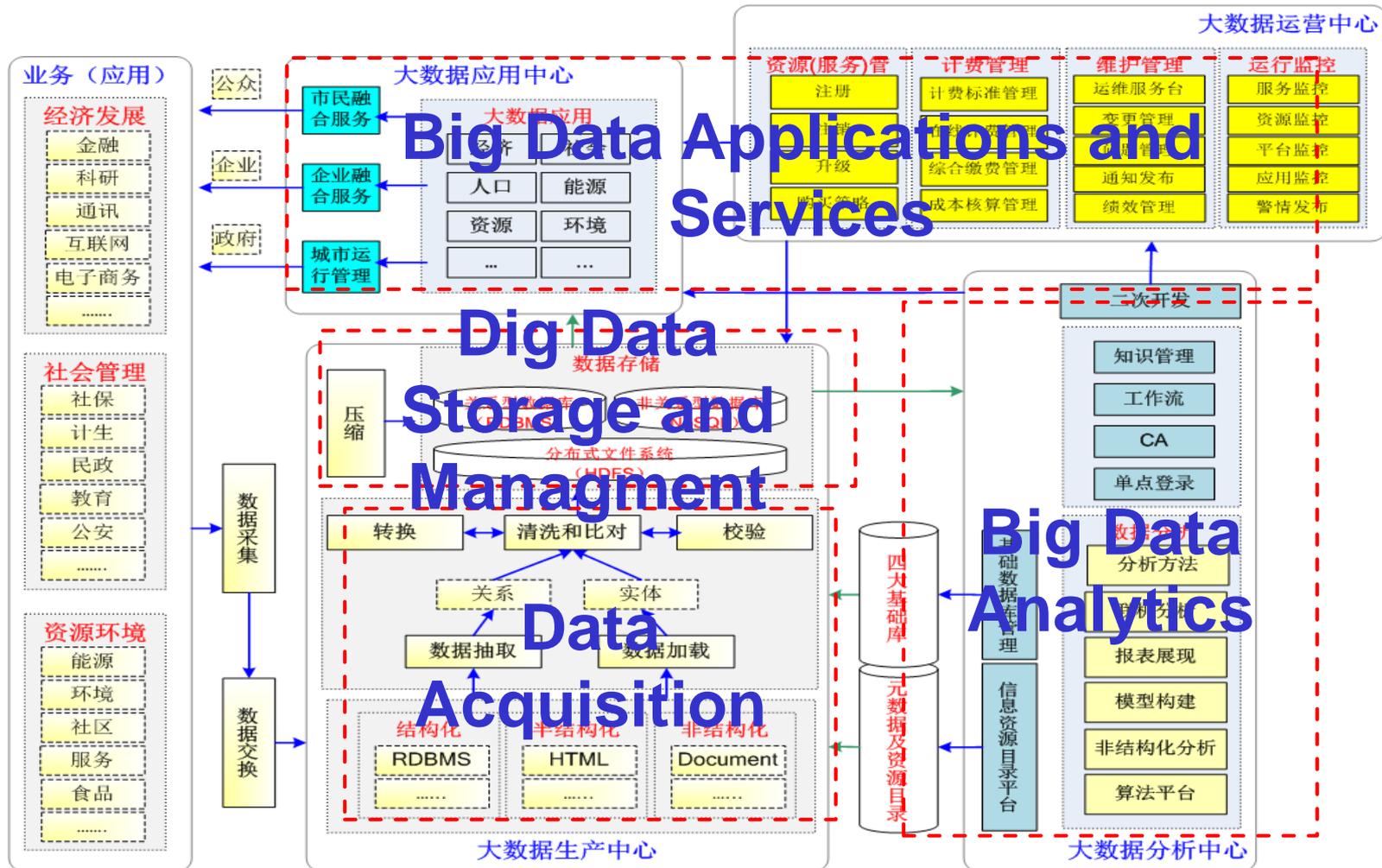
Data driven manufacturing system combined with virtual reality





