2022 Annual INCOSE international workshop

HYBRID EVENT

Torrance, CA, USA

Jan 29 - Feb 1, 2022

Premier Systems Engineering Workshop

The W-INCOSE Lightning Round Radio Show: Brought to You by Culture Hacking

Loss-Driven SE and ASELCM Pattern for Connected and Autonomous Vehicles

www.incose.org/iw2022/

Culture Hacking

- “…systematic design and implementation…that yield desired results.”

Feuer, Adam. 2011. “Culture Hacking.” *Core Protocols for Shared Vision.* twitter.

W-INCOSE LIGHTNING ROUND RADIO SHOW

MBSE Lightning Round

Lightning Round Discussants

- Today's Host:

  Dr. C. Robert Kenley
  - S.B. Management - MIT
  - M.S. Statistics - Purdue
  - M.S. Engineering-Economic Systems - Stanford
  - PhD. Engineering-Economic Systems - Stanford
  - Professor of Practice - Industrial Engineering – Purdue
  - Fellow, INCOSE

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Lightning Round Discussants

- Today's Guest:

  Ibukun Phillips

  – M.S. Industrial Engineering - Purdue

  – PhD. Student, Industrial Engineering - Purdue

  – Research Interest – Verification and Validation of AI-Enabled Systems, CAVs.

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Motivation

- Application of Artificial Intelligence (AI) in self-driving vehicles technology
- Safety-critical challenge
- Public trust and confidence in technology.

Tesla Model Y on snowy road. (https://insideevs.com/news/558832/tesla-fsd-beta-snow-fail/)

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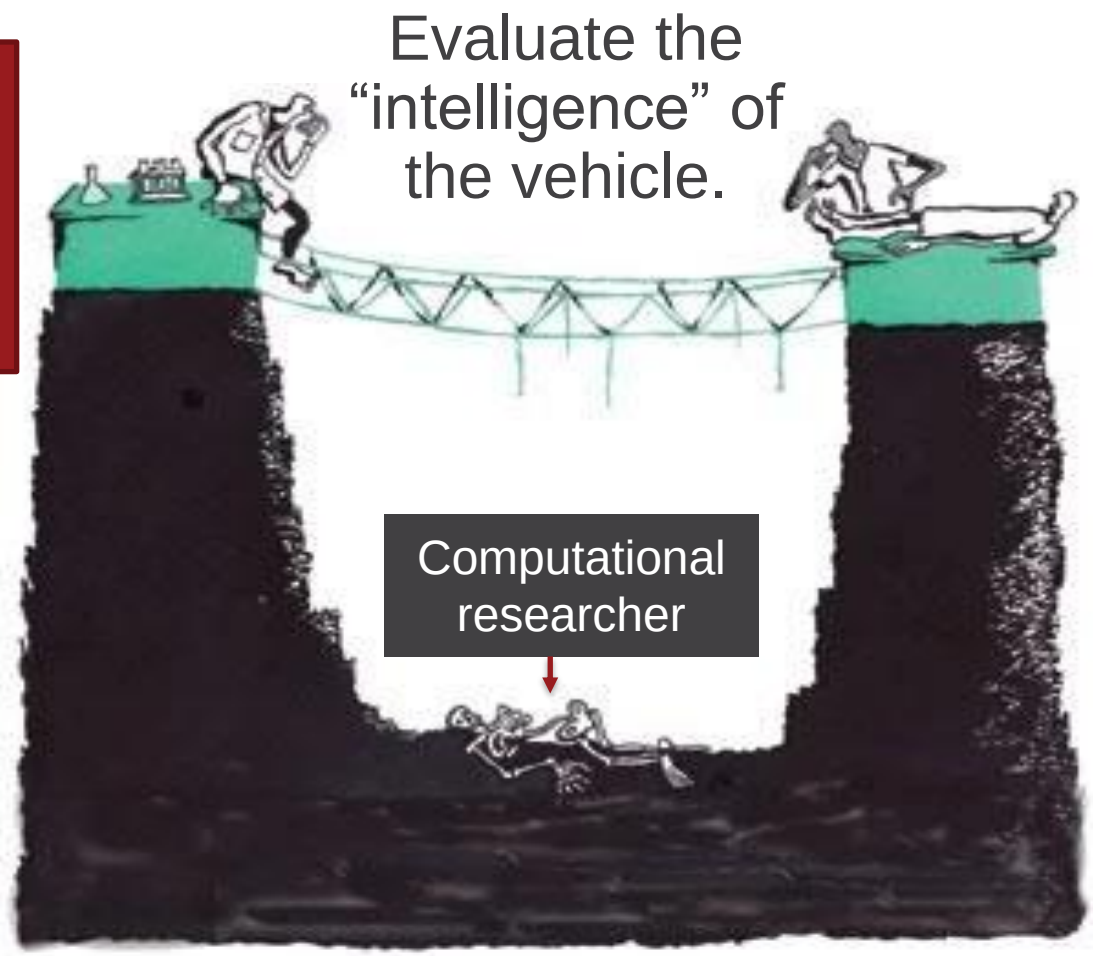
Bridging the Gap

