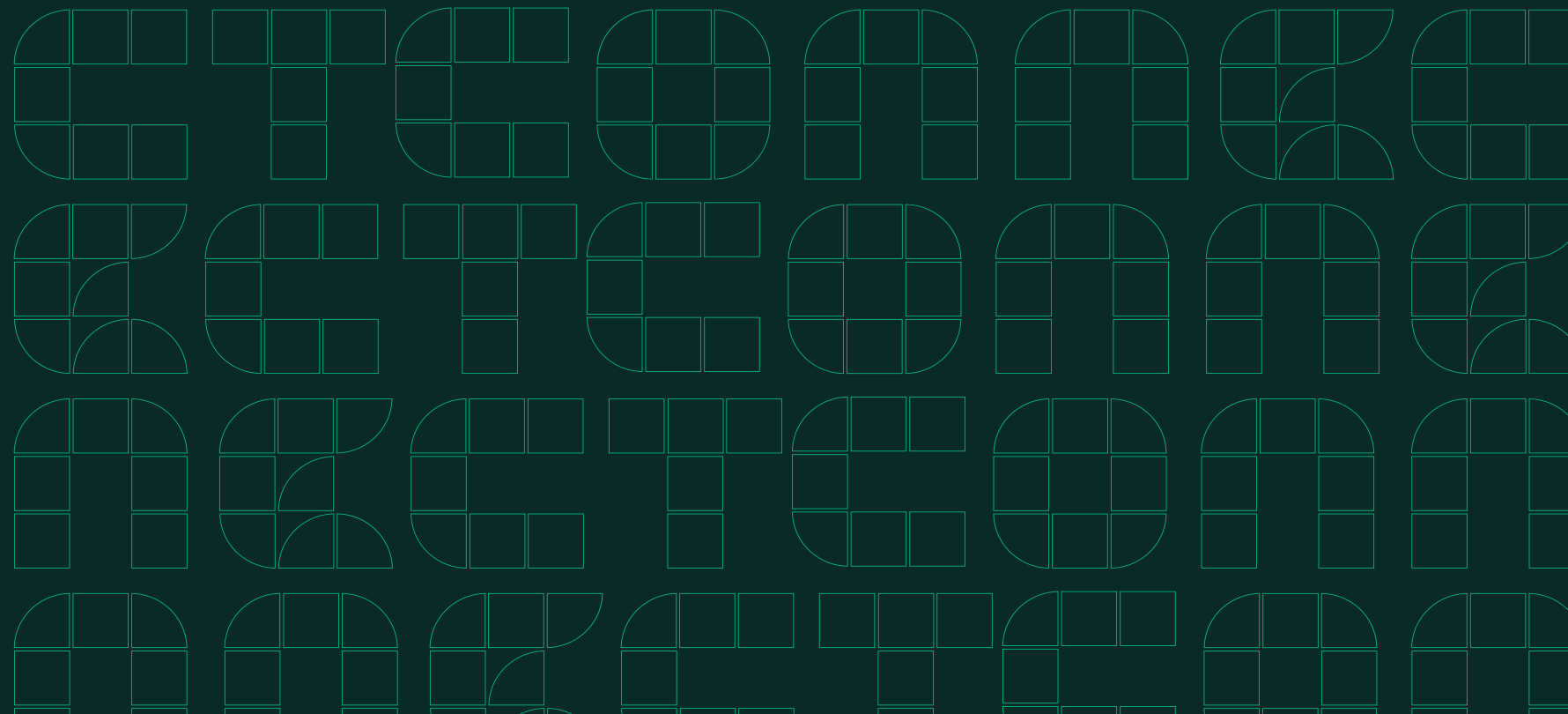


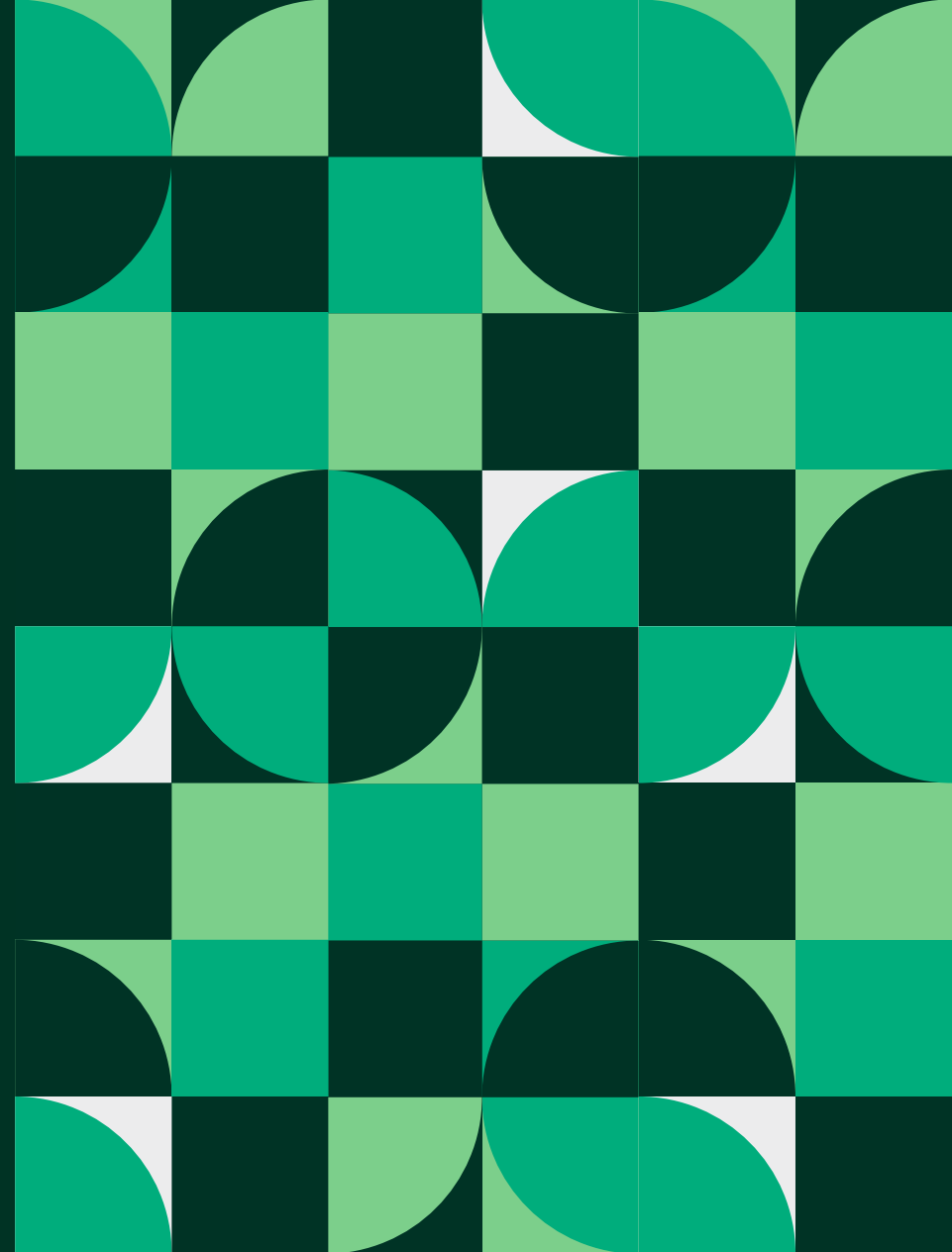
# CONNET



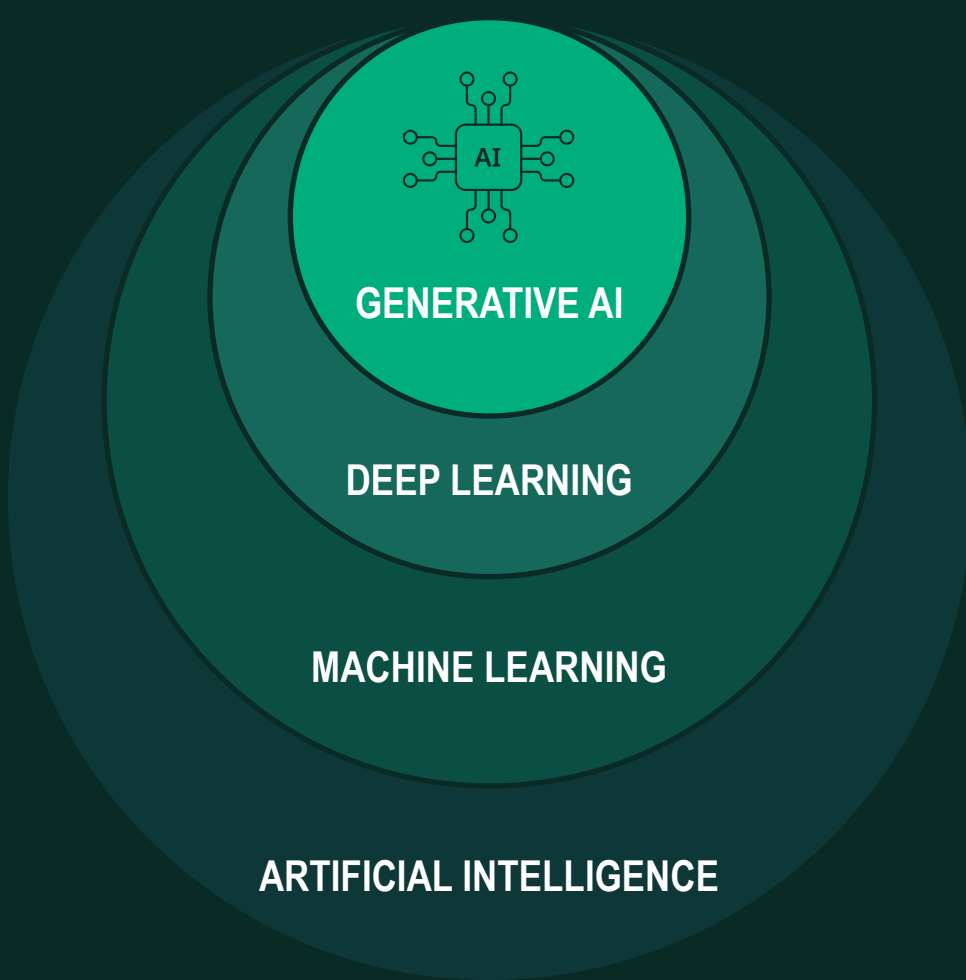
# Generative AI to Accelerate Test Workflows

John Bongaarts

Chief AI Technology Strategist



# Evolution of AI



2021

## GENERATIVE AI

Models which new written, visual, and auditory content given prompts or existing data.

