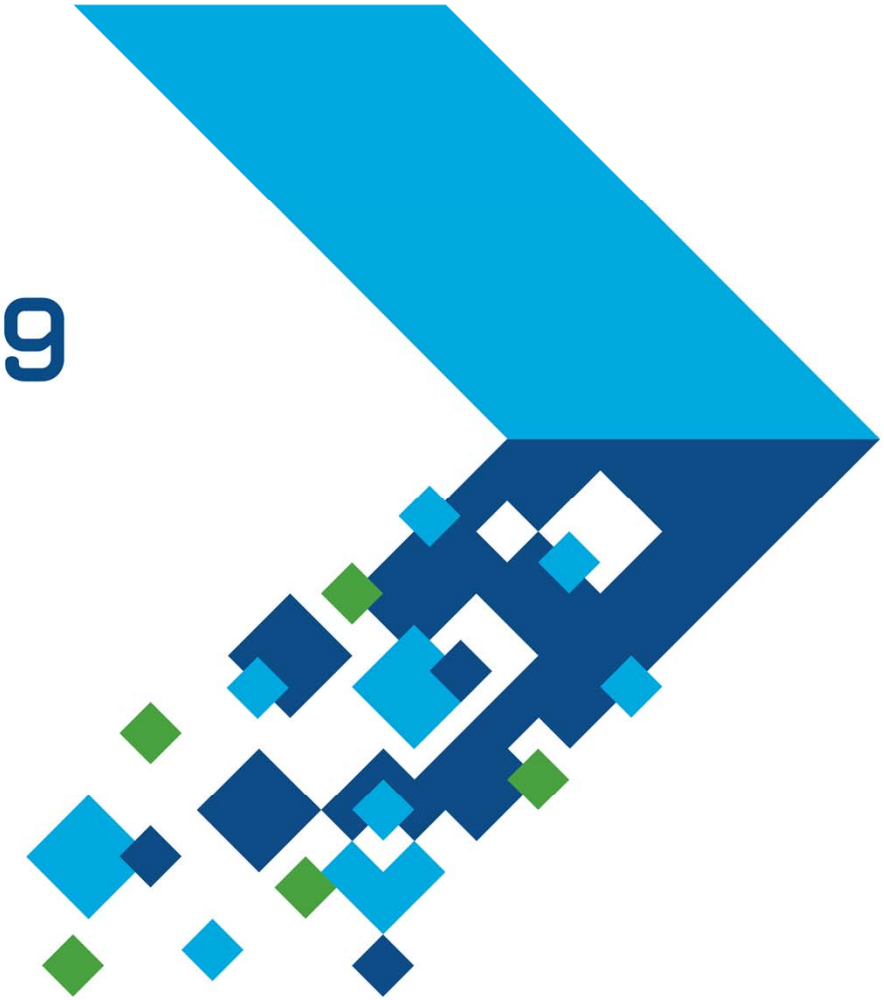
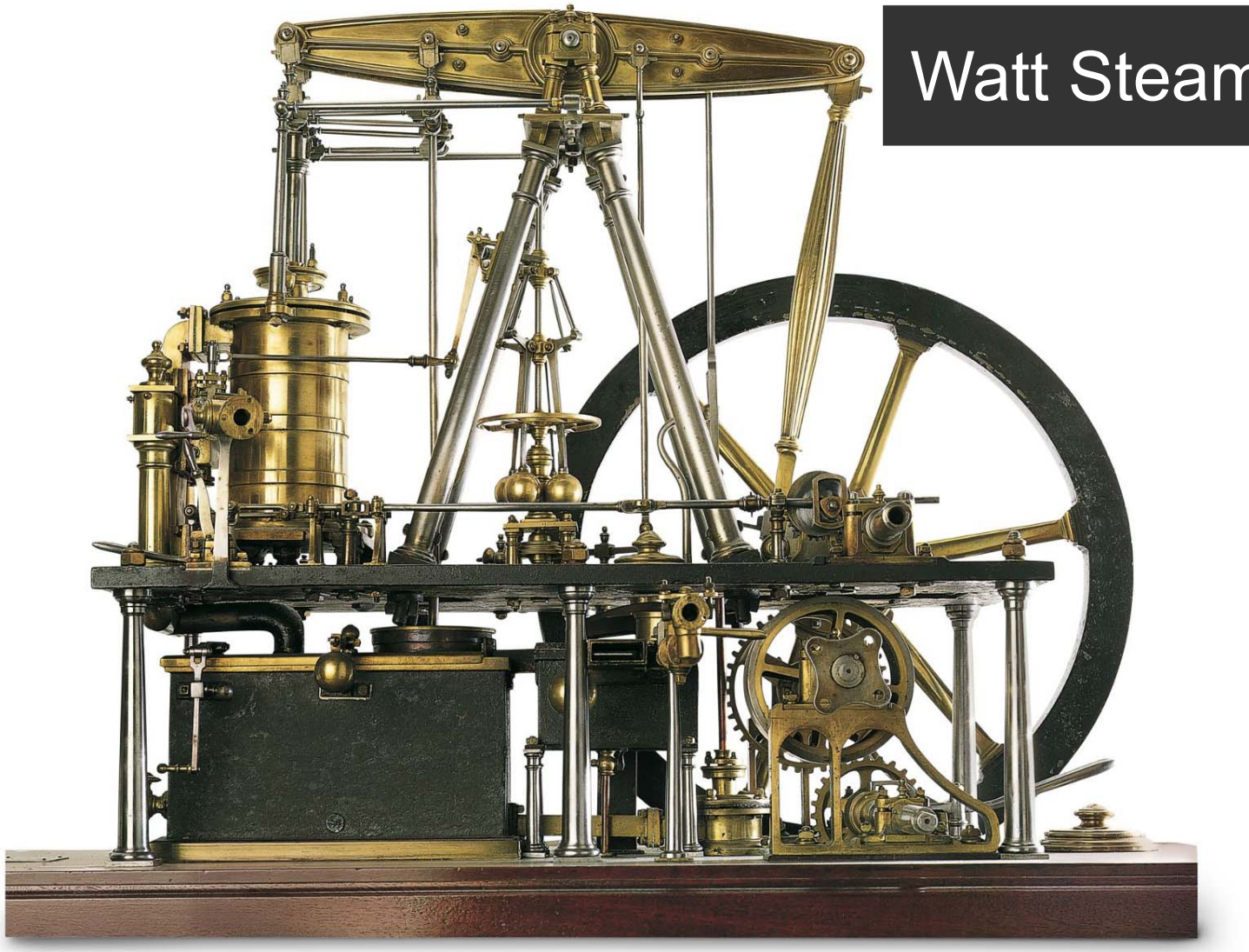
MATLAB EXPO 2019

Beyond the “I” in AI

Loren Dean



Watt Steam Engine



Artificial intelligence is a transformative technology

AI will create $13 trillion in value by 2030

based on McKinsey's latest AI forecast – September 2018

AI has tremendous potential to increase productivity

=

McKinsey Global Institute, September 2018

Yet AI is struggling

DigitalTonto
At the Crossroads of Media, Marketing and Technology...

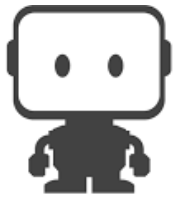
Most AI Projects Fail. Here's How to Make Yours Successful.