Traditional behavior-preserving systems



Credit: B. MELLOR

AI-Enabled vehicles that drive more safely than humans.

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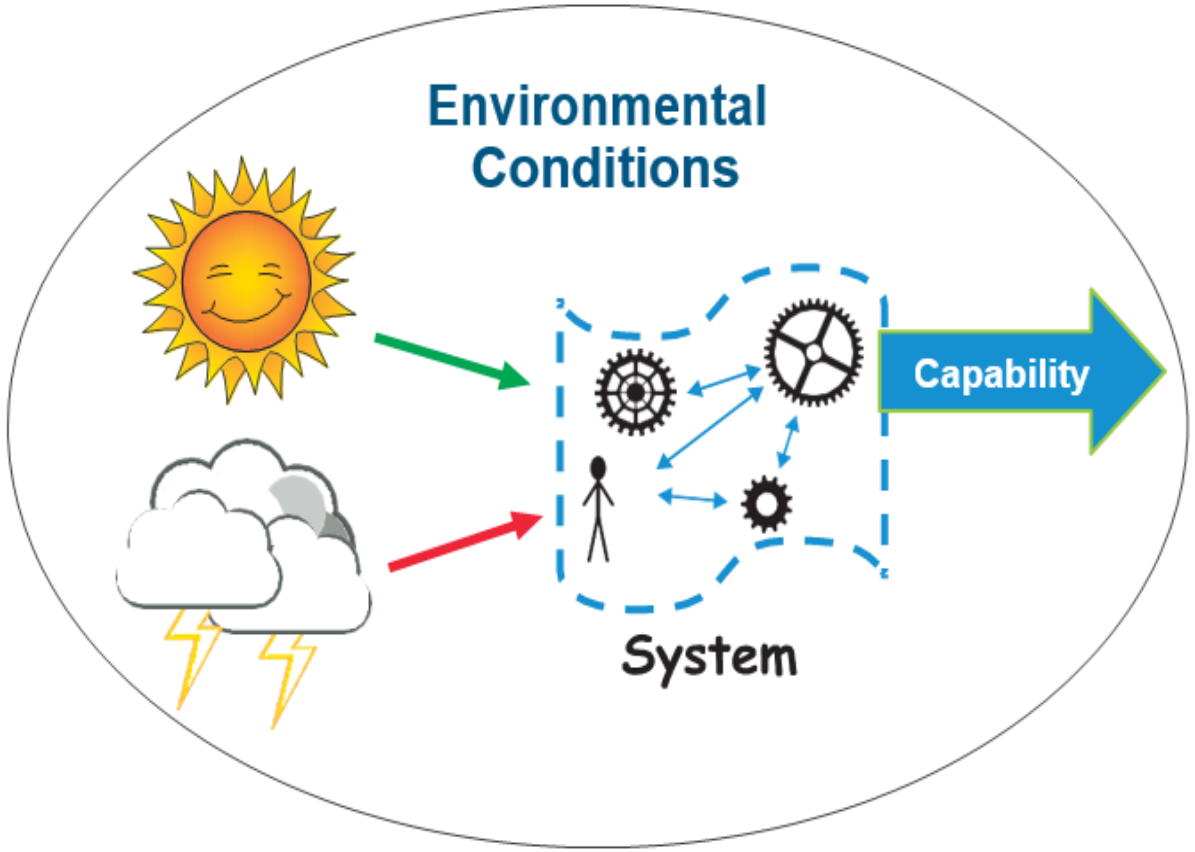
Loss-Driven SE



