

# Enhancing Margin Analysis through Dynamic Dashboards: A Case Study on High-Speed SERDES Link using Power BI and Snowflake

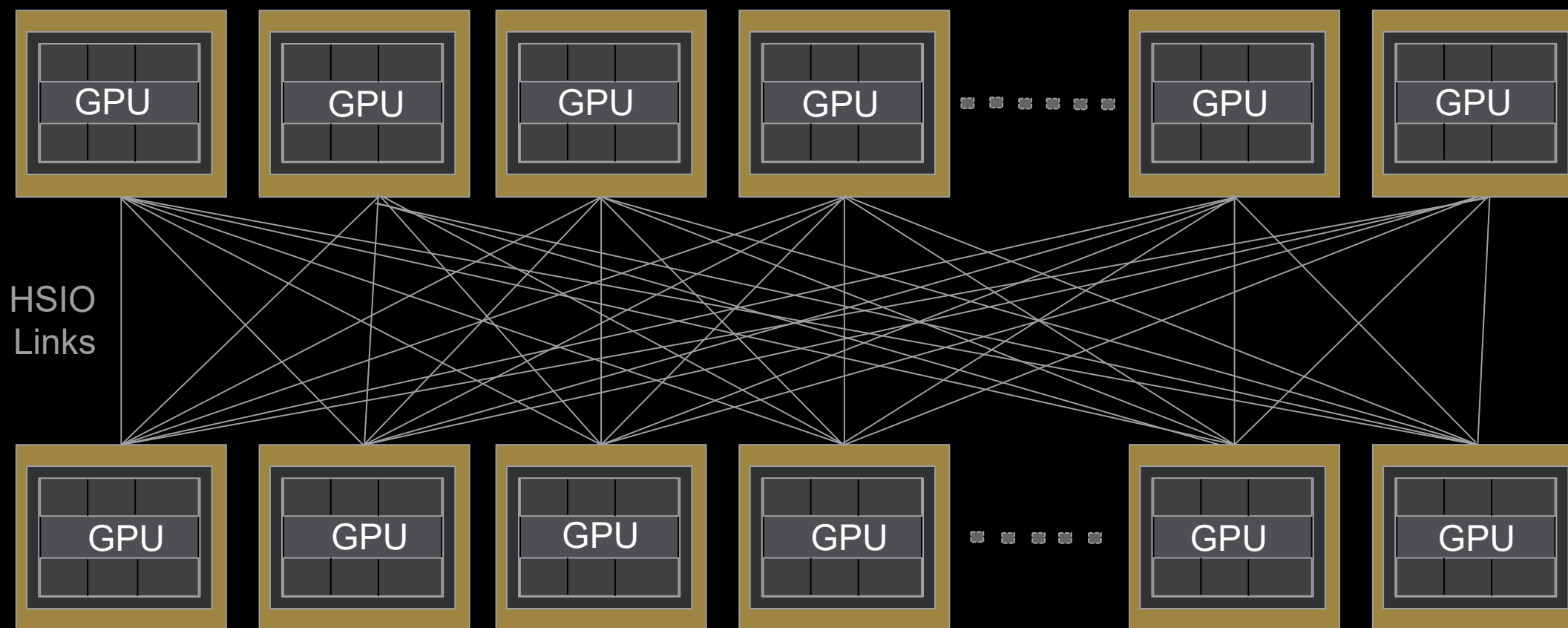
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# AGENDA

- Motivation
- Introduction
- Methodology
- Data: Acquisition, Extraction & Transformation
- Dynamic Visualization
- Case Study
- Conclusion
- Future Scope

# MOTIVATION

- Robust SERDES links are very essential for achieving a high throughput and low latency in HPC AI-Enabled systems.
- Having an adequate margin of over hundreds of links and millions of these systems is essential and this is one of the major concerns at the Datacenter manufacturing sites.



# INTRODUCTION

Prior to the implementation of the Power BI monitoring system, manufacturing and validation teams encountered several challenges in tracking platform performance metrics.

