Big Engineering Data Analytics with MATLAB

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How do you define Big Data?

"Any collection of data sets so large and complex that it becomes difficult to process using … traditional data processing applications."

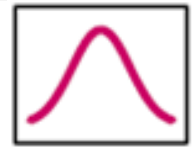
(General Definition)

*"Any collection of data sets so large that it becomes **difficult** to process using traditional MATLAB functions, which assume all of the data is **in memory**."*

(MATLAB)

Your Big Data Sources

Vehicle Component

Test or Simulation Method	Engine Control Module (ECM)	Engine	Exhaust Gas Aftertreatment	Vehicle and Driver	Topographic Drive Route	Variability of Results
Fleet of Test Vehicles						
Vehicle in Loop						
Aftertreatment in Loop						
Engine in Loop						
ECM in Loop						
Pure Simulation						

Hardware

Software

Challenges Analyzing Fleet Data

More Data ⇨ **Better Understanding of Field Conditions**

More Interesting Events

Challenges:

Big Data
Needle in the Haystack
Testing Ideas
Knowledge Transfer

Data Analytics with MATLAB

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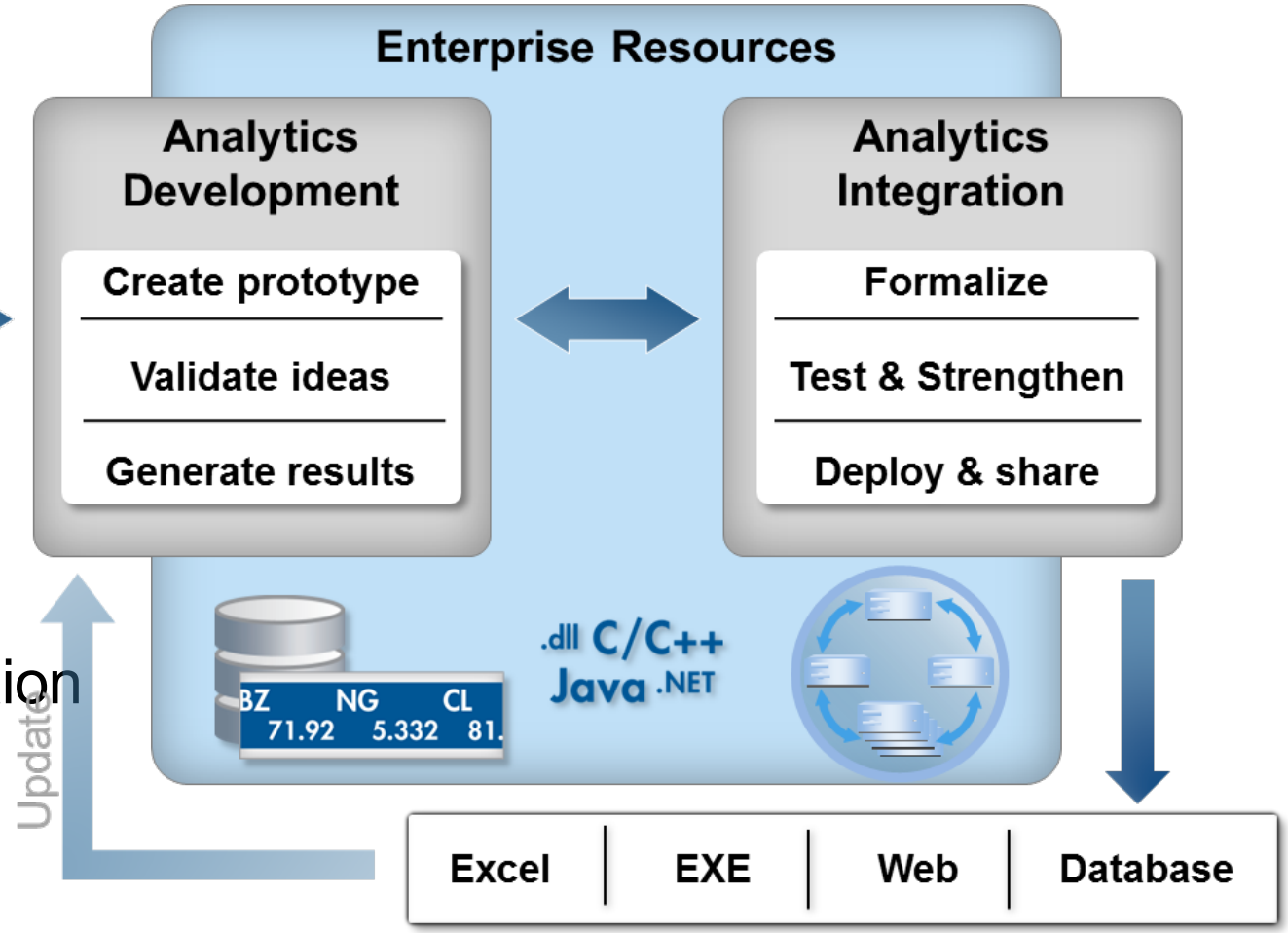
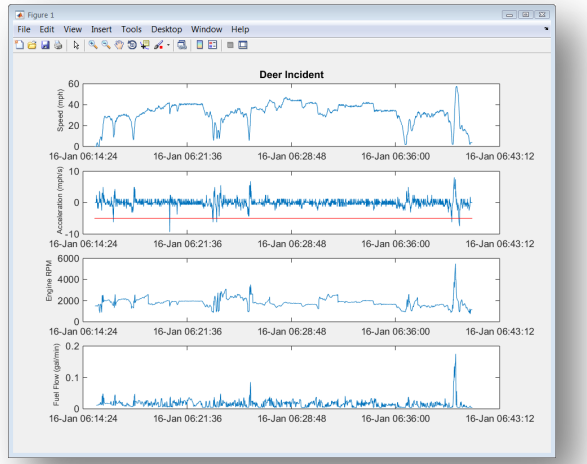
- Taking analytics to production



