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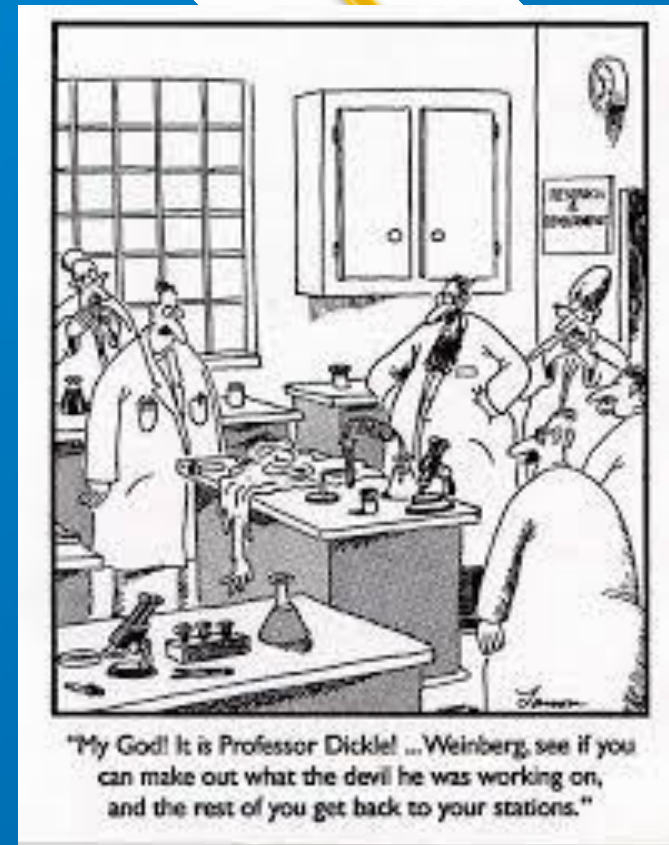
How to Specify a Detection Problem

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smiths detection
bringing technology to life

The Problem

- CBP has needs and problems
 - Vendors have solutions – do they solve the needs?
 - Academics can solve problems – but are they the right problems?
- Specification & Metrics drive performance
 - A good problem specification drives development
 - And drives testing/validation
- TSA's metrics probably will not work for other domains



Variety is the spice of life

- CBP is not TSA
 - Different operational model
 - Different acquisition model
 - Different problem model

What: {drugs, \$/£/€, meds, rad/nuc, contraband, people}

X

Where: {aviation, sea ports, land borders}

X

How: {suitcase, vehicle, person, mail}

X

When: {inbound, outbound}

What needs to be specified?

- Detection
 - Type (perhaps in groups)
 - Quantity
 - Presentation
 - Physical Characteristics that can be measured
 - Often dictated by the measuring technology
 - May change over time
 - How badly does it need to be detected?
 - P_D & P_{FA} (overall & by group)
 - Don't forget the distribution



→ COMPLEX UTILITY FUNCTION ←

What else?

- A bunch of other –ilities: speed, destructiveness, cost, ...
 - Flexibility: Are there problems that don't need to be solved?
 - Operational Considerations: What happens after an alarm?
 - What happens after a non-alarm?
 - Adaptability: how do we measure *that*?
- Be Real
 - Detection not 100%, FA rate not 0%, Cost not \$0
 - Everyone needs to accept this (politicians and public)
 - Not the same as accepting inadequate solutions
 - Solutions will improve to fit the solution space

Deployment drives; improvement iterative

Do we need to talk about Jell-O™ (or wood) again?

- Jell-O is a convenient surrogate in the TSA domain
 - Looks sufficiently like certain explosive threats, depending on properties
 - A solution to specification for Jell-O will probably work for real threats
 - Looks like other stuff that one might find in luggage (e.g., toiletries)
 - Can mix in other stuff for texture / inclusions

Surrogates may be useful for CBP



But wait! There's more!

- Is Detection Additive?
 - Depends on problem, technology, and more
 - Cost might also be additive
- How do we test?
 - What needs to be tested?
 - Can it be tested independently?
 - Can we test the surrogate?
 - What about combinatorics?
 - Are we taking this course pass/fail or for a grade?

In the complex CBP problem space, academia, industry, and government can collaborate to divide & conquer!

Specify, Measure, and Forge Ahead!



Watch the doughnut,
Not the hole



Thank You