System and interacting environmental elements. Source: INCOSE INSIGHT (2020)

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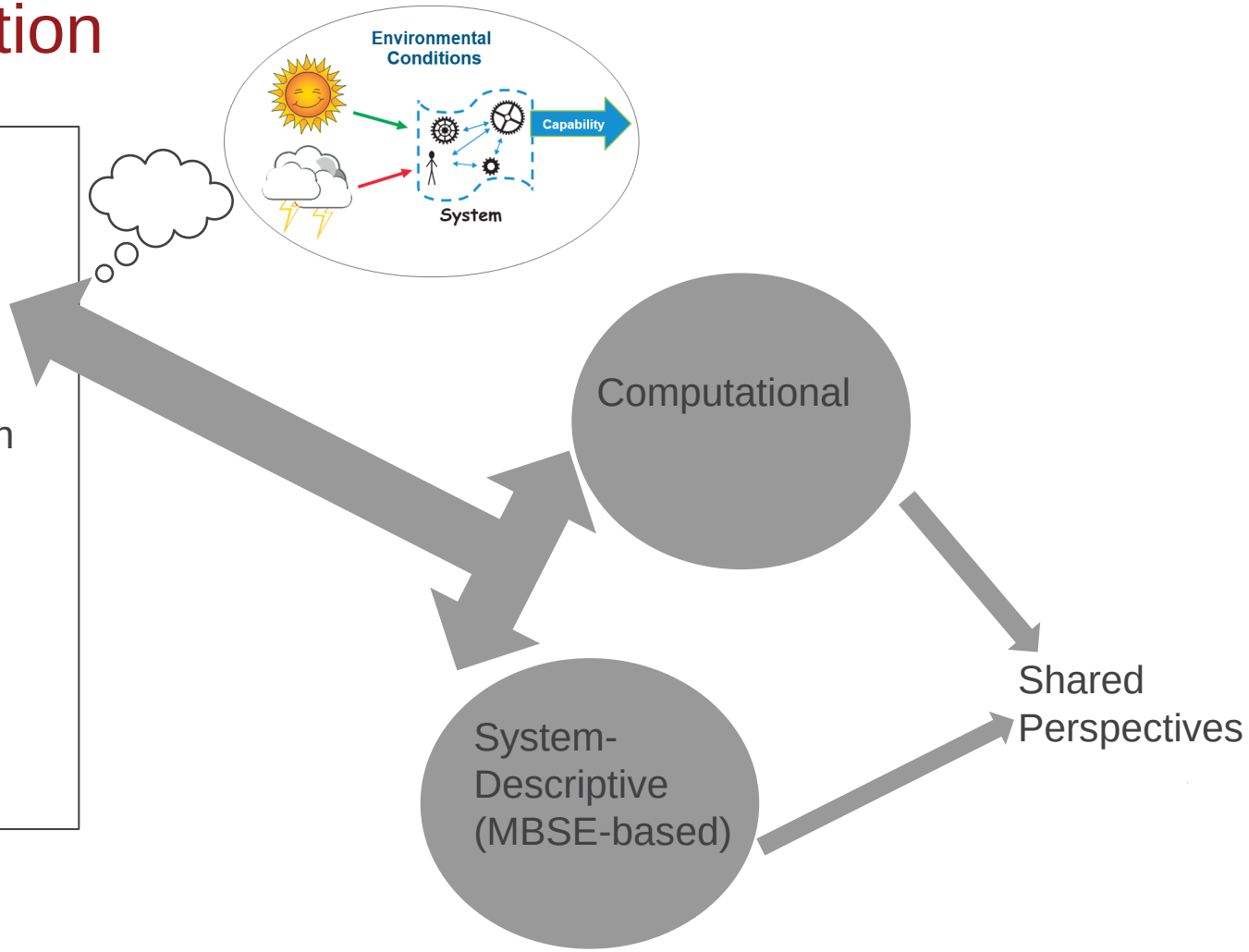
Classifying CAV Verification