July, 2018

CMS WiRE

3 Common Reasons Artificial Intelligence Projects Fail

May, 2018

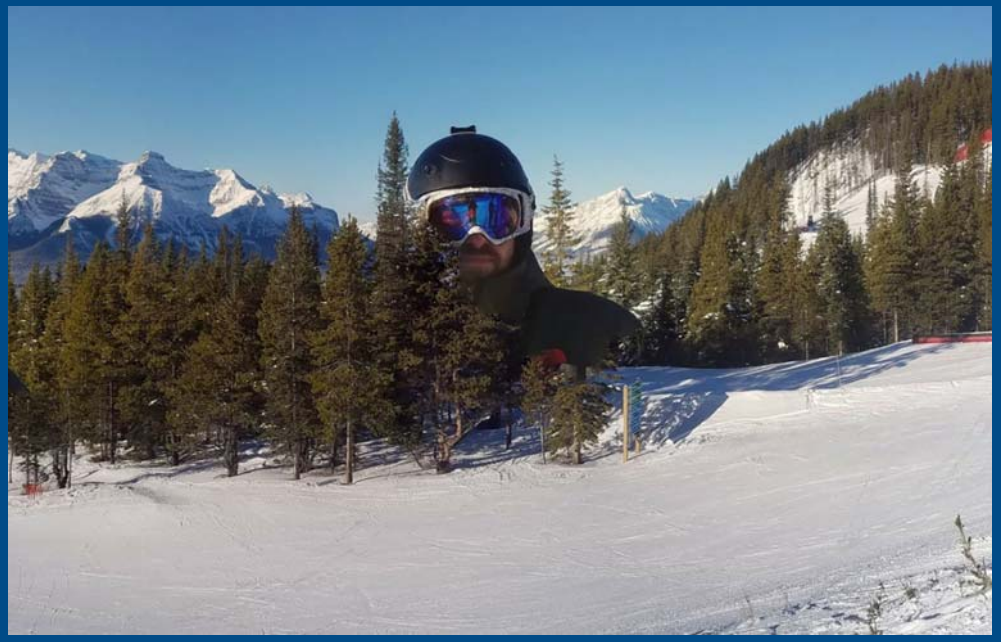


DataRobot

Why Most AI Projects Fail

Oct, 2017

Google Photos AI fail goes viral



engadget

AI's intelligence and stupidity in one photo stitch fail

01.23.2018

THE VERGE

I can't stop looking at this wonderfully bad Google Photos panorama stitch

By Natt Garun | @nattgarun | Jan 18, 2018, 6:51pm EST

There are many ways Artificial Intelligence can **fail**

No data scientists

Too much data

Poor ROI

Not enough data

Beyond the skill of the team

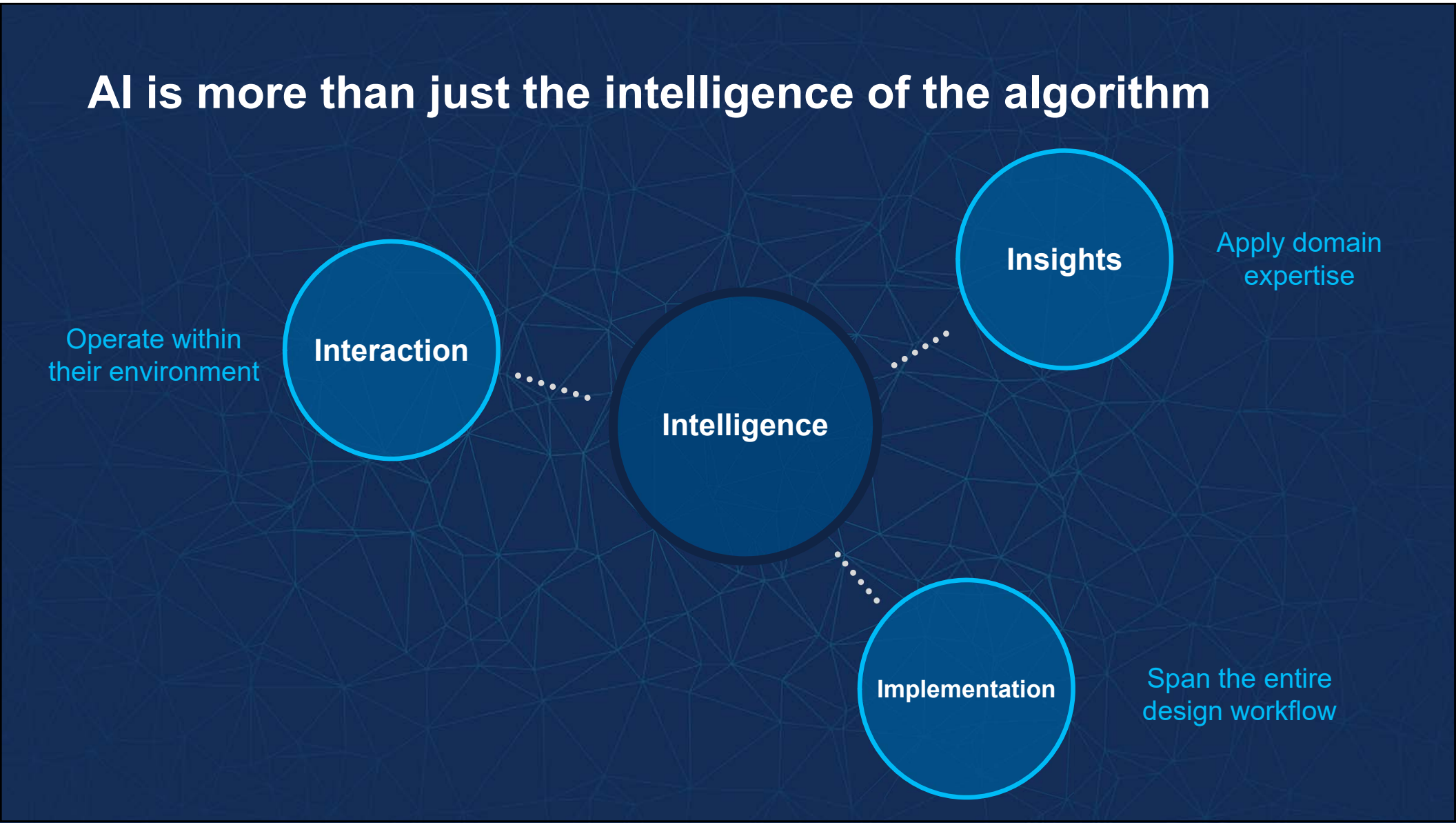
Incomplete tools

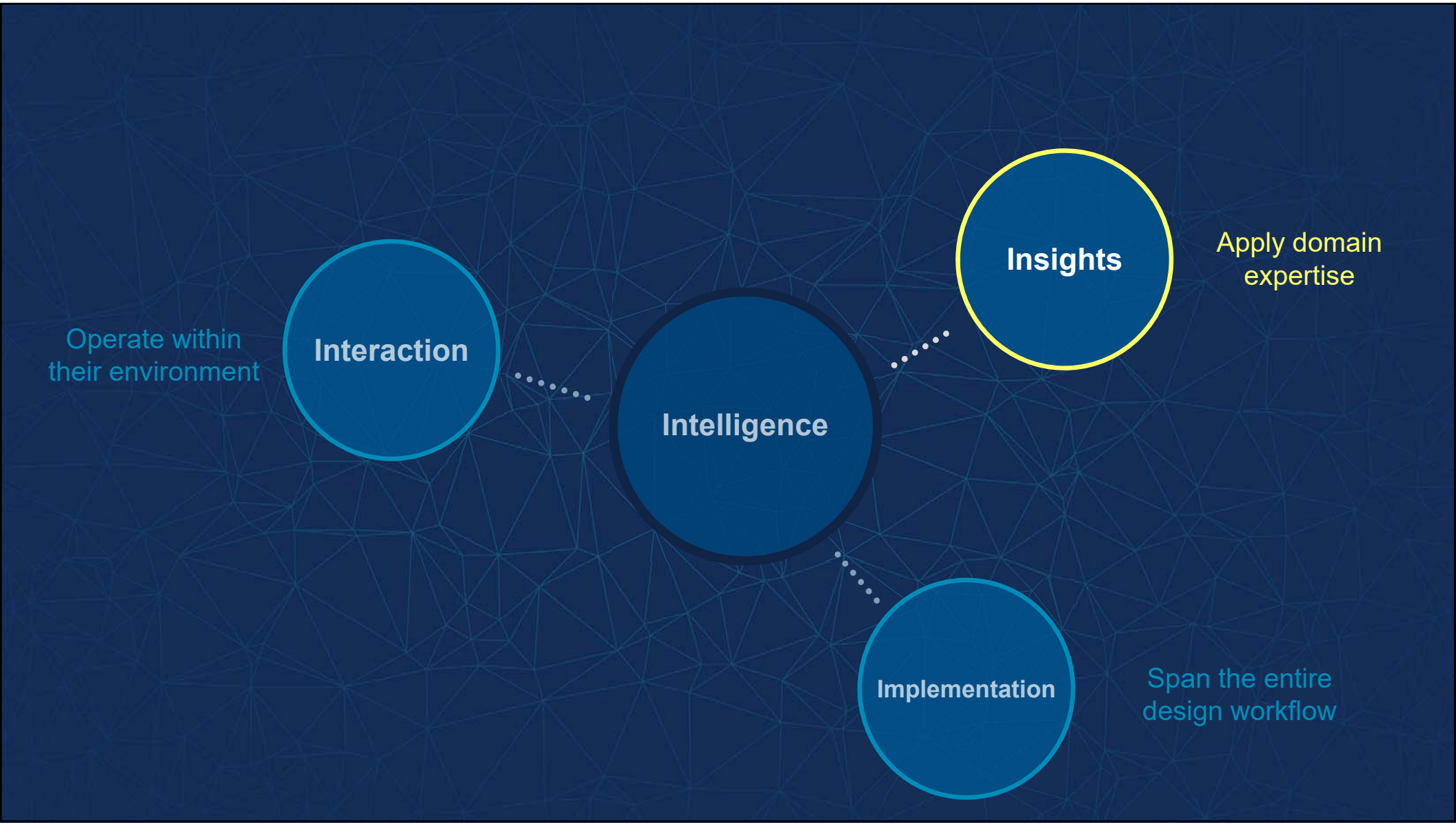
Problem is a poor fit for AI

Can't interact with other systems

Problem is unsolvable

AI is more than just the intelligence of the algorithm




Insights
Apply domain expertise
Operate within their environment
Interaction
Intelligence
Implementation
Span the entire design workflow

Bring human insights into AI

Select data

Make tradeoffs

Evaluate results

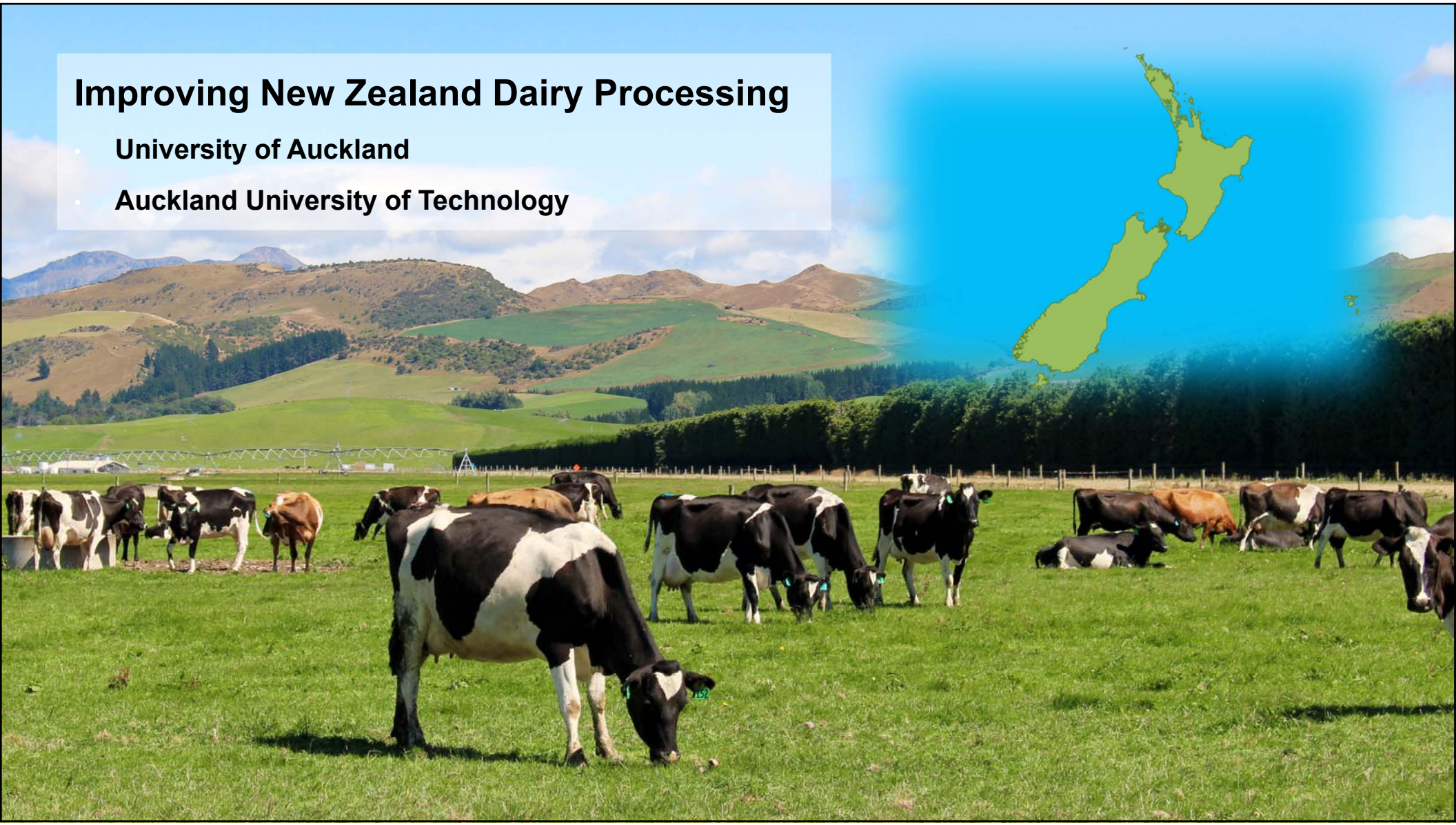
AI

Bring human insights into AI

- We are the domain experts
- Shortage of data scientists
- We need the right tools