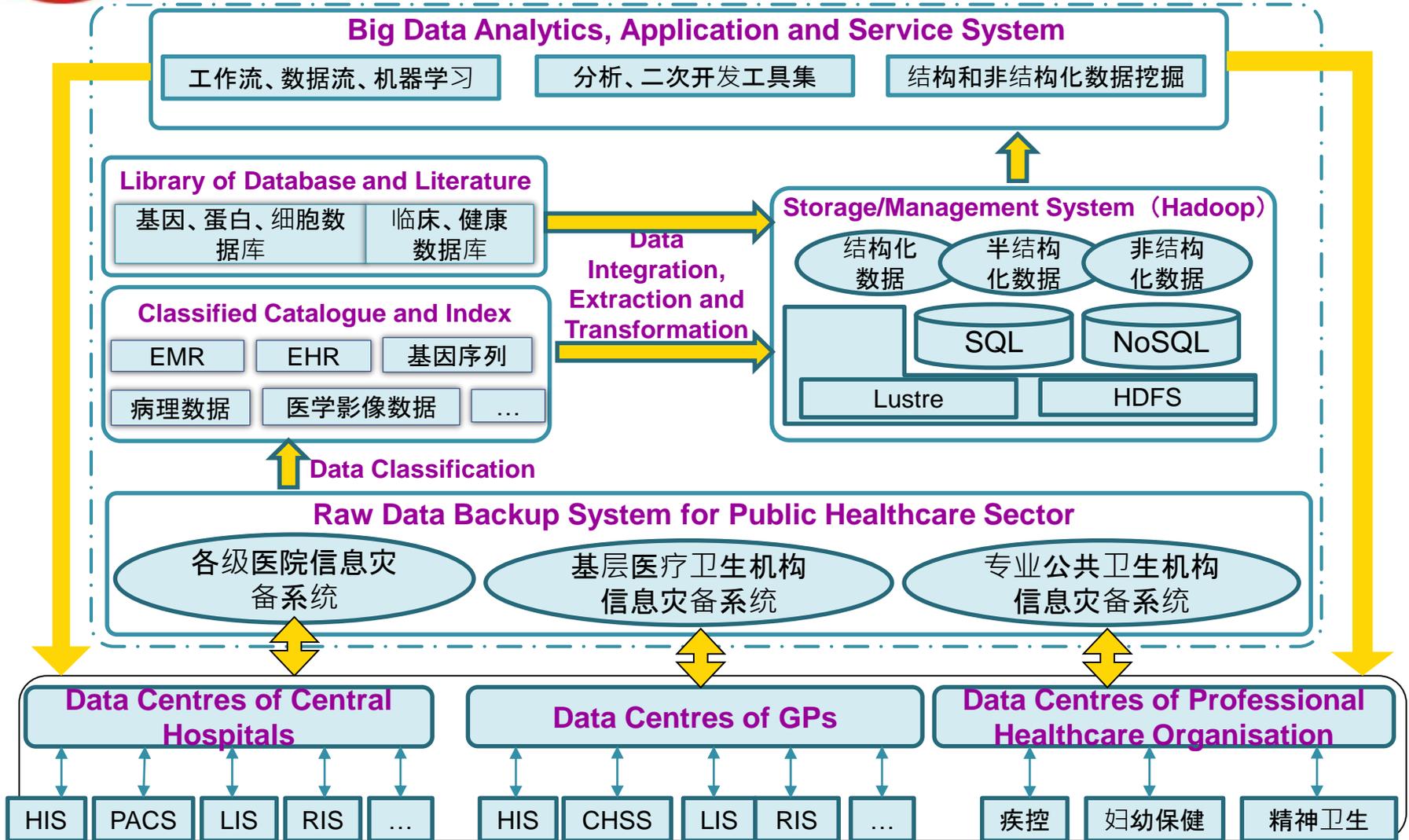
Reliability Design and Intelligent Detection and Diagnosis of Complex Equipment

- Embedded detection and diagnosis technology
- Big data driven analysis method for complex systems



