

Learning from Test Pilots:

Risk Management Strategies for Testing Complex Systems

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Content is the opinion of the author and not necessarily the position of any organisation

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What do Test Pilots do?



Capt Charles Yeager, Bell X-1, Muroc Air Force Base, May 1948

<https://unwritten-record.blogs.archives.gov/2022/10/13/captain-chuck-yeager-breaking-the-sound-barrier/>

System design feedback
- Identify operating envelope

Abstract operator bias
Constrain variables

Manage Risk



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So what?



Common experience

On-going research

Better risk management

- eliminate ineffective practices
- address complexity



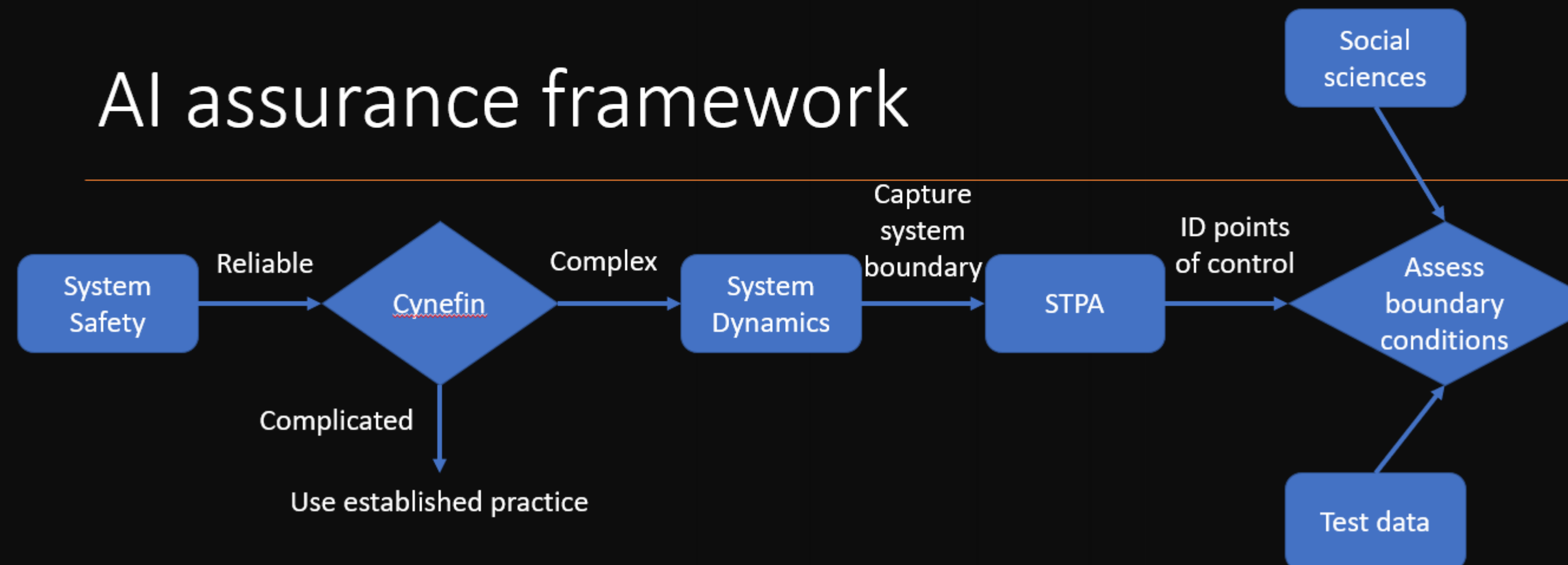
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aSCSa 2022

Subsystem A

AI assurance framework



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Research

Findings

1. Uniquely across 3 domains
2. Parallel approaches
3. Inefficient but assures effective

Experimental flight test crew

- survey, n=49
- interview, n=9

Outcomes

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3 types
of systems
- different attributes



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Outcomes

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One size
does not fit all

3 types
of systems
- different tools



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What to do with this?

