

IEA
LINGUISTICS

Development Team

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Team**

What is IEA?

Input Spec

**Design
Overview**

Demo

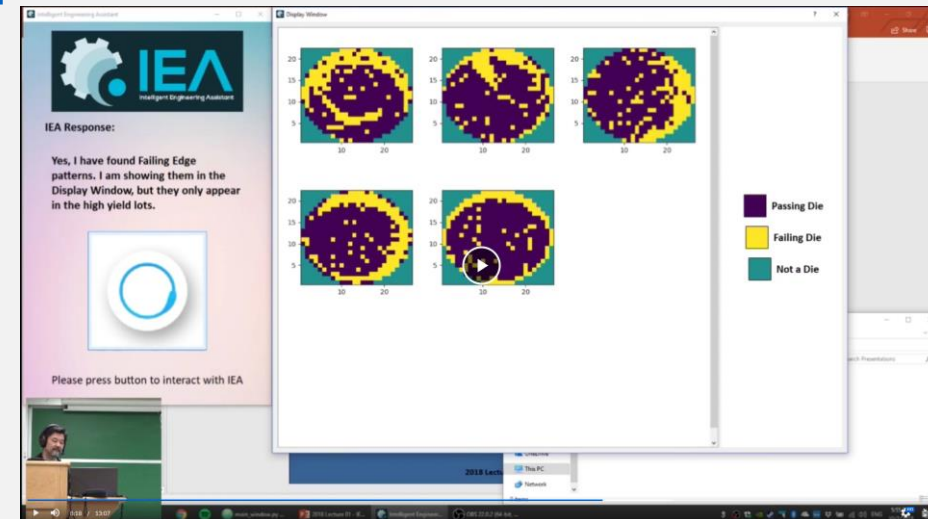
Sponsors

What is IEA?

➤ IEA – Intelligent Engineering Assistant



➤ <https://iea.ece.ucsb.edu/>



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What is IEA?

