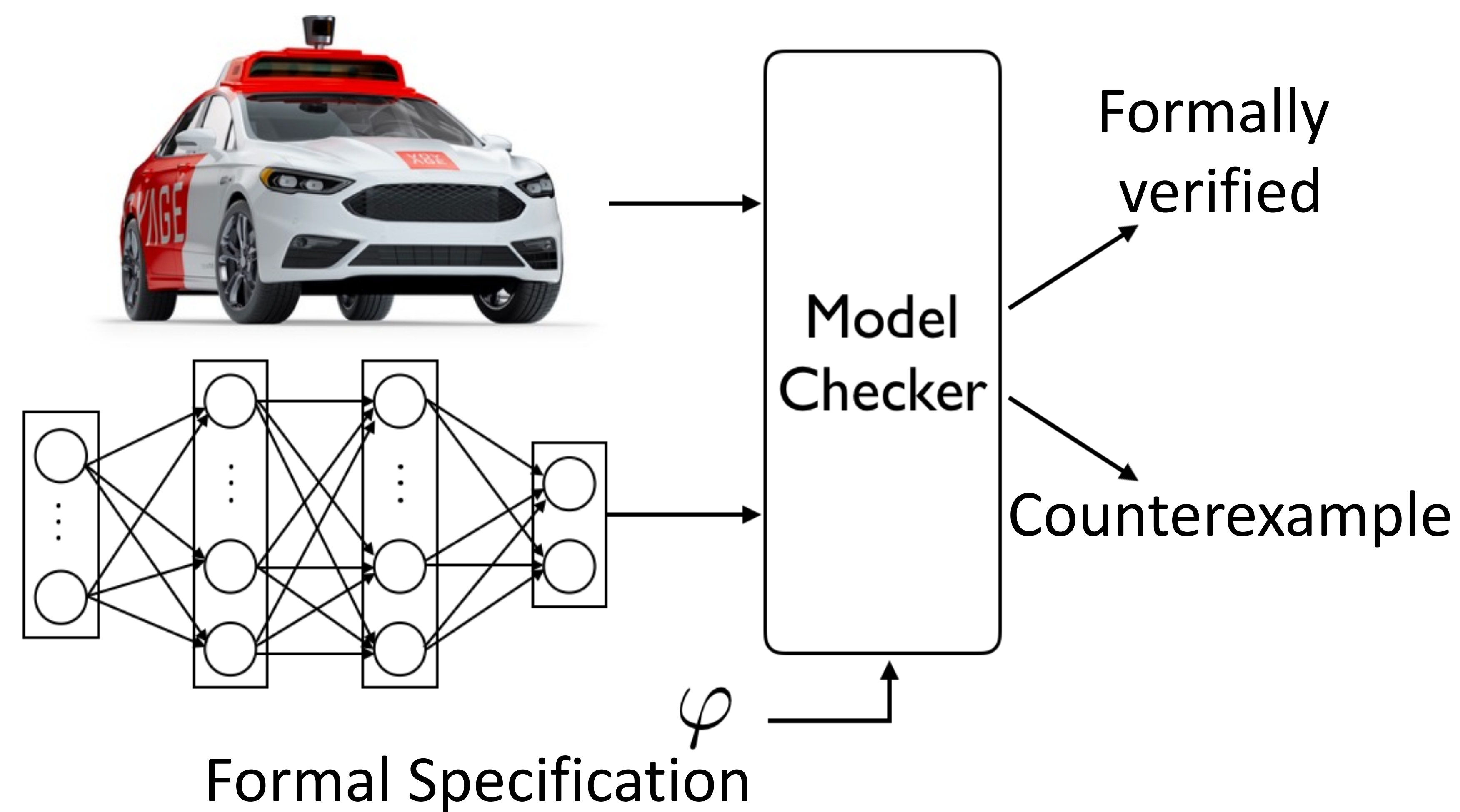


CAREER: Decision Procedures for High-Assurance AI-controlled CPS

PI: Yasser Shoukry – University of California, Irvine – Award #2002405

Challenge:

- Data driven controllers (e.g., neural networks) lack safety and reliability guarantees.
- Can we design tools that can automatically analyze their behavior?
- Can we automate the design of “provably” correct NNs?

