“AiYa! This is amazing~!” - IEA
Development Team

Ryan Kirkpatrick (Leader) - GUI Design and NLP
Dang Nguyen - Data Retrieval and Organization
Dali Xiao - Display Engine and Canvas Production
Min Jian Yang - Interpretation Engine and NLP

“Wow these guys are so cool” - IEA
Purpose

- Companies are allocating a lot of resources into the manufacturing process, especially hardware verification.
- Engineers spend a lot of time looking over production data and trying to extrapolate meaningful results in order to improve yield.
- This process is rather deterministic and can be automated.
- This will help push products to the market faster as well as reduce company labor costs.

“What’s the point?” - IEA
IEA System to execute the tasks
Product Description

Querying System

- Interacts with the user through audible AI
- Retrieves and caches data for queries
- Understands the context of what data is available and how to conversation is developing
- Displays essential data through charts or graphs

“What I do~” - IEA
The querying system consists of a GUI, an interpretation engine and a display engine.

To ensure these subsystems run smoothly, a control system is used to handle signaling between subsystems.

Signalling lets subsystems communicate across threads, and threading will be done on a functional basis.

Threading helps with:
- avoiding interference, running in-sync, scheduling processes
- Signal using pyqtSignals and pyqtSlots

Error: The program has stopped responding...
GUI

- **Main GUI:**
  - IEA Response: A textual response from IEA that reads the same as the audio output of the interpretation engine
  - Button to tell interpretation engine to start listening to the user

- **Display GUI:**
  - Display window for showing matplotlib graphs generated by the display engine
  - Excess area for labels to be given from display engine
  - Understanding of plot type, and ways to represent different structures/display objects

“Does this GUI make me look fat?” - IEA
GUI - Spec

Input:
- From User:
  - Clicks to toggle audio
- From Interpretation Engine:
  - Response Text
- From Display Engine:
  - Display data and format type

Output:
- To User:
  - Displayed response text and graphs
  - Final output of PPT Presentation
- To Interpretation Engine:
  - Signal to start listening to user

What's Next:
- More interaction on the display UI and more options for charts and graphs

Main UI:

Display UI:

“Does this GUI make me look fat?” - IEA
Interpretation Engine

- Queries the user by using Amazon Web Service's Text-to-Speech API to convert text string to audio
- Uses Google Speech-to-Text API to convert user's query into text string
- Passes the text string into an Natural Language Processor to extract semantic meaning
  - Part of speech (POS) parser, state machine, NLP algorithm (LSTM, GRU, etc...)
- Maps the semantic meaning to corresponding function and pass it into the Display Engine

"Sorry, could you say that again?" - IEA
Interpretation Engine - Spec

❖ Stage 1: Keyword Identifier
  ➢ Mapping user command to specific keywords -> display engine commands
  ➢ Small finite state machine keep track of the context

❖ Stage 2: Part-of-Speech
  ➢ Extract semantic meaning by breaking the sentence up with POS parser (features)
  ➢ Combine the POS parser with keyword identifier and distance measure
  ➢ Complex state machine with more descriptive states

❖ Stage 3: To be determined...
  ➢ Insufficient data to train right now
  ➢ Neural Network?
  ➢ Hybrid Network?

"Sorry, could you say that again?" - IEA
Display Engine

- Depending on the user's query, IEA will try to output a graph that is appropriate for the data.
- The query has specific user intents that can be mapped to display functions.
- External data is initially cached, then used for lookup.
- Different kinds of graphs can be supported:
  - Trend, Scatterplots, Wafer plots, etc.
  - Additional graphs can be implemented.

“Here are some graphs displaying useless data.” - IEA
Display Engine - Spec

- Graphs have corresponding signals linked to Interpretation engine
- Keeps track of current intent / state
- Output - organized data for specific graph to GUI

What’s Next:
- More charts and graph types
- Actually interact with real data
- More threading to prevent hanging

“Here are some graphs displaying useless data.” - IEA
Costs?

$0!

Just kidding… We might need microphones to synchronize testing of audio input across different computers and reduce noise.
## Current Progress

### IEA Gantt Chart

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<td>Final Presentation</td>
<td>Dates : Corresponds to Fridays that represent that entire week</td>
<td>Time when we should be working on a task</td>
<td>Left over Time where we may still be working on a task</td>
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Goals

Features we want to implement moving forward:

- Additional graph support
- Passive listening
  - the program will know when to listen to the user based on conversation context
- Ability to export session data
  - Powerpoints, PDF, etc.
- Robust NLP so that the user can hold a natural conversation
- Generalize querying system (probably not happening)
THANK YOU !!!

Prof. Yoga
Prof. Li-C Wang
Chuanhe (Jay) Shan
Yueling (Jenny) Zeng