2012

## DEEP LEARNING

A machine learning technique in which layers of neural networks are used to process data and make decisions.

1997

## MACHINE LEARNING

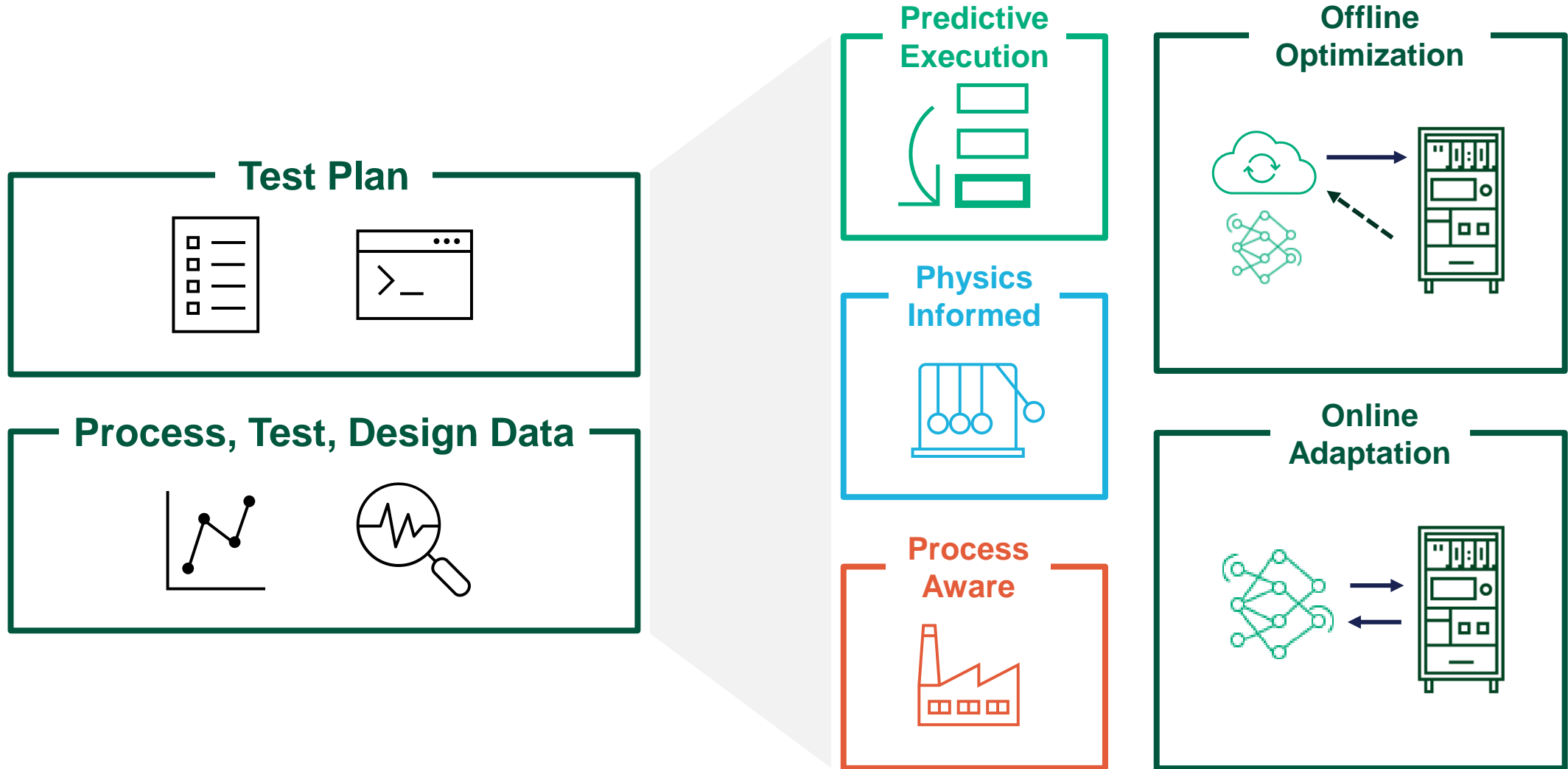
Subset of AI that enables machines to learn from existing data and improve upon that data to make decisions or predictions.

1956

## ARTIFICIAL INTELLIGENCE

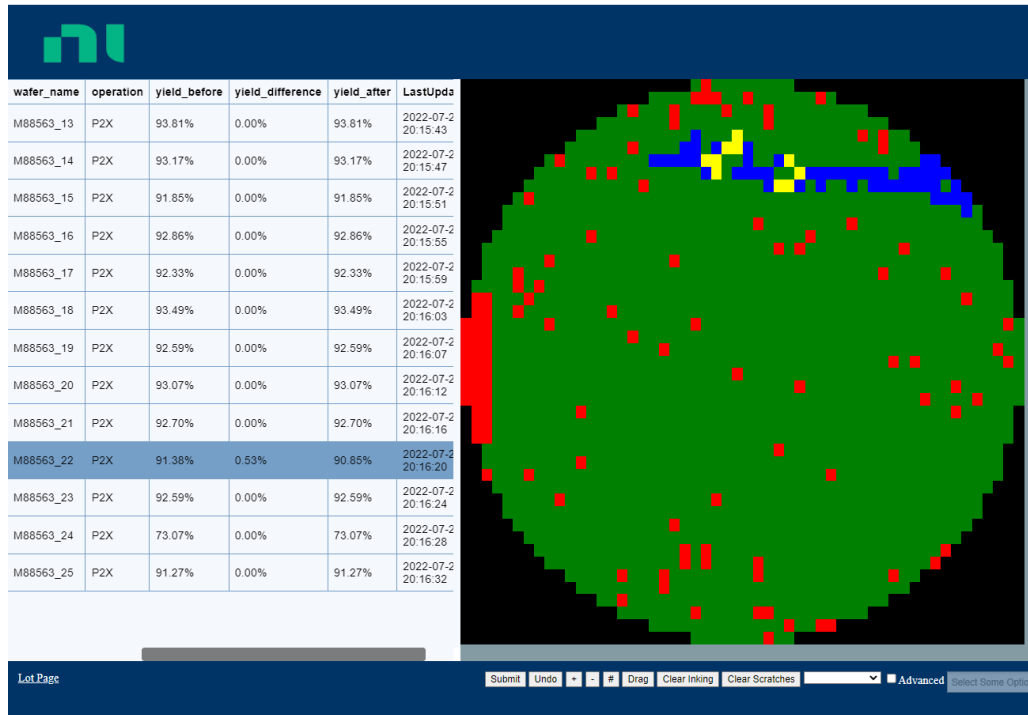
The field of computer science that seeks to create intelligent machines that can replicate or exceed human intelligence.

