Collaborative Research: CPS: Mutualistic Cyber-Physical Interaction for Self-Adaptive Multi-Damage Monitoring of Civil Infrastructure

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Mutualistic CPS

- Improve the ability of CPS to predict, reconfigure, and adapt

Challenge:

- Generalizable and knowledge-consistent predictive analytics
- Optimization and adaptive control for reconfigurable sensing
- Efficient and effective information extraction

Solution:

Damage Prognostics (Cyber) sing Predict onset and propagation of multiple damages Se Damage: Cracking (D1) Damage: Spalling (D2) configurable Onset timing: T1 Onset timing: T2 ction: Quantity: 2' x 3' x 0.1' Quantity: 1' x 5' x 0.6' Location: Deck, Span 2 Location: Pier 2 (60.2 ft along optic fiber) (158.7 ft along optic fiber) 1: Inform reconfigurable sensing about Physical when to reconfigure for what damages mpr Reconfigure sensor to optimal for stics Reconfigure sensor to optimal for D1 @T1 D2 @T2 Bridge with a rogno distributed fiber optic Q sensor age **Reconfigure a sensor to monitor each of predicted damages** Dam **Reconfigurable Sensing (Physical) Broader Impact:**

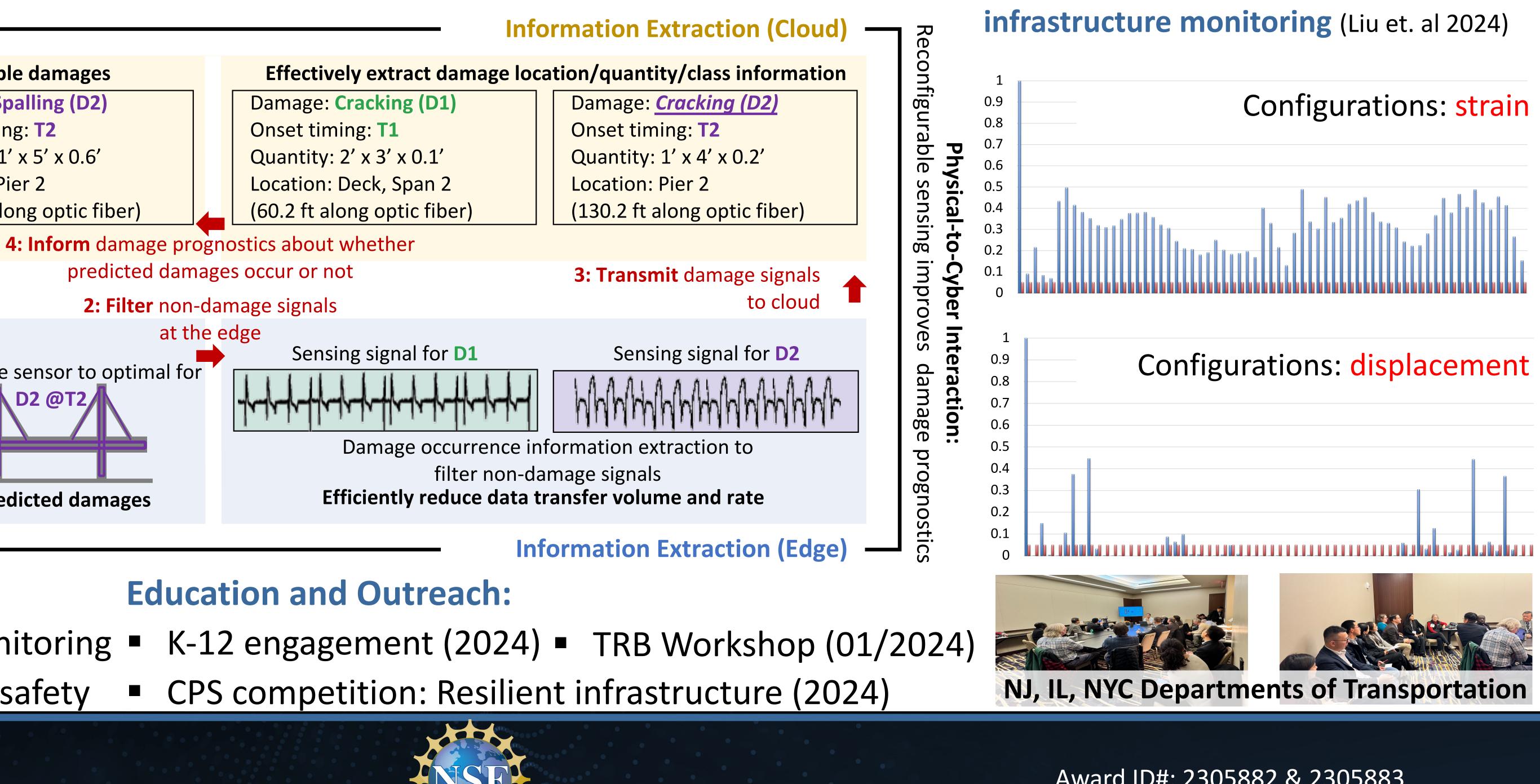
- Cost-effective infrastructure monitoring
- Resilient infrastructure & public safety

Predictive analytics & reconfigurable sensing mutually benefit each other



Scientific Impact:

- to other CPS



Enable self-adaptive, cost-effective infrastructure monitoring Offer knowledge-informed ML, sensor reconfiguration, and quality-aware efficiency optimization methods translational **Need reconfigurable sensing for**

Award ID#: 2305882 & 2305883