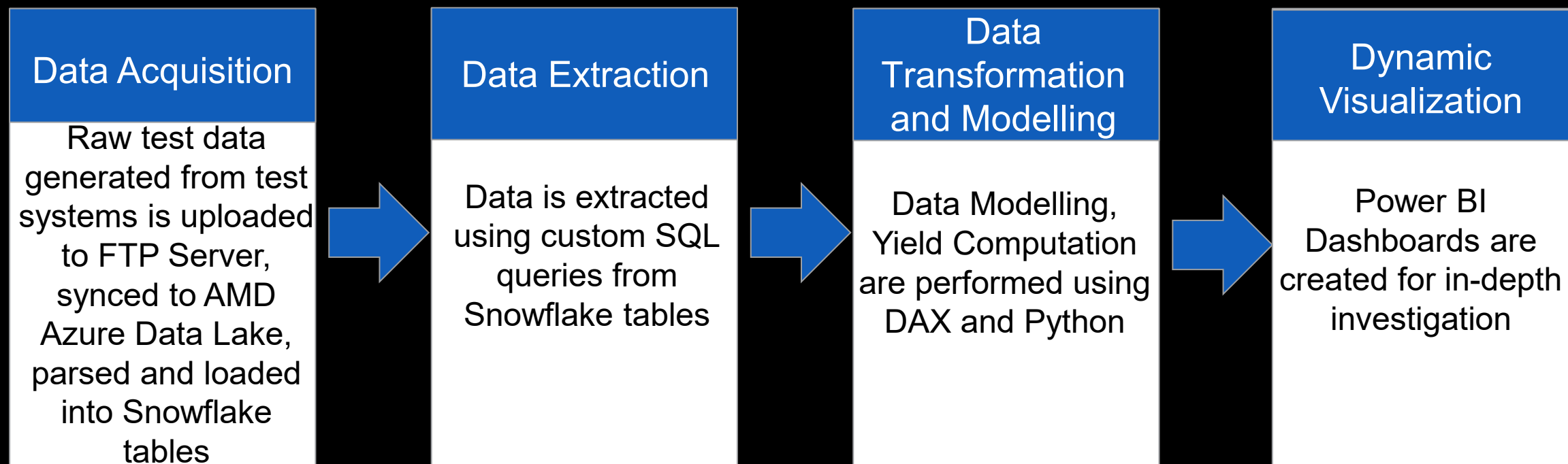
## **Problem with Current Workflow (Data Downloads in csv, JMP):**

- ✗ Data Synchronization Issues**
- ✗ Real-Time Analysis Limitations**
- ✗ Delay in Root Cause Analysis**

## **Our Solution: Power BI + Snowflake Integration**

- ✓ Automated Cross-Database Integration**
- ✓ Real-Time, Cloud-Native Analysis**
- ✓ Rapid Anomaly Detection**