Improving New Zealand Dairy Processing

- University of Auckland
- Auckland University of Technology



Wanted to detect a bad product earlier

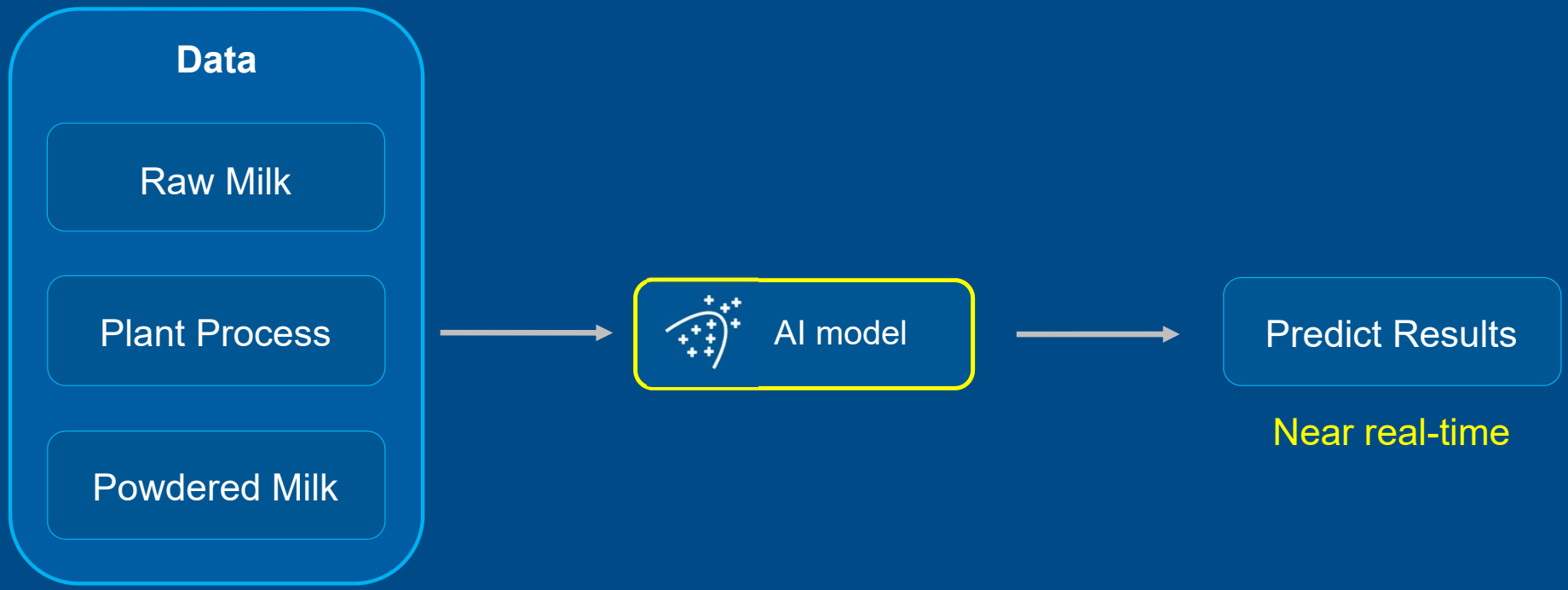
Raw Milk

Continuous Plant Process

Powdered Milk

Days later

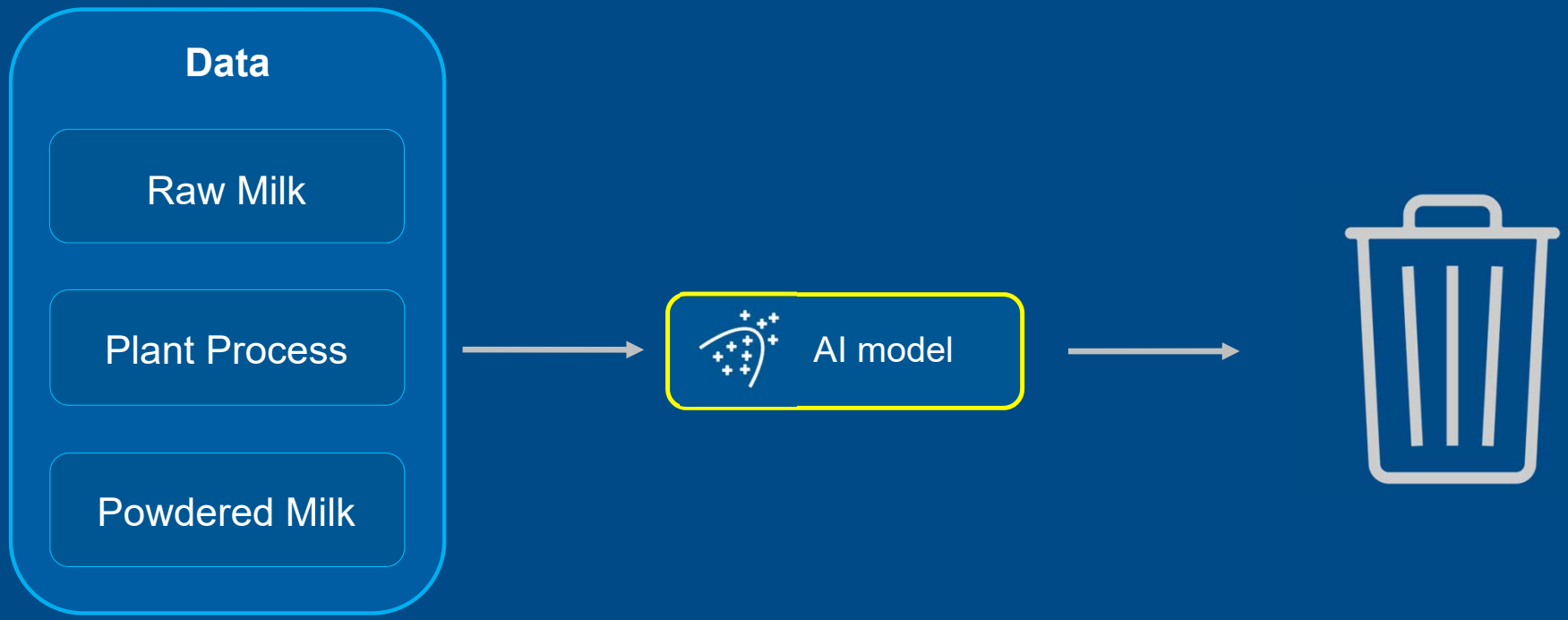
Wanted to detect a bad product earlier



They had lots of data

- Millions of data points
- 6 years
- 3 plants

But…



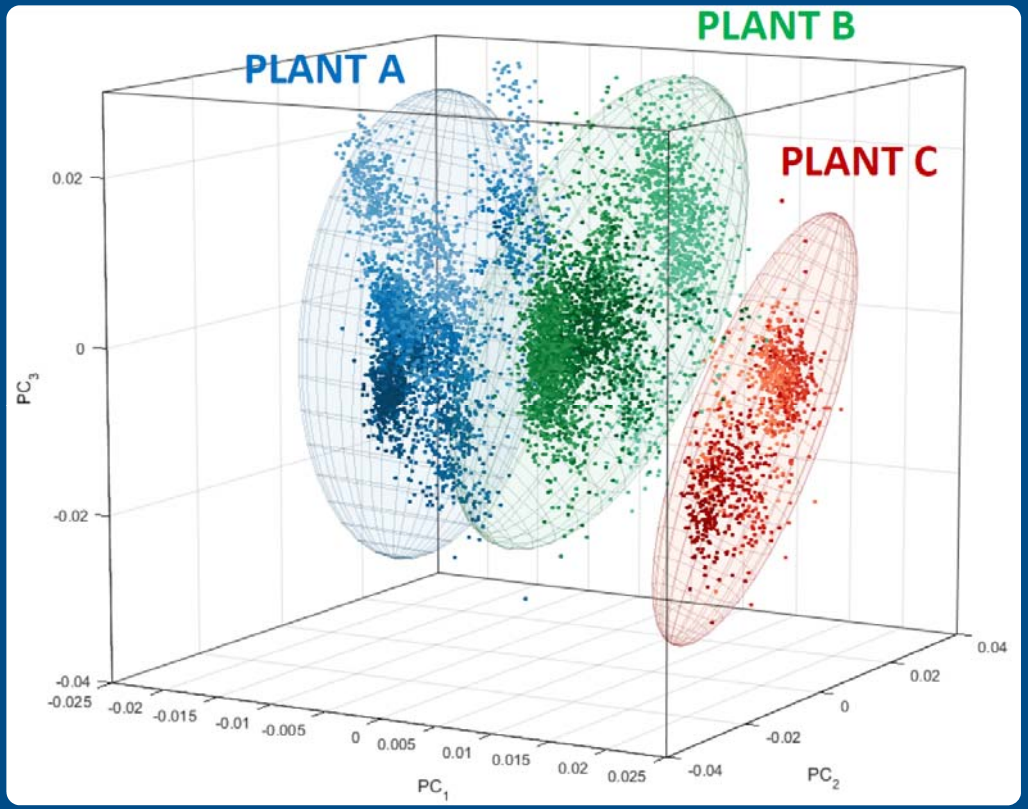
They made several key insights

1. Results were wrong

They made several key insights

1. Results were wrong
2. Need to build a separate model for each plant

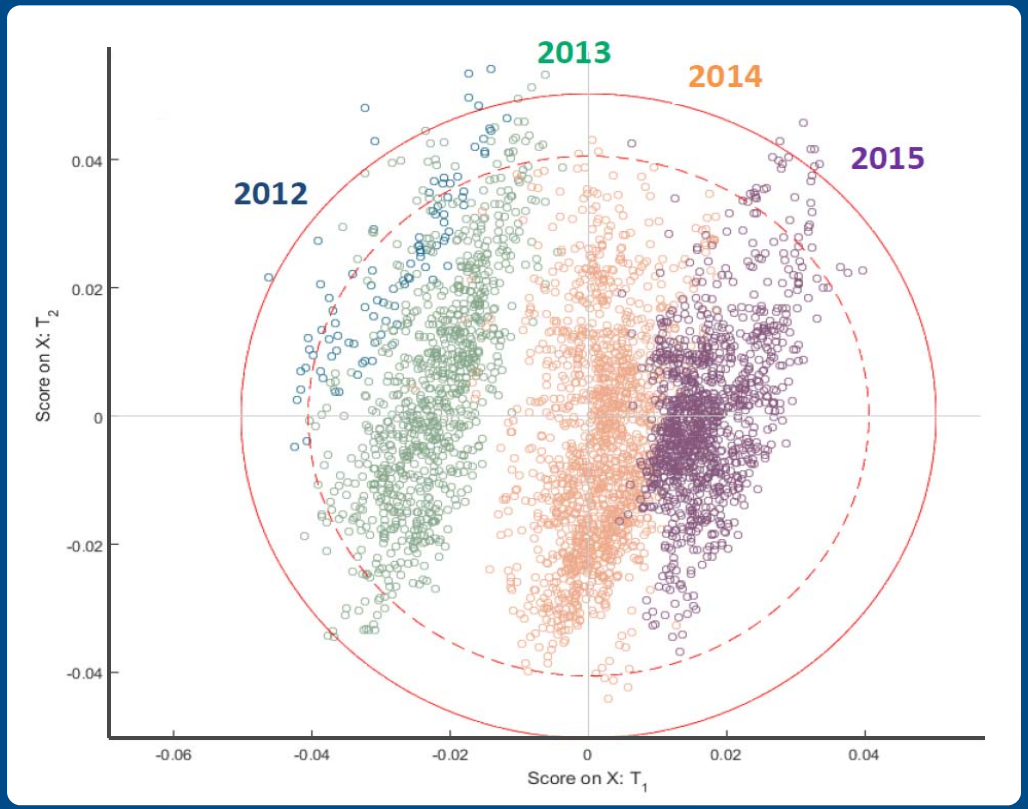
Plants behaved differently from each another



They made several key insights

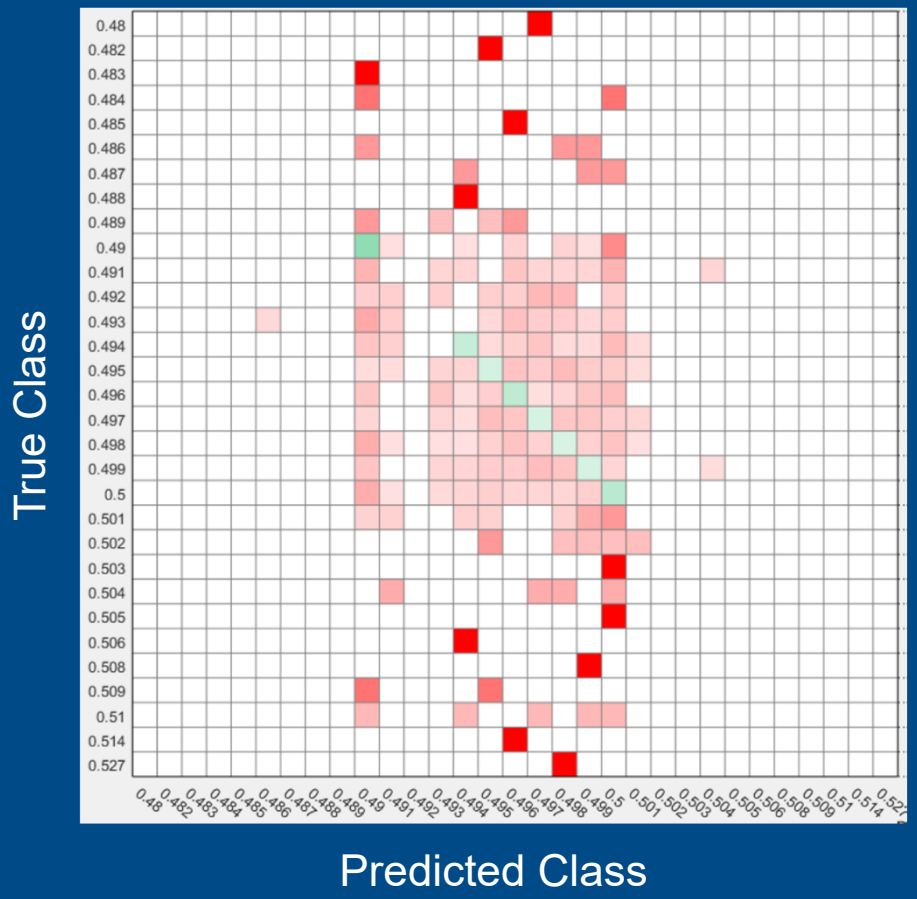
1. Results were wrong
2. Need to build a separate model for each plant
3. Plant's operating state changes each year

Each year was like a completely different plant



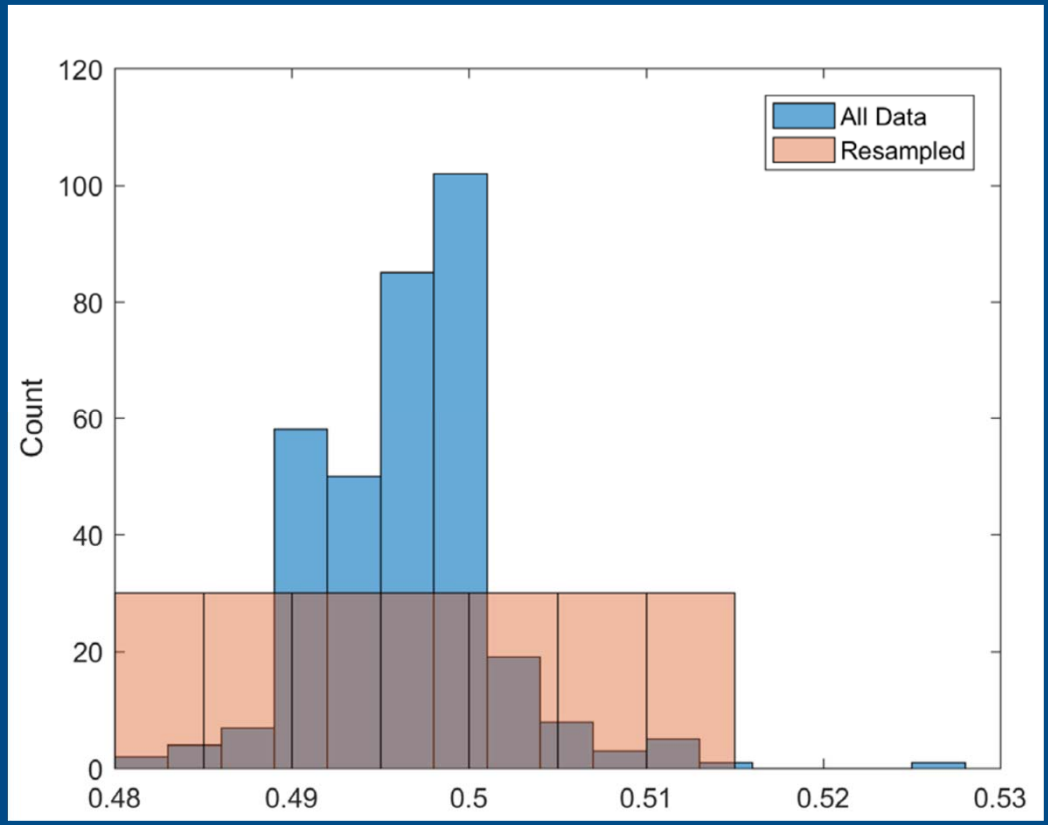
Bulk density prediction results were inaccurate

