

CERTUS

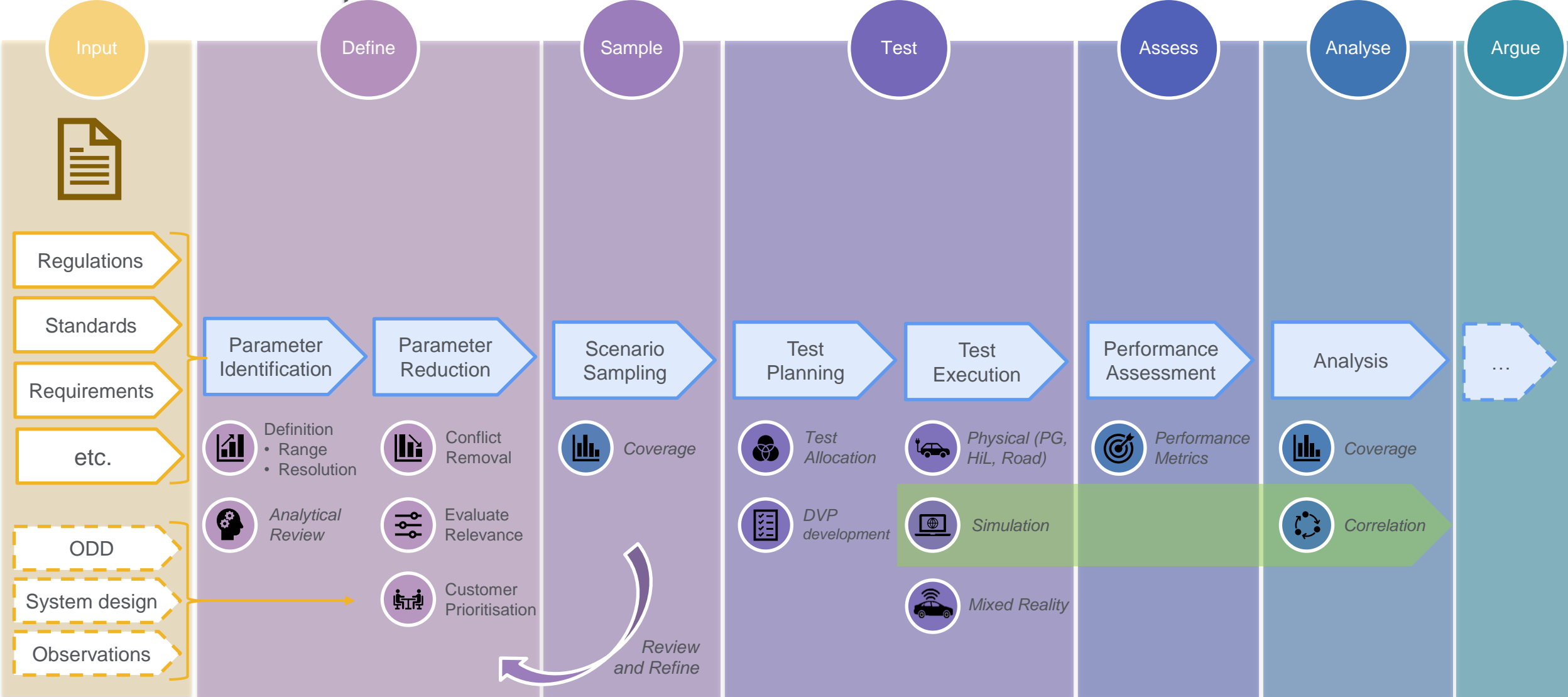
CERTUS: an automated AD/ADAS V&V toolchain