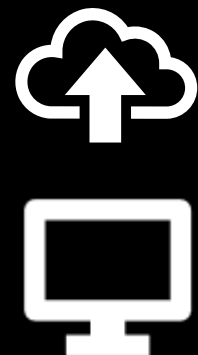
# METHODOLOGY



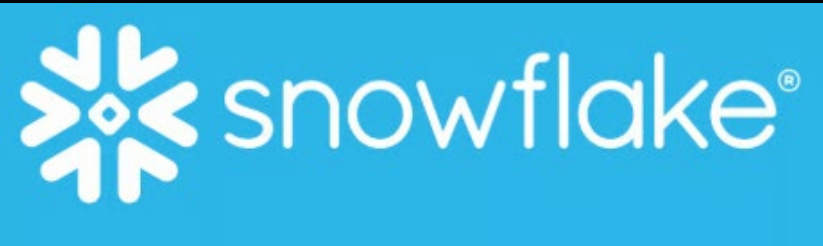
# Data Acquisition



Measured test data from automated test systems is usually in csv formats

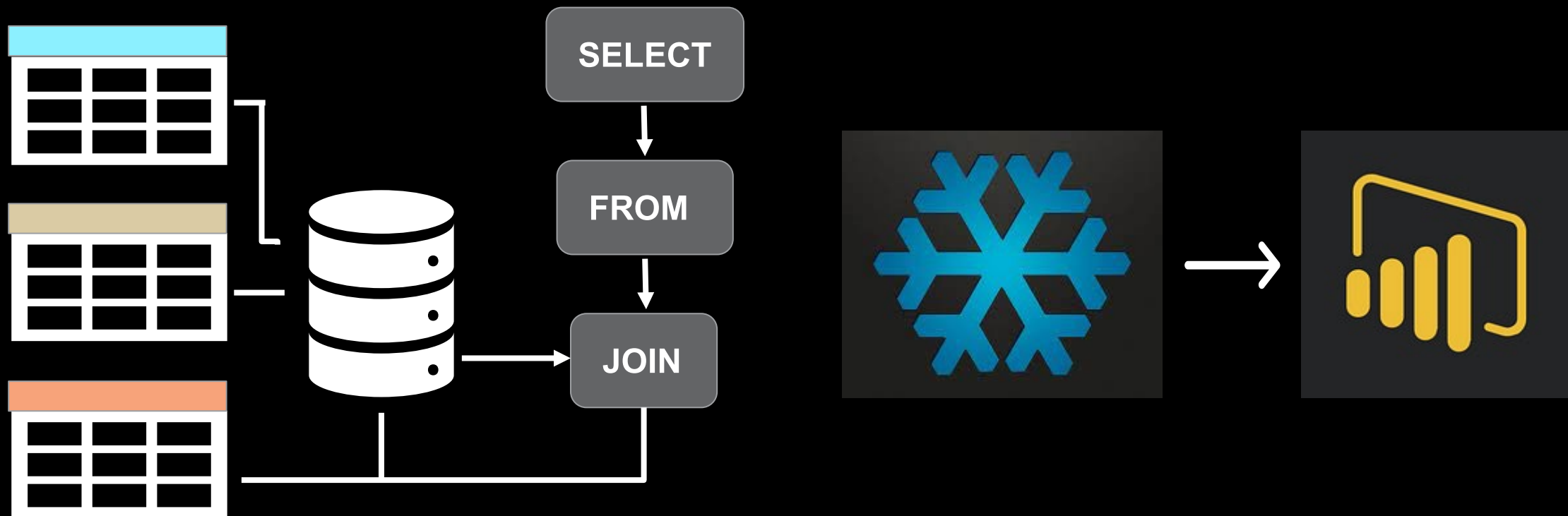


Ingestion process begins with uploading the raw test data into AMD Azure data lake



Data is parsed and loaded into Snowflake tables. Snowflake is a scalable cloud-native platform for data ingestion and analytics

# Data Extraction



## SQL Query Advantages:

- Enhances performance by enabling targeted access to relevant test parameters, test types and timestamps.
- Significantly reduces the complexity of transformations within PowerBI.

# Data Transformation and Modelling

## Power Query Editor

- Perform transformations such as handling null values, changing data types, filtering rows, etc.
- Python in Power Query Editor extends Power BI beyond drag-and-drop, enabling deeper analytics, automation, and advanced visualizations.

## DAX Modelling

- DAX ( Data Analysis Expressions ) defines the relationships between various tables.
- Calculated columns or measures are created using DAX.
- DAX responds to real-time user applied slicers and filters across dashboards.