- Many false positives
- Unused classes



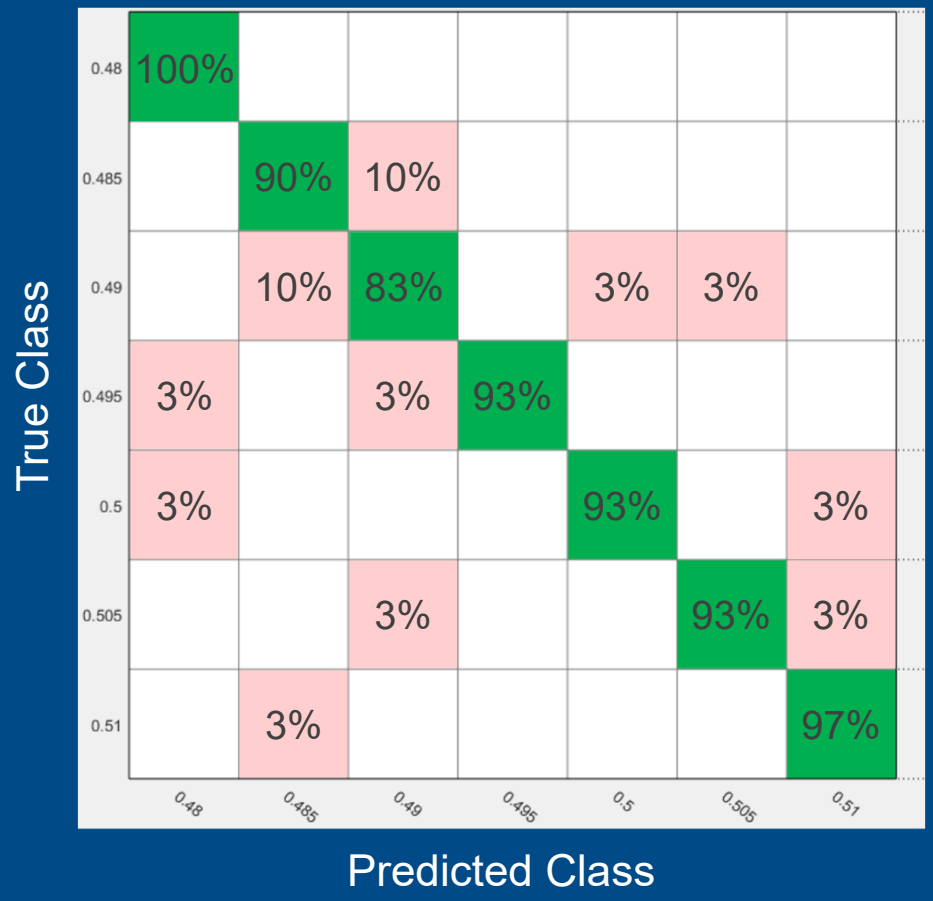
They made several key insights

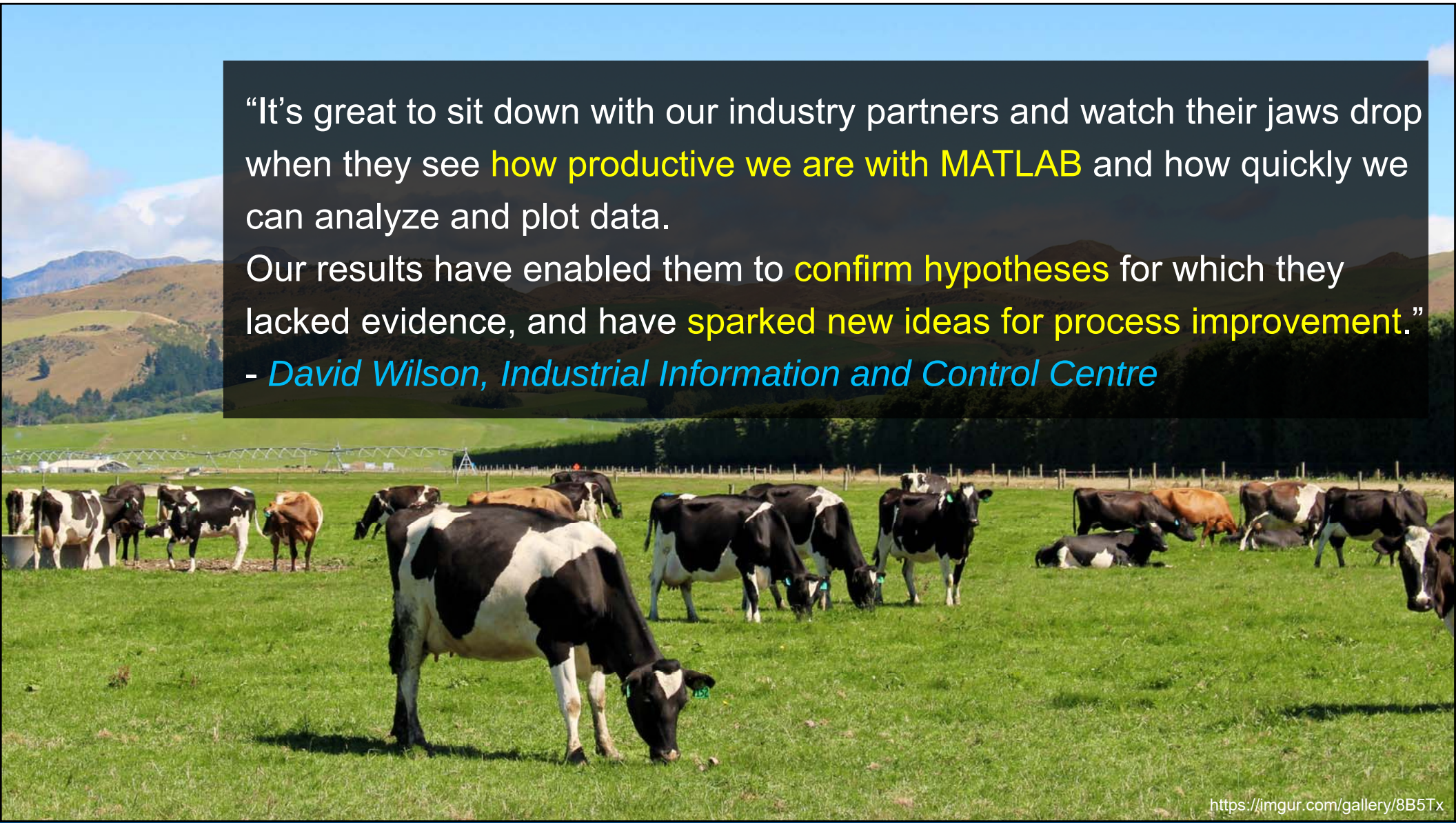
1. Results were wrong
2. Need to build a separate model for each plant
3. Plant's operating state changes each year
4. Training data was biased