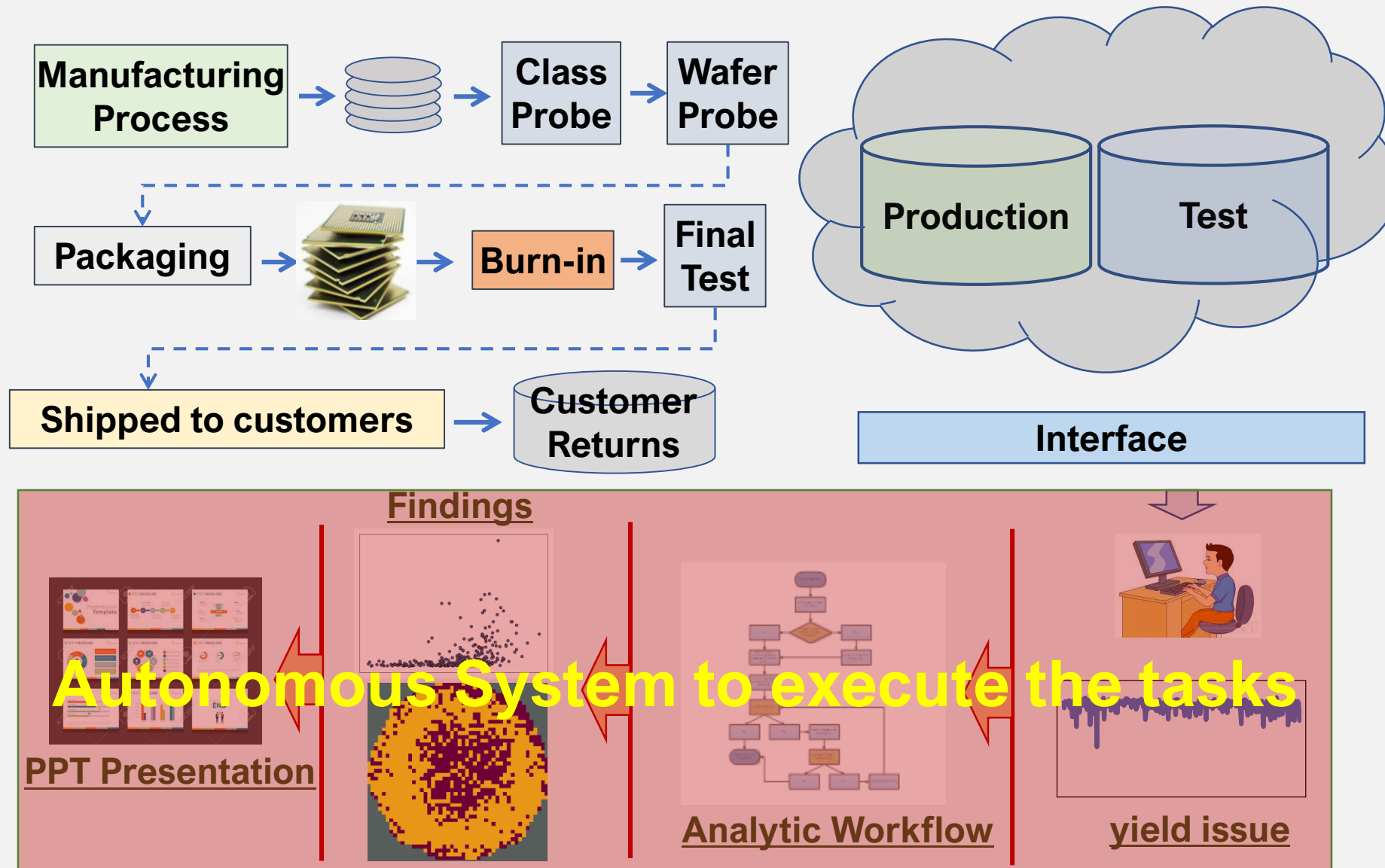
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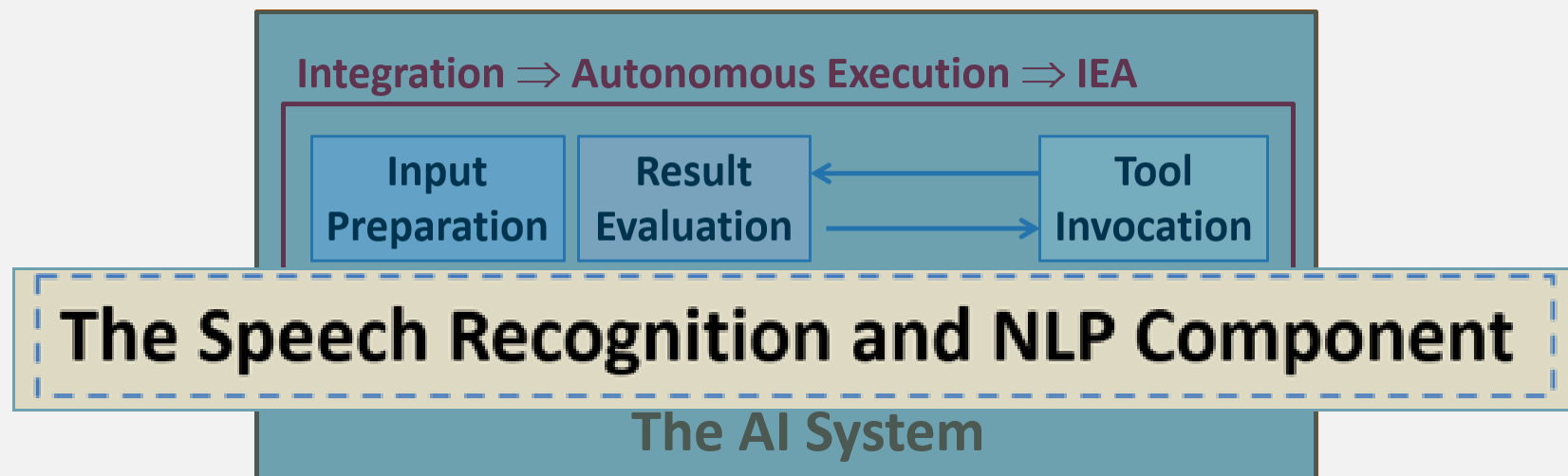
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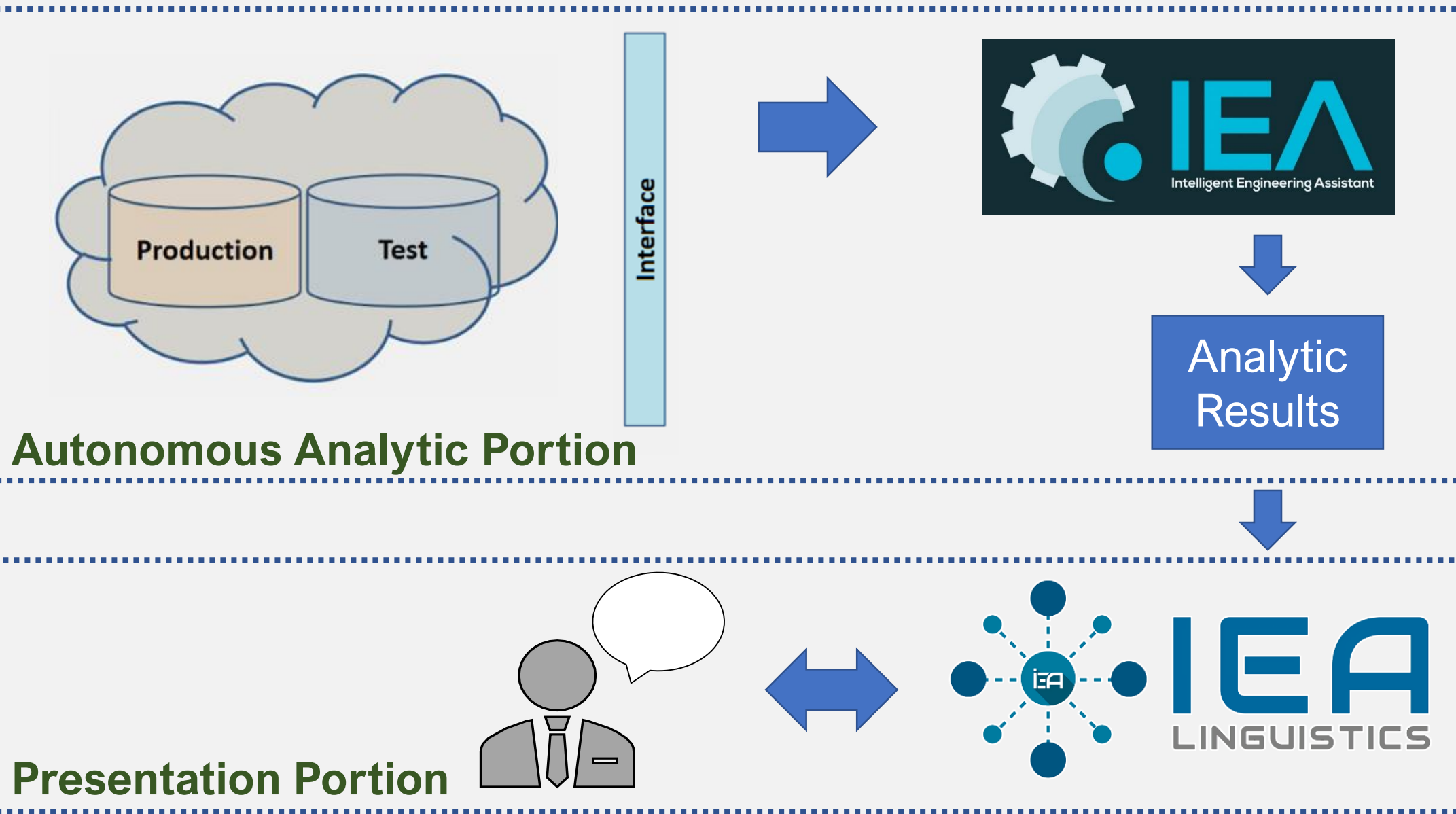
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- Improve linguistic portion for deployment
- Make a robust, user-friendly, and intuitive NLP interface
- "Human-to-machine interface"

