Tips and Tricks for Data Analysis with MATLAB

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Data Analysis Software Requirements

Access and Explore Data

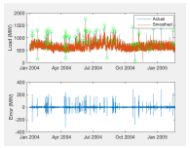
Files

Databases

Sensors

Preprocess Data

Working with Messy Data



Data Reduction/ Transformation

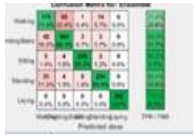
Feature Extraction

Develop Models

Model Creation

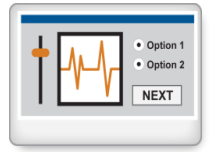
Scale your computation

Model Validation



Results Sharing

Desktop Apps

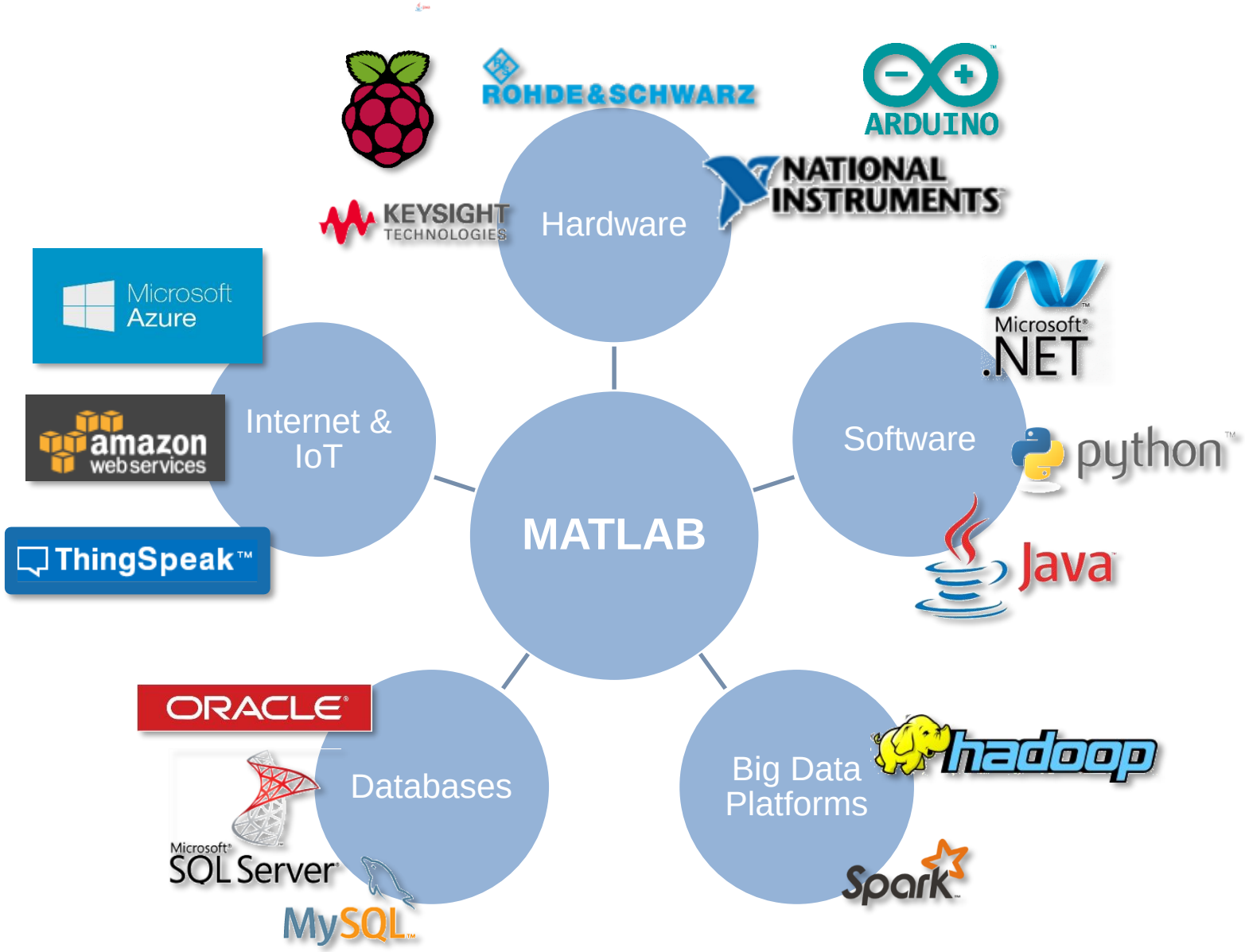


Enterprise Scale Systems

MATLAB Excel .NET C/C++ .exe Java .dll

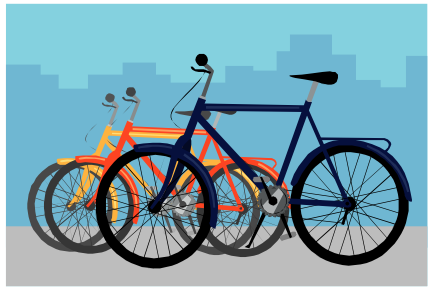
Embedded Devices and Hardware

Leveraging a Broad Array of Technologies



Analysis of bike rental data

- Workflow
  - Data importing
  - Data trend analysis
  - Parameter fitting
  - Programming
  - Summarize as a report



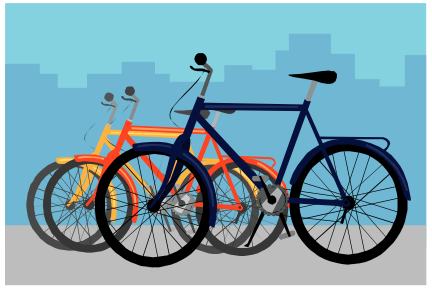
How many bicycles will be out today?

bike rentals = f (time, temperature)

How many bicycles will be out today?

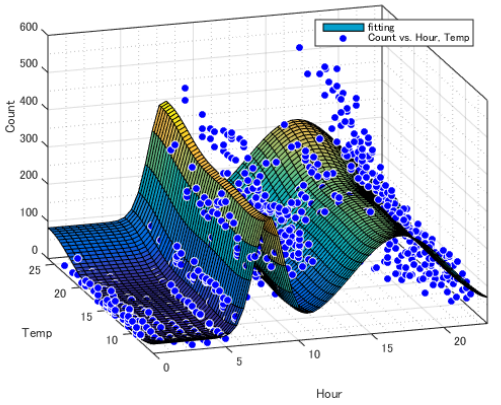
$$a_1 * \exp(-((x - b_1)/c_1)^2) + a_2 * \exp(-((x - b_2)/c_2)^2)$$

Variation by time



