

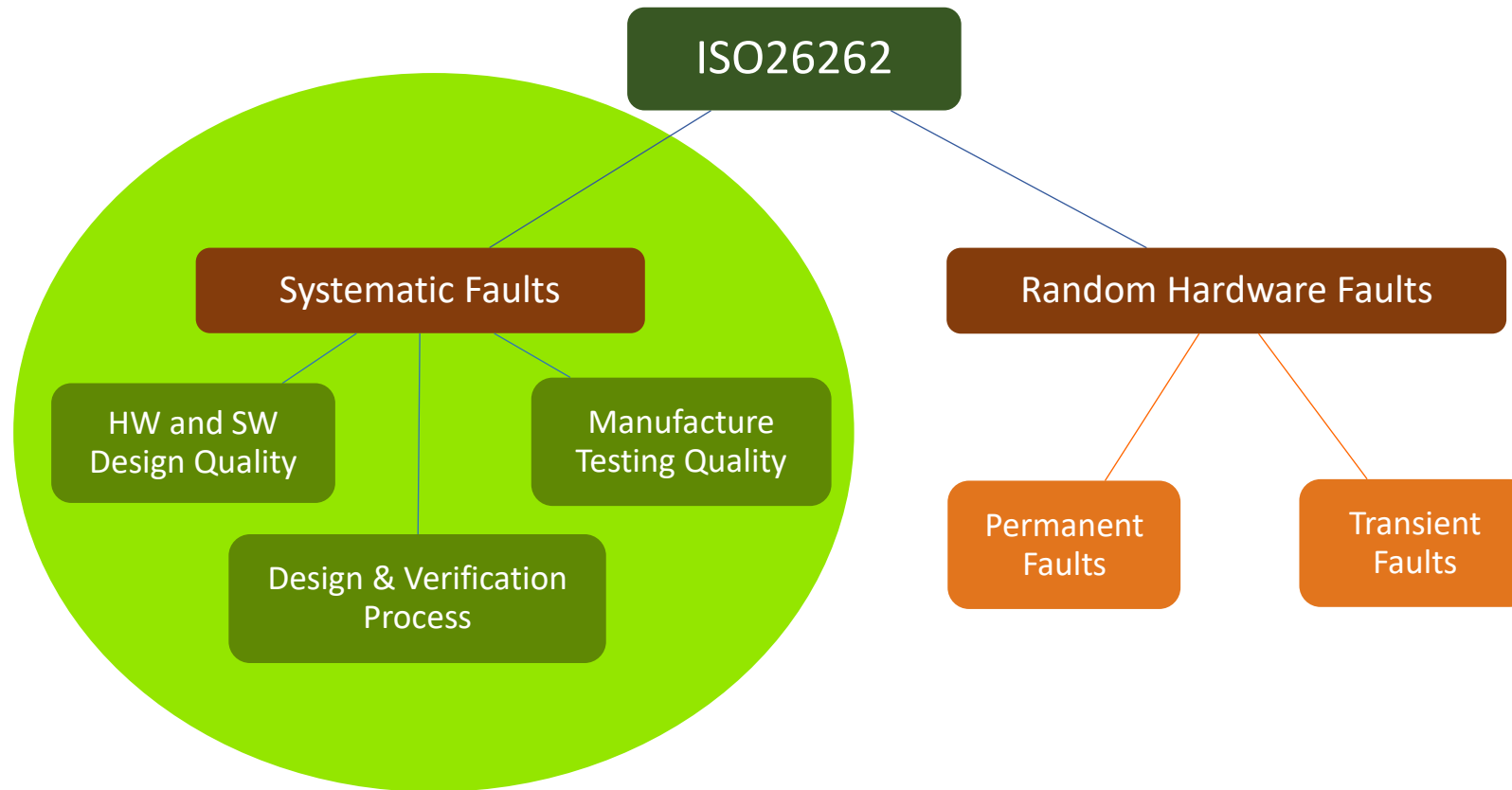
Can We Trust Self-Driving Cars?

Are We Making Them Any More Trustworthy Over Human Drivers?