# Intelligent, Adaptive Test Plan Optimization



# Example Machine Learning Applications

## Defect Classification

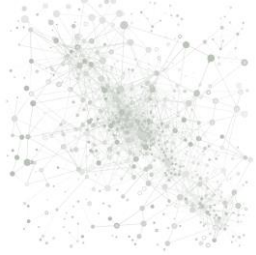


## Anomaly Detection



# “Simple” Ingredients at Scale

## Architecture



Billions to trillions of network parameters

## Data



Internet-scale training data

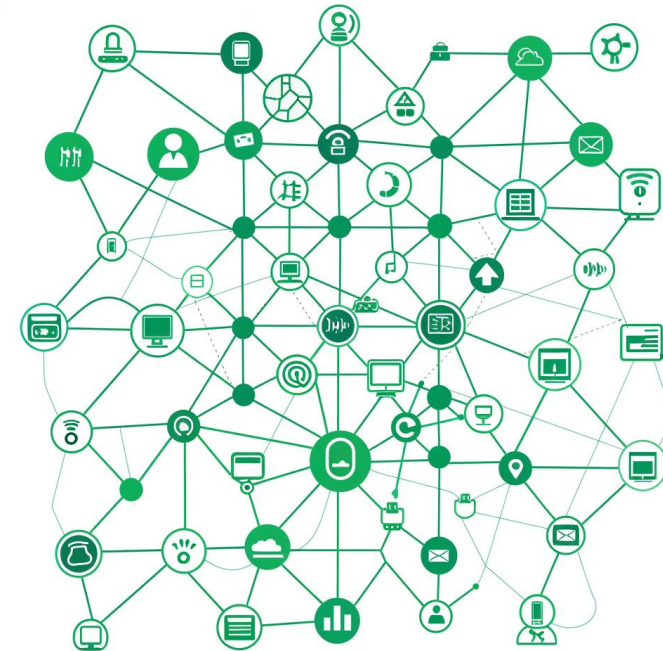
## Compute



Billions+ petaflops of training compute

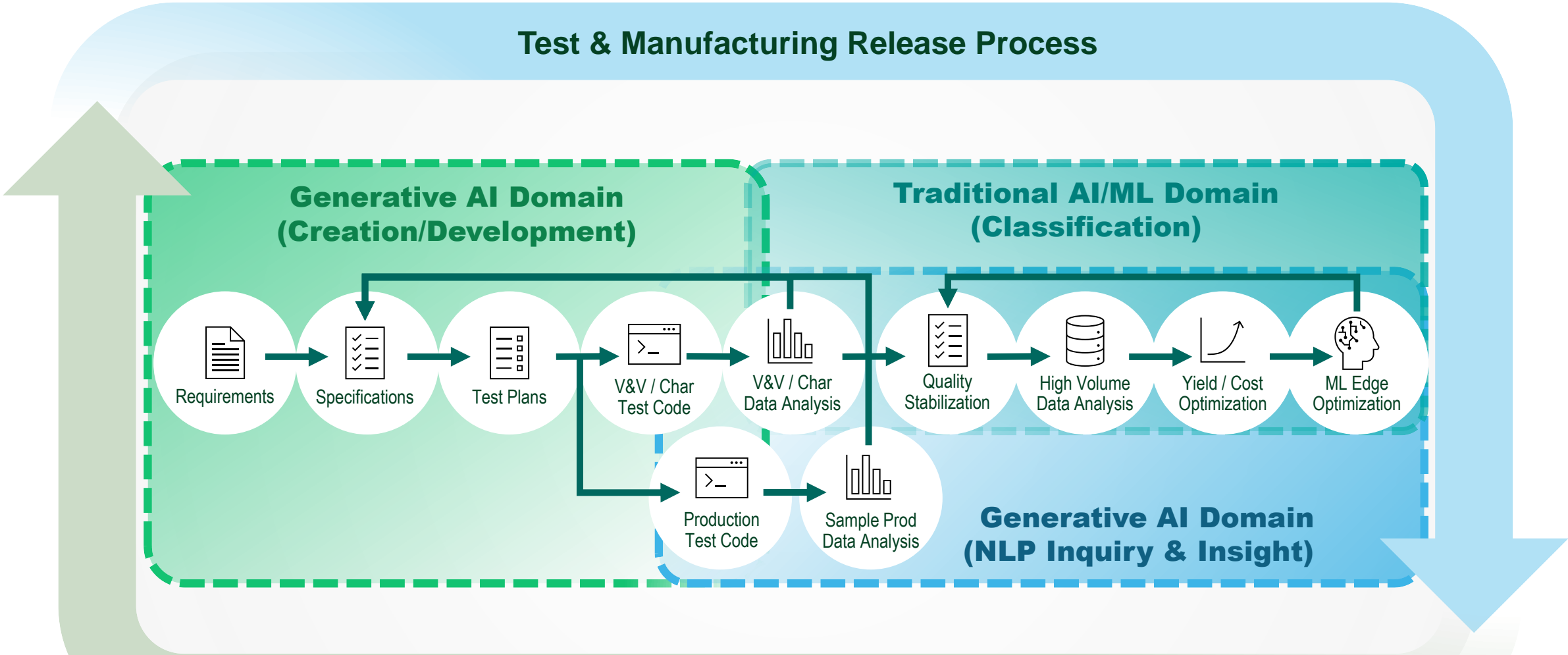
## Results

### Versatile AI Capabilities



# Business Impact of Generative AI in Test Engineering

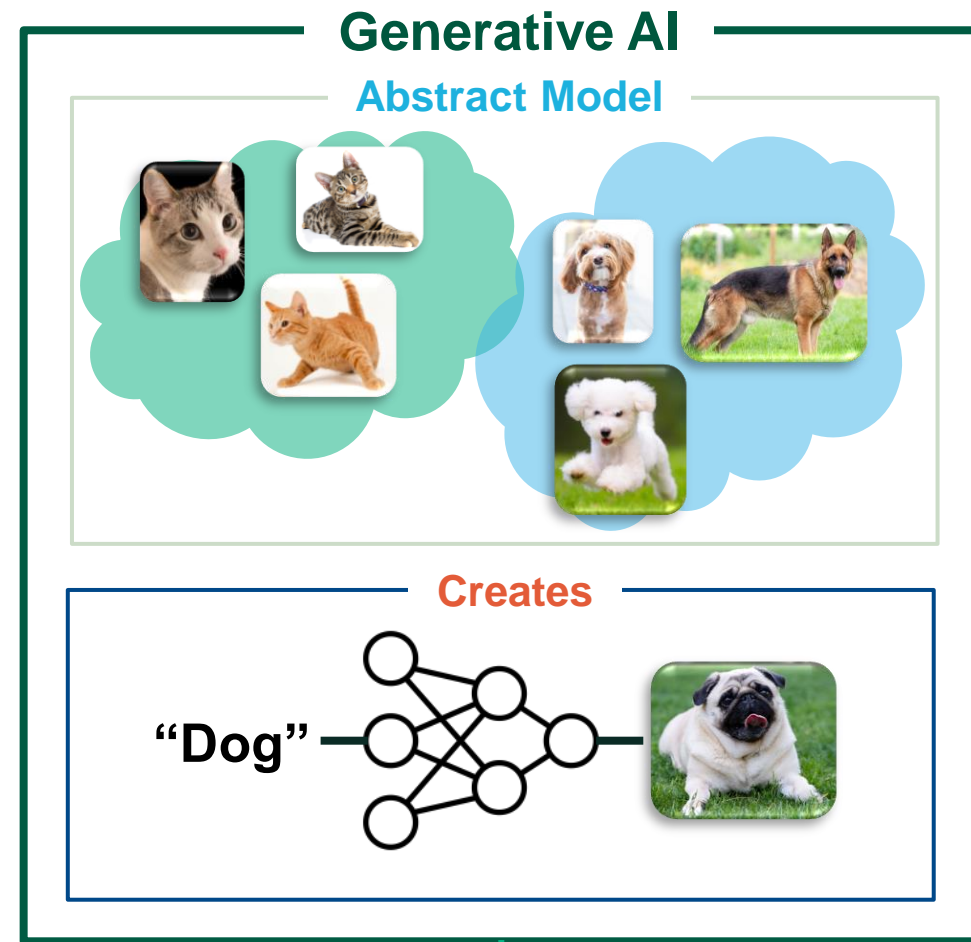
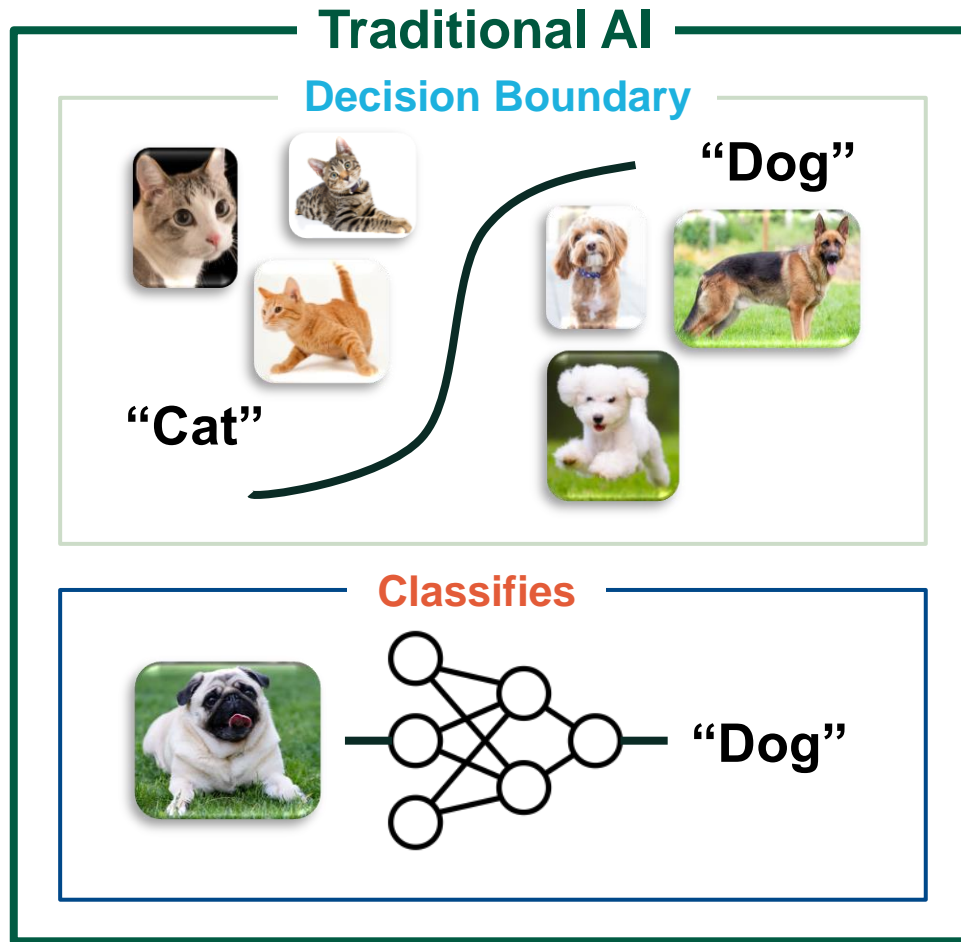
## Test & Manufacturing Release Process