Categories of Verification

- External
  - Tasks involving CAV & physical environment.
  - Challenges involve:
    - Evidence of certification
    - Public trust
- Internal
  - How CAV system is engineered and built.



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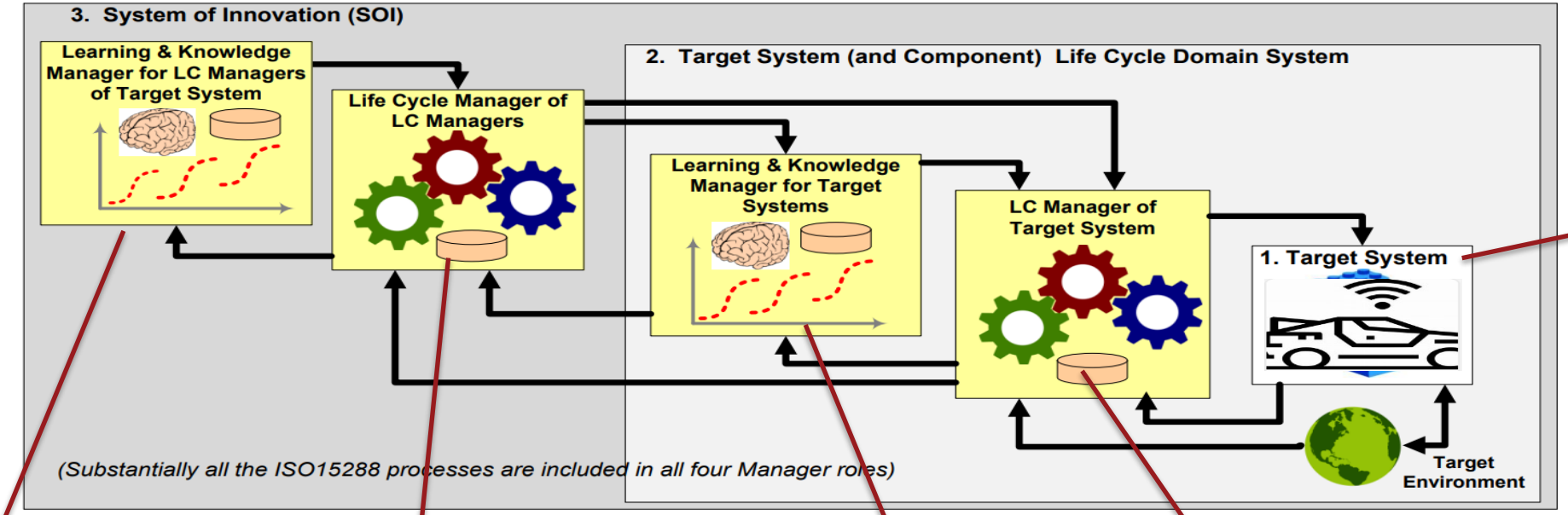
ASELCM Framework (System Modeler)



System 1: Autonomous Vehicle as the engineered system

System 3: Configurable patterns for System 2 models learned over activities.

System 3: Configured model of System 2 ecosystems to be utilized for organizational change management and continuous improvements.

System 2: Configurable domain patterns for System 1 models learned over testing experiments, traffic scenarios and observations.

System 2: Configured model of System 1 and Target Environment, for 'already known' uses.