Nirmal R. Saxena

NVIDIA

We Need to Look at Systematic Faults



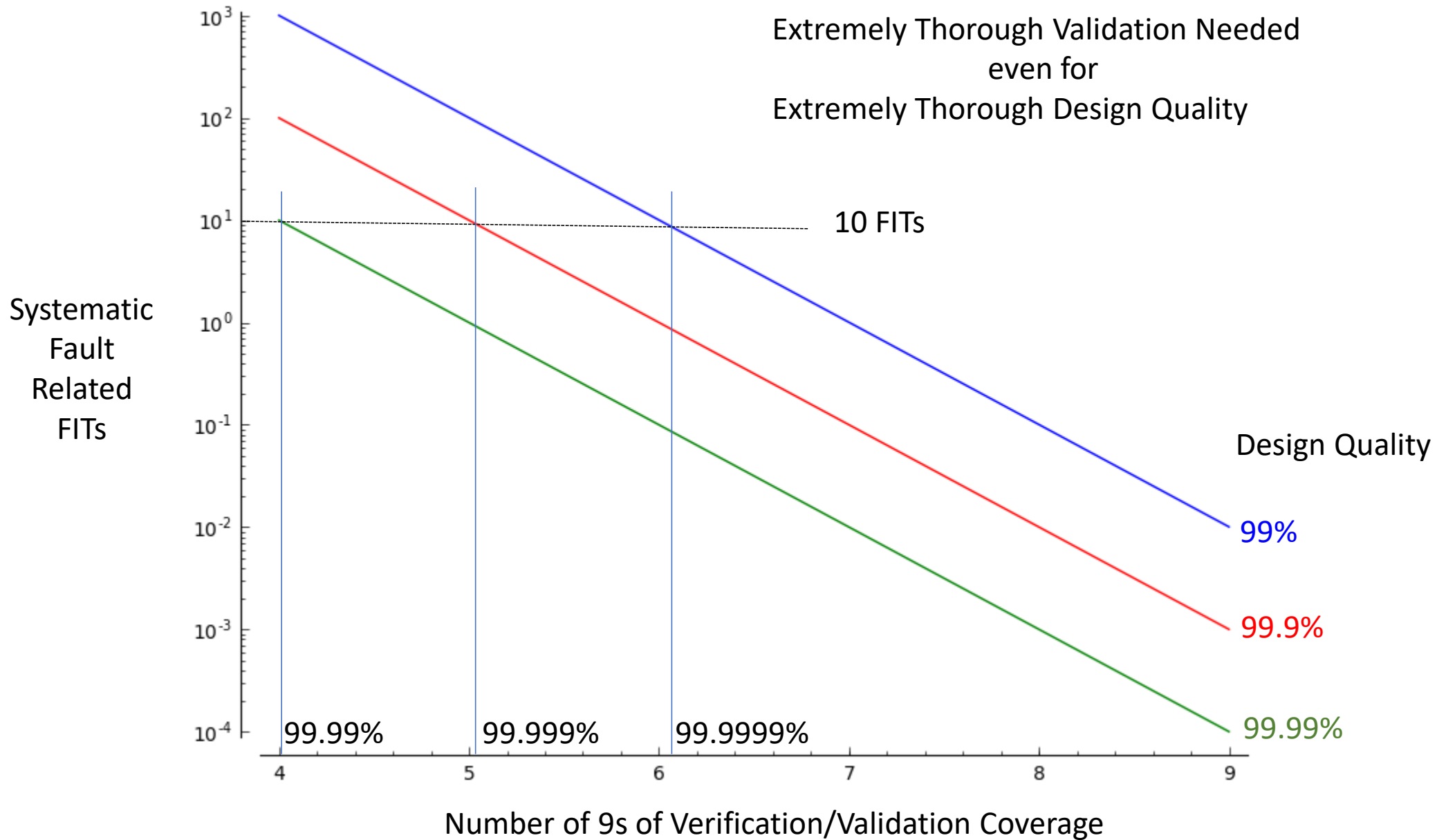
What is FIT Rate for Systematic Faults?

Systematic Faults	Observed Bug Rate	FIT Rate
Hardware Design Faults	4 Bugs in 50 Years	9000
Software Design Faults	1 Bug Every Year	100000

Mitigating Factors

Automotive Environment is More Constrained

- Hardware Design Quality– Need Three Orders of Improvement
- Software Design Quality– Need Four Orders of Improvement



Systematic Faults for Deep Learning Algorithms Need to Be Thoroughly Validated

- Need to Characterize What Training Inaccuracy Means in Terms of Safety
- Design Diversity Helps Here (LIDAR, RADAR, Camera)

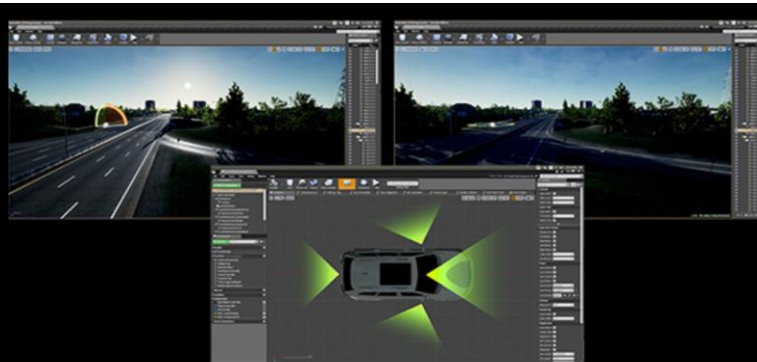
Exploit Big Data & Super Computing for Virtual Reality Based Validation

- Billions of Traveled Miles Simulated in Days
- Deploying Updates on Ground Needs Cross-Validation

SW Bug Updates Require Thorough Security Authentication

VIRTUAL VEHICLES. REAL-WORLD RESULTS.

DRIVE Constellation uses photorealistic simulation to create a safer, more scalable, and more cost-effective way to bring self-driving cars to our roads. It uses the computing horsepower of two different servers to deliver a revolutionary cloud-based computing platform, capable of generating billions of miles of autonomous vehicle testing.



DRIVE SIM

The first server runs DRIVE Sim software to simulate a self-driving vehicle's sensors—from cameras to lidar and radar. Powerful GPUs generate photoreal data streams that create a wide range of testing environments and scenarios. This means you can easily test rare and difficult conditions: rainstorms, snowstorms, and sharp glare at different times of the day and night, with different road surfaces and surroundings.

Why Fault Modeling & Validation?



If you can not measure it, you
can not improve it.

~ Lord Kelvin

AZ QUOTES