## Test & Manufacturing Optimization Process

# Traditional AI vs. Generative AI

“What I cannot create, I do not understand.” – Richard Feynman

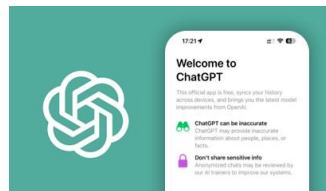


Generative AI can also classify

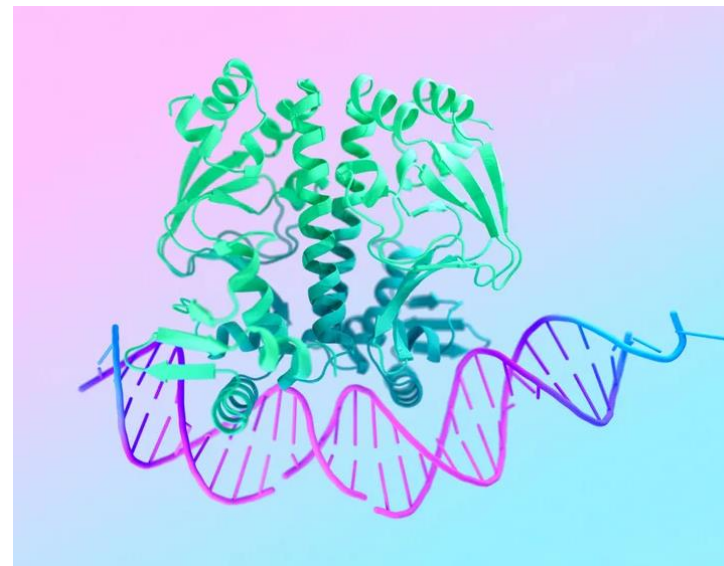


# AI Architectures Generalize Powerfully

## Language Models



## Life Sciences Models



Source: Google's AlphaFold3

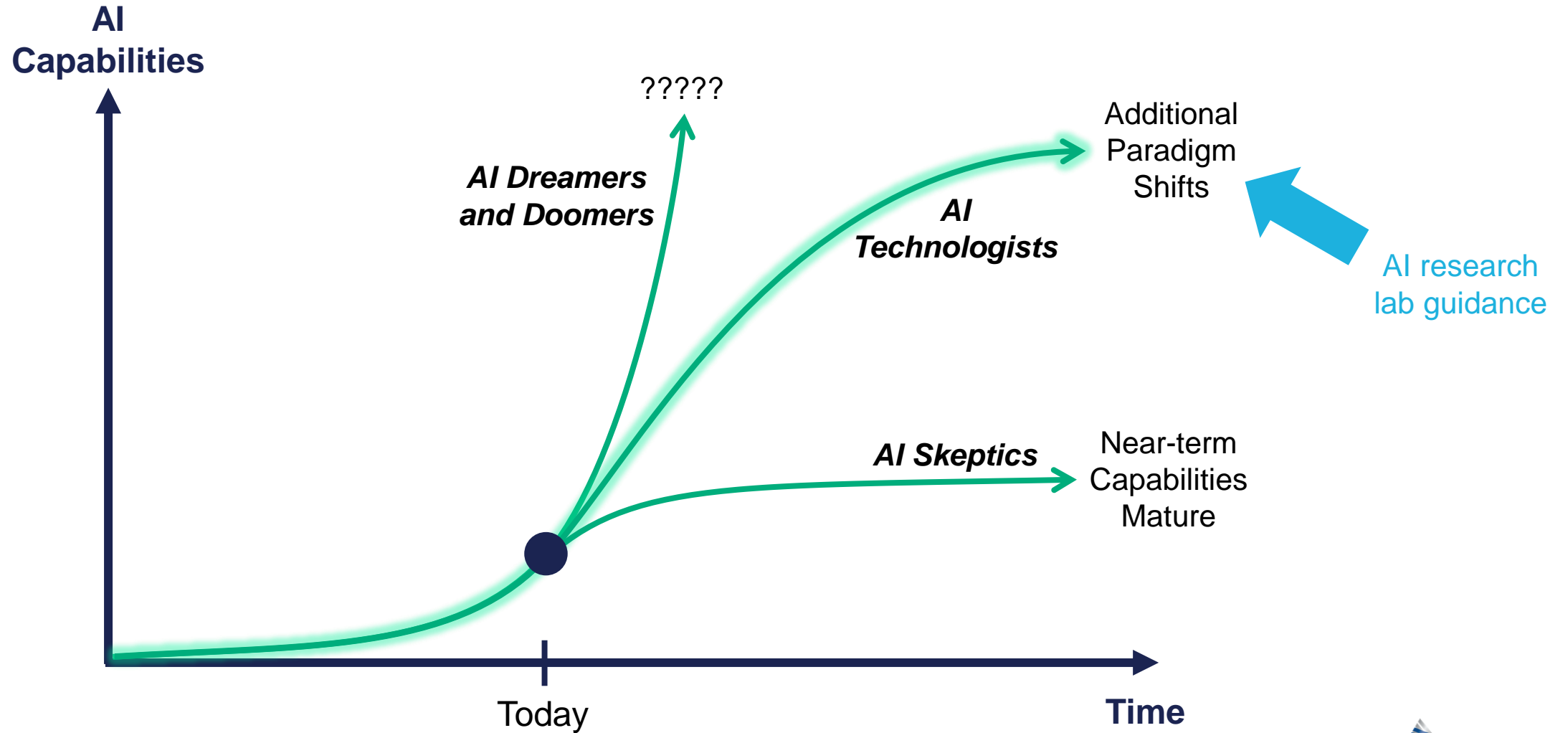
## Image / Video Models



“ Learnings from Llama [language] and Sora [image / video] can inform and accelerate life sciences. I find this level of generality absolutely mind-boggling. ”

**Dr. Jim Fan**  
Sr. Research Manager, NVIDIA

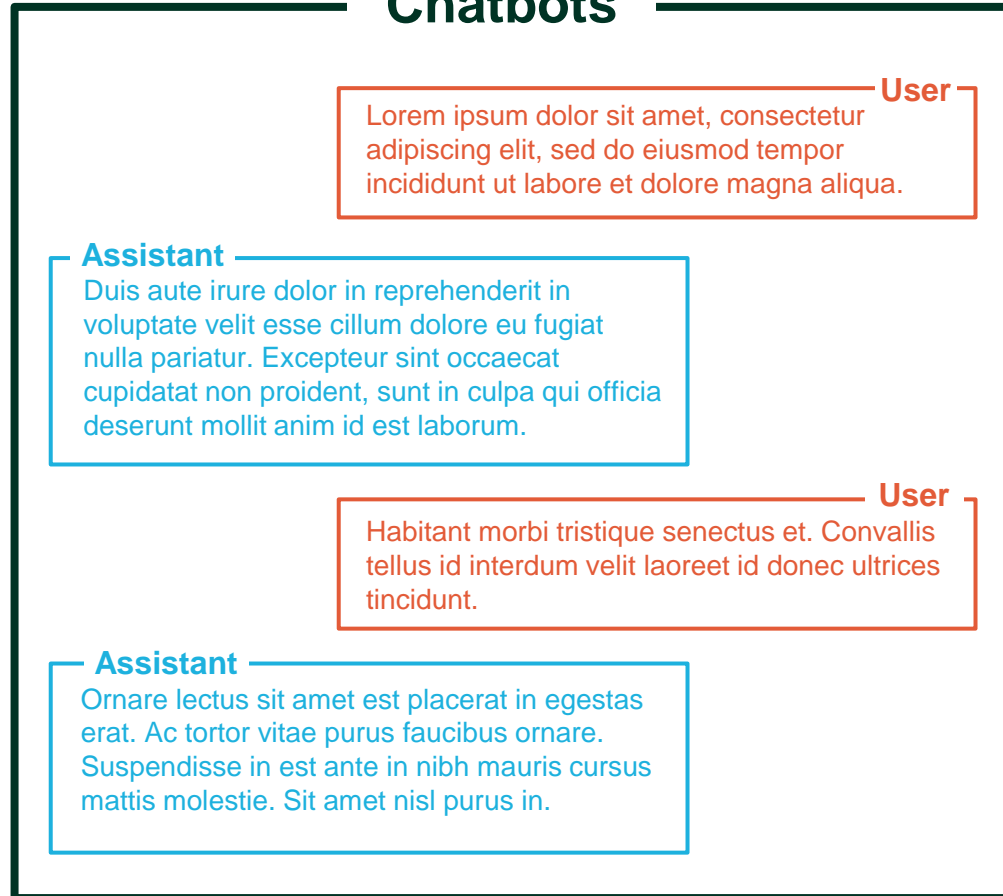
# AI Capabilities are a Moving Target



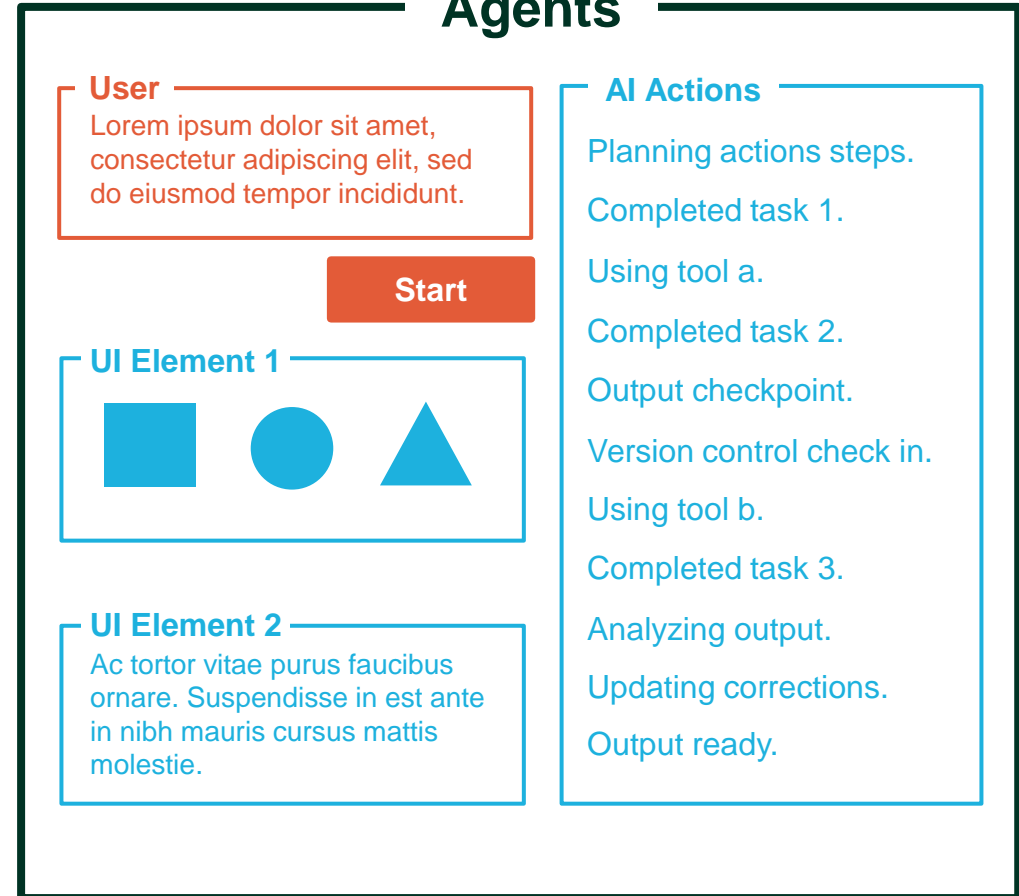
# From Chatbots to Agents

Open-ended discussion to closed-ended task completion.

## Chatbots



## Agents



# AI Market Landscape

## Applications



Applying AI models to domain specific applications.