ASELCM reference boundaries. Source: Schindel, B (2019)

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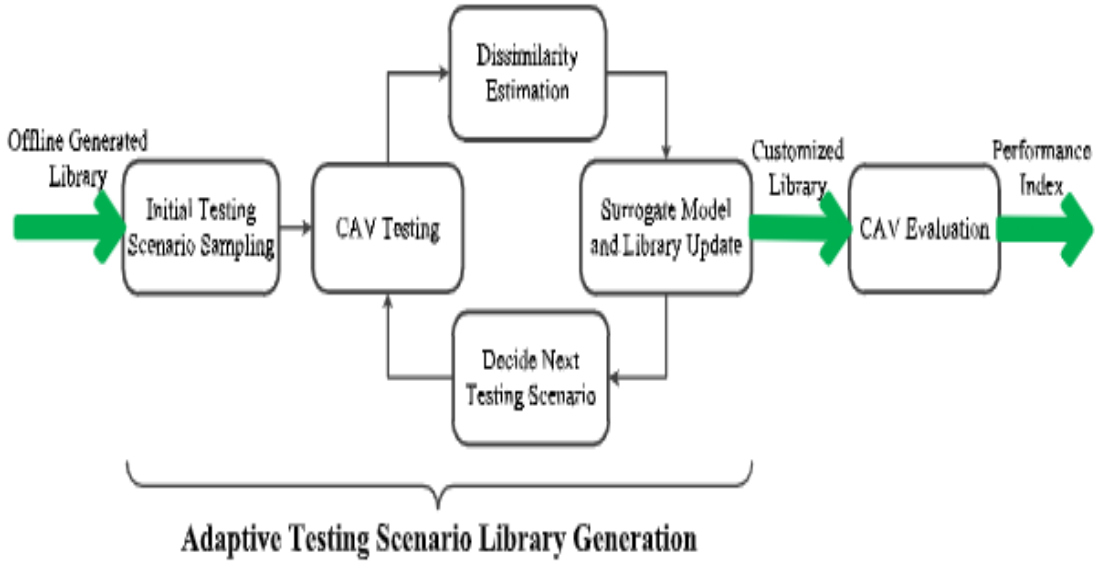
ATSLG Framework (Computational Modeler)



Adaptive Testing Scenario Library Generation Framework Source: Feng, et.al. (2020)