Alejandro Trueba



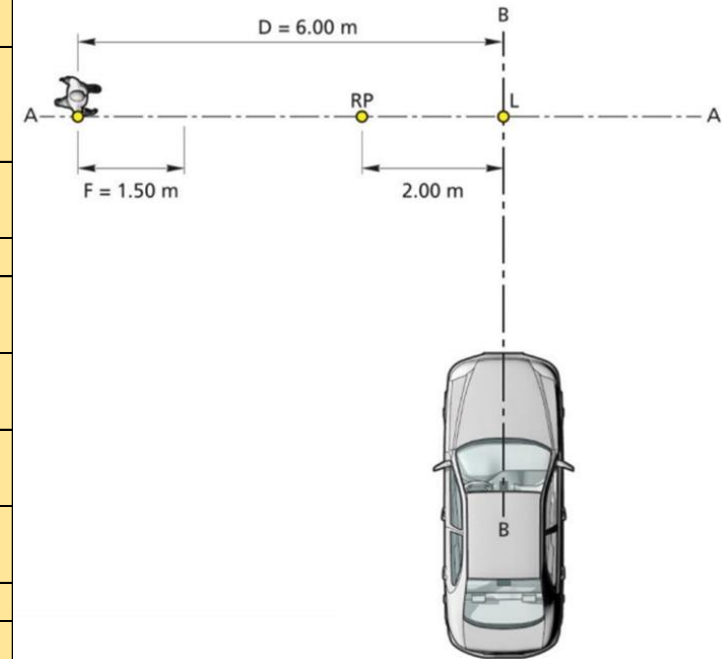
The Problem

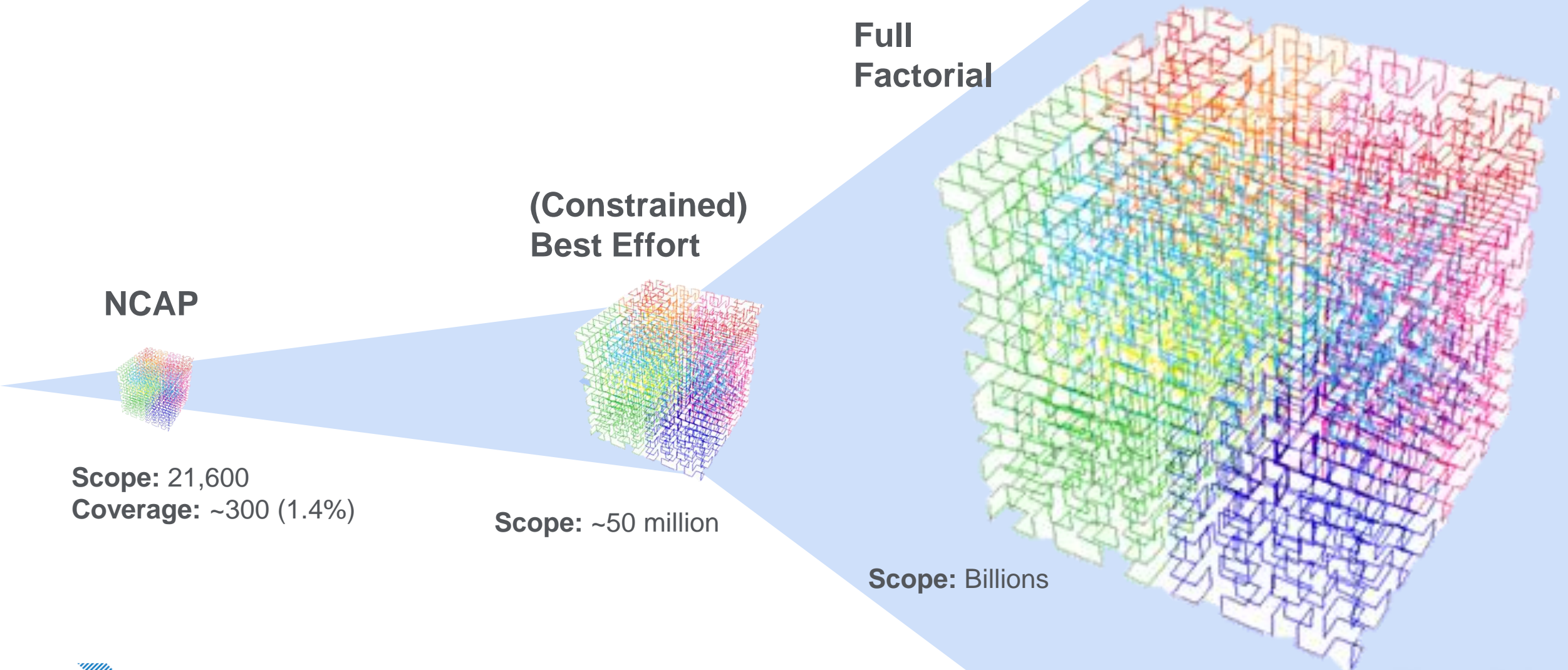
CERT✓S | Introduction – V&V Workflow



- **Functional Scenarios** provide a general description
- **Logical Scenarios** set parameter bounds
- **Concrete Scenarios** set definitive parameter values