## Models



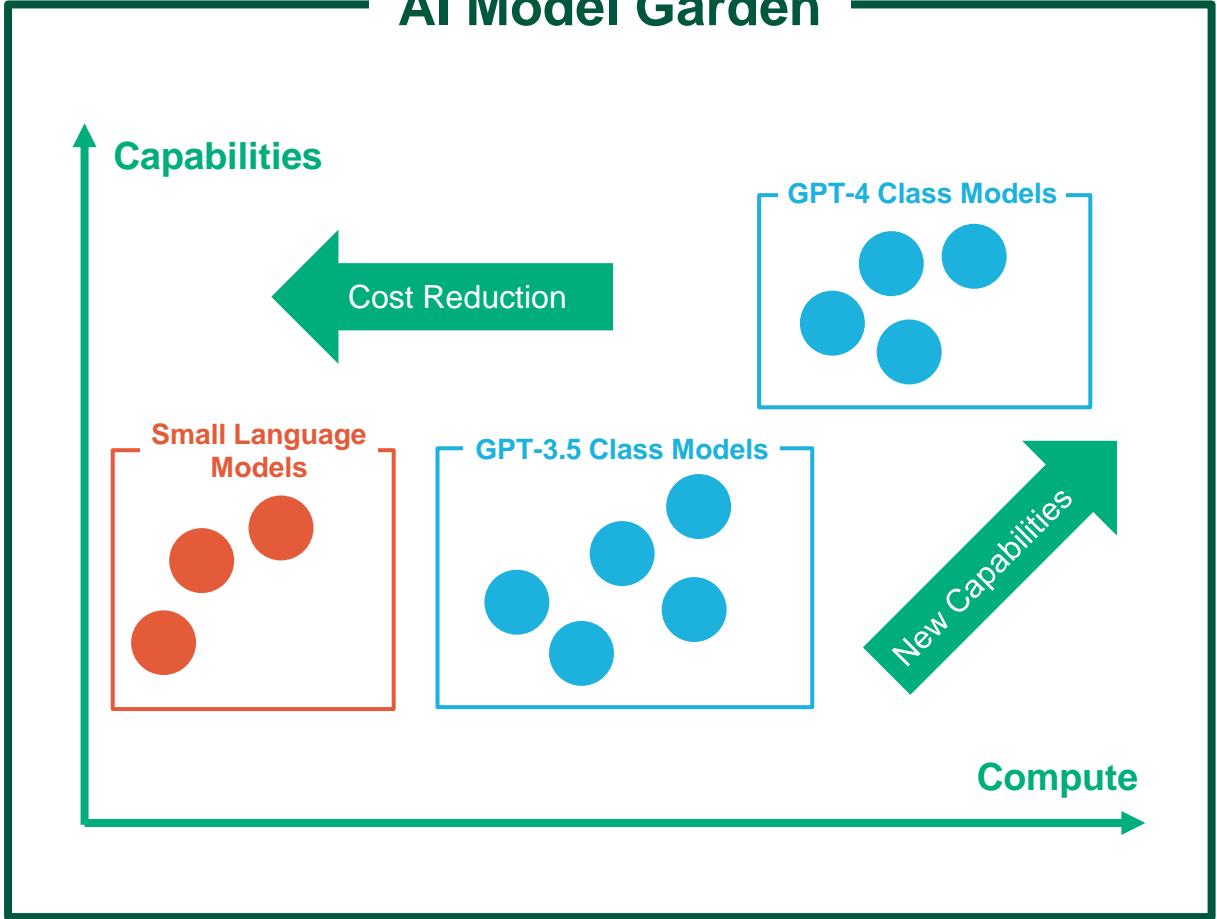
Training and serving models via API, weights, or containers.

## Compute



Providing compute architectures, chips, and infrastructure.

## AI Model Garden



# AI Risk and Safety

## Reliability



Considerations around factual inaccuracies, hallucinations, outdated information, and biased outputs.

## Privacy



Considerations around protection of proprietary, sensitive, confidential, and/or personal information.

## Explainability



Techniques to explain the mechanistic behavior of AI models, reducing the “black box” nature.

## Security

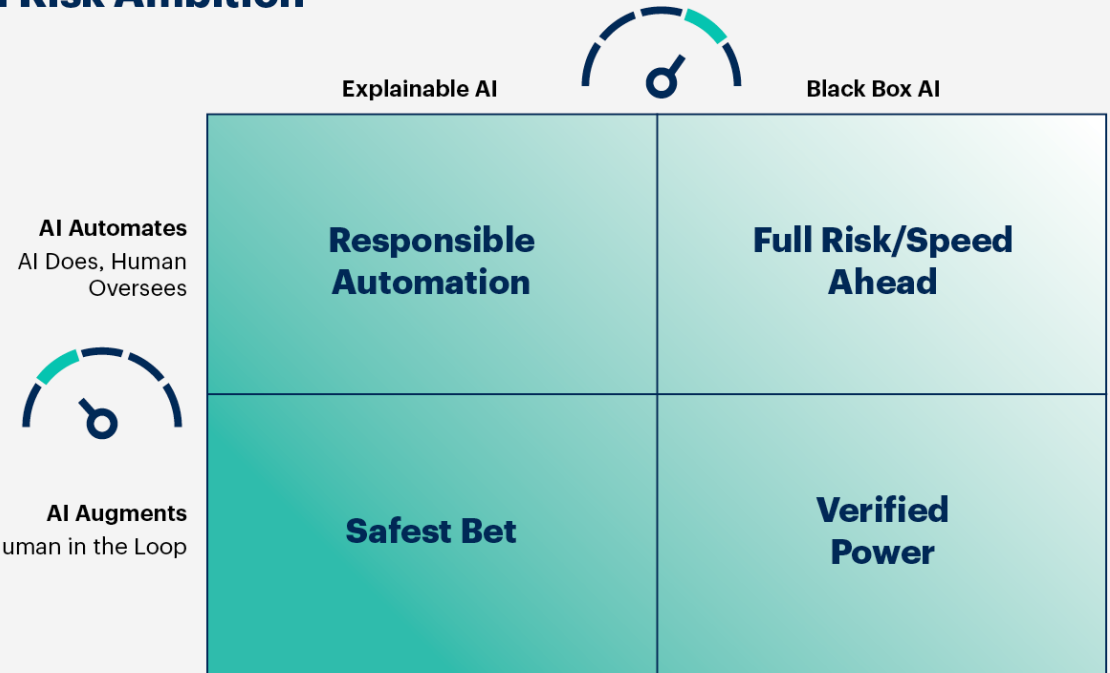


Defense against malicious actors seeking to access private data or force the AI to act in ways which serve the adversary.

Source: Gartner

## AI Risk Matrix

### AI Risk Ambition



Source: Gartner

# Responsible AI Practices

Managing Data Security, Privacy, Legal, and Ethics Risks with an AI Governance Strategy



Establish **Policies** aligned with industry best practices for managing the inherent risks of AI use



Develop and conduct **Responsible AI training** with employees who use AI in their work



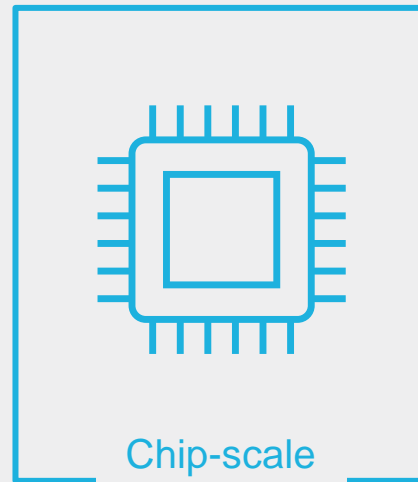
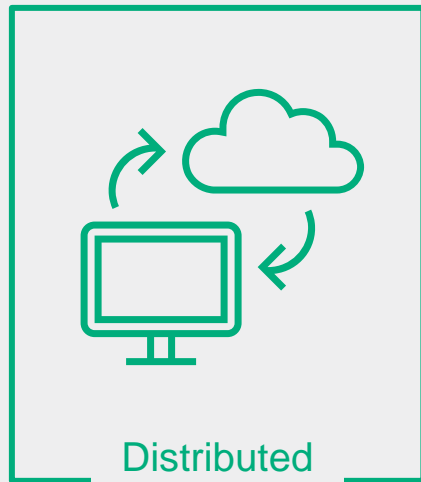
Conduct **Risk Assessments** for AI use cases in potential products, services, offerings, and internal development and process optimizations



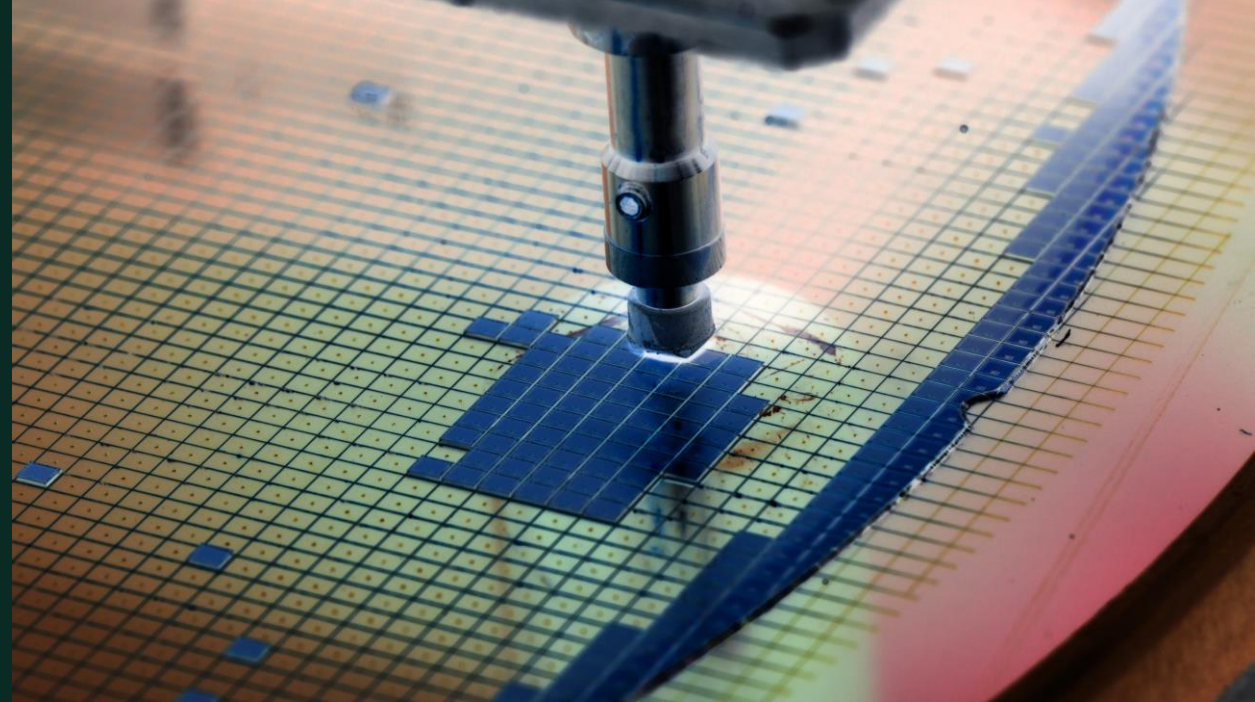
NI created its AI Steering committee in 2022, and since the acquisition has integrated its AI governance structure with Emerson.

The Emerson AI governance team (including NI) owns and drives development and continuous improvement of our AI policies, training, and risk assessment processes.