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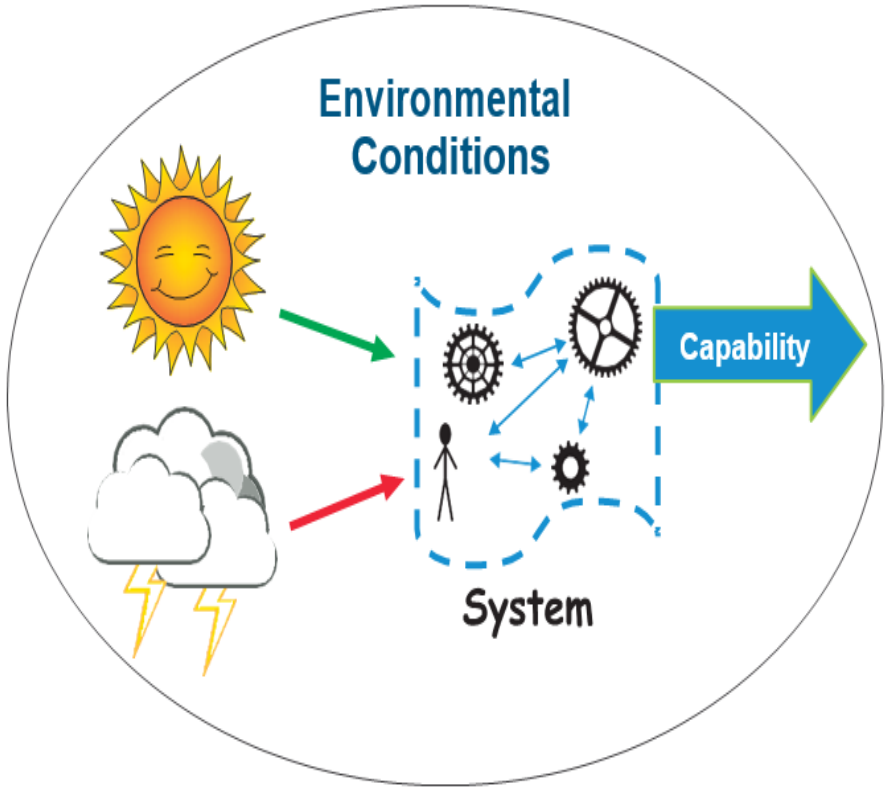
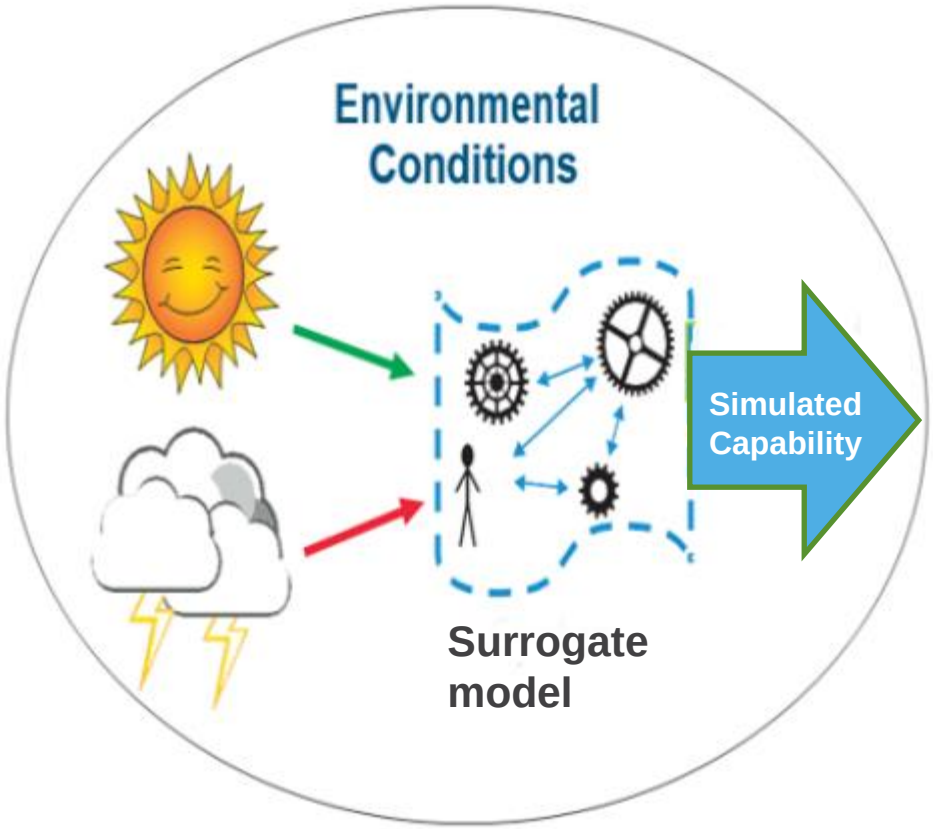
CAV-Surrogate Model Approach