Resampling data resulted in higher predictive accuracy

- Resampled data
- Reduced the number of bins

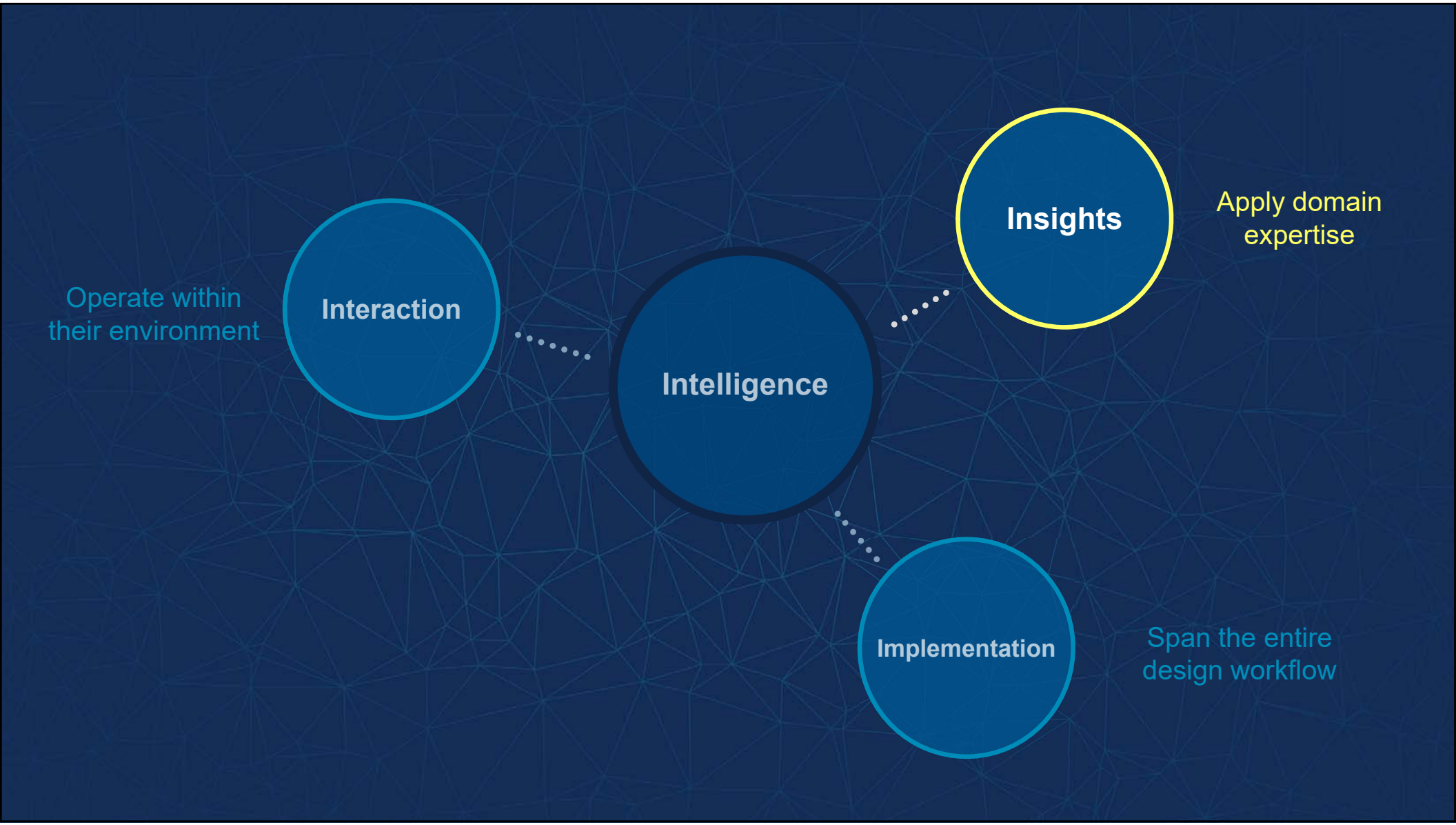


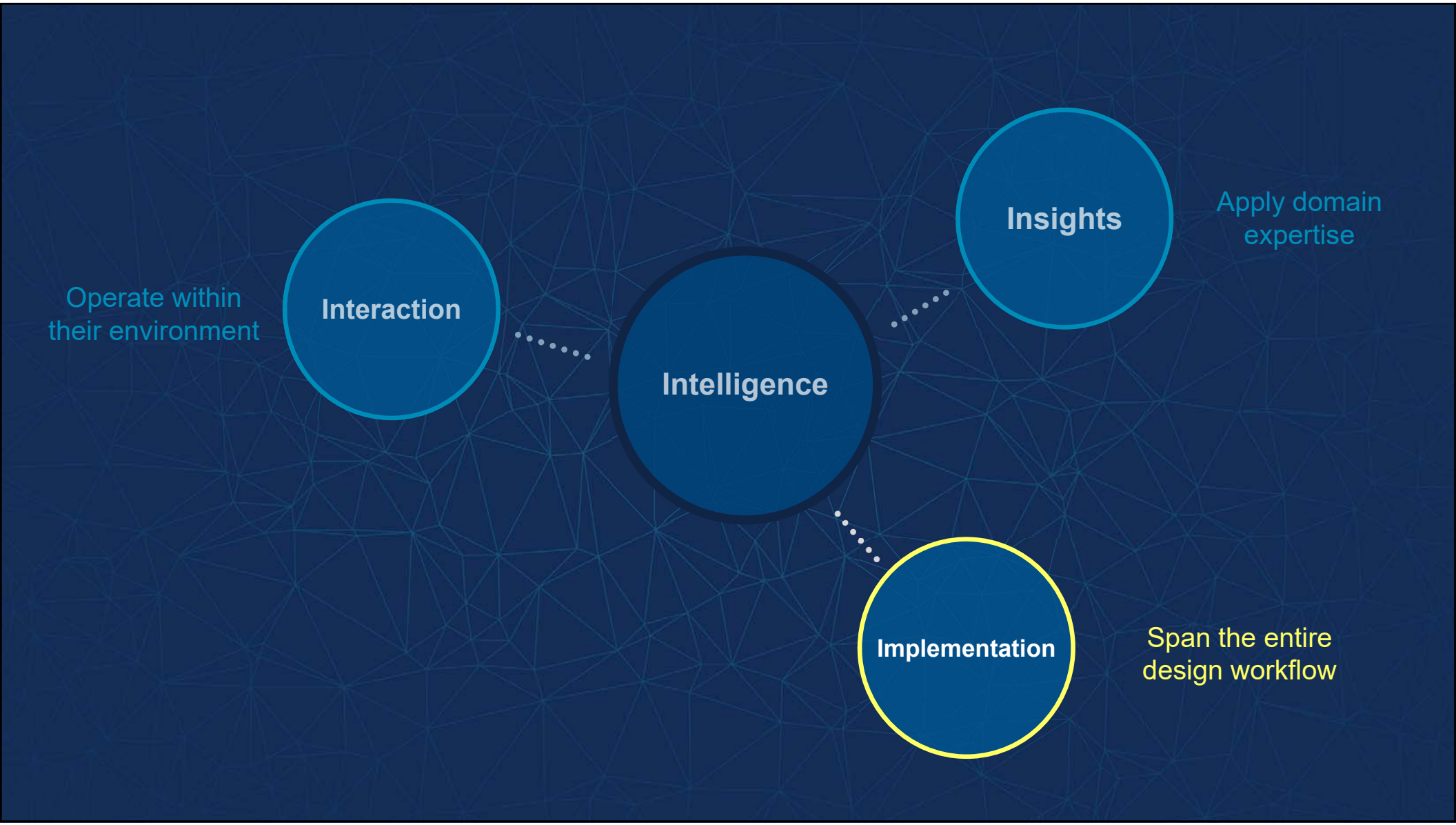

“It’s great to sit down with our industry partners and watch their jaws drop when they see how productive we are with MATLAB and how quickly we can analyze and plot data.
Our results have enabled them to confirm hypotheses for which they lacked evidence, and have sparked new ideas for process improvement.”
- David Wilson, Industrial Information and Control Centre
https://imgur.com/gallery/8B5Tx

To be successful with AI, we must …

Combine AI model building
with scientific and engineering insights

Along with tools that span
both the science and engineering and the data science


Operate within their environment
Interaction
Intelligence
Insights
Apply domain expertise
Implementation
Span the entire design workflow


Operate within their environment
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Span the entire design workflow

Implementation is about designing the solution

Research

Testing
Data analysis
Reporting

Manufacturing

Developing concept
Prototyping
Deployment

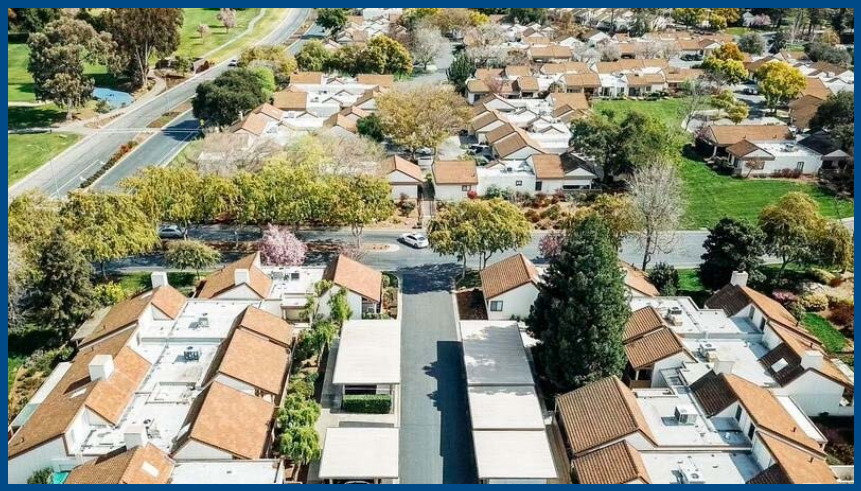
Autonomous System

Requirements building
Modeling and simulation
Verification and validation


“Deliver on the promise of self-driving cars today.”
VOYAGE

Voyage's goal was to quickly get to market

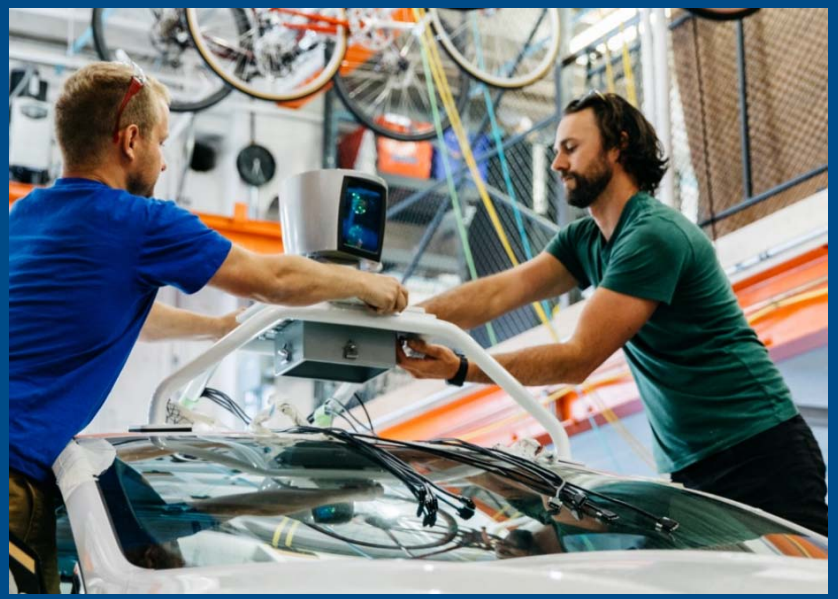
1. Target retirement communities



Voyage's goal was to quickly get to market

1. Target retirement communities

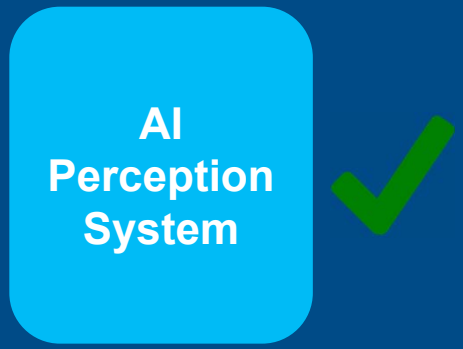
2. Use off-the-shelf components wherever possible



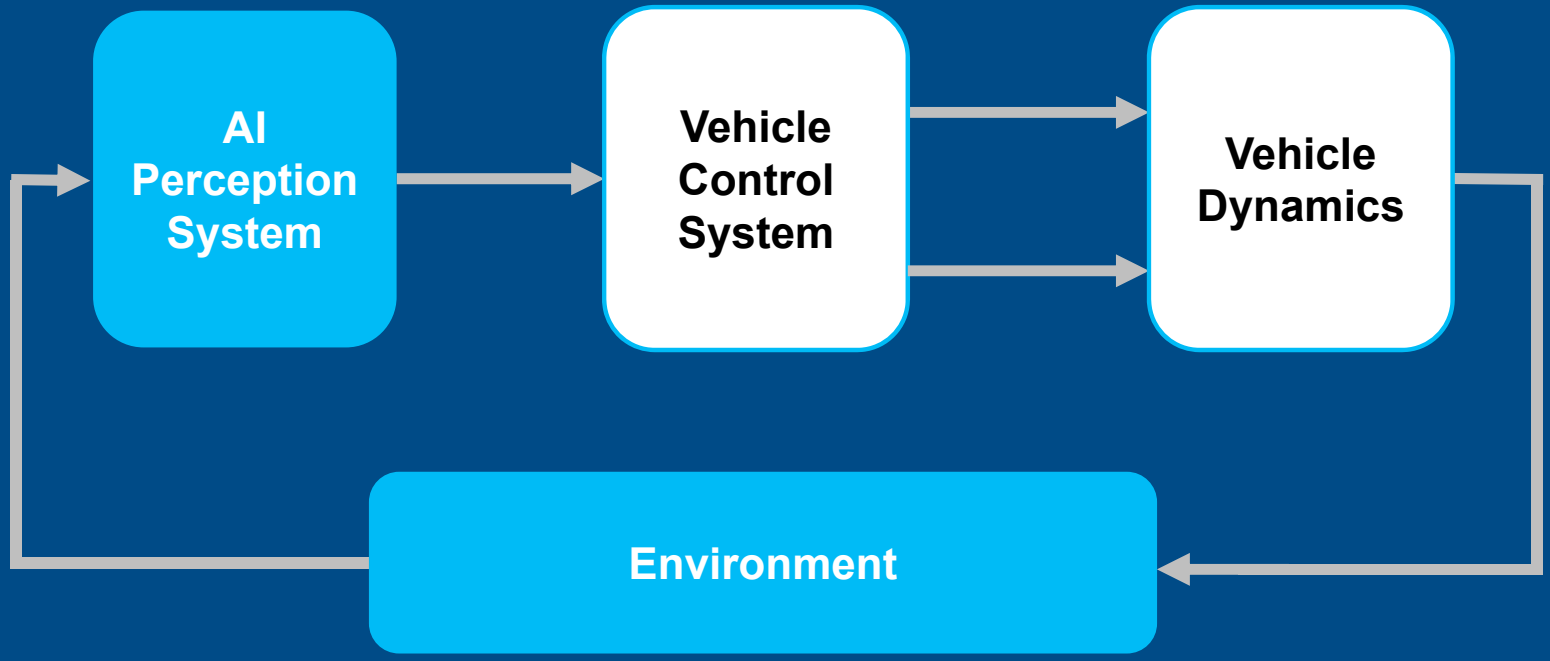
Voyage's goal was to quickly get to market

1. Target retirement communities
2. Use off-the-shelf components wherever possible
3. Bring in the right software tools across the entire workflow

