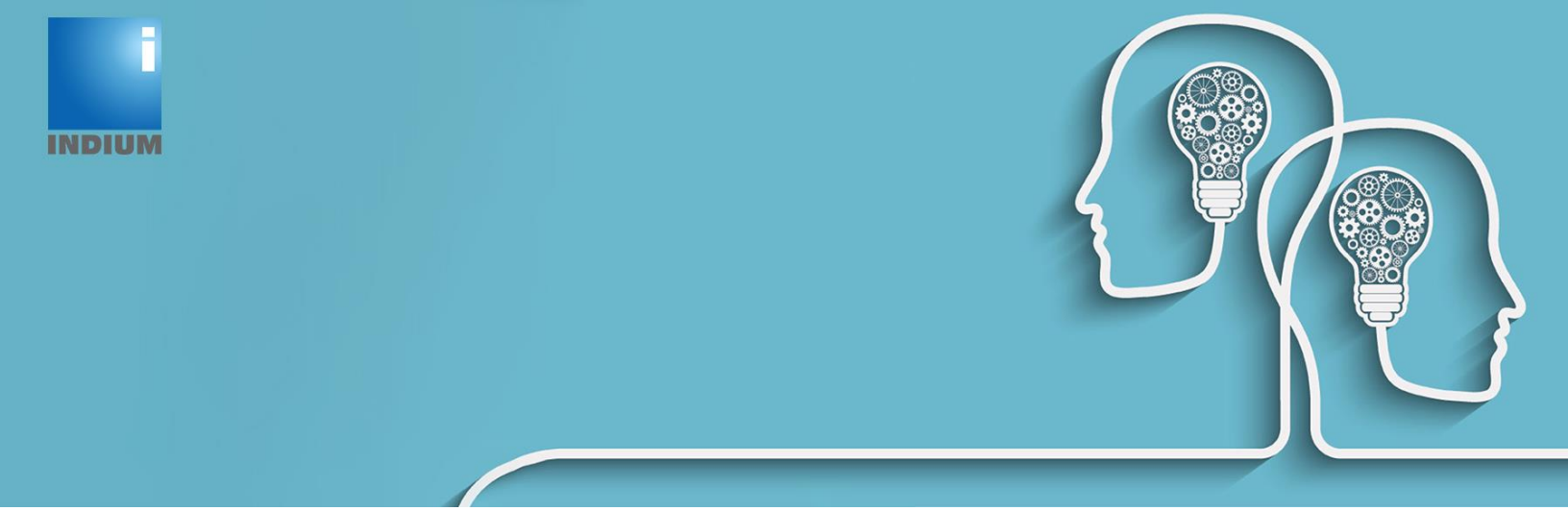


To push boundaries in Technology, Businesses need critical insights visualized

Application: Semi-Conductor Manufacturing Process Data Application

Services Offered: Big Data Processing, Predictive Analytics and Data Visualization

Tools: R, R Shiny for Data Visualization

Client

Our client is a California based value-added services provider for semiconductor manufacturers. They develop and supply wafer fabrication equipment and services to build innovative devices. The process of creating chips involves a chain of individual steps; with each process module producing multiple wafers in defined recipes of temperature, pressure conditions etc.

Key Highlights

Duration

6+ month (Ongoing)

Team

1 Data Scientist

2 R Shiny Developers

1 Program Manager

Algorithms Implemented:

Principal Component Analysis

Mahalanobis Distance

Hotellings T2 Distance

t-SNE

Technology:

Hadoop

PostgreSQL

Application Overview

The application is a data bank of the all critical data points gathered in the process chain. The recipes or the conditions of the process chambers are recorded and stored in real time by sensors installed in the process module.

The data produced was continuous, time series in nature and significantly huge in size. This led to an unusual IoT problem. However, the Data was an asset to business which when put to insightful use, facilitates real time monitoring and defect prediction in the process module.

Business Challenges

The client wanted a solution to make use of the available data to achieve the following goals:

- Measure efficiency of the wafer productions
- Monitor production line of wafers
- Identify outliers process modules
- Prediction of defects in process modules
- Predictive maintenance

Our Solution Overview

Indium analyzed the data collected from the sensors installed on process modules and modelled a solution that treated the data for business use, making it potentially describe, predict and prescribe insights for business efficiencies.

We implemented a Data Science Solution combined with a Visualization layer to aggregate the data volumes from the process chambers and extend it on an actionable interface for key business users.

