CPS: Small: Imposing Recovery Period for Battery Health Monitoring, Prognosis, and Optimization
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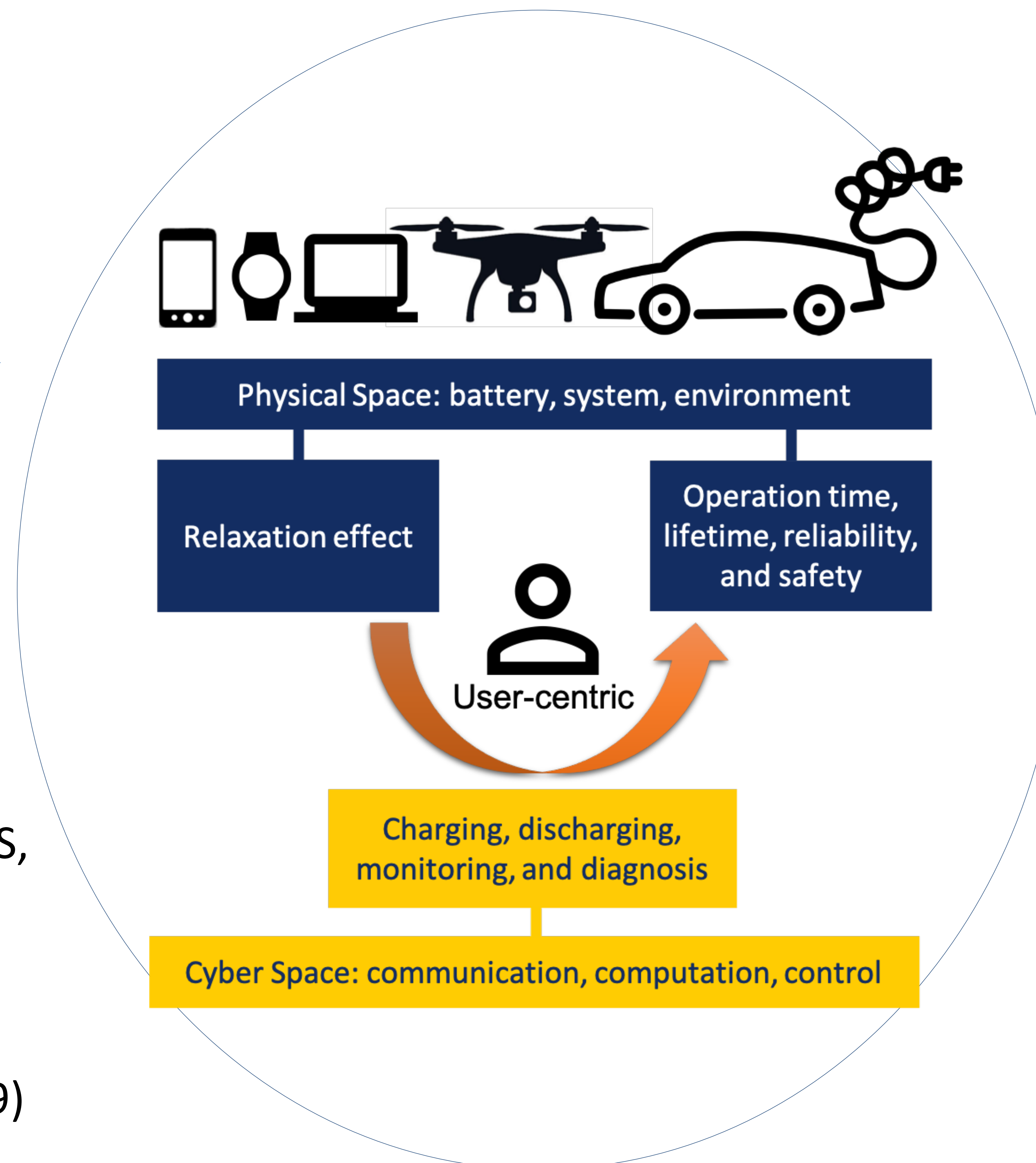
Challenge:

Battery health degrades over time, causing system reliability and safety problems

Solution:

R-Aware: a relaxation-assisted battery health management system

- Battery charging (MobiSys'17, '20; patent pending)
- Battery discharging (TMC, TCPS, TOSN, TPDS)
- Battery monitoring (ICCPS'17, '19; patent pending)
- Battery prognosis (e-Energy'19)

Physical Space: battery, system, environment

Relaxation effect

Operation time, lifetime, reliability, and safety

User-centric

Charging, discharging, monitoring, and diagnosis

Cyber Space: communication, computation, control

Scientific Impact:

- A thorough understanding of battery's relaxation effect
- Demonstrating a research methodology of combining the physical modeling with (cyber) data-driven analysis

Broader Impact:

- Economical: Increased OEM competitiveness
- Social: Safe/reliable battery systems for end users
- Environmental: wider deployment of battery systems and thus reduced fossil-fuel consumption
- Presented at academic institutions and conferences; integrated at senior/graduate level courses; graduated 1 PhD and 1 MS students