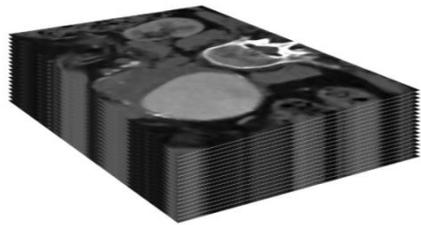


Systems Biology and Biomedical Engineering

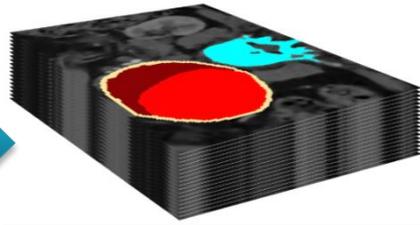




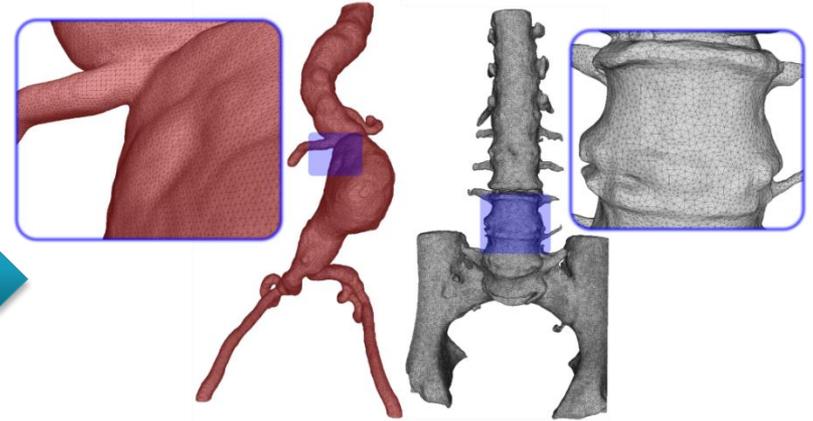
WORKFLOW on Digitalisation of Living System



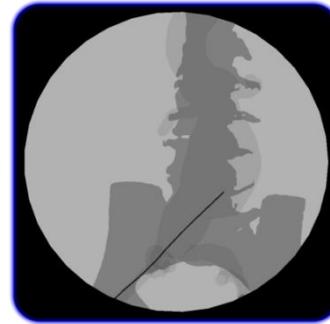
Medical Images



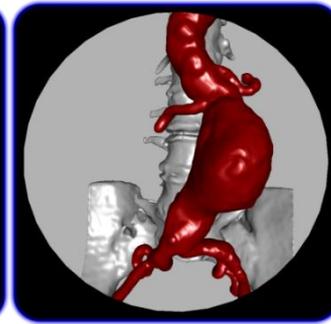
Segmentation



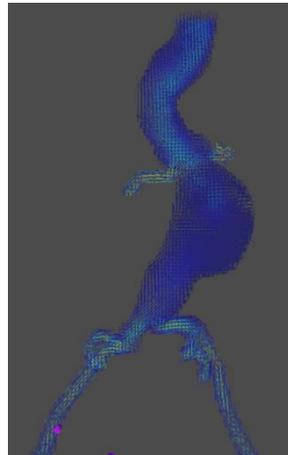
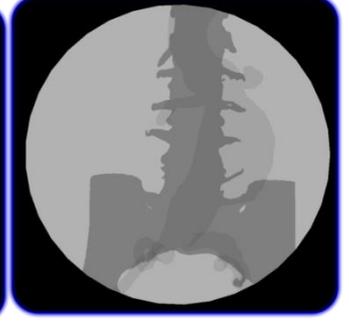
Digital reconstruction