Fleet Data Event Detection



- Parse data, find sudden deceleration
- MapReduce workflow

Datastore

Device Time	Engine RPM	Fuel flow rate	Torque	Speed (ODB)
15-Jan-XXXX 15:37:24	1445.75	0.0537	5.26	3.10
15-Jan-XXXX 15:37:25	1445.75	0.0537	5.74	0.48
15-Jan-XXXX 15:37:26	1445.75	0.0537	17.80	4.97
15-Jan-XXXX 15:37:27	1458.5	0.0107	11.10	6.21
15-Jan-XXXX 15:37:28	1458.5	0.0107	11.10	0.59

Map

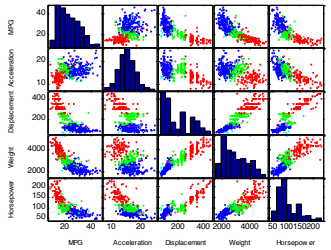
Acceleration	Decelaration
-2.62	0
4.49	0
1.24	0
-5.62	1

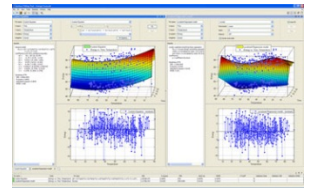
Reduce

Acceleration
-5.62

Analysis Domains

Statistics
- Summary Statistics
- Regression, ANOVA, Machine Learning





Signal Processing
- Sound quality analysis
- LIDAR analysis

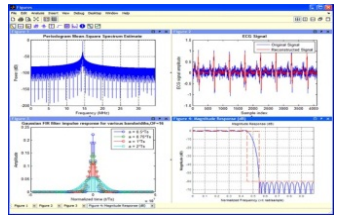
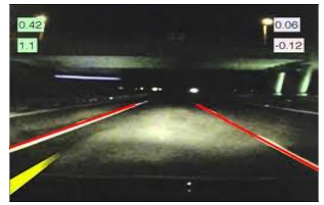
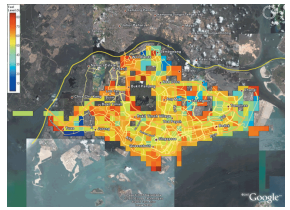
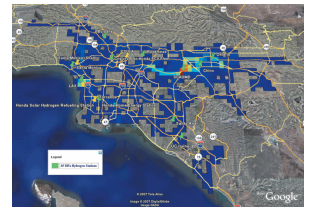


