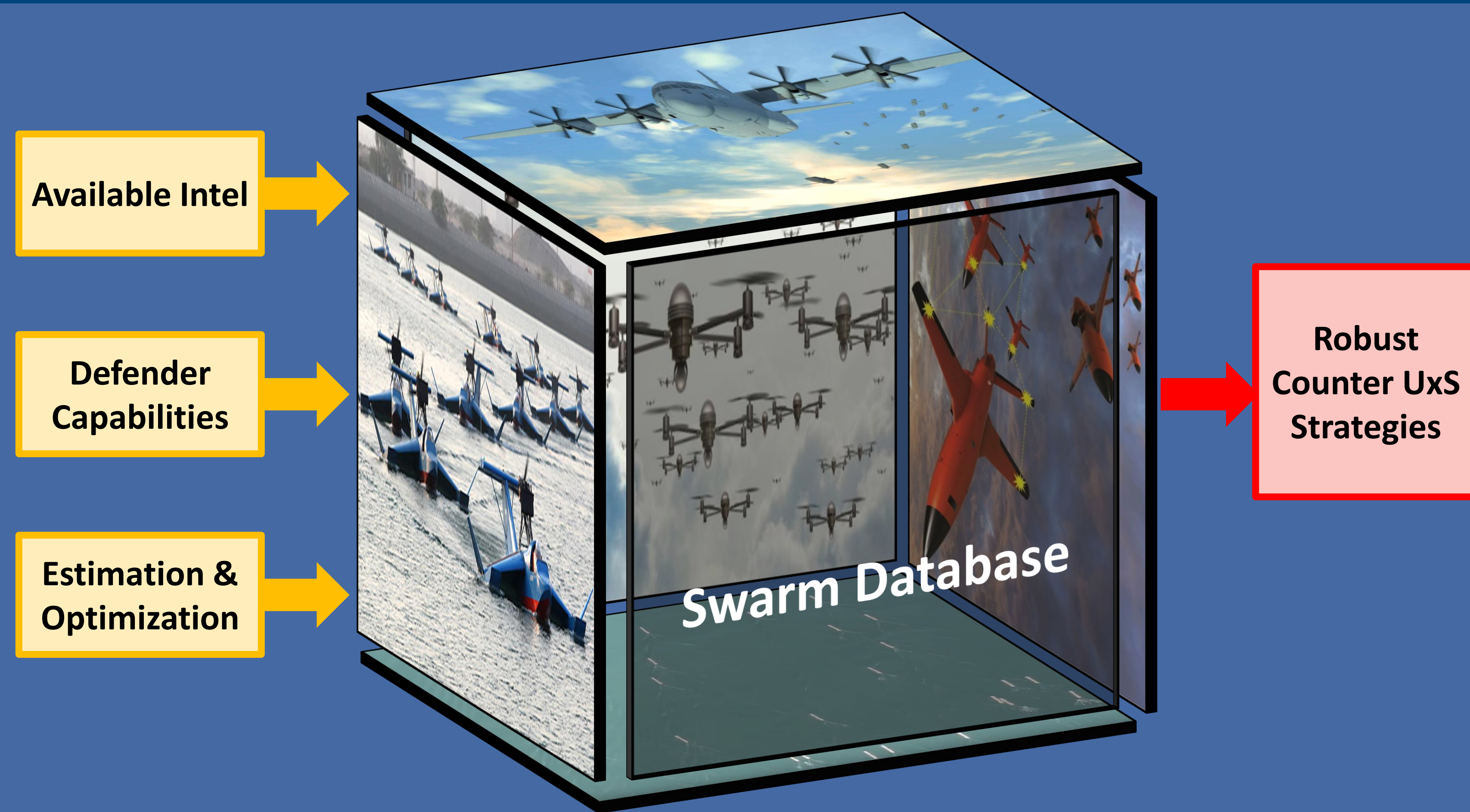


# Robust Counter UxS Strategies Against Multi-Domain Super Swarms



## How

- Optimize defensive strategies for robustness against variable swarm tactics
  - Swarm cooperation mechanisms are a **black box** to defenders
  - Develop robustness guarantees against this uncertainty
- Analyze thousands of counter-swarm scenarios to quantitatively assess
  - Defender capabilities matrix, asset allocation, attacker type/priority
- Develop universal counter UxS strategies that
  - Don't require *a priori knowledge* of attacker swarming algorithms
  - Ensure engagement outcomes are *robust vs. unknown swarm tactics*

## Why

- Large-scale adversarial swarms are an imminent threat
- Future adversarial swarms will employ multiple, switching tactics
- Defensive strategies must be robust to uncertainty of sophisticated swarms

## Objectives

- Robustness guarantees against highly uncertain threat
- Quantitative metrics for mission success/failure (risk)
- Estimation/Optimization/Analysis tools
- “Super Swarm” scalability, from  $O(10)$  to  $O(10^6)$  agents!

## What / Deliverables

- Robustness training database
  - Scalable counter-swarm engagement database, multiple defensive & offensive tactics, available to NPS, ONR, and DoD researchers
- New metrics for quantifying mission risk/success against adversarial swarms
  - e.g., # of perimeter penetrators, # of lost defenders, etc.
- Asset Allocation Estimates for counter UxS/swarm defense
- Fundamental research findings shared through:
  - Student theses, class projects, CRUSER reports and presentations
  - Conference and Journal publications
  - **xSwarm, Counter-Swarm 2020 Workshop**