Continue to abide by the rules

Critical thinking

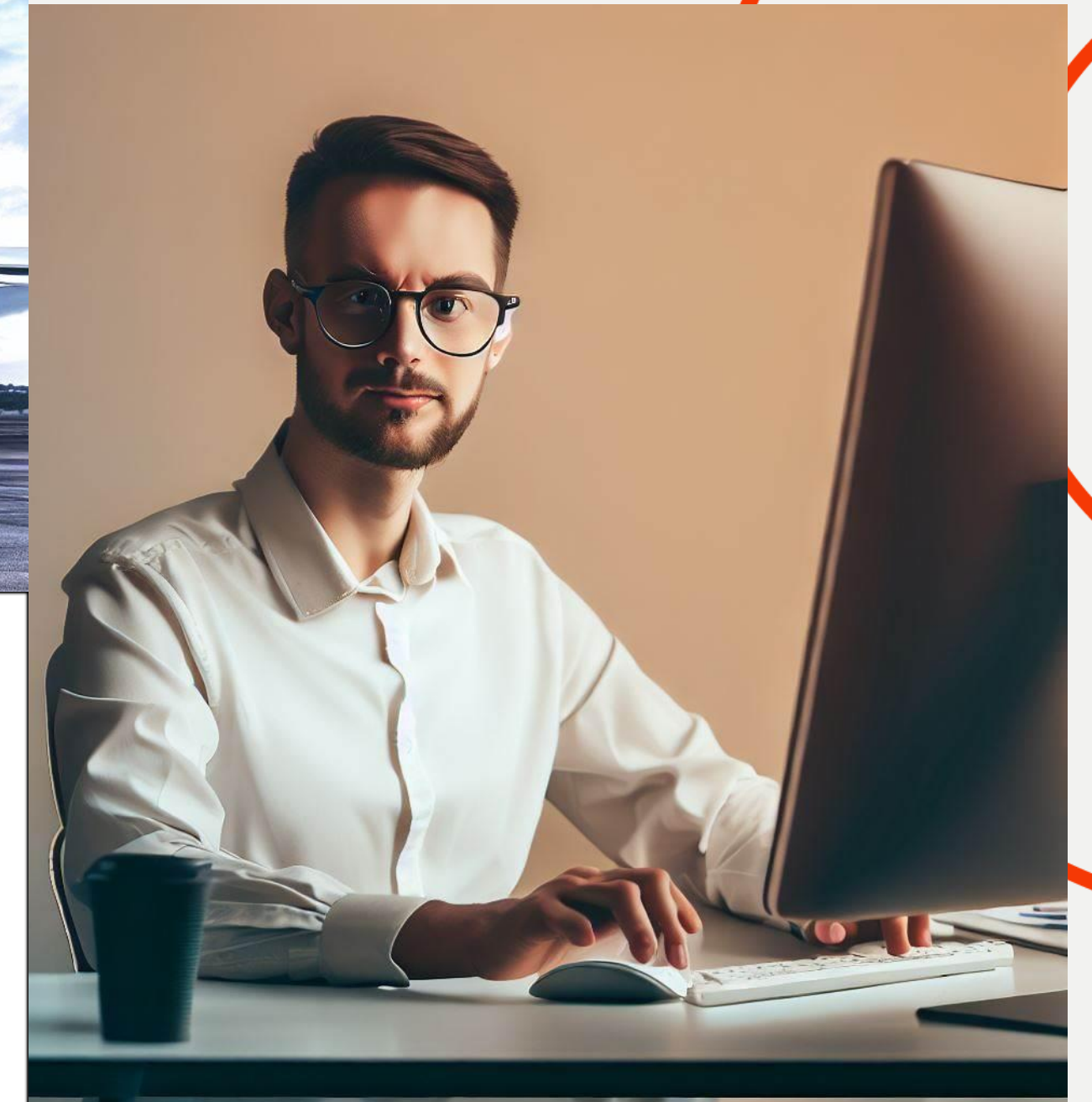
- right tool for the job
- do you really know the probability?