Human-Machine Interaction



Rendering

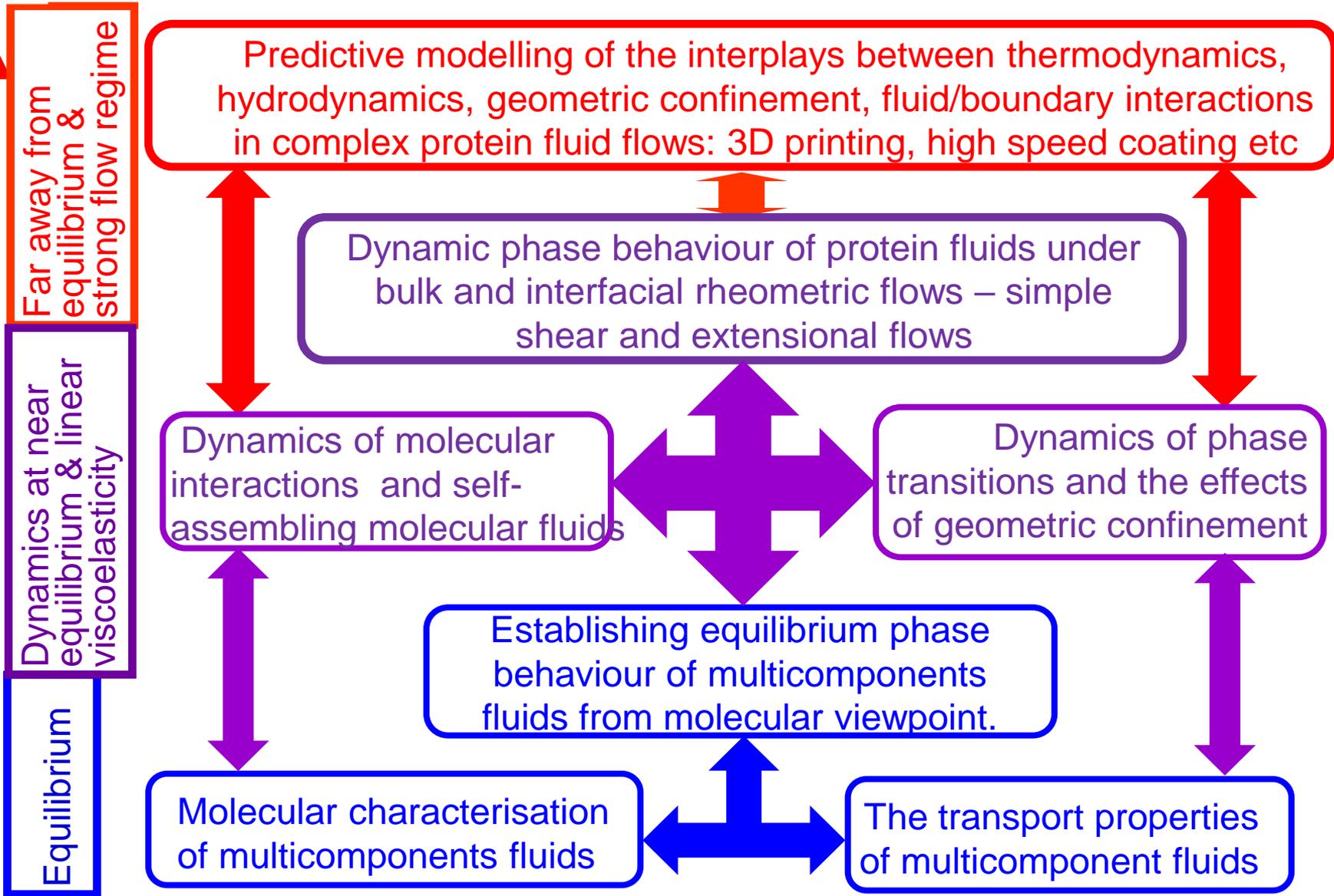


- 114,688 CPU cores
- 141,900,569 mesh nodes
- Human-Machine Interaction System



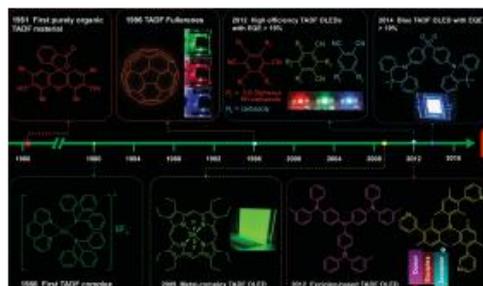
Systems Rheology– Quality by Design

Scaling up Length and Time Scales

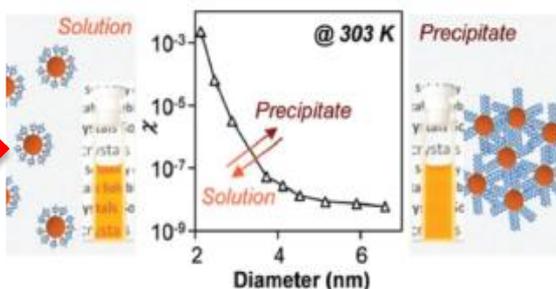




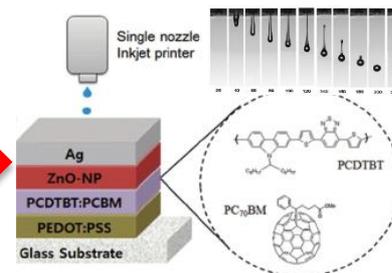
Intelligent Manufacturing of Advanced Materials and Electronic Devices