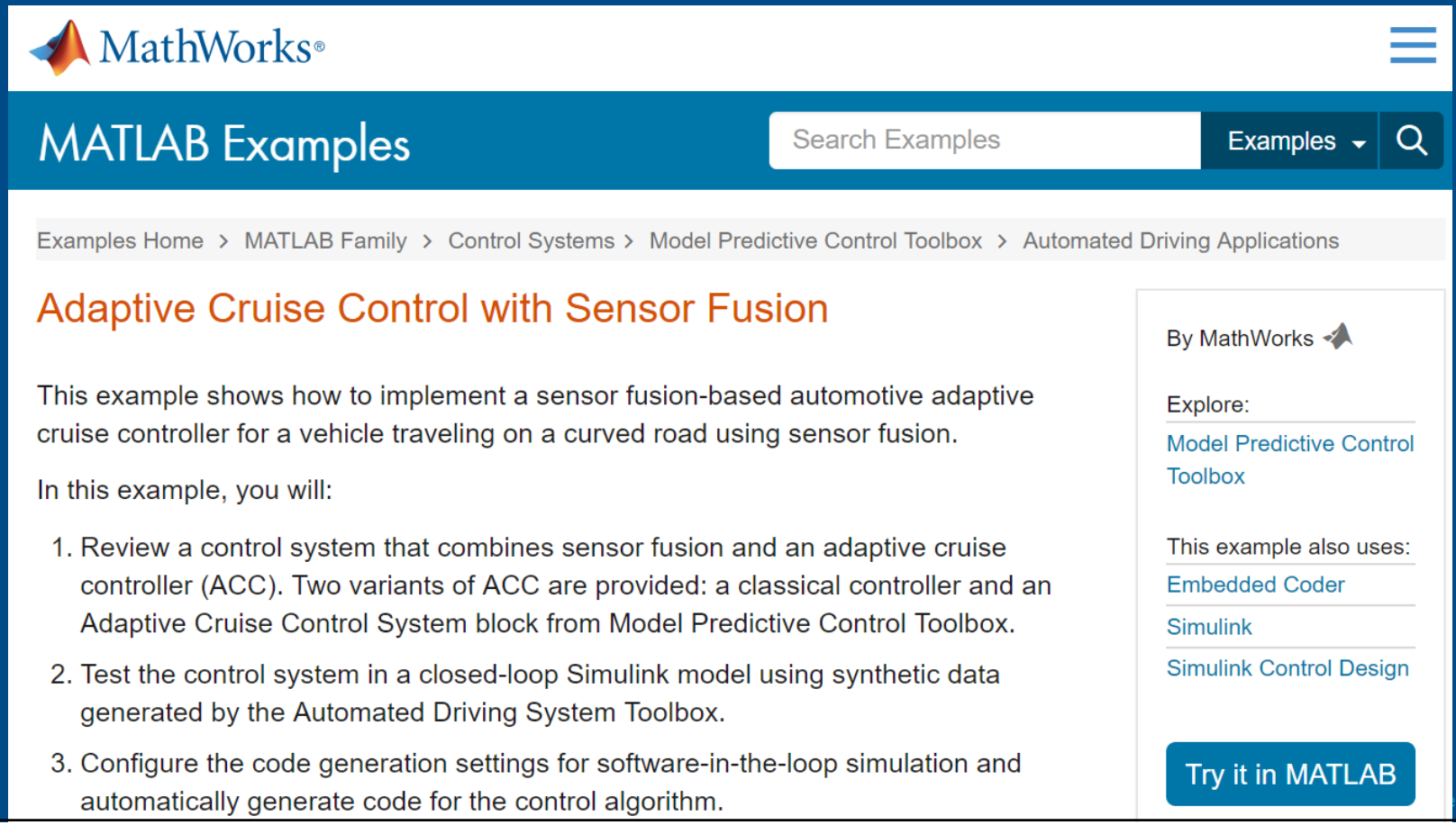
Voyage completed their AI system first



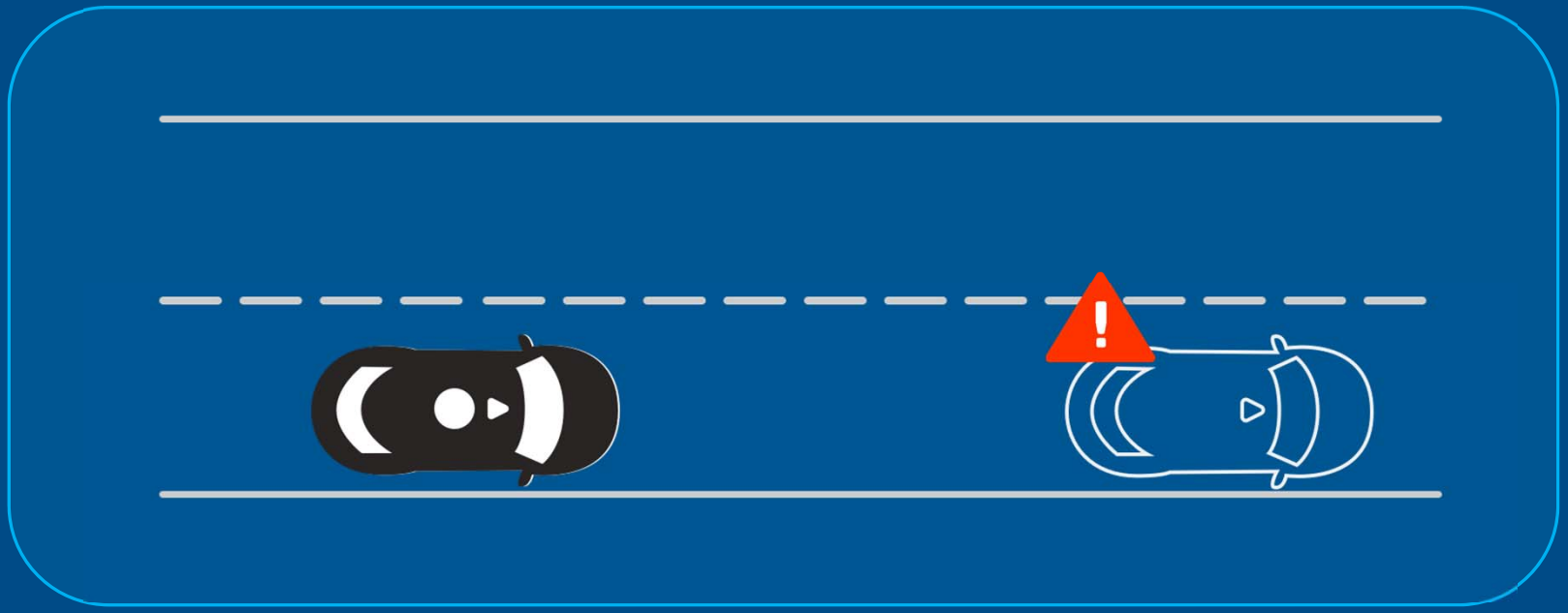
But they needed to connect the AI to the rest of the system



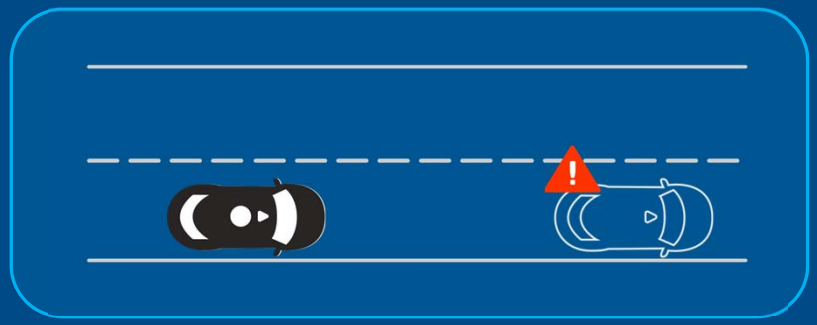
Started with Simulink example that they could build upon



Injected simulated vehicles to interact with while driving



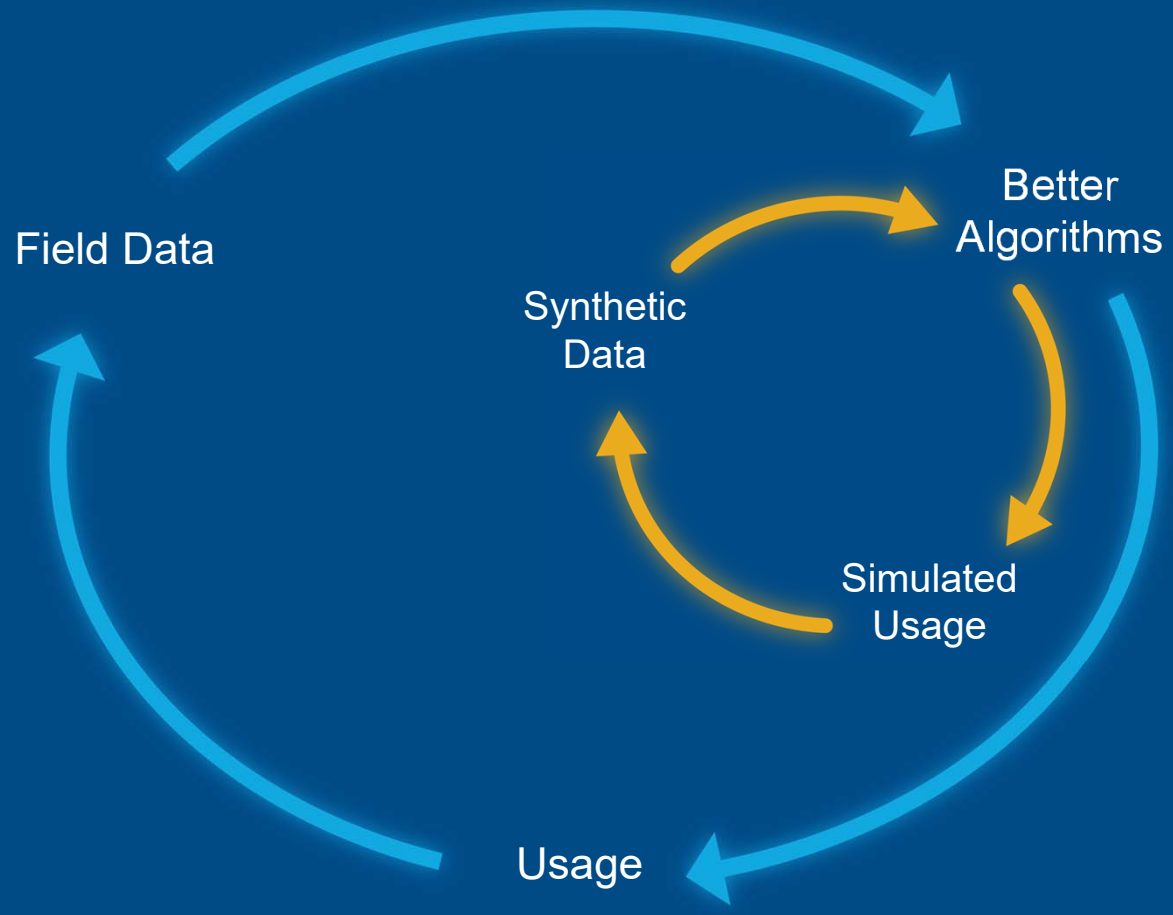
Deployed controller as ROS node and generated code



Robotics System Toolbox
Embedded Coder

ROS
Robot Operating System

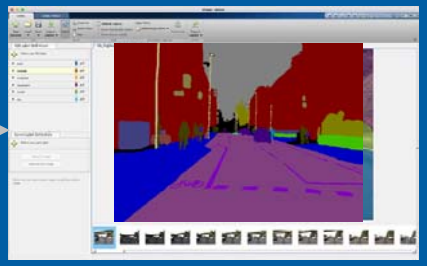
Train your AI faster with tight simulation loops



One example of leveraging simulation for data synthesis

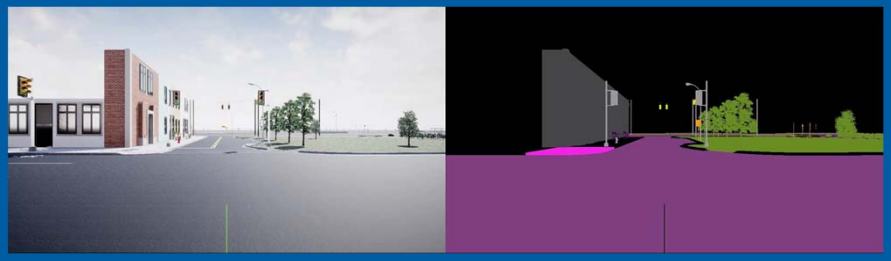
Traditional deep learning workflow

Record



Label

Simulation-based workflow



Simulate

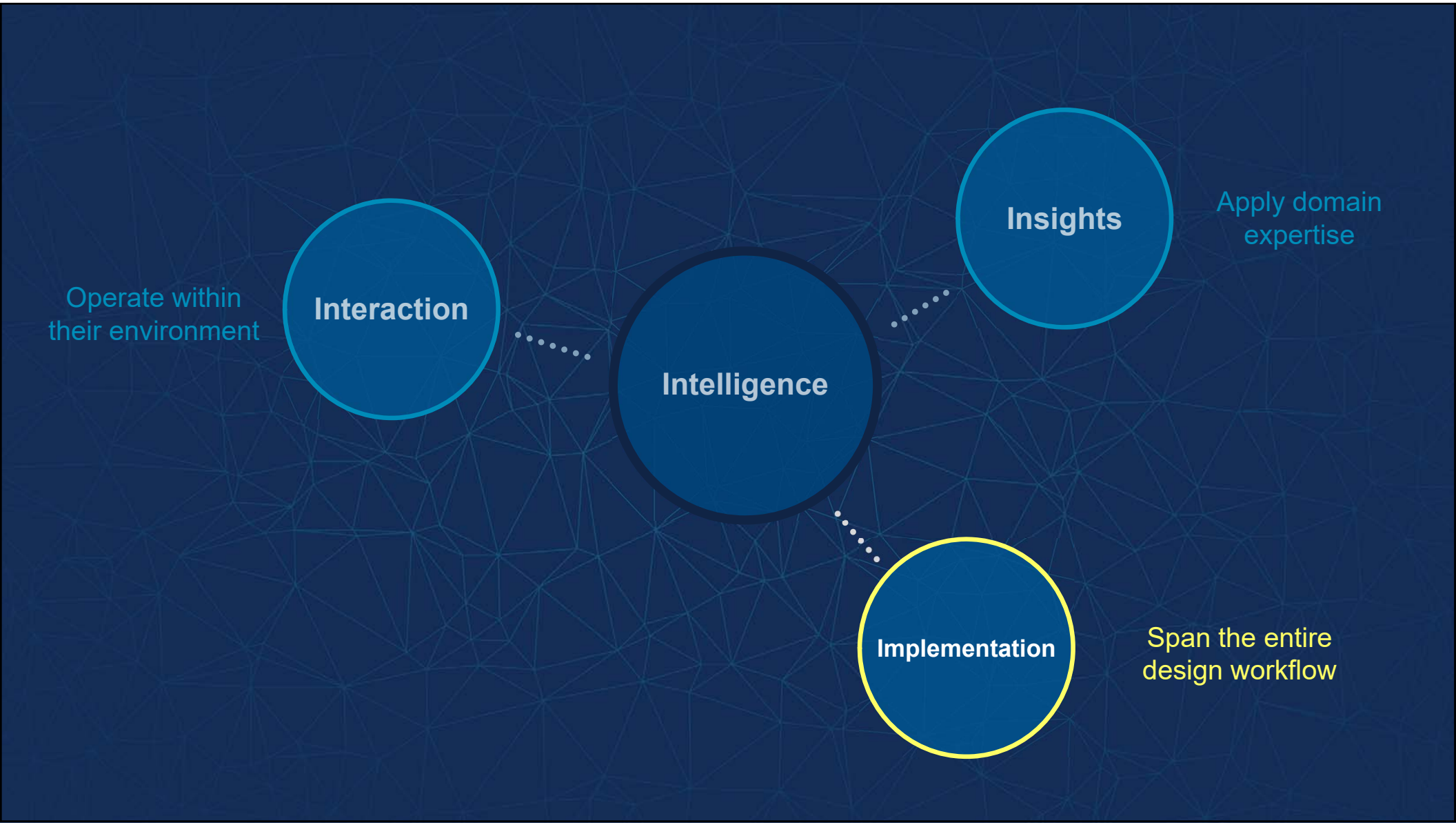
Auto-label

"Simulink + ROS allowed us to deploy a Level 3 autonomous vehicle in less than 3 months."