# Cross-Industry Technology Trends



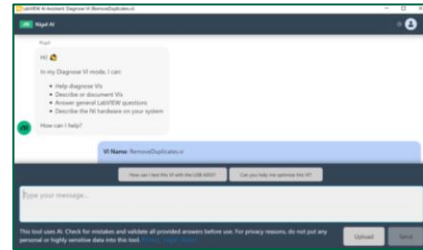
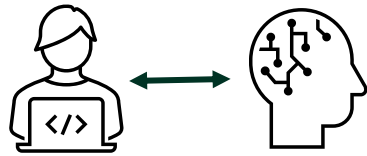






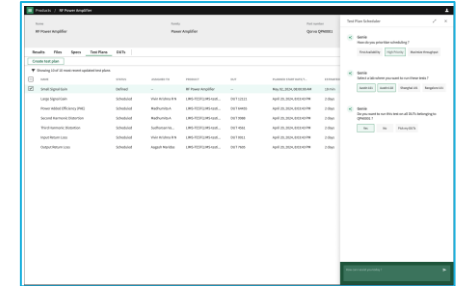
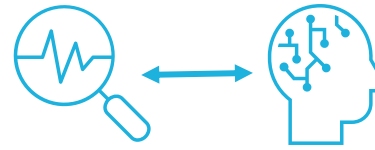
# Test Co-Pilot Workflow Acceleration

## Test Code Authoring



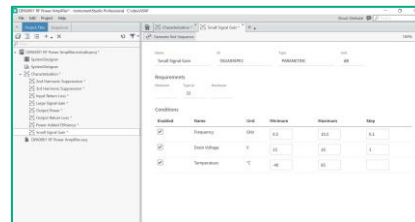
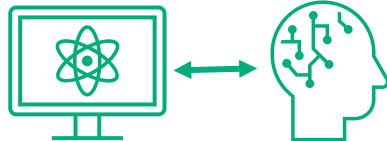
LabVIEW

## Data Analysis



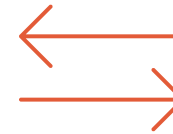
SystemLink

## Interactive Measurements



InstrumentStudio

## Translation Workflows



Migrations



Requirements  
to Test Specs



Device  
Control

# LabVIEW AI Assistant can Describe VIs

The screenshot displays the LabVIEW AI Assistant interface. At the top, there's a header with the 'ni' logo and 'Nigel AI'. Below this, a chat window shows a user's question: "Can you describe the algorithm in more detail?". The assistant, Nigel, responds with a detailed description of the VI "Triggering TTL PS and DMM.vi".

Nigel

Certainly! The given VI, "Triggering TTL PS and DMM.vi," describes a complex sequence of operations aimed at setting up a test that involves power supplies (PS) and digital multimeters (DMM). This is a high-level overview of the algorithm based on the provided components:

- 1. Initialization:**
  - o Constants are set for various parameters like reset signals, error messages, device names, driver type etc.
  - o Input parameters are taken from front panel controls such as file paths and starting error clusters.
- 2. Sequence Structure:**
  - o A Sequence structure ensures operations occur in an explicit order.
  - o It starts by processing any input errors followed by configuring the Measurement Graph.
- 3. Parsing Input Parameters:**
  - o VIs such as "Input Parameter Parser.vi" parse the input parameters to extract information like remaining parameters, independent channels etc.
- 4. Resource Mapping:**
  - o With extracted parameter details, other VIs map resources to obtain device names ("Alias"), chassis numbers etc.
- 5. Device Initialization:**
  - o Devices are initialized using "Initialize Channel Switch.vi" & "niDMM Initialize.vi".
  - o Conditions check if devices support specific features ("Is Atomic SMU?").

6

Type your message...

This tool uses AI. Check for mistakes and validate all provided answers before use. For privacy reasons, do not put any personal or highly sensitive data into this tool. [Privacy](#) [Legal](#) [About](#)

Upload Send

# LabVIEW AI Assistant can Create VIs

The screenshot displays the LabVIEW AI Assistant interface. At the top, a user prompt asks: "Write a VI that removes duplicates from an array of numbers". The assistant, Nigel AI, responds with a message: "Creating VI...". Below this, the assistant provides the following information:

**VI Name:** RemoveDuplicates.vi

**VI Description:** This VI takes an input array and processes it to remove any duplicate elements, outputting an array with unique elements only. It begins by initializing an empty array and then iterates through each element of the input array. For each element, it checks if the element already exists in the output array. If the element is not found (i.e., its index is less than 0), it is added to the output array. This process ensures that the output array contains only one instance of each unique element from the input array.

The assistant also includes a LabVIEW block diagram for the VI. The diagram shows an input array being processed by a loop that checks for duplicates and builds an output array. The output is labeled "Array out".

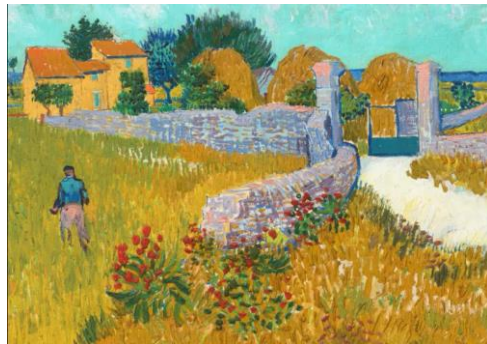
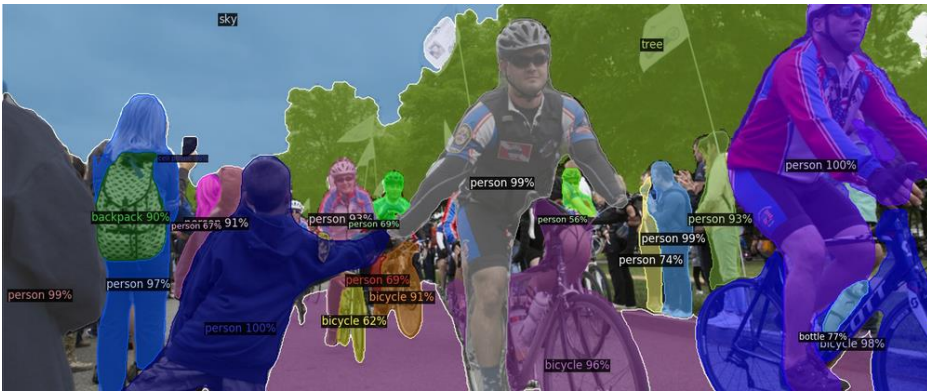
Below the diagram, there is a link: [Open the VI in LabVIEW](#)

At the bottom of the chat, there are two suggested prompts: "How do I handle duplicates with non-numeric arrays?" and "Can you explain how the 'Search1DArray' function works?".

The interface also features a text input field labeled "Type your message...", a "Privacy" link, and "Upload" and "Send" buttons.

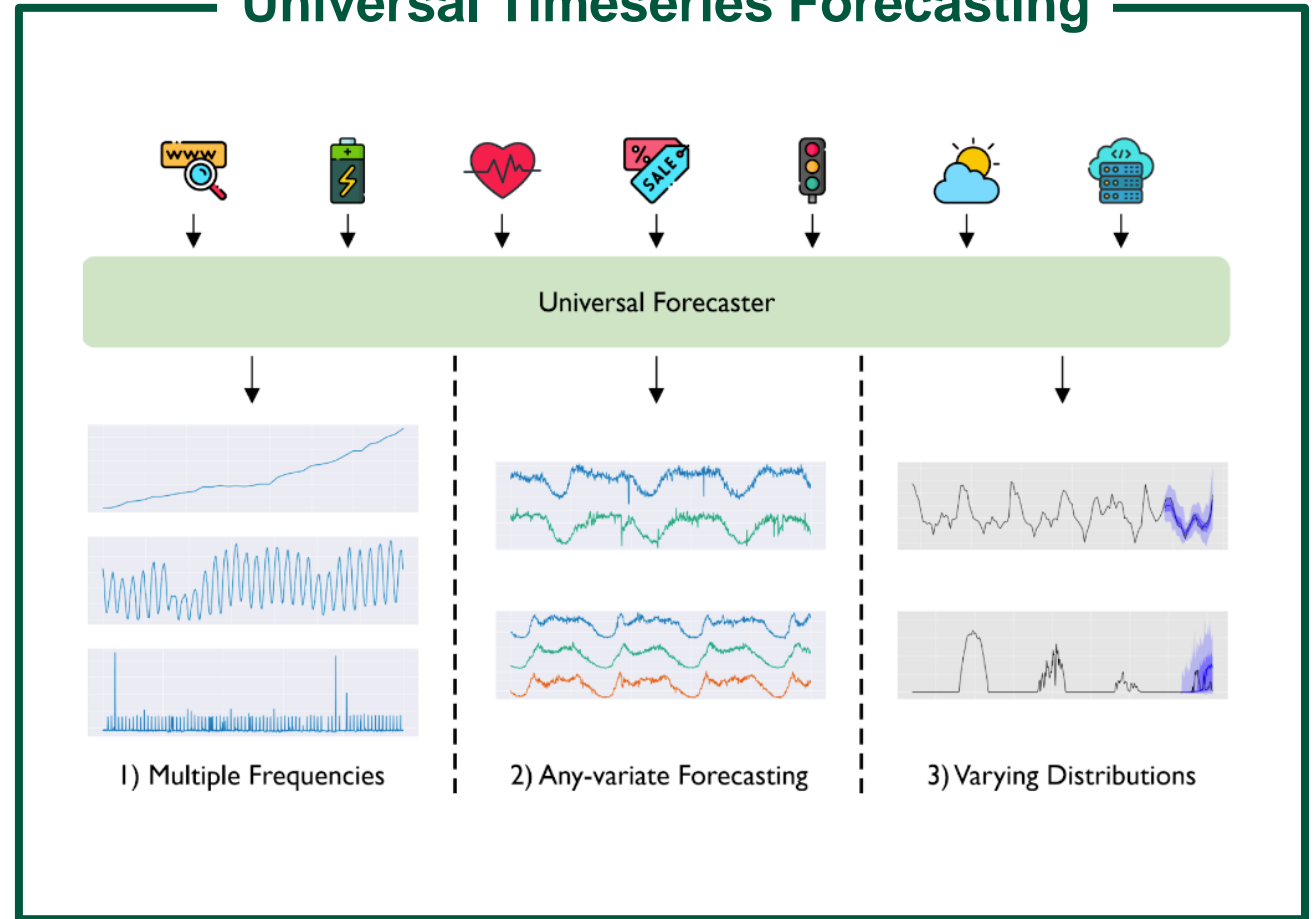
# Foundation Models for Domain-Specific Tasks