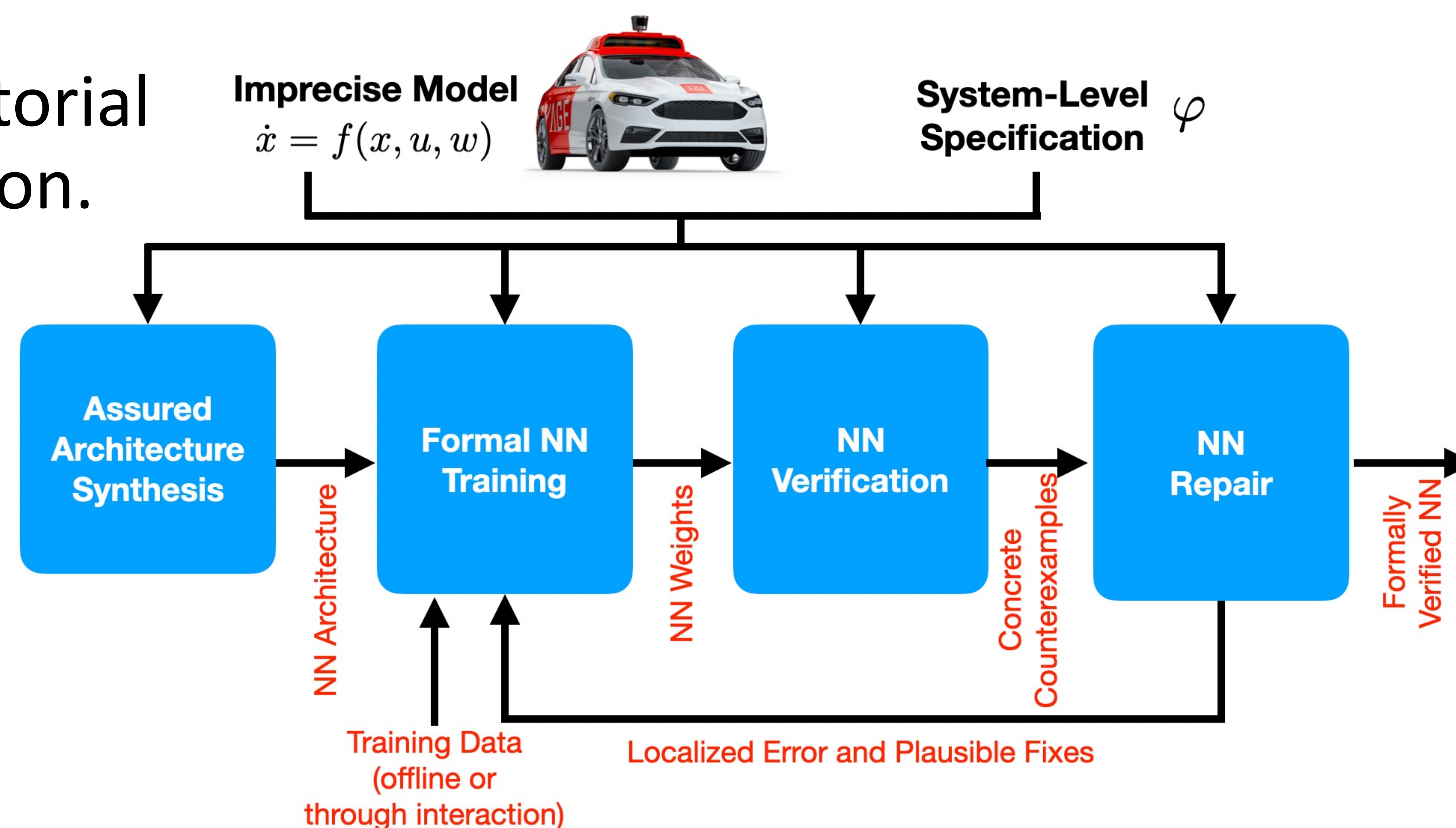


Scientific Impact:

- The developed tools provide a scientific basis to design safe and reliable AI-controlled CPS.
- Generic tool-flow to reason about a wide variety of nonlinear CPS, complex specifications, and NNs.

Solution:

- Combine ideas from combinatorial search with convex optimization.
- Exploit the knowledge of the physical system to extract properties essential to the correct behavior of AI/ML.
- **Contributions:** An end-to-end framework for correct-by-construction NNs.



Broader Impact:

- Recent polls show the societal rejection of AI technologies due to safety issues.
- Companies went out of business, citing safety and reliability concerns of AI/ML.
- New classes on “Formal Methods for Autonomous Systems” – STEM Academy (K-12 STEM Scouts program).