– Alan Mond, Voyage

To be successful with AI, we must …

Use tool chains that span
the entire design workflow


Operate within their environment
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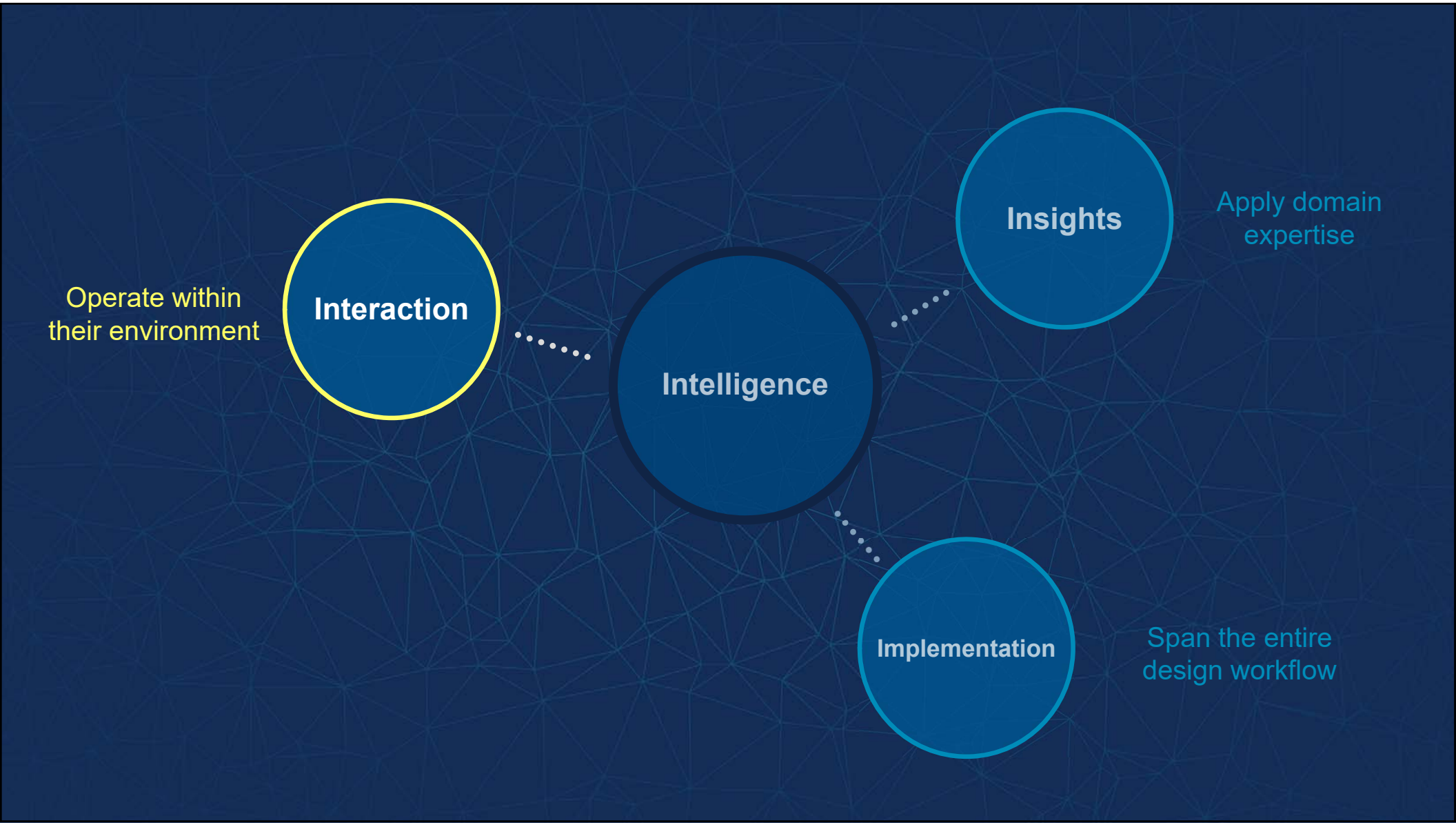
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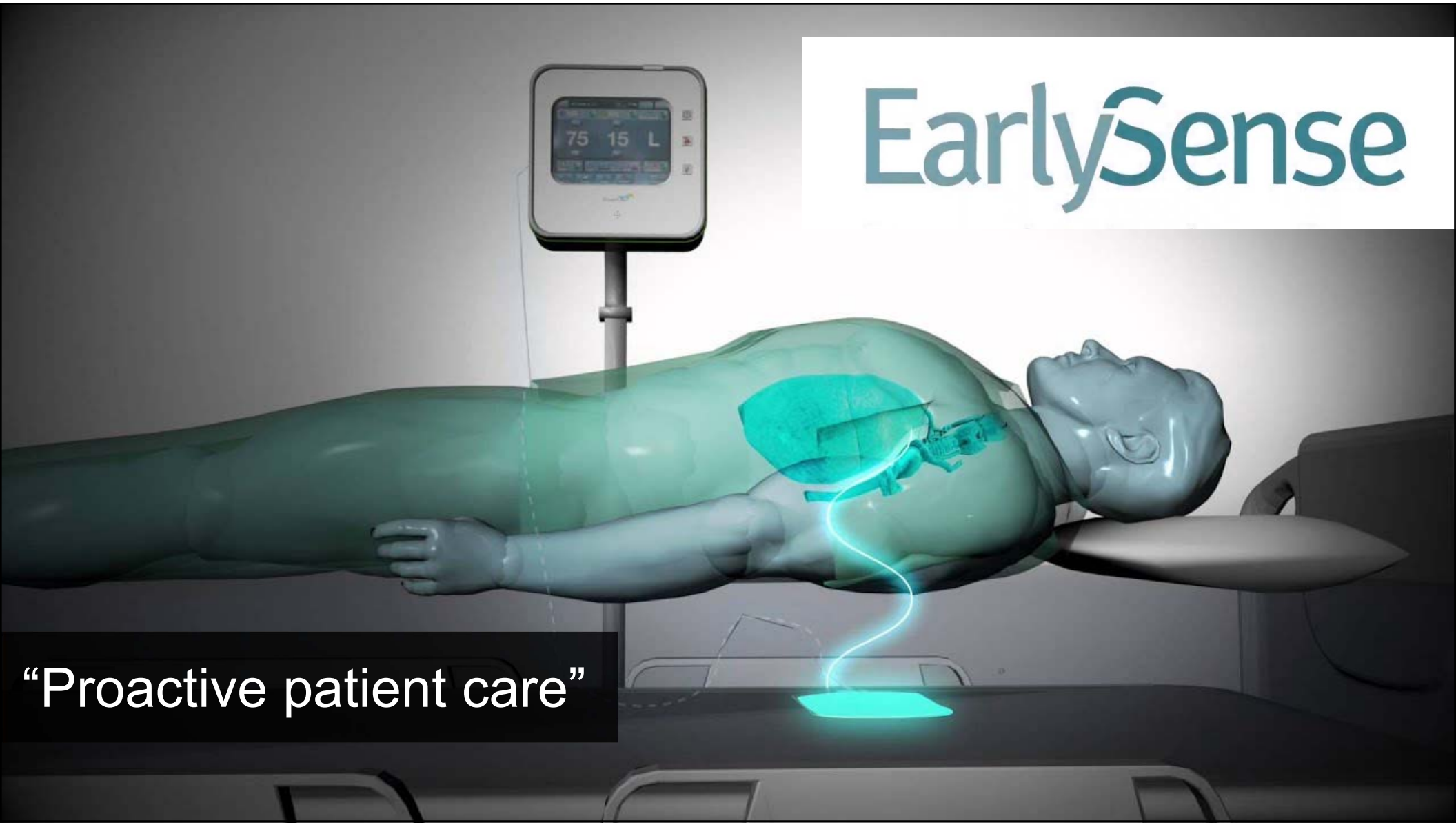
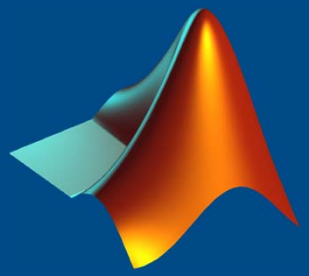
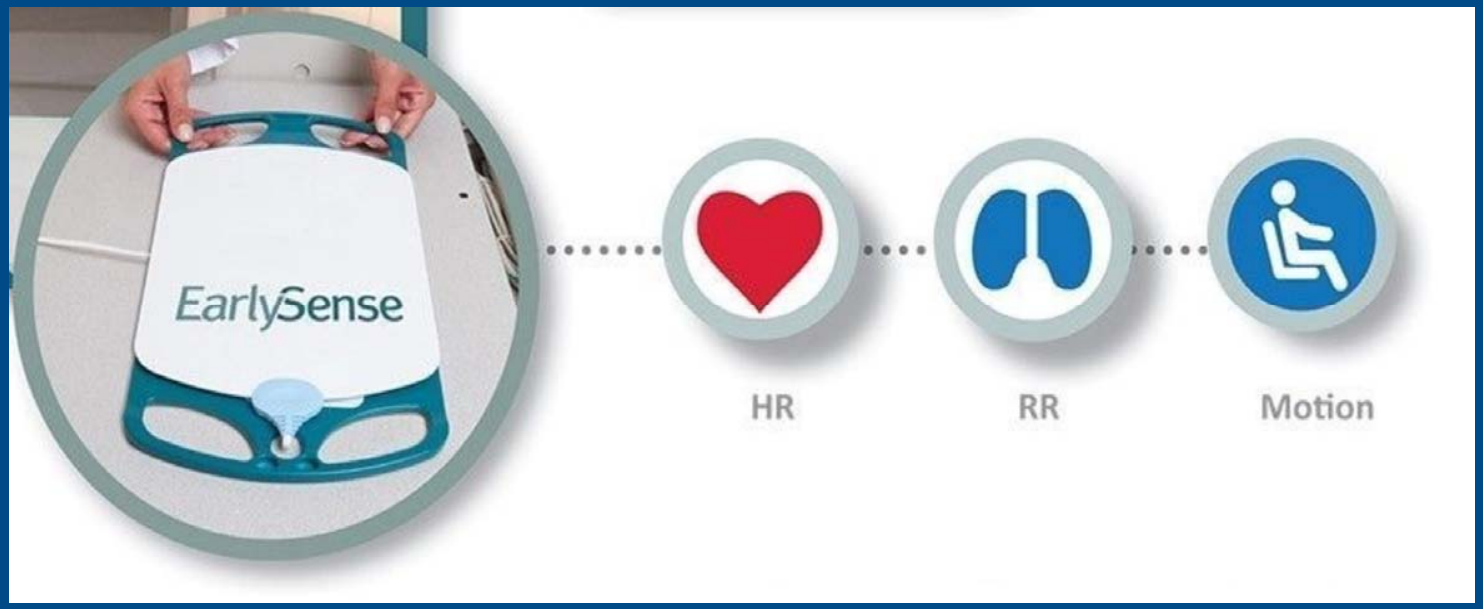
Interaction within complex environments

What was the larger system the vehicle had to operate in?