# Dynamic Visualization



## Interactive Dashboards

Time-series plots indicating performance and correlating with various parameters



## Anomaly Detection

Tailored visuals like heatmaps, violin plots help with identifying the outliers



## Focused Analysis

Real-time , clickable visuals for insights

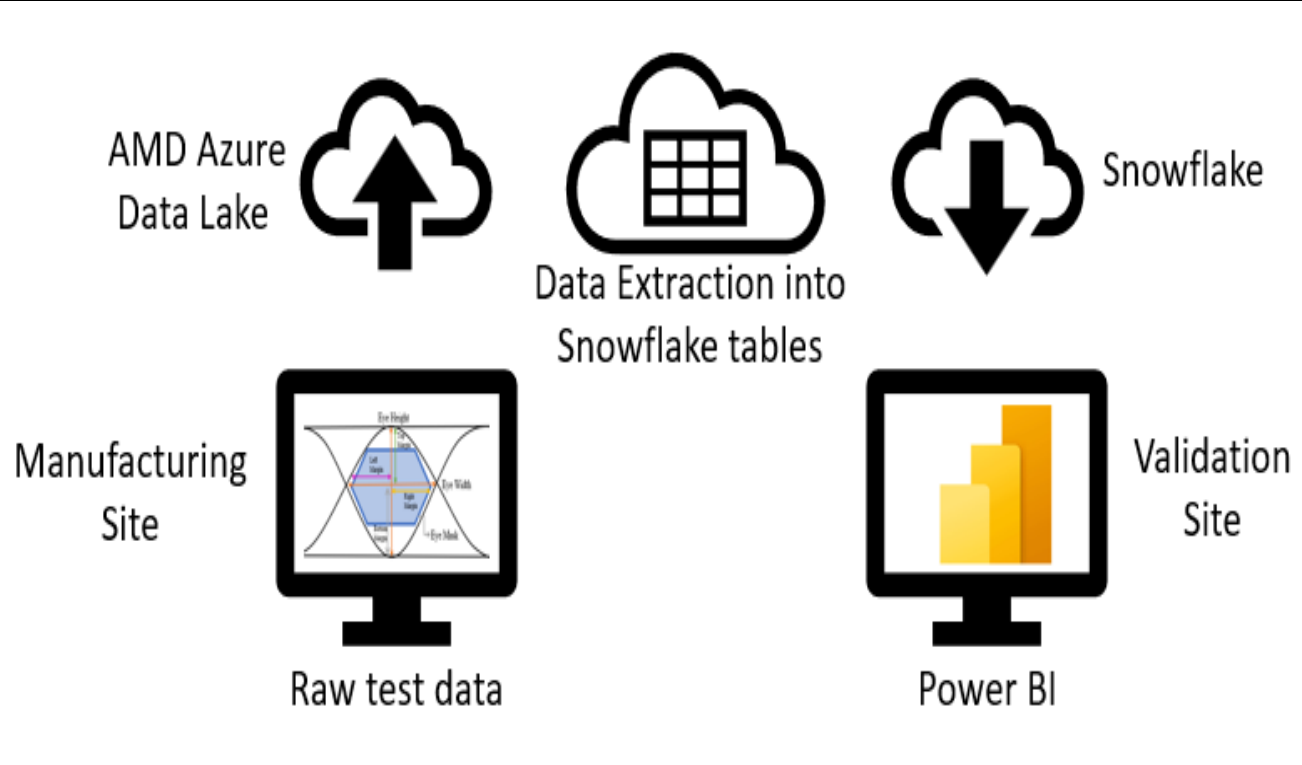


## Drill-Through Investigation

Investigate and enable detailed root cause analysis

# CASE STUDY

## HIGH-SPEED SERDES MARGIN ANALYSIS OF HIGH-PERFORMANCE COMPUTE AI ENABLED SYSTEMS



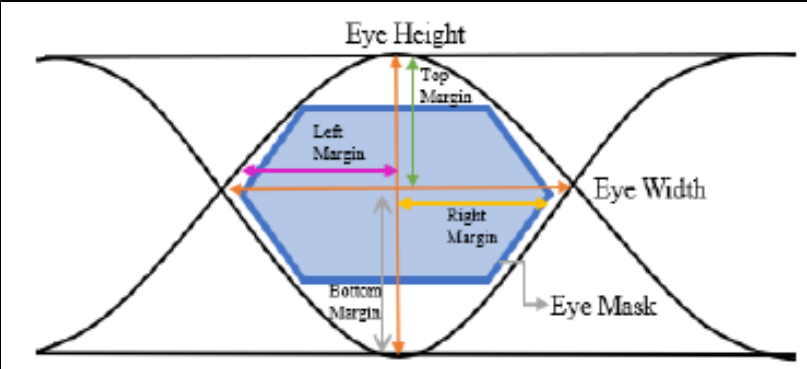
PCIe margin data of datacenter GPU at manufacturing site is utilized for this case study

The parsed data from Snowflake is directly imported into PowerBI.

