Research Summary

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1 Research Vision and Contributions

Overview: Cyber-Physical-Human Systems (CPHS) are complex systems where people interact with data-driven algorithms, most often through observations collected by diverse sensors to infer the state of both human cognition as well as the environment. This is an interdisciplinary field which spans across the areas of game theory, machine learning, statistical signal processing and cognitive psychology. My research interests mainly lie in the design of ***strategic and trustworthy CPHS***, where people exhibit *selfishness*, *bounded rationality* (e.g. inattention) and sensitivity to *social discrimination*, *faulty decisions* and *malicious agents*. Due to the ubiquitous presence of CPHS in a wide range of applications, I and my students are quite fortunate to carry out ***use-inspired research*** at Missouri S&T via collaborating with domain-experts in transportation, healthcare and underground mining.

Contributions: The main scientific contributions of my research include the design and validation of ***machine learning*** and ***game-theoretic algorithms*** for (i) braking intent detectors using *spiking neural networks* on neuromorphic hardware, (ii) *strategic and trustworthy blockchain consensus* protocols, particularly under limited computational resources in IoT networks, (iii) scalable *strategic interventions for transportation* (e.g. approximate strategic information design, trust-aware Stackelberg routing, cognition-aware forward collision warning), and (iv) feedback elicitation methods to *learn stakeholders' fairness preferences* regarding machine learning based solutions used in kidney placement.

2 A Brief Summary of Outcomes and Impact

All of the outcomes shown below are current, as of April 18, 2024:

PUBLICATIONS:

- **Journals:** 13 + 1 (accepted)
  - 6 + 1 (accepted) @ Missouri S&T: Sci.Rep [IF: 4.6], IoTJ [IF: 10.6], PPMP [IF: 1.61], JME [IF: 7.4], SS [IF: 6.1], PMC [IF: 4.3]
- **Peer-Reviewed Conferences:** 22
  - 8 + 2 (accepted) @ Missouri S&T: CHIL 2024, SMARTCOMP 2019/2024, BCCA 2023, MASS 2023, AIPR 2023, SFF 2022, ICCCN 2021, ICBC 2021, MSWIM 2019
- **Peer-Reviewed Workshops and Working Papers:** 4
  - 4 @ Missouri S&T: BIAS 2023, AASG 2021, FAccTRec 2020, HCOMP 2019

EXTERNAL GRANT AWARDS:

- **Current Grant Amount:** $6,087,161 (My Share: $599,218)
- **Pending Grant Amount:** $1,502,680 (My Share: $283,840)
- **Supported Federal Agencies:** National Science Foundation, CDC-NIOSH, Dept. of Transportation
- **Industry Grants:** Boeing Inc., Optirock Group LLC

IMPACT (from Google Scholar):

- **h-index:** 10
- **i-10 index:** 16
- **Citations:** 432

2.1 Research Honors

- Best Paper Candidate Award in IEEE SMARTCOMP 2019
- Travel Award for National Science Foundation's Smart and Connected Communities Workshop in 2019