Usage Flow



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Input Spec to IEA Linguistics

Analytic
Results



Product A

Yield
Excursion

...

Failing
Bin
Analysis

...

...

Product B

Wafer
Pattern
Analysis

...

Correlation &
Association
Analysis

...

...

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Input Spec to IEA Linguistics

Product A

Yield
Excursion

...

Failing
Bin
Analysis

...

...

➤ Analytic Results

– Locally Stored Results

- Interesting
- Non-interesting
- Supporting

– Infrastructure Data

- Pointers for access non-local database

– Analytic Metadata

- Attributes & parameters
- Internal types
- Various settings

(allows queries for analytic results not found on local data)

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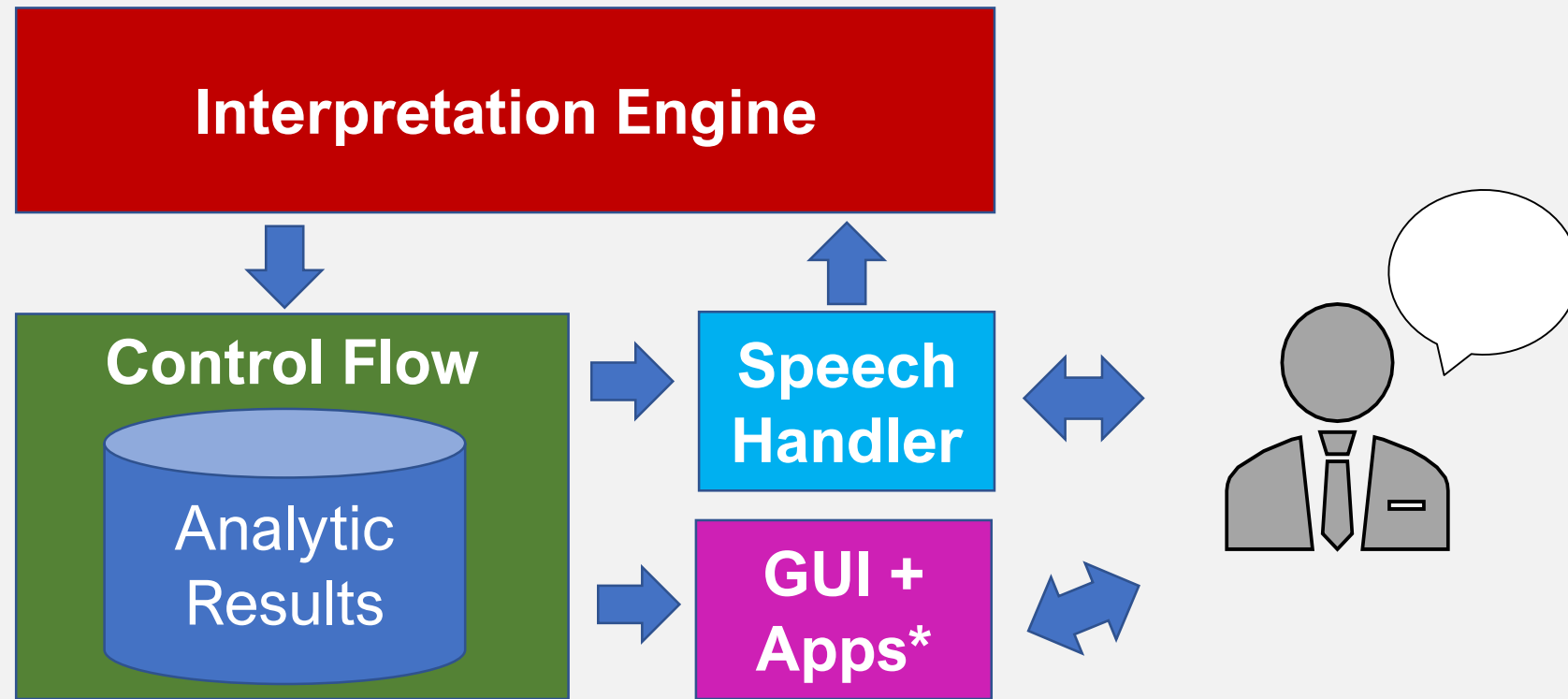
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*GUI & Apps made for demo purposes and is not the main focus of this project

Design Overview – Speech Handler

❖ Passive Listening

- ❖ Block user input while speaking
- ❖ Listens to user after speaking
- ❖ Repeat

❖ Google S2T

- ❖ Converts speech to text
- ❖ Returns different possible conversions
- ❖ E.g. “way for” vs “wafer”

❖ Text Sanitizer

- ❖ Improved vocabulary for our application context
- ❖ Off-the-shelf tools are available
- ❖ By implementing our own, for robustness and flexibility