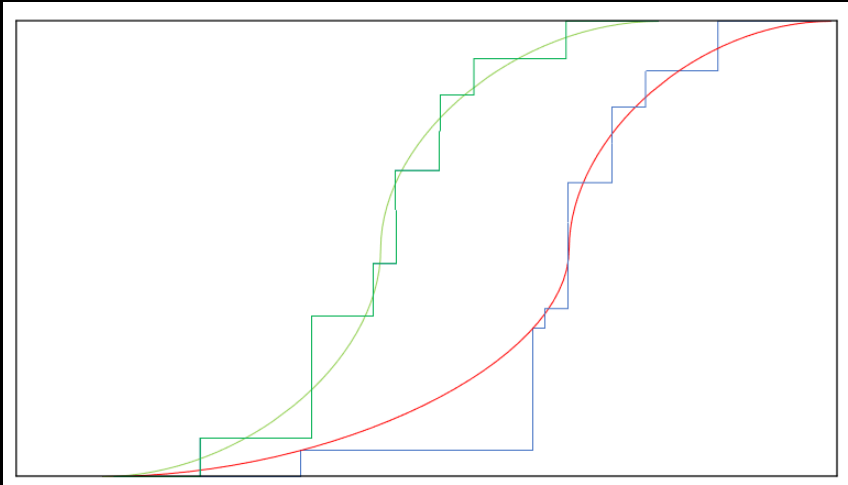
# CASE STUDY

The python script is written for statistical yield computation on each of the left, right, top and bottom margin using the Empirical Cumulative Distribution (ECDF) function in the Power Query Editor directly within the PowerBI workflow.

XX.X YIELD	XX.X YIELD LEFT	XX.X YIELD RIGHT	XX.X YIELD TOP	XX.X YIELD BOTTOM
XXX PPM	XXX PPM LEFT	XXX PPM RIGHT	XXX PPM TOP	XXX PPM BOTTOM