Understanding

- risk acceptance
- empathy



RISK ASSESSMENT MATRIX				
SEVERITY PROBABILITY	Catastrophic (1)	Critical (2)	Marginal (3)	Negligible (4)
Frequent (A)	High	High	Serious	Medium
Probable (B)	High	High	Serious	Medium
Occasional (C)	High	Serious	Medium	Low
Remote (D)	Serious	Medium	Medium	Low
Improbable (E)	Medium	Medium	Medium	Low
Eliminated (F)	Eliminated			



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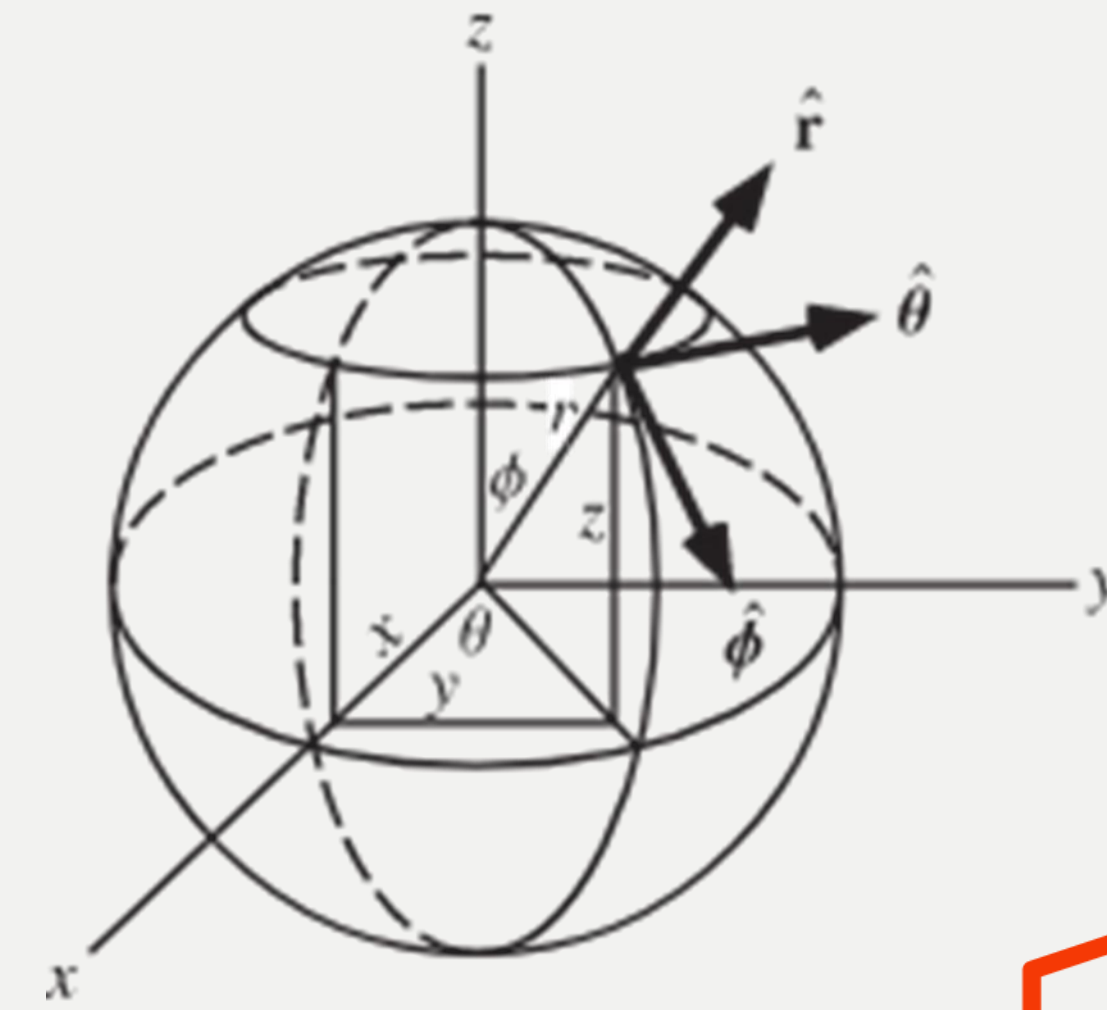
Conclusion