Solution Highlights

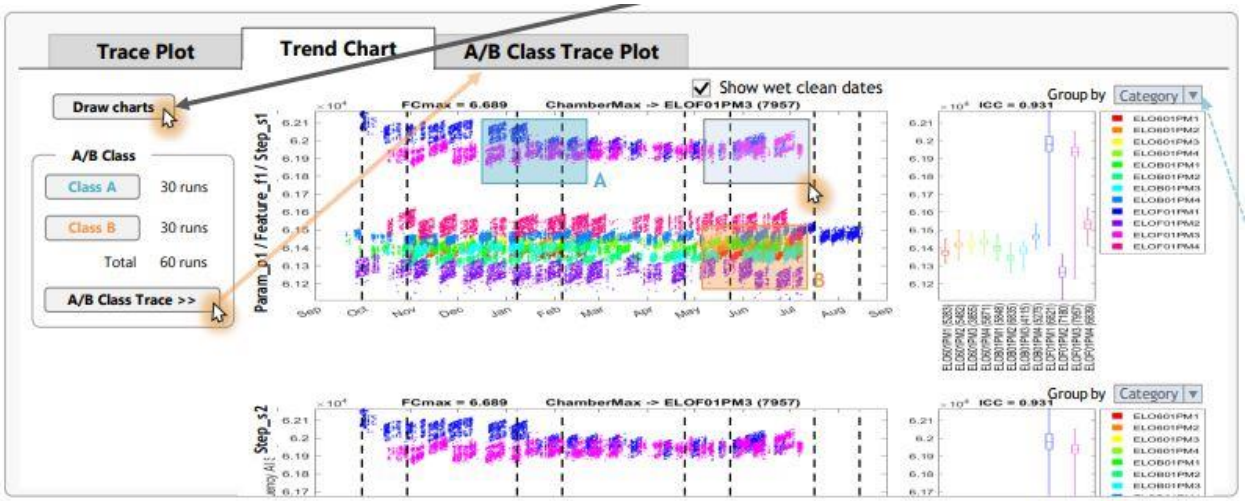
- The continuous flux of data from the process required a powerful data base to handle raw data as well as the aggregated data (processed). We introduced a Hadoop based solution for data storage.
- The data so processed performs the following
  - ✓ Identifies outliers / anomaly modules in regular production
  - ✓ Reports defects
  - ✓ Caters to wafer-level resolutions (lowest possible resolution)
  - ✓ Monitors production guidelines
- Data insights were realized in interactive and responsive charts using powerful visualization tools
  - ✓ The charts render quick response times
  - ✓ Feature interactions like zoom-in/brush & deselect/simulations/pop ups/drill-downs
  - ✓ End-to-end analytics from data navigation (selecting Customer, Lab, Process modules of choice) to model building for displaying results and recommendations in a single snapshot.

Value delivered

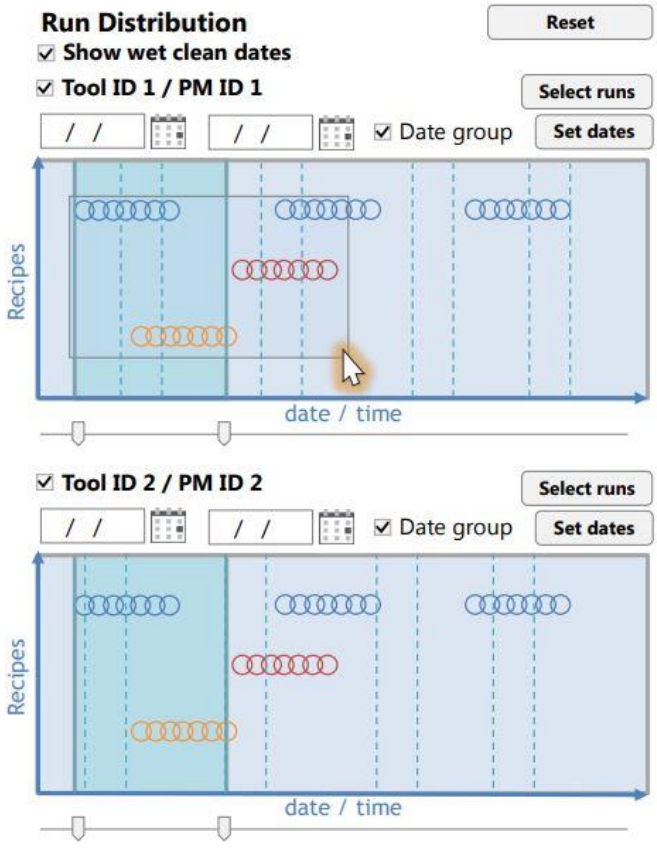
- 3X reduction in repair and maintenance cost and downtime of the process modules
- 20% increase in the efficiency of the process modules resulting in more wafer production per unit time
- Built a product which has become one of indispensable offering by our client to their customers

Visualization Samples

Find our visualization work samples for client below.


Trace Plot
Trend Chart
A/B Class Trace Plot
Draw charts
A/B Class
Class A 30 runs
Class B 30 runs
Total 60 runs
A/B Class Trace >>
Show wet clean dates
FCmax = 6.689
ChamberMax -> ELOF01PM3 (7957)
Param_p1 / Feature_f1 / Step_s1
Group by Category
ICC = 0.931
Step_s2


Trace Plot
Trend Chart
A/B Class Trace Plot
Draw charts
Runs selected by
: selected option...
Option...
A/B Class
Class A 30 runs
Class B 30 runs
Total 60 runs
Step by CurrentStepNumber
Align by step
Group by Category
step 1
step 2
step 3
step 4
step 5
parameter_1 value
process time (msec)
box plot
Zoom Group
Zoom


Run Distribution
Reset
Show wet clean dates
Tool ID 1 / PM ID 1
Select runs
Date group
Set dates
Recipes
date / time
Tool ID 2 / PM ID 2
Select runs
Date group
Set dates
Recipes
date / time