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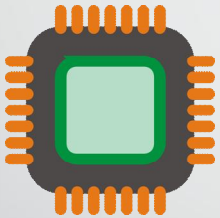
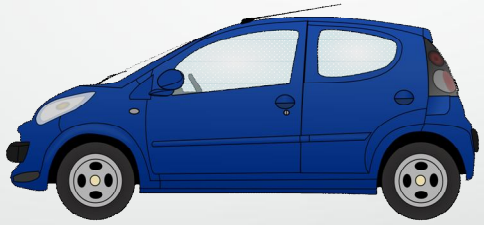
What is the Semiconductor Industry?

- Manufacturing of electronic devices





- Customers want:
  - High Quality
  - Low Cost

Manufacturing Goals

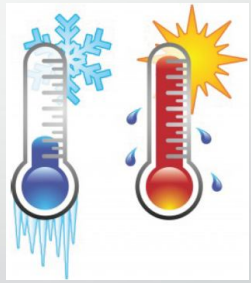
- Raising quality usually means raising costs
- As the process matures, the goal is to:
  - Minimize cost
  - Meet quality expectations
  - Maximize yield
- Engineers must look for ways to balance these goals

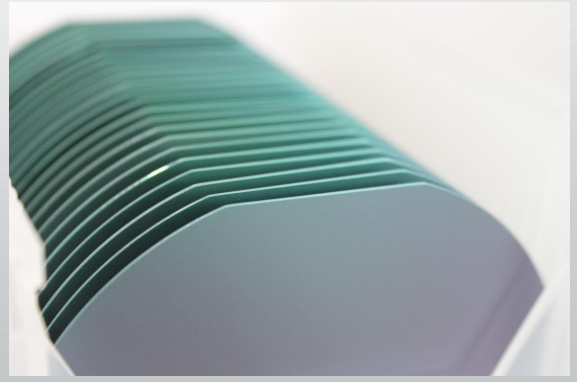
How to Approach the Problem

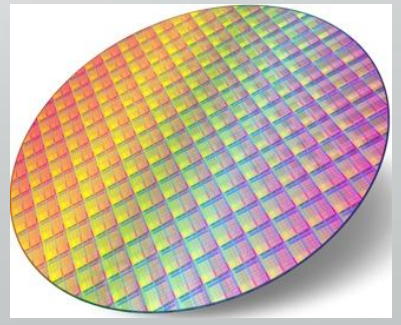
- The testing process produces vast amounts of data
- By investigating this data we can potentially:
  - Increase product quality
  - Reduce test time
- Engineers are using data analytics
  - We want to provide an infrastructure to perform this data analytics

Test Data

- The data contains:
  - Test values on particular parts (i.e. voltage, current, frequency)
- The data is categorized by:
  - Insertion (temperature)
  - Lot (Production batches)
  - Wafer (Set of dies)
  - Die (Each individual part)







Objective

- To create an infrastructure to aid product engineers in analyzing test data

Our Solution

- Software tool that provides flexible functionality for:
  - Data Accumulation
  - Data Selection
  - Data Analysis
  - Data Visualization
  - Model Building

dVA

Modules

- Data Download
  - Download Test Data
- Scope Selection
  - Selecting data based on certain criteria
    - Temporal
    - Spatial

Modules

- Analysis
  - Analyze data scope with a set of tools
    - i.e. Correlation, Univariate, Bivariate
  - Caching
- Visualization
  - Visualize results of analysis
    - i.e. KDE, Wafer Plot, Histogram