## Universal Image Segmentation



Source: Meta

## Universal Timeseries Forecasting

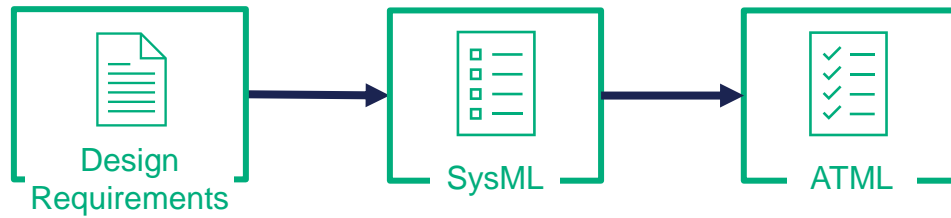


Source: Salesforce AI

# Structured Test Documentation AI-Pipelines



## ATML Test Engineering

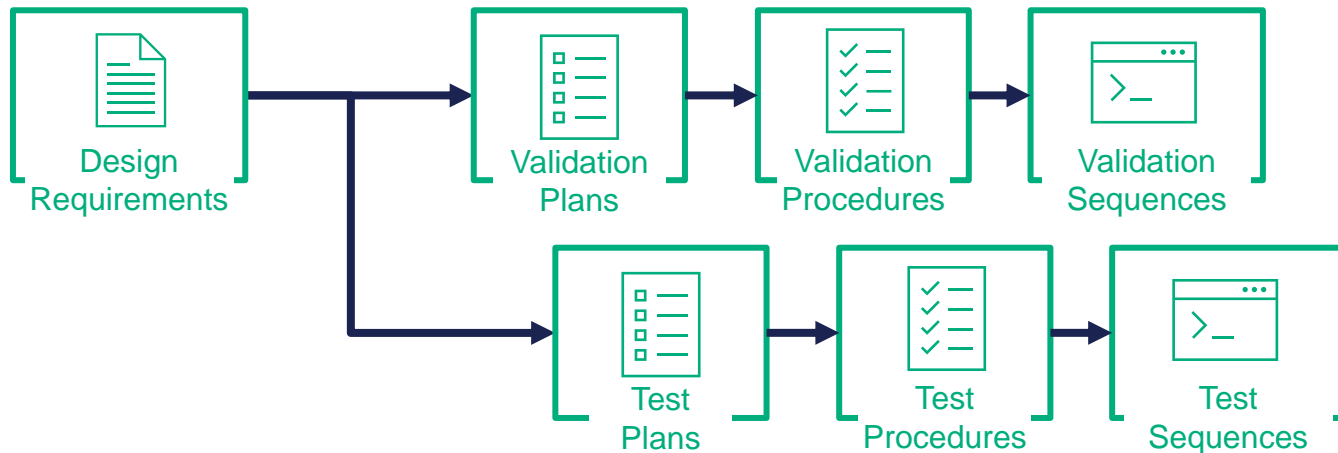


## Example

```
validation_test_plan: PXIe-4139 ±60 V, 3 A Precision SMU
tests:
  voltage_programming_and_measurement:
    - range: 600 mV
      points: [0, 300 mV, -300 mV, 600 mV, -600 mV]
      temperature: 23C ± 5C
    - range: 6 V
      points: [0, 3 V, -3 V, 6 V, -6 V]
      temperature: 23C ± 5C
    - range: 60 V
      points: [0, 30 V, -30 V, 60 V, -60 V]
      temperature: 23C ± 5C
    - accuracy_verification:
        spec_tcal_±5C: refer to voltage accuracy table
        spec_tcal_±1C: refer to voltage accuracy table
    - tempco_verification:
        temperatures: [0C, 23C, 55C]
        spec: refer to voltage tempco table

  current_programming_and_measurement:
    - range: 1 µA
      points: [0, 500 nA, -500 nA, 1 uA, -1 uA]
      temperature: 23C ± 5C
    - range: 10 µA
      points: [0, 5 uA, -5 uA, 10 uA, -10 uA]
      temperature: 23C ± 5C
    - range: 100 µA
      points: [0, 50 uA, -50 uA, 100 uA, -100 uA]
      temperature: 23C ± 5C
```