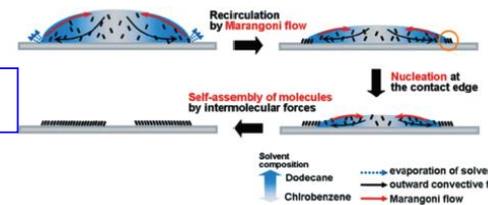
Molecular Design and Synthesis of OLED & QLED



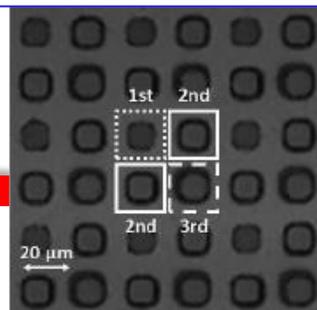
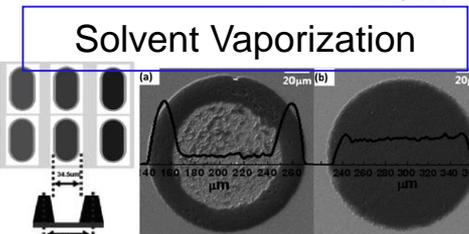
Formulation Design and Preparation of OLED & QLED based E-ink



3D Printing of Multiple Layers E-ink



Printing next layer after E-ink setting

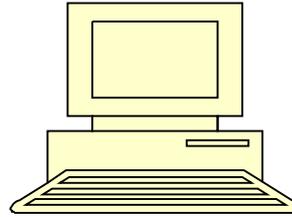
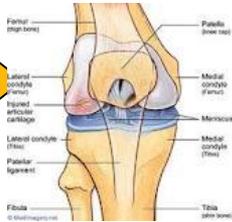




3D Printing Biomaterials for Regenerative Medicine



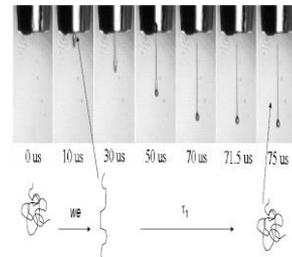
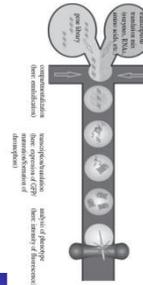
3-D Information from X-ray or MRI or CT



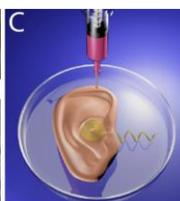
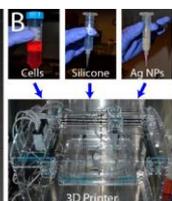
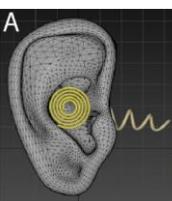
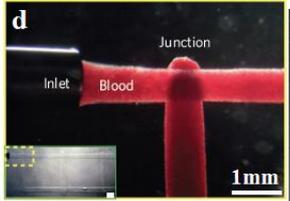
Computer Aid Design (CAD)

Biomaterials & Stem Cells from Patients
Growth factors - Biofluids
Formulation Design
Rheology & Process Control

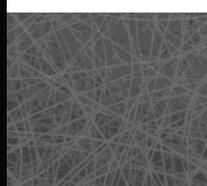
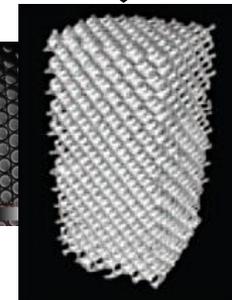
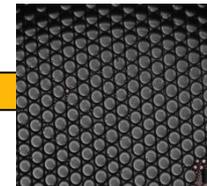
New Tissue