Modules

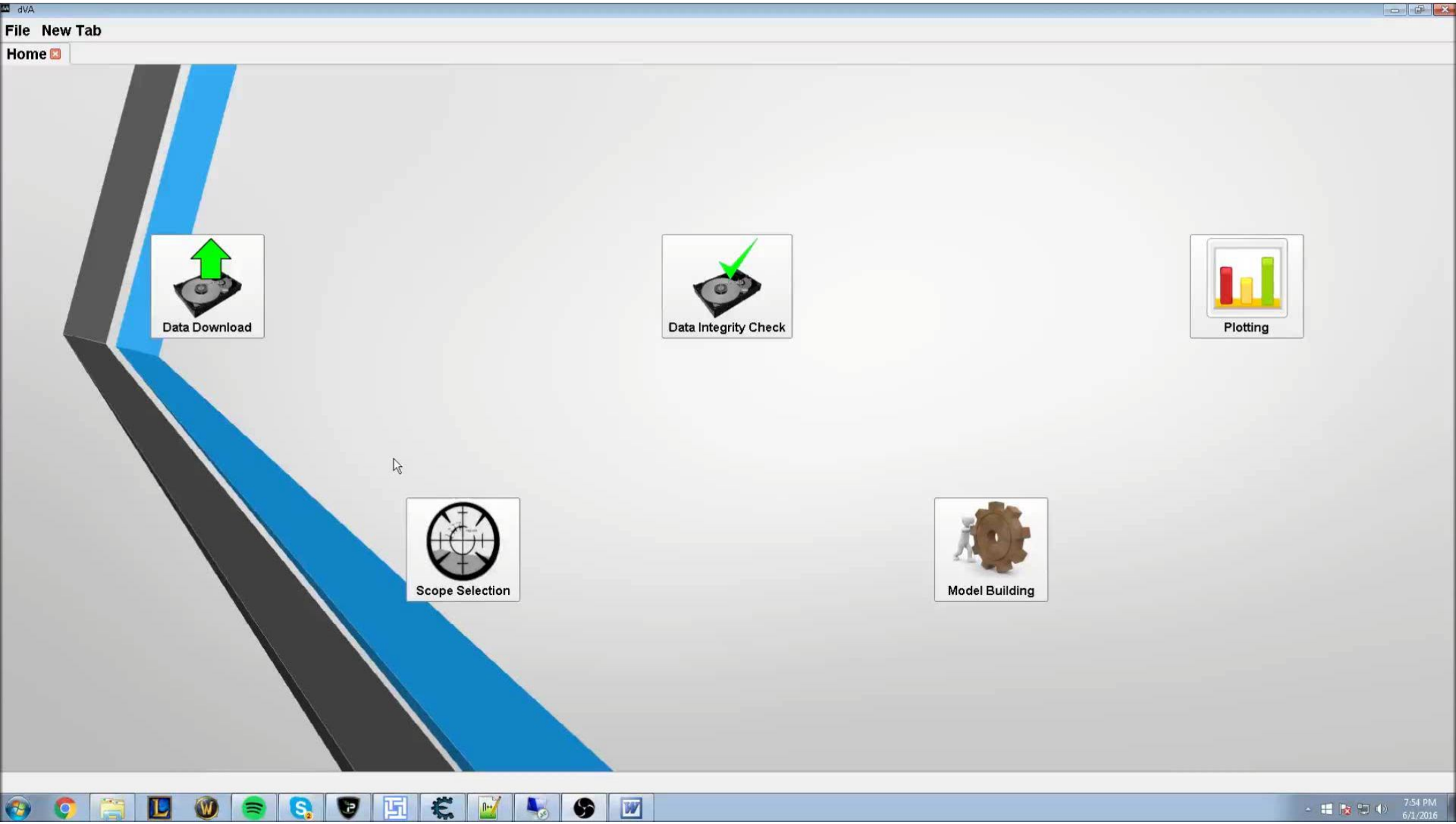
- Model Building
  - Evaluating analysis results
  - Using analysis results to create screening rules
    - Screening rules are derived from product failures or customer returns
    - Screening rules are then applied to prevent future failures/returns

Applications

- Test Time Reduction
  - Finding test redundancy
    - Analyzing correlation between tests
- Quality Analysis
  - Analyzing customer returns
    - Identifying tests with outlying behavior