Typical Eye Diagram Measurements

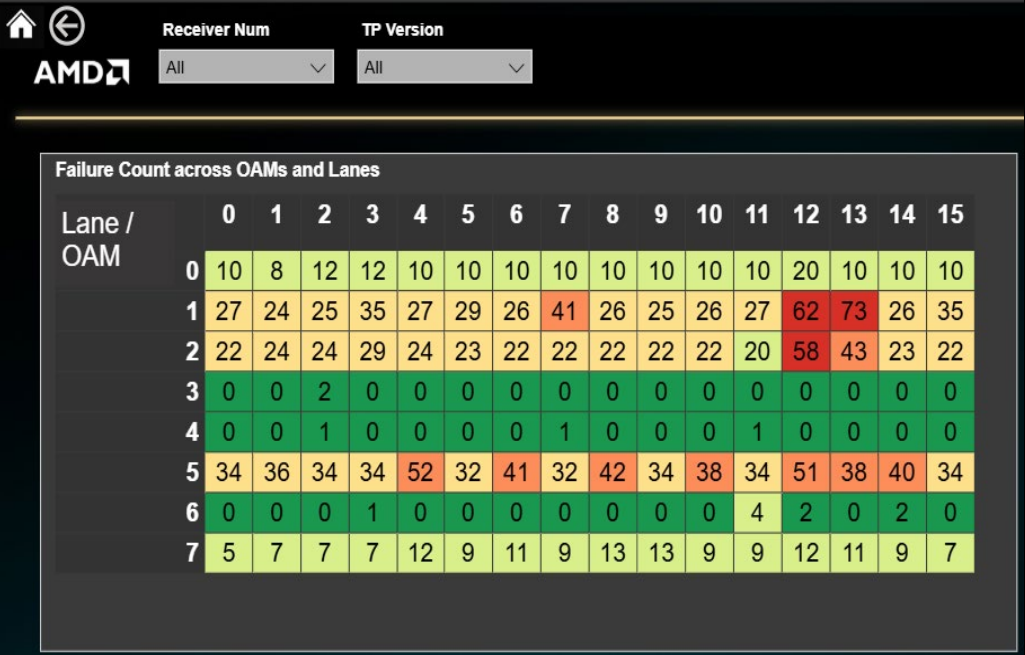


Empirical Cumulative Distribution Function

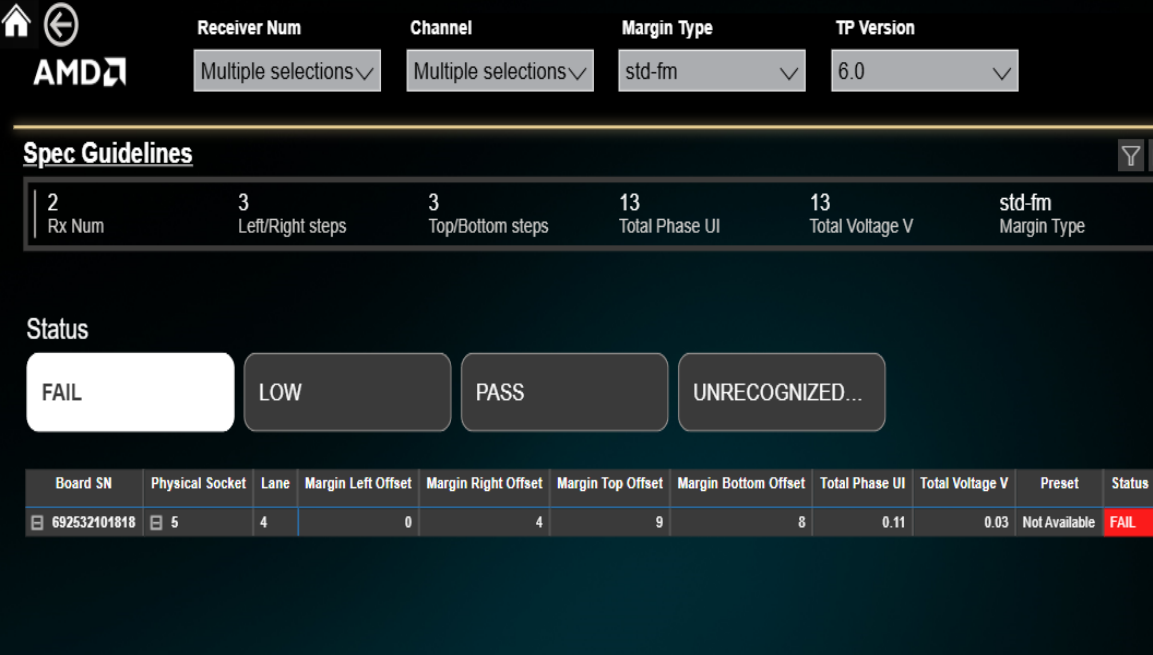
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# CASE STUDY



Heatmap highlighting anomaly



In-depth Analysis using drill through

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# CONCLUSION

## Key benefits of the proposed solution:

### **Transforms digital validation workflows with Yield Analysis via ECDF ( Empirical Cumulative Distribution Function )**

- Compute and visualize yield distributions across links along with the correlation to various tables.

### **Empower engineers with timely insights and actionable analytics**

- Enhances time efficiency by improving real-time monitoring and enabling proactive intervention such as comparing margin behaviors across sockets, ports, and link types (xGMI, PCIe).

### **Scalable & Automated Reporting**

- Eliminates bottlenecks and supports high-volume data handling.

# FUTURE SCOPE



**Predictive analytics features such as utilizing Machine Learning models for training on the HVM test data, BIOS versions and configuration data to predict margining failure in the early phase or before they occur.**



**Enable automated alerts through Power Automate that can implemented in the dashboard with rule-based logic.**

# Q & A