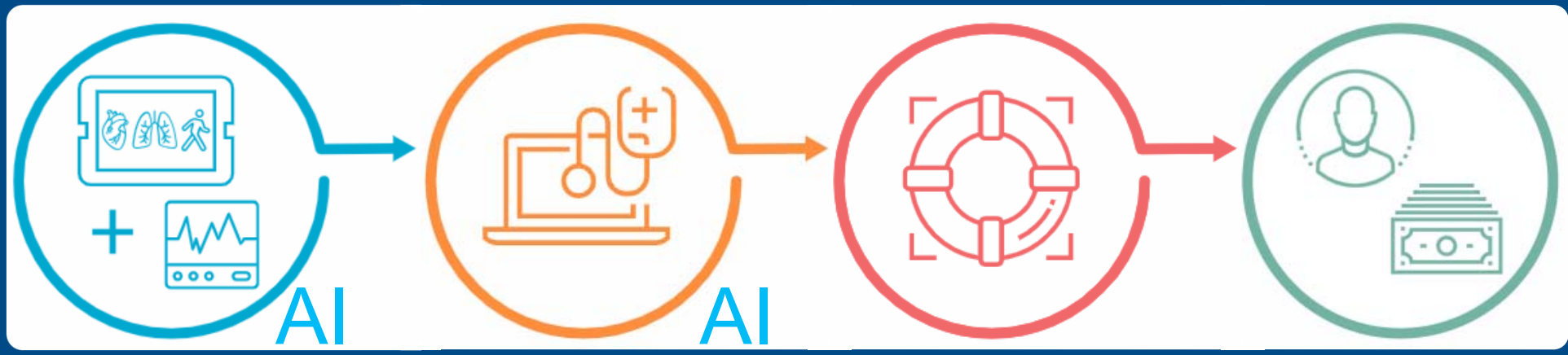

EarlySense
75 15 L
“Proactive patient care”



Statistics and Machine Learning Toolbox
Signal Processing Toolbox
MATLAB Coder
Embedded Coder



EarlySense's AI can predict critical events before they happen



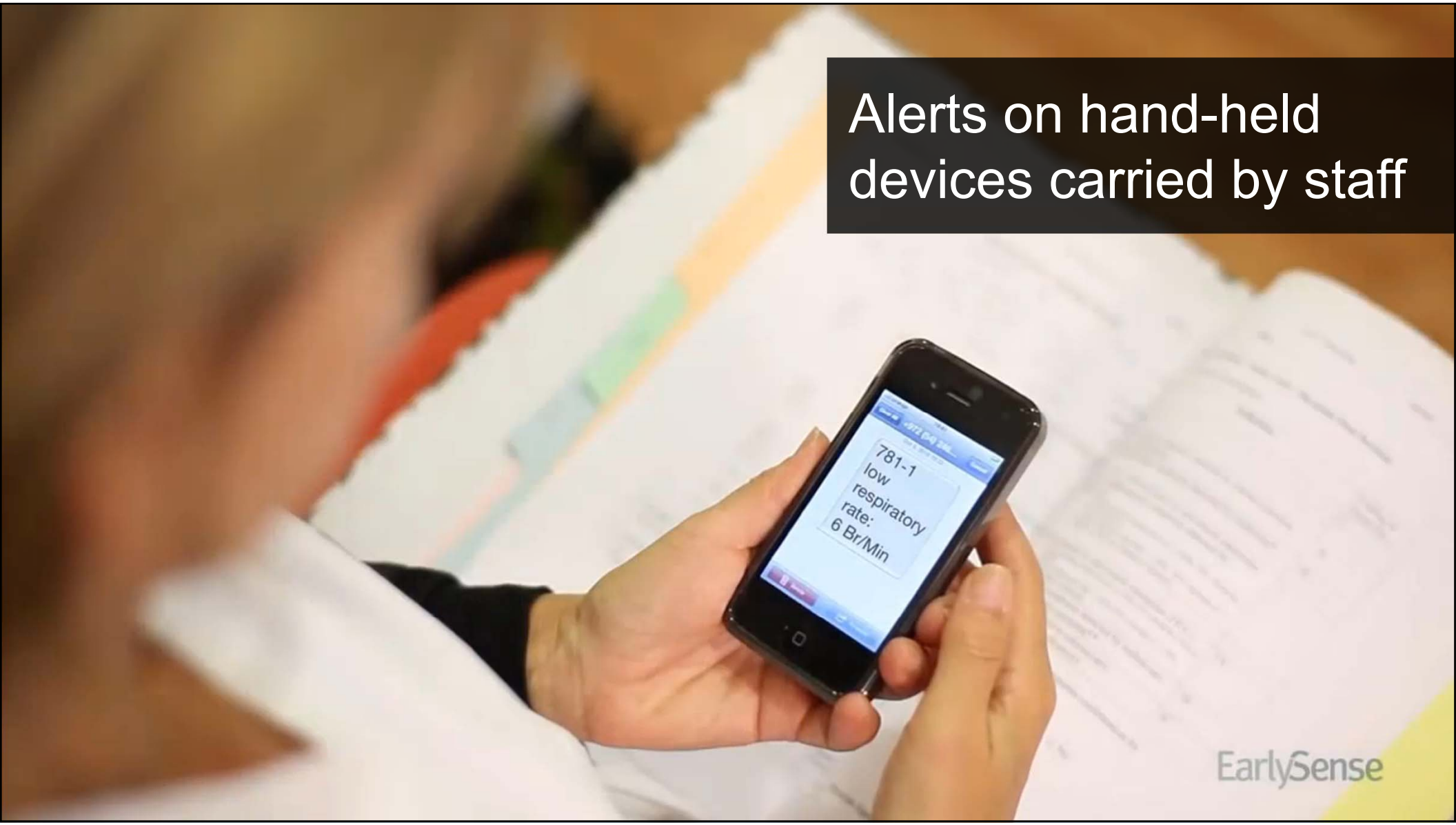
Continuous Monitoring

Early Detection

Early Intervention

Better Outcomes


Dashboards at nurses’ stations
and on hallway monitors
EarlySense


Alerts on hand-held devices carried by staff
781-1 low respiratory rate: 6 Br/Min
EarlySense

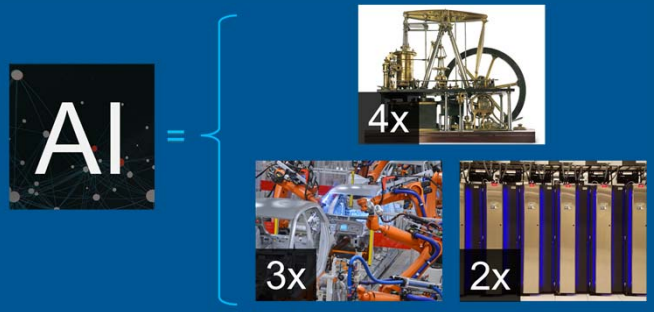

Address problems before they become emergencies

To be successful with AI, we must …

Design how our systems will integrate
and interact within their environment

Success requires more than just intelligence

AI is a transformative technology



But AI projects can and do fail

DigitalTonto
At the Crossroads of Media, Marketing and Technology...
Most AI Projects Fail. Here's How to Make Yours Successful.
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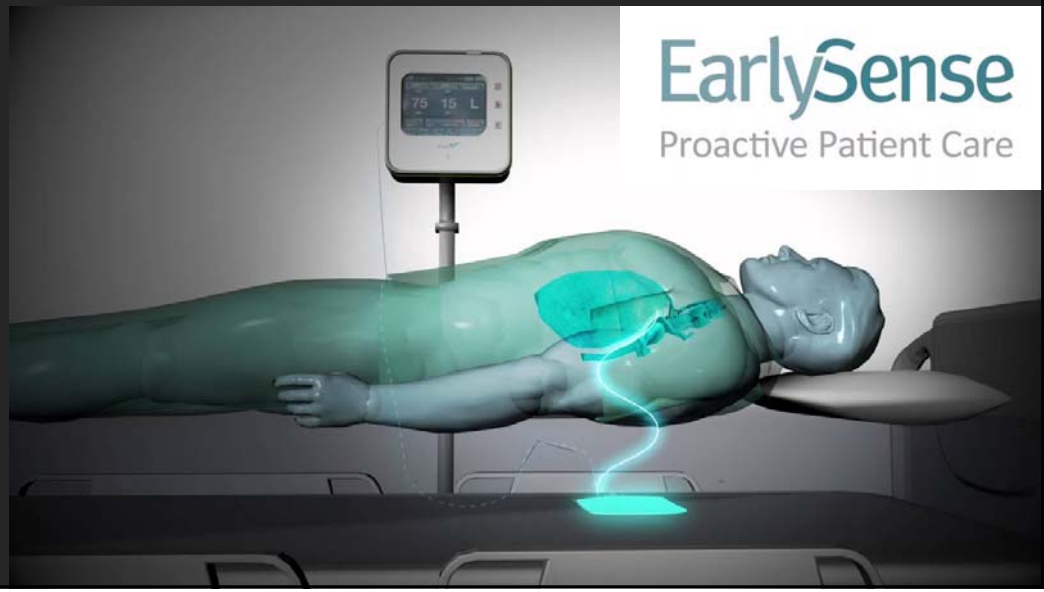
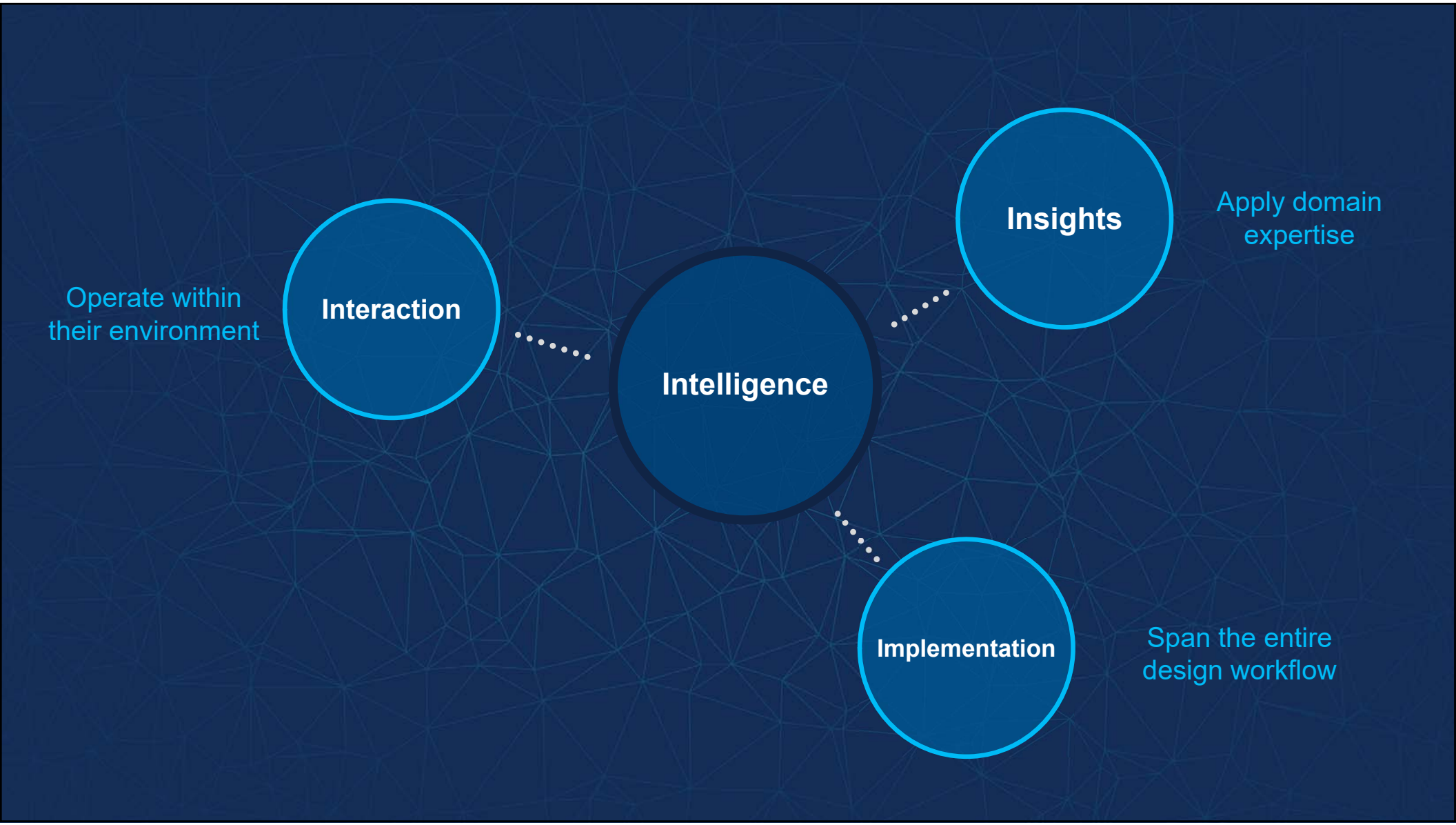

EarlySense
Proactive Patient Care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How will you apply AI to your projects?

MATLAB Expo 2019

Go Beyond the “I” in AI