Scenario 1: Test Time Reduction

- Identify tests with similar purposes
- Investigate tests with high correlation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Home
Data Download
Data Integrity Check
Plotting
Scope Selection
Model Building
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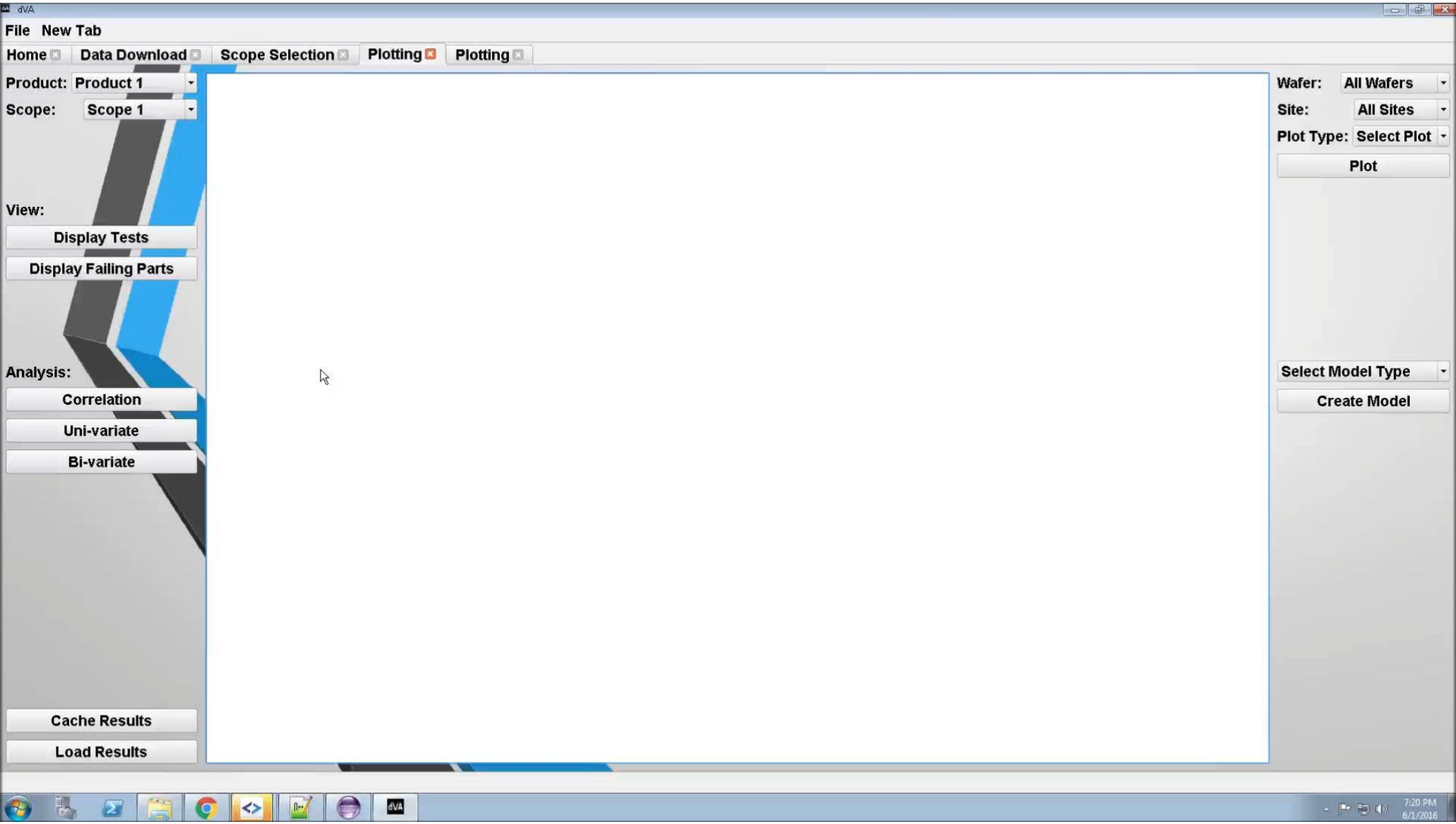
Scenario 1: Conclusion

- Present results to peers/supervisors
- Suggest where tests can be removed with support from data

Scenario 2: Customer Return

- Learn from returned parts
- Identify test(s) in which the part exhibits outlying behavior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Scope: Scope 1
View:
Display Tests
Display Failing Parts
Analysis:
Correlation
Uni-variate
Bi-variate
Cache Results
Load Results
Wafer: All Wafers
Site: All Sites
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Plot
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Create Model
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Scenario 2: Conclusion

- Further examine each test
  - Analyze implications of each test
  - Determine which tests are likely to indicate failure
- Review results
  - Examine consequences of applying test rule

Logging and Learning

- Logging of user workflow
  - Enables the tracking of program usage
- Enables the demonstration of procedure to peers and superiors
- Enables the engineer to reflect on past workflows if faced with a similar problem
- Analyze program usage to learn the thought process of the product engineer – potential for performance improvement and/or automation

Future Additions

- Implement learning features using log data
- Data integrity analysis
- Implement more types of:
  - Data Analysis
  - Data Visualization
  - Screening models

Q & A