Implantation

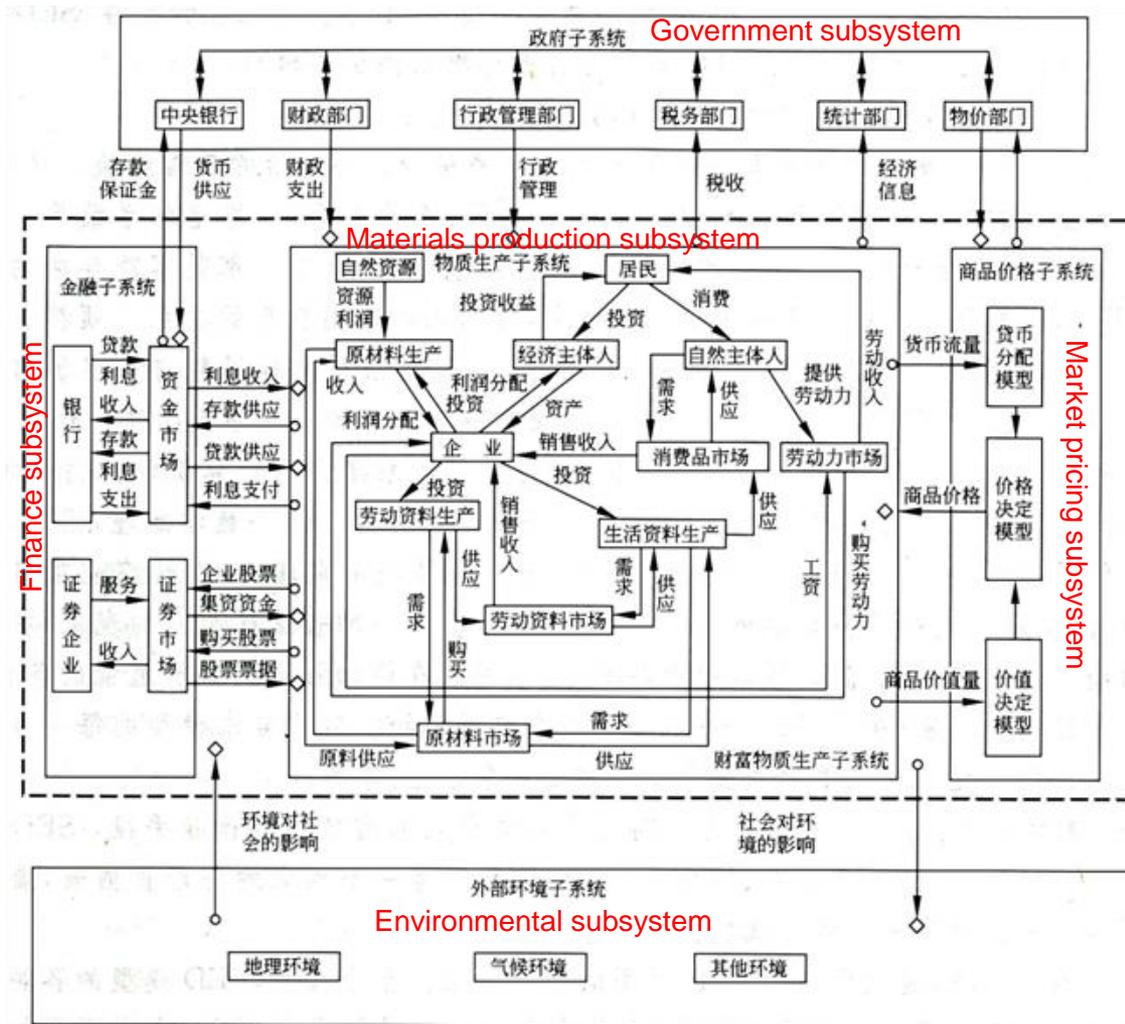


Cell Culture





Systems Model for Simulation of Social Economy Dynamics





Bridging the Gaps between Interdisciplinary Research and Industrial Sectors along “One Belt and One Road”