Parameter	Range	Resolution	Value
Ego velocity	[10..80] km/h	10km/h	30km/h
Road condition	[Dry; Wet]	-	Dry
Road Markings	[None; Dashed lane markings]	-	None
Angle of approach	[Straight; Curve 22.5/Radius 30; Curve 30/Radius 30; Curve 22.5/Radius 50; Curve 30/Radius 50; Turn into left side-road; Turn into right side road]	-	Straight
Obstruction	[None; Parked vehicle; Façade]	-	None
Scenery	[Open field; Complex City Environment]	-	Open field
Number of actors	[0..2]	1	1
Actor initial location	[Nearside; Farside]	-	Nearside
Type	[Adult; Child; Infant; Cyclist; E-Scooter; Bobby Car]	-	Adult
Clothing	[Standard; Hi-Vis; Dark]	-	Standard
Actor velocity	[3; 5; 8; 15] km/h	-	5km/h
Offset	[None (false positive); 25%; 50%; 75%]	-	50%
Illumination	[Day-Bright; Day-Overcast; Night-Unlit; Night-1 light; Night-5 lights]	-	Day-Overcast
Precipitation	[Clear; Light rain; Heavy rain]	-	Clear





The Solution

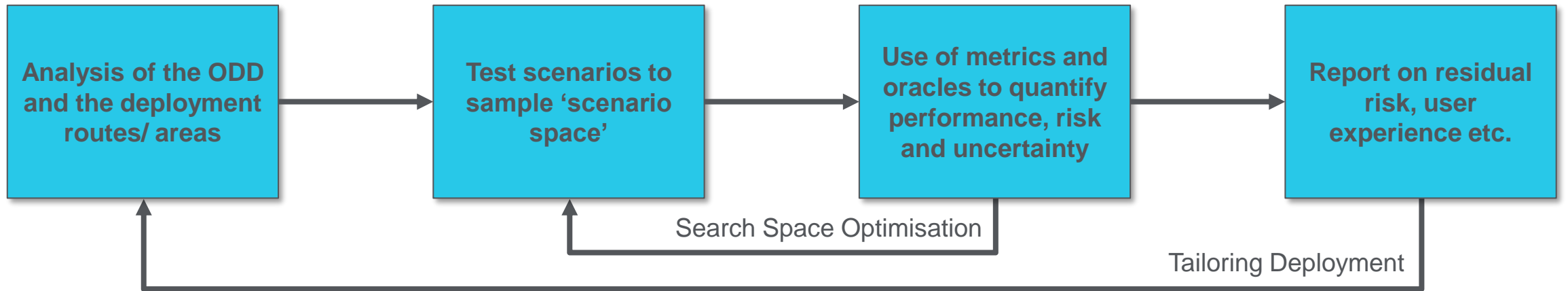
CERT✓S | Project Objective

A toolchain and service to deliver efficient verification & validation for automated driving systems through intelligent & targeted scenario generation, analysis and reporting.

The results support the CAM supply chain, and assist regulators and insurers by answering key questions:



CERTVS | Project Certus



CERT✓S | Battleship Analogy

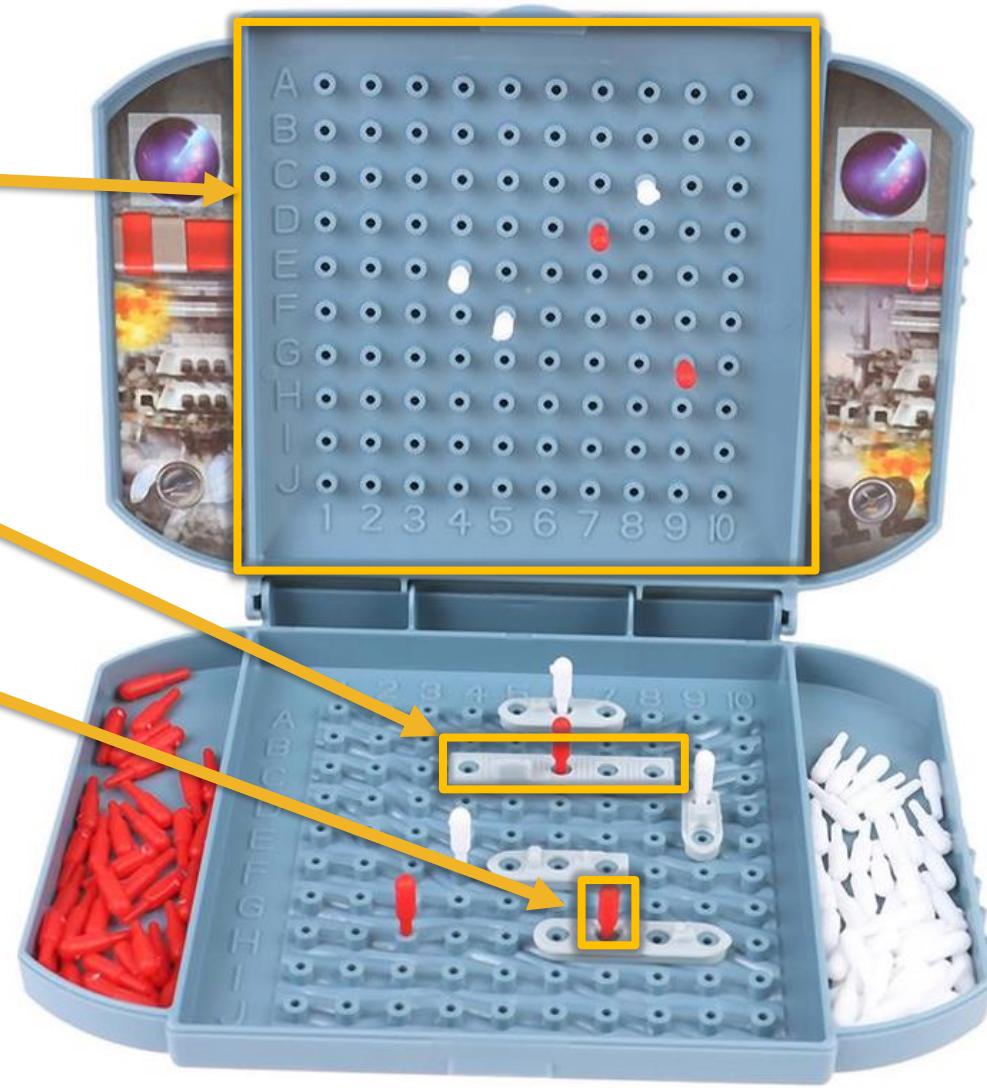
1. Problem Space (2D, 10x10)