❖ Amazon Boto3 T2S

- ❖ Converts text to audio
- ❖ Friendly development infrastructure

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❖ Converts Text to System Commands

- ❖ Called “Intents”
- ❖ An Intent usually triggers an async. PyQt Signal
- ❖ Signal Example:
 - ❖ *Signal(signalType, sender, receiver, payload)*

❖ Google’s Dialogflow

- ❖ Neural Network NLP Model - API
- ❖ Takes sanitized speech as input
- ❖ Returns an Intent to our system

❖ Ex. – Invoking an Intent:

1. “Change the plot color to **red.**” → Speech Handler
2. Speech Handler → Dialogflow
3. NLP Agent infers the most appropriate Intent + Entity
4. System receives:
 - Intent: ChangeColor
 - Entity: “**red**”



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Dialogflow Trained Intents

Graphing Related Intents

ChangeAxis
ChangeColor
ChangeDataType
ChangeGraphType
DetectParameter
OverlayGraph
PlotBinCount
PlotCorrelation
PlotLotYield
PlotWafer
ZoomIn
ZoomOut

Context Related Intents

Default Fallback Intent
DetectNotification
Yes
GoBack
Next Intent

System Related Intents

Default Welcome Intent
Goodbye Intent
Help
Logout

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Training Intents

➤ Training Data for Intents

- we emulated Engineers and generated (*Query*, *Intent*) pairs
- Each *Query* is composed of some *Action* and some *Entity*

➤ Example – ZoomIn Intent

- “Can you **zoom in** to the **first 5 plots**?”
- “Let’s **enlarge** the **last plot**.”

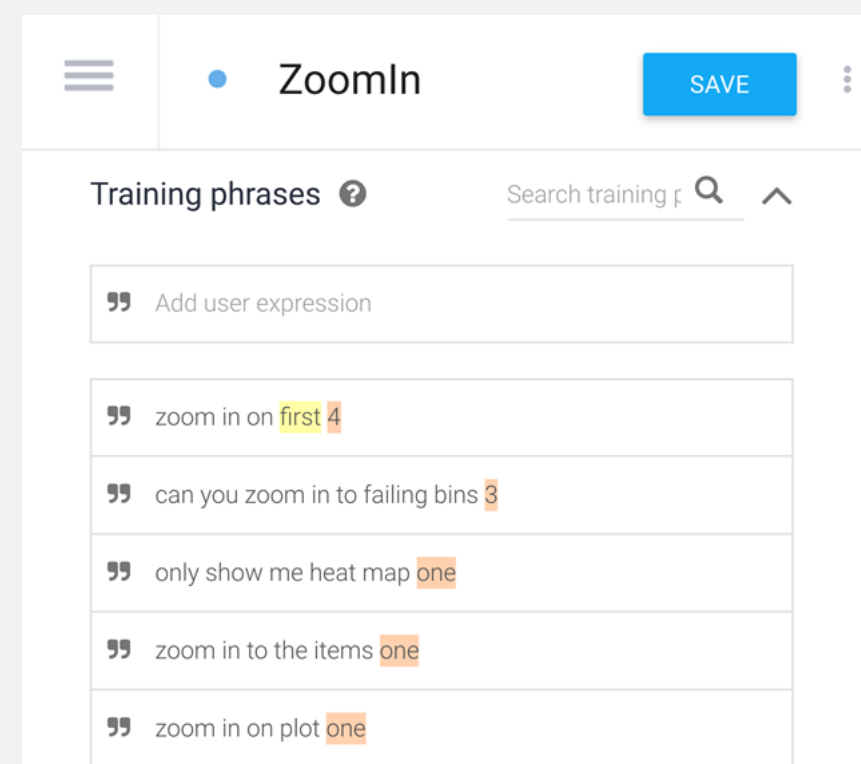
– Actions:

- “Zoom in”
- “Magnify”
- “Enlarge”
- ...

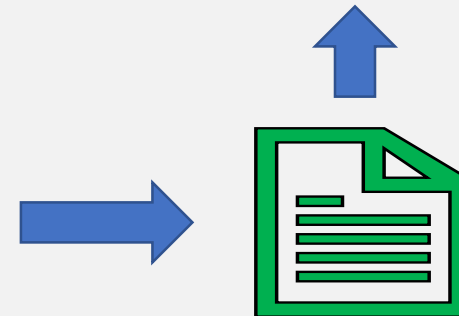


– Entities:

- “First 5 plots”
- “Last plot”
- “Last 3 plots”
- ...