$$+d_0 + d_1 * \cos(y * w) + e_1 * \sin(y * w) +$$
$$d_2 * \cos(2 * y * w) + e_2 * \sin(2 * y * w)$$

Variation by temperature



x: time
y: temperature

Data Type

Numeric Types
Integer and floating-point data

Characters and Strings
Text in character arrays and string arrays

Dates and Time
Arrays of date and time values that can be displayed in different formats

Categorical Arrays
Arrays of qualitative data with values from a finite set of discrete, nonnumeric data

Tables
Arrays in tabular form whose named columns can have different types

Timetables
Time-stamped data in tabular form

Structures
Arrays with named fields that can contain data of varying types and sizes

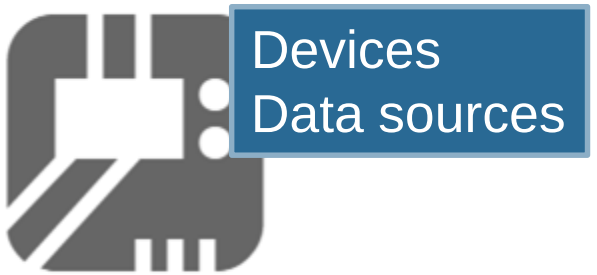
Cell Arrays
Arrays that can contain data of varying types and sizes

Function Handles
Variables that allow you to invoke a function indirectly

Map Containers
Objects with keys that index to values, where keys need not be integers

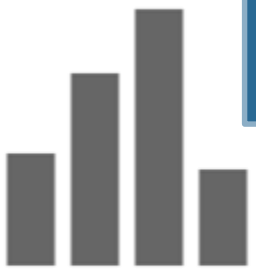
Time Series
Data vectors sampled over time

MATLAB Workflows



Devices
Data sources

CONNECT



Data Analysis
Signal processing

ANALYZE

Mathematical modeling

SIMULATE

GPU, Cluster & Cloud

SCALE