## Cross-Industry Applicability



# Business Dynamics of AI Adoption

## Adoption Considerations



Target pilots



Clear success metrics



Dynamic adoption cost

## Workforce Dynamics



Evolving job roles



Rapid upskilling



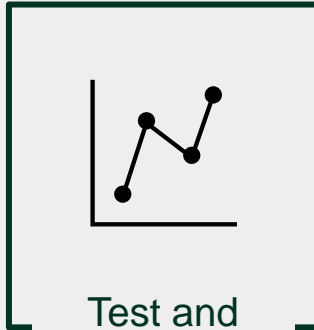
Bottom-up innovation



AI adoption as a strategic differentiator

# A Data Strategy is Critical Today

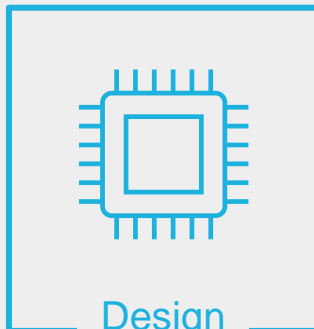
## Data Sources



Test and  
Process Data



Unstructured  
Documents

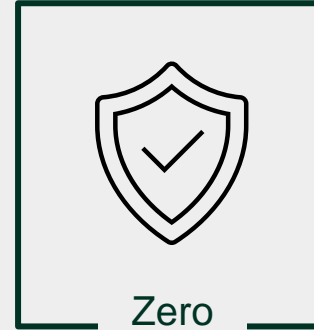


Design  
Files

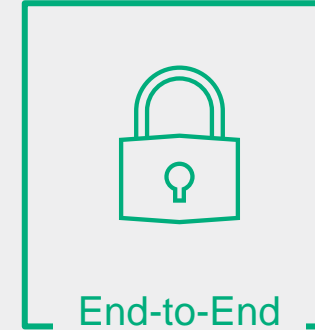


Source  
Code

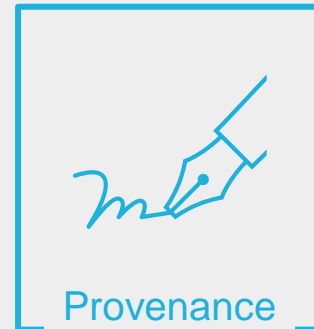
## Data Considerations



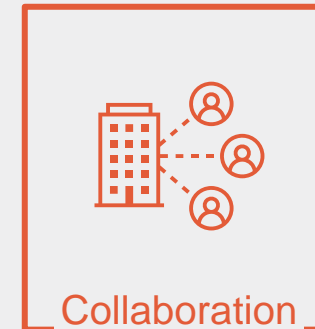
Zero  
Trust



End-to-End  
Encryption



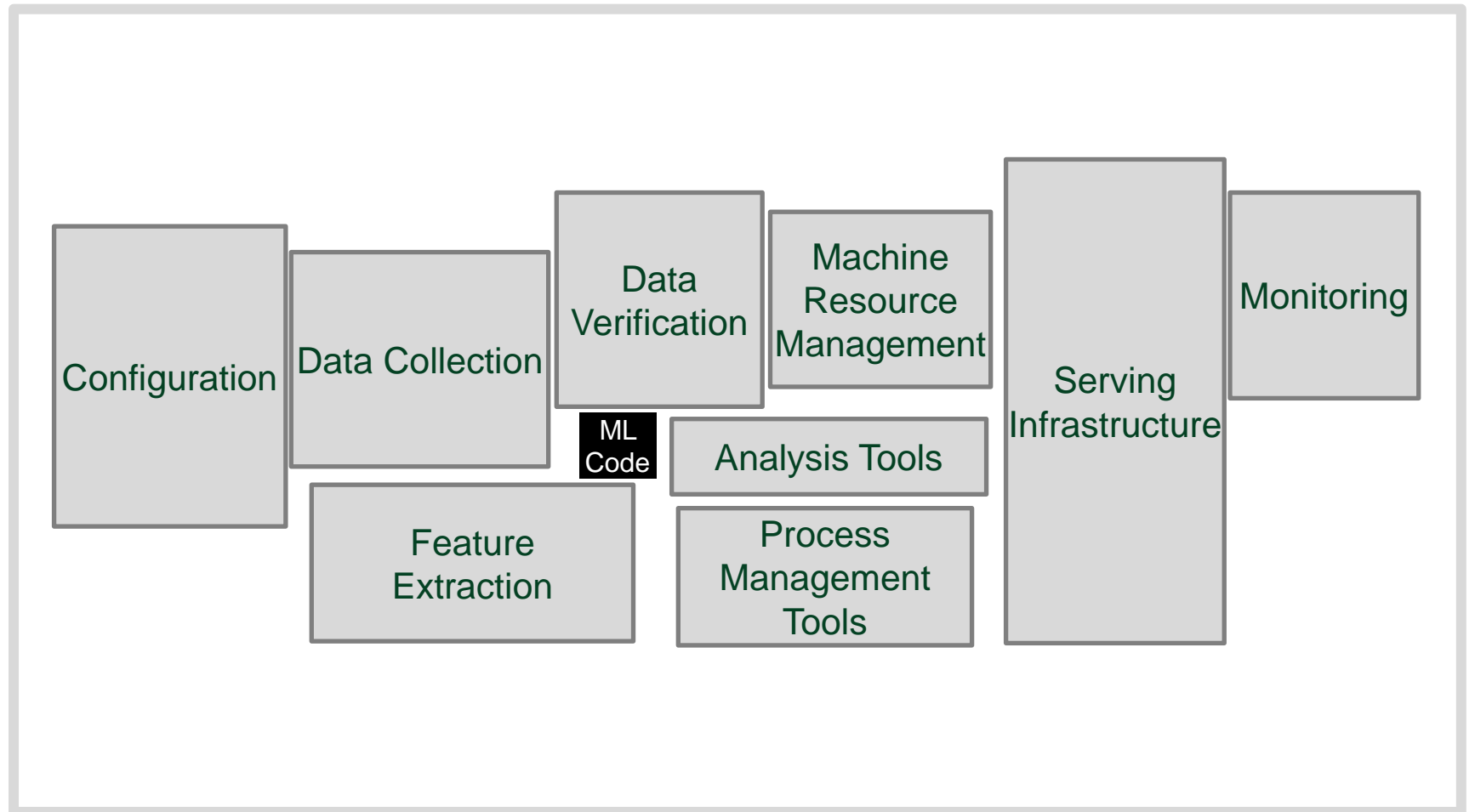
Provenance  
Tracking



Collaboration  
Models

# Hidden Complexity – the Google View

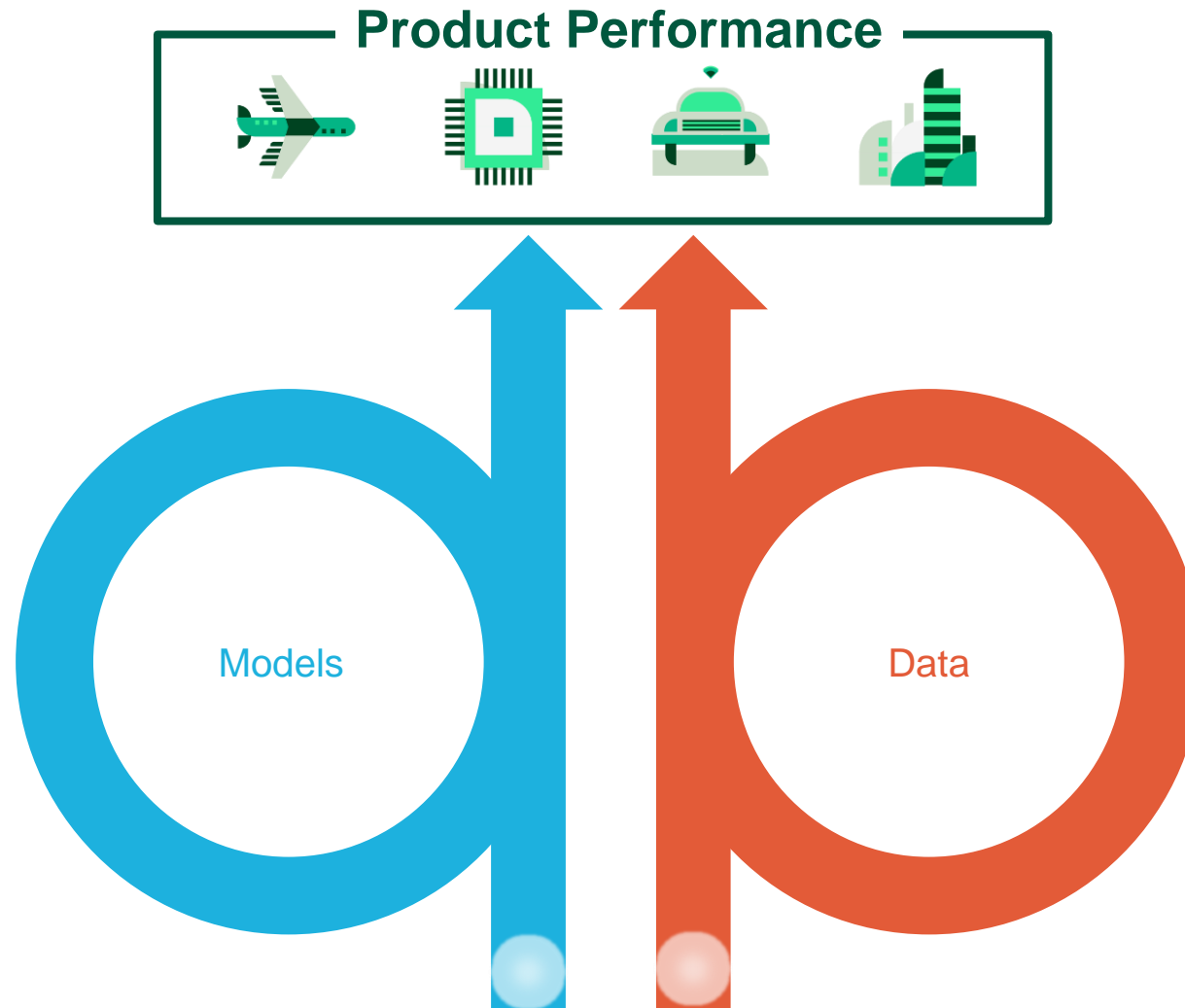
It's all  
about the  
infrastructure



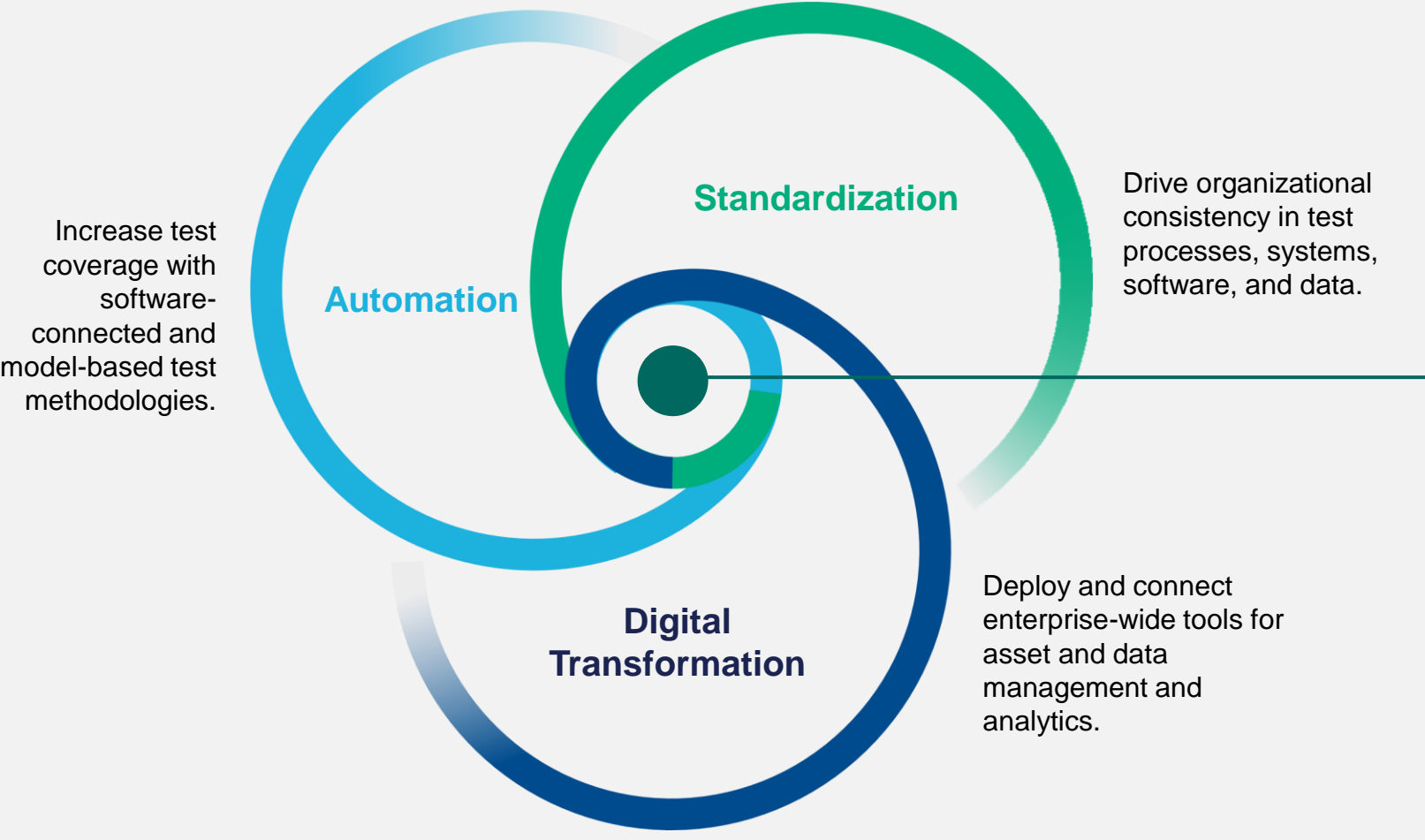
Source: Google article from 2014: Hidden Technical Debt in Machine Learning Systems  
<https://papers.nips.cc/paper/5656-hidden-technical-debt-in-machine-learning-systems.pdf>



# Data as a Competitive Advantage







# Make Test a Strategic Differentiator for Your Business

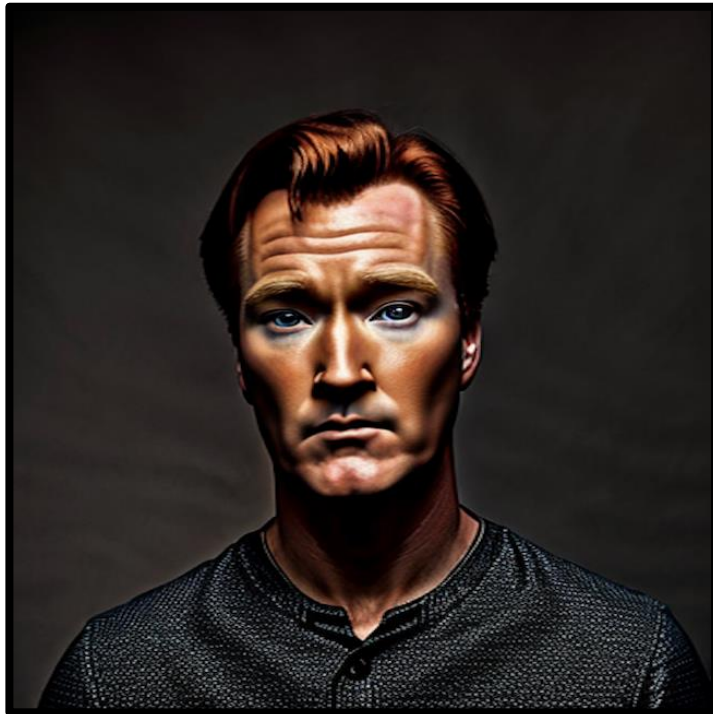


## Business Performance

Realize the benefits of an intentional test strategy.

-  Reduce time to market
-  Deliver customer satisfaction
-  Improve the bottom line
-  Prepare for the future

# Q&A and Discussion



“Take my LinkedIn profile picture and mix it with a very serious artistically styled Conan O’Brien”

LabVIEW Generative AI Early  
Access Request