Image Processing
- Active Safety

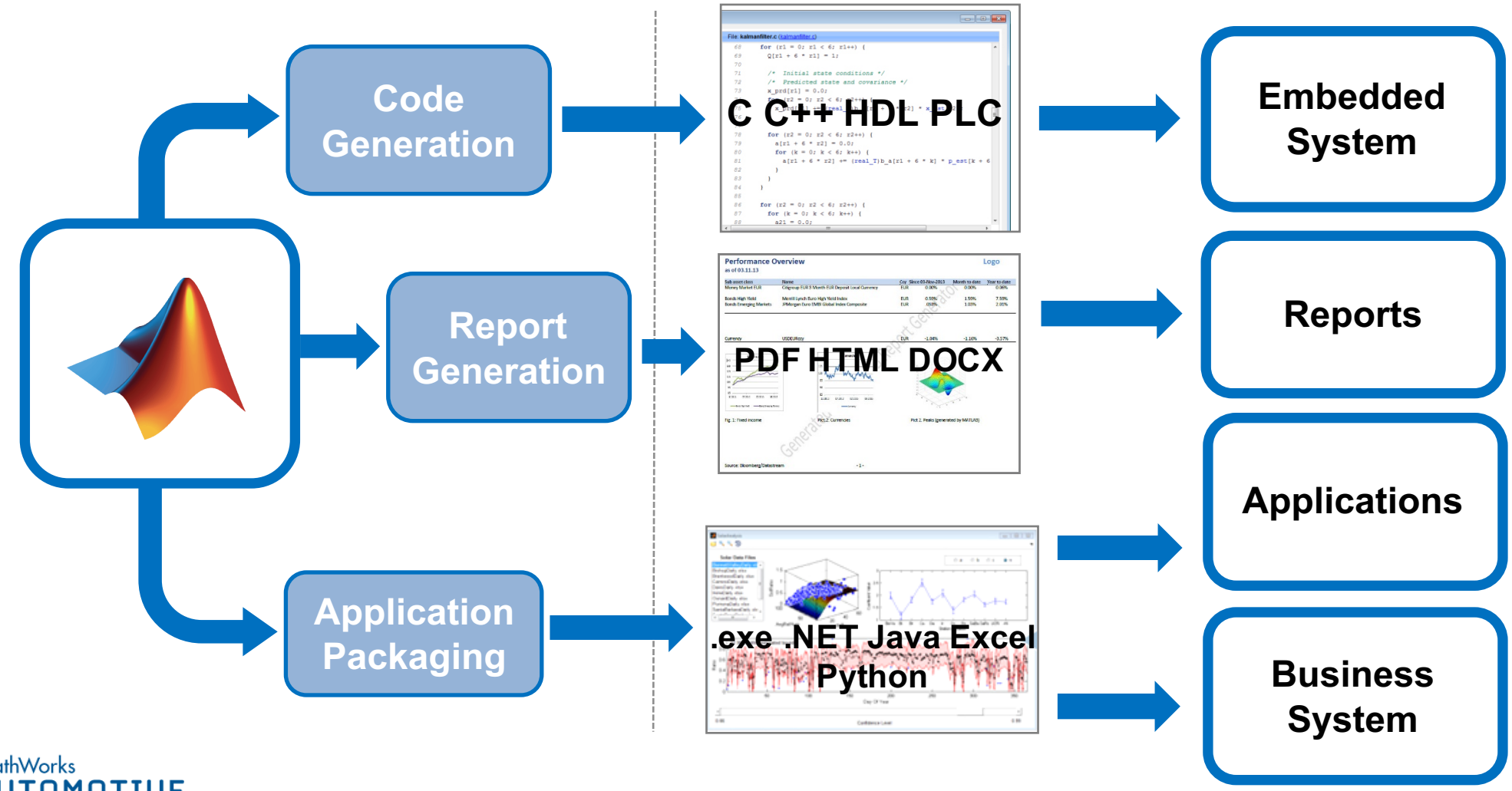


Location/Mapping
- Analyzing GPS Data
- Custom Visualizations





Taking MATLAB to Production

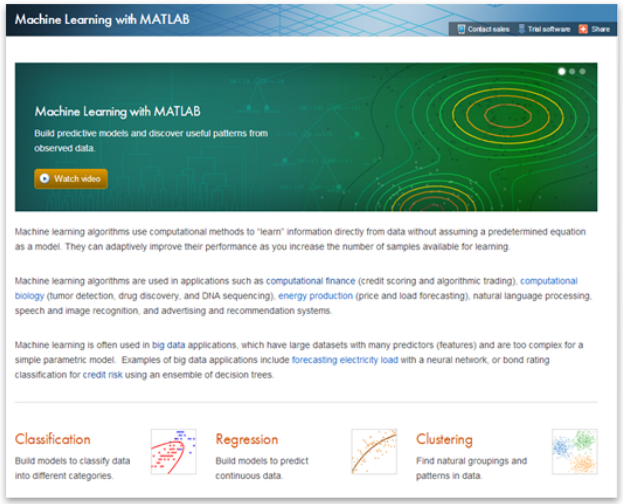


Analyzing Big Data using MATLAB

- Operate on Big Data from MATLAB with MapReduce
- Quickly try out an idea, then iterate