Real-world



Surrogate-world

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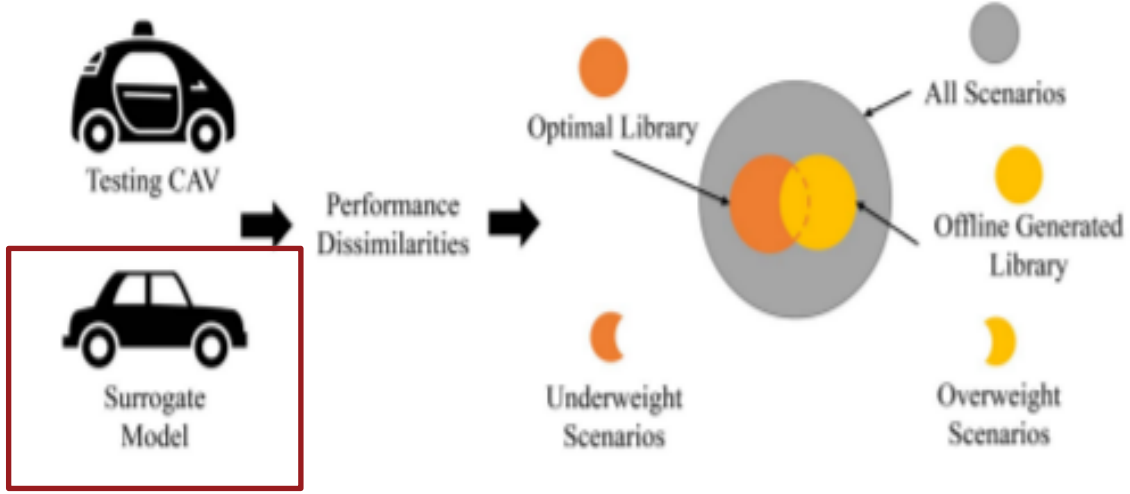
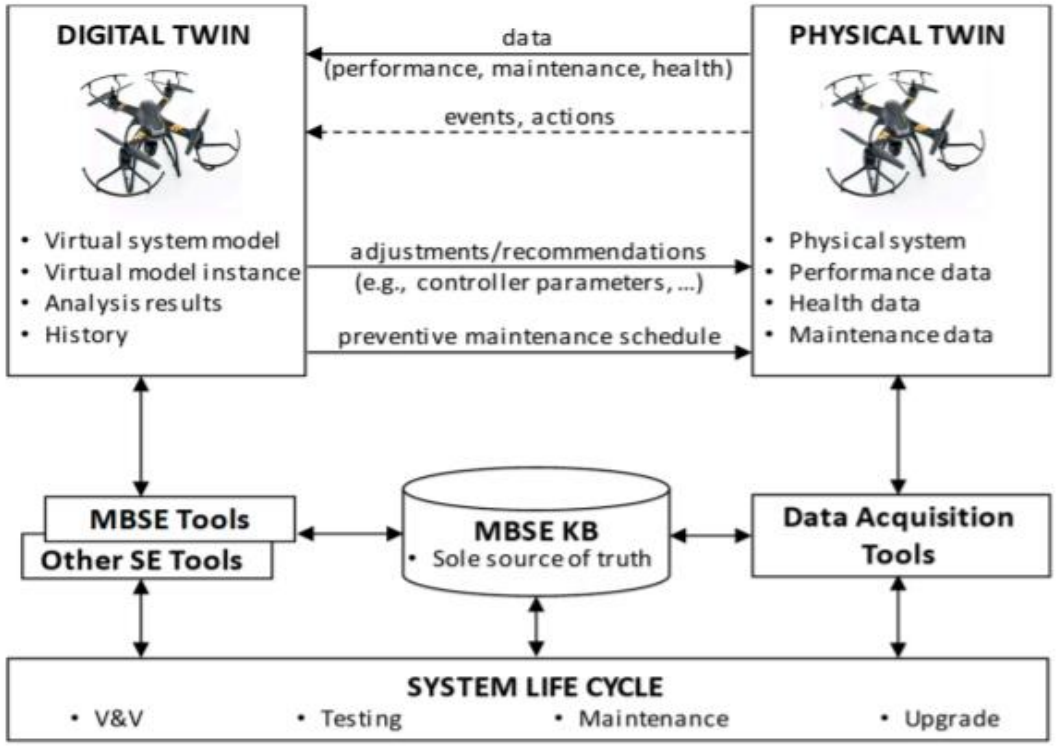
Shared Modeling Ideas

Computational Modeling



System Modeling



Digital Twin within MBSE.
Source: Madni, Madni & Lucero (2019)

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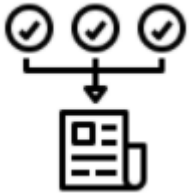
Shared Perspectives

Phenomenon/Interactions

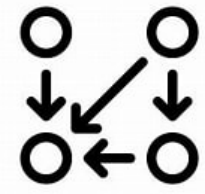
Traffic scenario (e.g. cut-in, highway exit etc.)

Attributes/Variables



Safety, functionality

Dependencies/Laws



Road signs

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