The screenshot shows a web interface for training intents. At the top, there's a header with a menu icon, a blue dot, the text 'ZoomIn', and a 'SAVE' button. Below the header, there's a section titled 'Training phrases' with a search icon and a search bar. A list of training phrases is displayed, each preceded by a double quote icon. The phrases are: 'Add user expression', 'zoom in on first 4', 'can you zoom in to failing bins 3', 'only show me heat map one', 'zoom in to the items one', and 'zoom in on plot one'. The words 'first', 'one', and 'one' are highlighted in orange in the original image.



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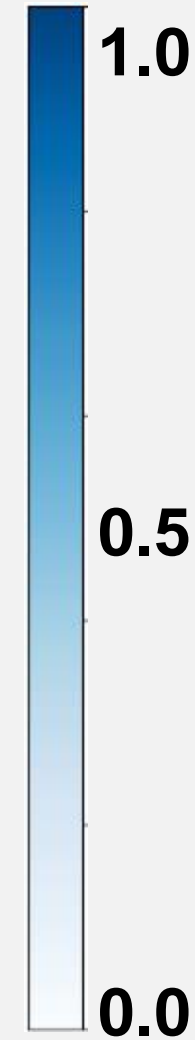
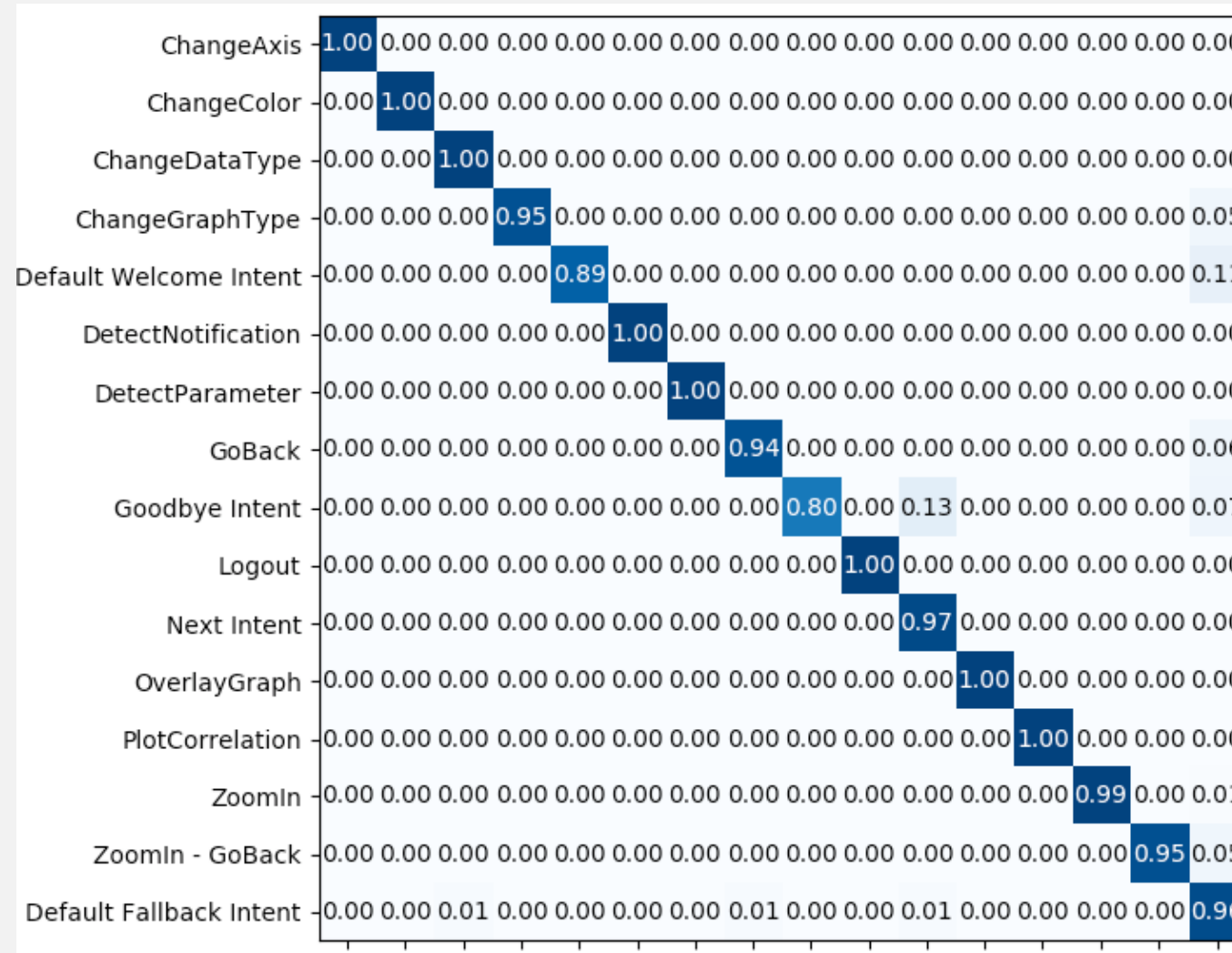
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Results