Previously: 2 domains - linear

- just do it twice

Now: 3 domains, add Complex

- more effort is not better



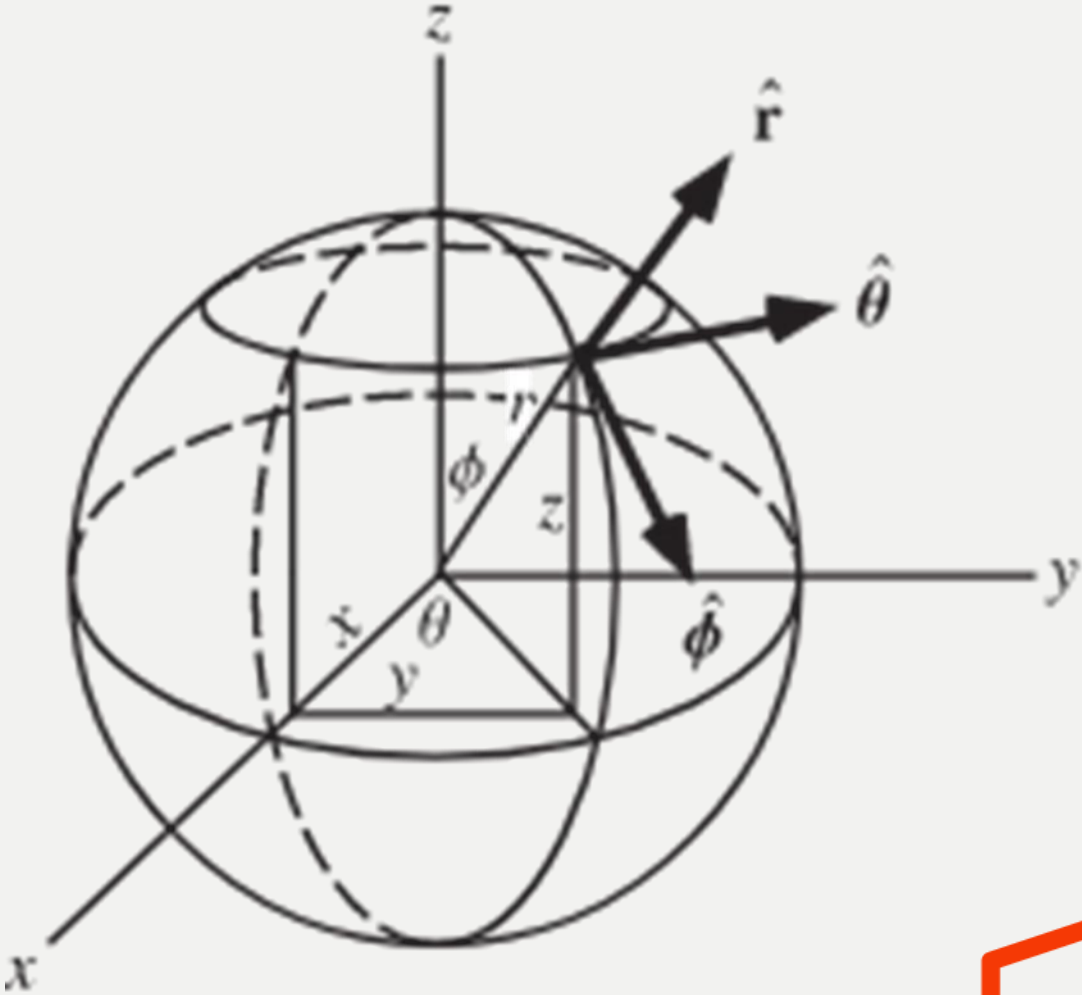
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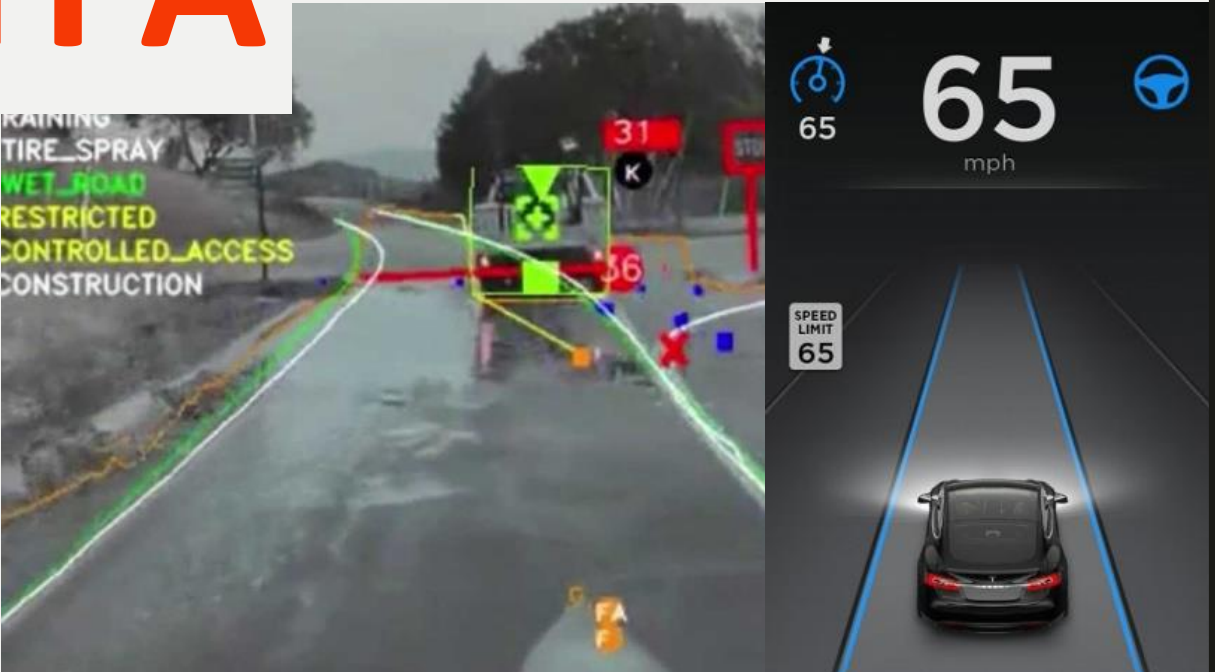
Conclusion