2. Stop criteria (5 ships, known size)

3. Feedback

4. Decision making

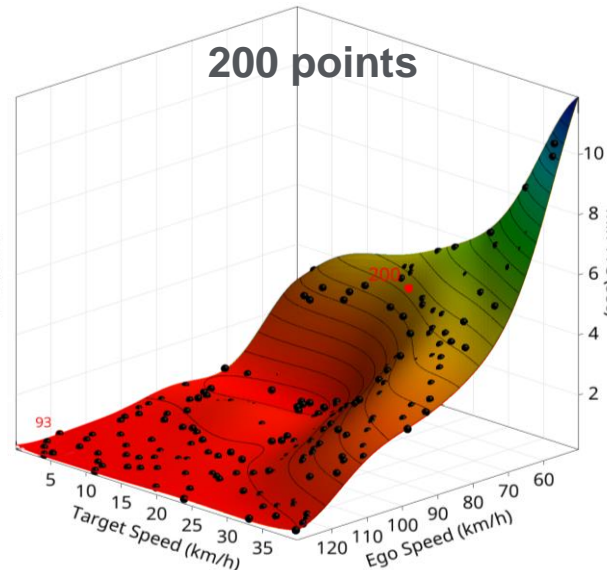
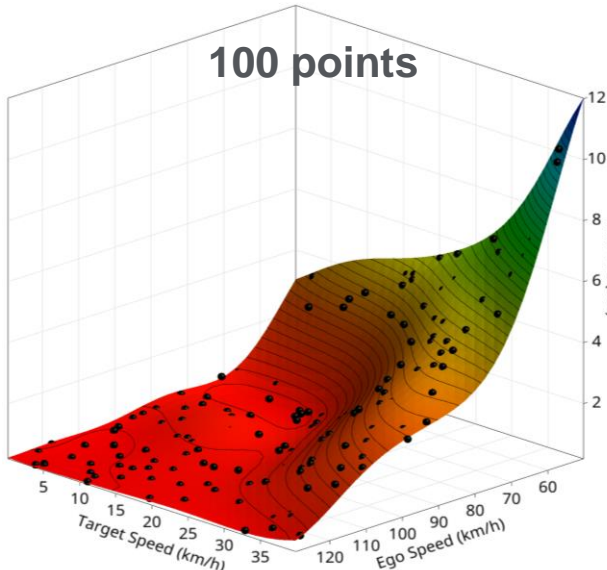
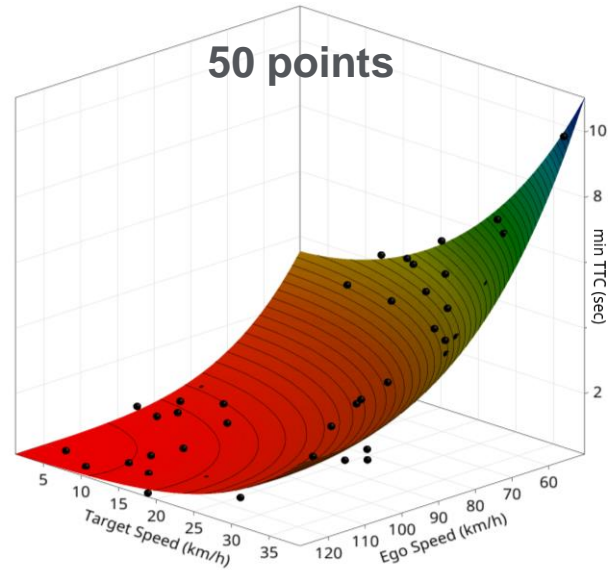
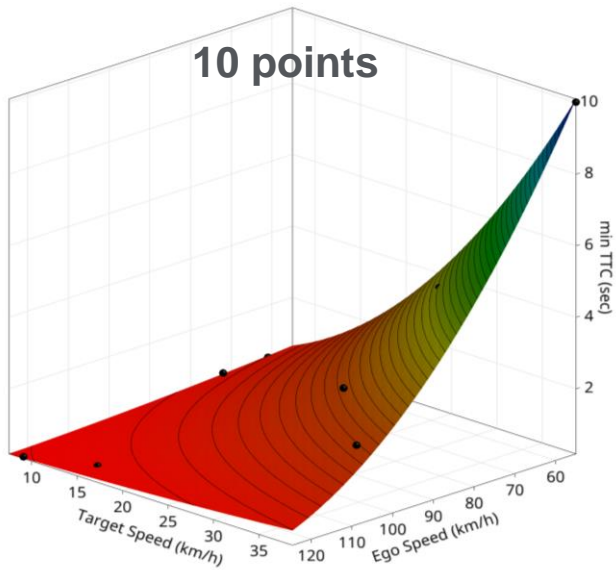
Your brain (if you have)



CERTUS | Battleship Analogy

Battleship	CERTUS
Problem Space	
2D (10x10)	Known, not constant
Stop Criteria	
Ships – known number and shape	TBD
Feedback Process	
Direct	Test creation / execution
Feedback	
Yes / No	Metrics / Oracles
Decision Making	
Brain	Algorithms





Takeaways

CERT✓S | Core Innovations

- Developed to **test self-driving feature** for a global OEM (Polestar).
- **Intelligent scenario selection** based on **parameter sensitivity & search space optimisation** – each scenario getting you closer to your answer.
- **Automated** tool for identifying compliant / non-compliant **areas for deployment** based on the ODD.
- Novel **mixed reality** test environment to **fuse physical and virtual scenarios**.



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Q&A