True Label



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Approx. training time ~3m

Predict Label

Design Overview – Control Flow

❖ Keeps track of Context & States

- ❖ Accesses analytic results/cache
- ❖ Defines States/Flags
- ❖ Definitions for Controllers
- ❖ Definitions for Signals
- ❖ “Interconnect” – facilitates signal passing

❖ Ex. – Context Tracking:

- Remember color change for a type of graph
- Enables “go back” & “continue” Intent
- Appropriate follow-up questions

Interpretation Engine

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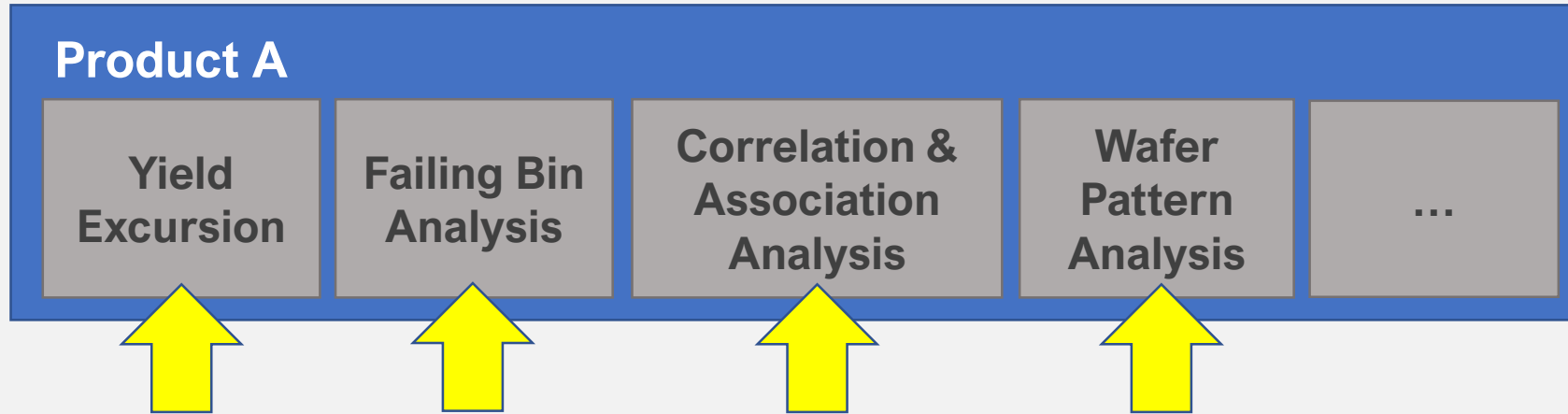
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Demo Context



➤ Features you'll see:

- Reports findings triggered by an sudden drop in yield (excursion)
- User can request optional results
- User can interact with the system:
 - Changing the graph shown
 - Changing the color of the data shown
 - Zooming into specific aspects of graph
 - Keeps track of context – “Go back”

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Demo

Thank you!!!

Li-C. Wang, Jay Shan, Jenny Zeng

**Yogananda Isukapalli, Brandon
Pon, Carrie Segal**

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