Complex domain

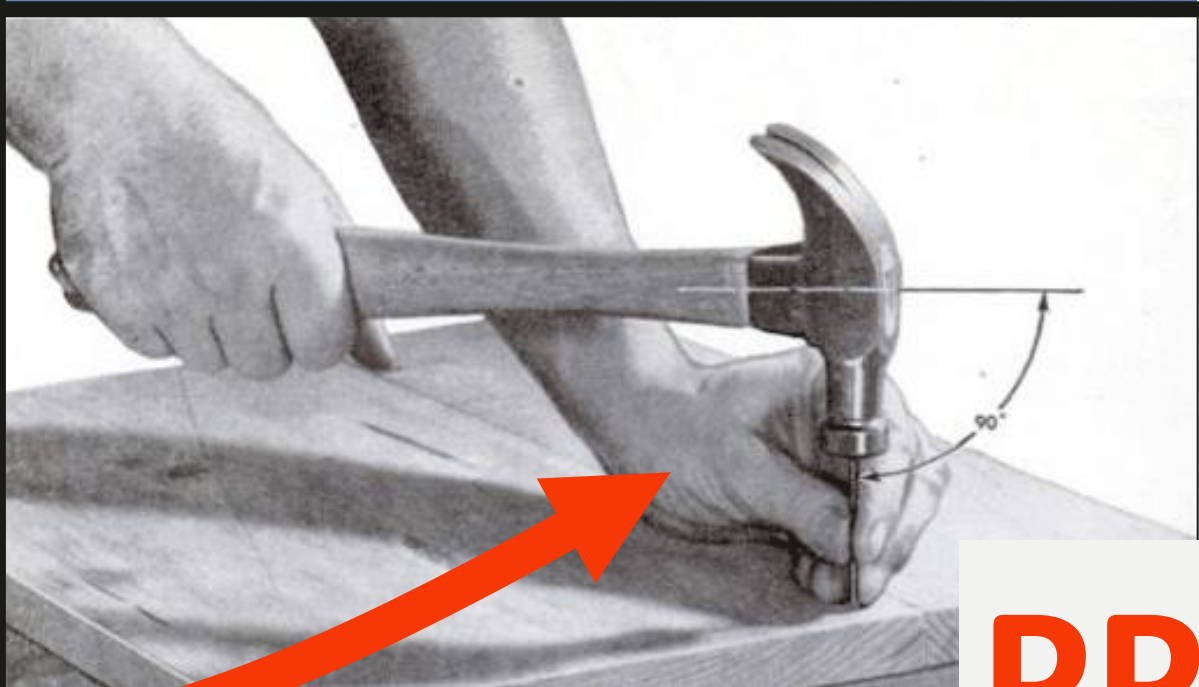
- statistical tools don't work
- need tolerable consequences



STPA **Precautionary**



SMS



Unstable

PPE

Questions

