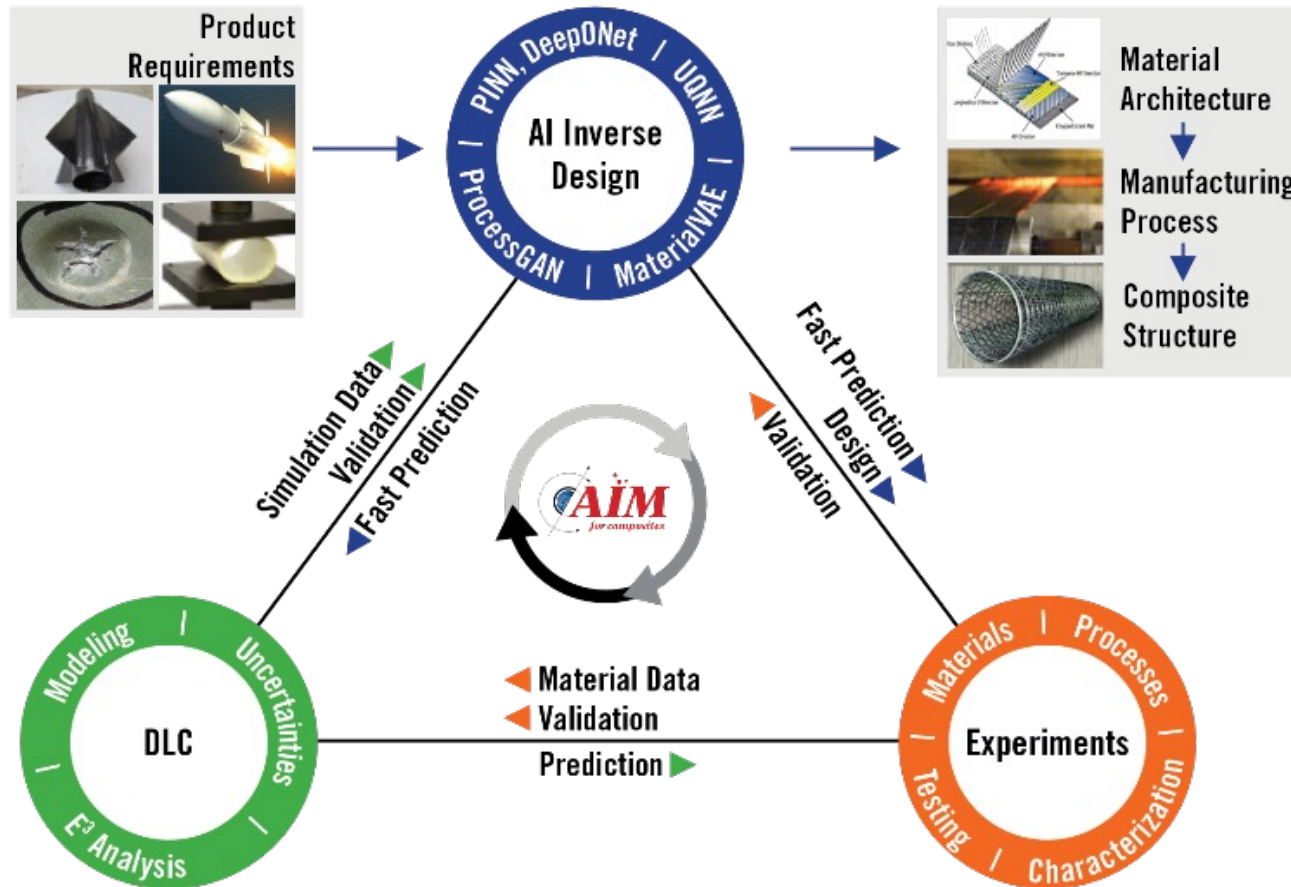**Research Thrust II: Physics-informed AI models**
- Physics informed predictive AI models
- Generative AI models for materials and manufacturing process design
- Microservice-based cloud tools

Product Requirements

PINN, DeepONet / UQNN / MaterialVAE / ProcessGAN

AI Inverse Design

Material Architecture → Manufacturing Process → Composite Structure

Simulation Data / Validation / Fast Prediction

Fast Prediction / Design / Validation

AIM for composites

DLC — Modeling / Uncertainties / E³ Analysis

Experiments — Materials / Processes / Characterization / Testing

Material Data / Validation / Prediction

Research Thrust I: "Digital Life Cycle" (DLC)
- Elucidating the material-process-microstructure-performance (MP2) relationships
- Quantifying uncertainties for decision making
- Linking material + process to energy and carbon footprint

Research Thrust III: Experiments
- Material engineering –new material architecture
- Convergent manufacturing
- Multiscale material characterization
- Innovative material testing methods