UU/SU

Mathematics
+ CS/Linguistics
Statistics & Logic

Me

thanks to connections developed here

Sensmetry

Chief ~~data scientist~~ architect

this means "mathematician with computer

this means I also get to put maquettes of my favourite buildings in the office

back to talk to you about

Also here today

Ruta

HR & Marketing manager

Sensmetry

≈ 20+ ppl here

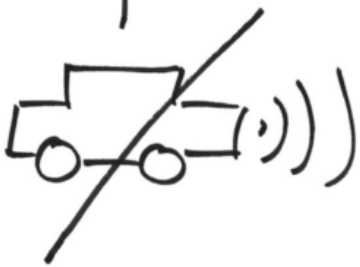
Started by

Juozas Steve

response to stoppiness of automated driving industry practices

we graduate!

Focus changed since:



Help companies

manage risk of expensive or dangerous machines

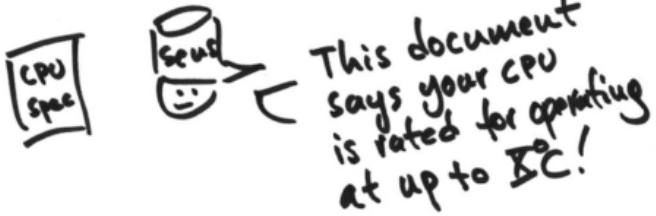
~~financial~~

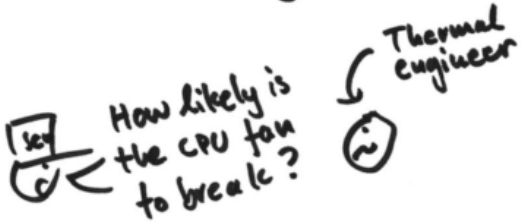
insu~~rance~~

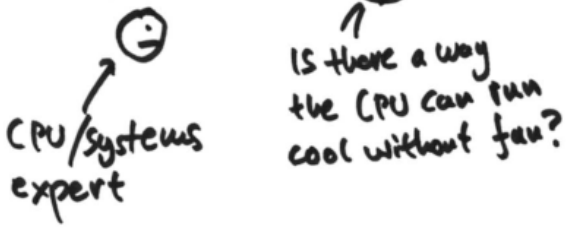
Managing risk?

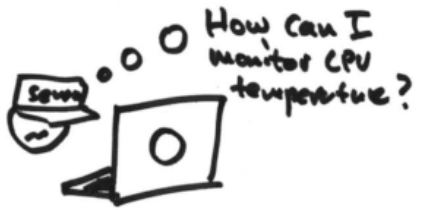
Work with companies/creating: satellites, vehicles, fleets, ... to

Maintain a picture of what can go wrong

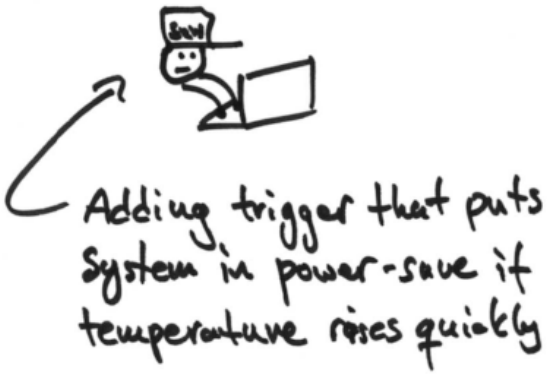








Implement systems that mitigate and look out for the things that can go wrong



Not about knowing more about antennas or thermal dynamics than client, but about being more systematic: ensure *all* components considered, *all* consequences taken into account, ...

Reality

Most "non-engineering" work involves lots of programming, IT-maintenance, and data processing

Most application of non-trivial mathematics tend to be shallow, speculative, or, at best, useful mental guides

There <u>is</u> potential, but industry bottlenecked elsewhere (esp. awful software and math/computer illiteracy)

Nonetheless, a number of places people with a mathematics have turned out to be skilled!

Systems & Concept modelling

"there is a CPU" "CPU may overheat" "CPU necessary for running system"

Lots of book-keeping: system design, ways things fail, potential consequences, evaluation of failure/consequence, justifications for evaluations, ...

"System not running could kill people, which is really bad!" "... according to report XYZ"

⇝ "exists component 'your CPU'"

? → "operating condition 'at 1°C' applies to 'your CPU'"

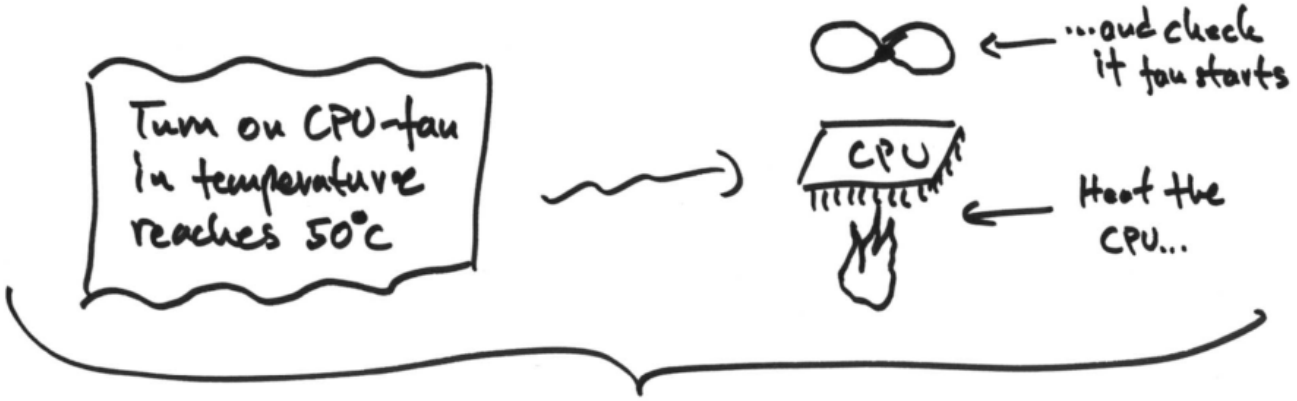
Captured either formally (in e.g. formal ontology) or informally (in e.g. structure of tables)

Mathematical theories are basically clever book-keeping devices that aid in dealing with certain structures, mathematicians do this all the time!

- Ensure not too difficult/cumbersome to write information
- Capture at sufficient granularity to be of use
- avoid inconsistencies
- aid computation
- ...

Design for testing

Need to test mitigating measures once they have been proposed and implemented



often simple for each individual test!...

Need to create a formalism for describing mitigating measures such that "sufficient" set of tests can be derived automatically

... but there will be thousands of these, at any given time, and they may be replaced as the system evolves or understanding of system improves!

Other areas

- (statistical) risk modelling: E.g. how to estimate reliability of system from experiments on its component pieces?
- (Physics) simulation: E.g. deriving good rule thresholds
  E.g. realistic input/output for testing
- (!) organisation: E.g. identify information channels and roles that ensure necessary & sufficient communication happens
  - not overwhelm
  - to make intelligent decisions