Improving Wafer Yield with Predictive Analytics

The Customer

A leading wafer manufacturer operating complex, multi-stage production with interdependent processes and numerous measured variables—seeking to identify process-inherent yield drivers, predict sample-specific yield reliably, and determine how early in the chain final yield can be forecast.

The Challenge

Deliver high-confidence yield prediction and reveal pathway drivers by:

- Mapping the "process journey" and correlating parameters to yield outcomes.
- Finding significant differences between high- and low-yield samples.
- Building predictive models with strong explanatory power (target $R^2 > 0.8$).
- Pinpointing the earliest stage where reliable yield prediction is feasible.
- Providing an interactive way to explore what-if scenarios and optimal flow.

The Solution

A multi-phase analytics and modeling program:

- Exploratory Data Analysis: In-depth profiling of wafer journeys and parameter correlations.
- ML model development: Predictive models to estimate final yield and determine earliest reliable prediction point.
- Interactive optimization dashboard: What-if analysis to design optimal flow for wafer- and process-specific options.

The Results

The initiative strengthened visibility and decision-making:

- Linked upstream drivers: Clearer relationships between process parameters and yield.
- High-accuracy prediction: Models targeting strong R^2 performance.
- Decision support: Interactive tools for productivity and cost optimization.

Impact Delivered

- 90% Yield prediction accuracy
- Earlier yield predictability
- Better process understanding
- Optimized material flow

Solution Components

- Machine-learning models
- Data-engineering routines
- Exploratory data analysis
- Interactive optimization dashboard