- Transfer your results by taking MATLAB to production

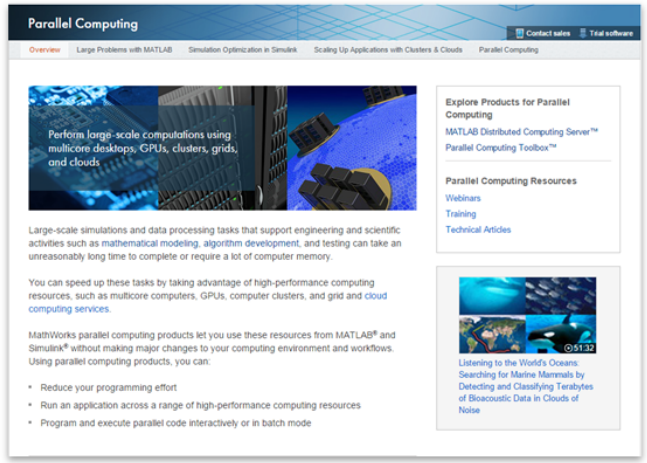
Additional Resources

Machine Learning



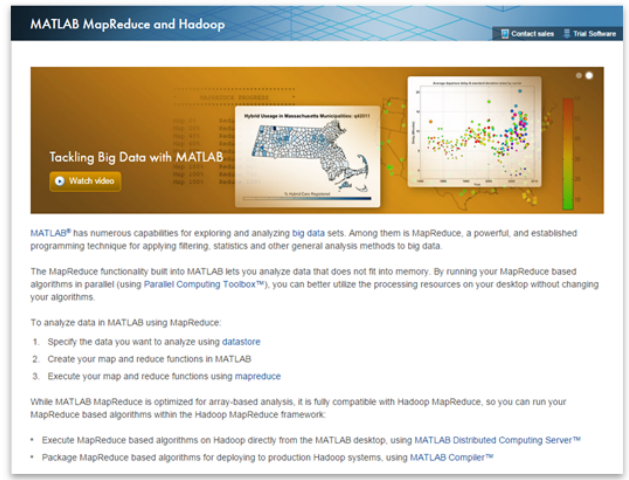
mathworks.com/machine-learning

Parallel Computing



http://www.mathworks.com/solutions/parallel-computing/

MapReduce



http://www.mathworks.com/discovery/matlab-mapreduce-hadoop.html

Questions?