






# MATLAB CONFERENCE 2017

Achieving Measurable Business  
Results Partnering with  
MathWorks:  
Practical Examples from  
Around the World

Kevin J Rzemien  
Branko G Dijkstra  
MathWorks Consulting Services

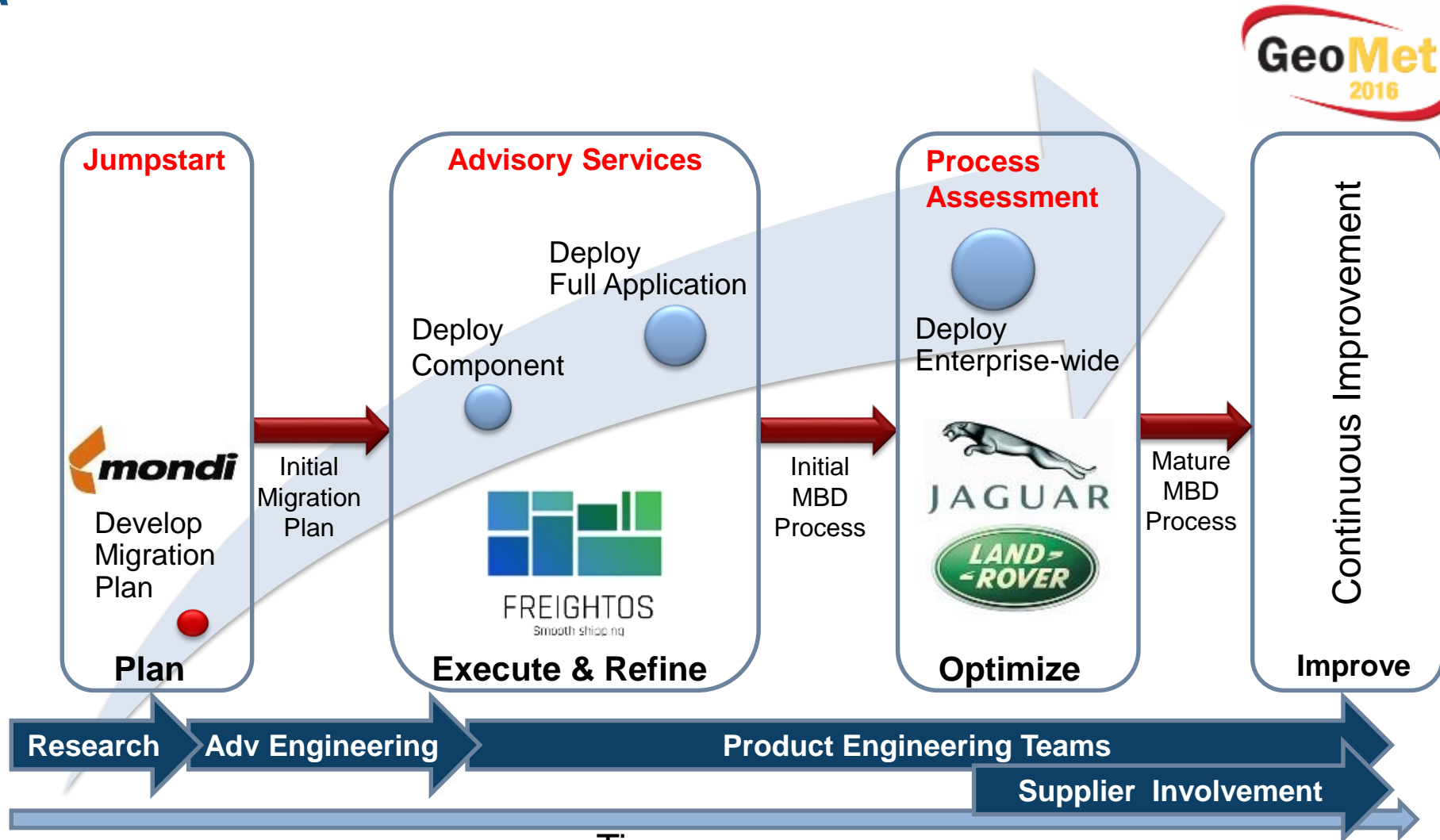


# Agenda

- Health Monitoring and Predictive Maintenance 
- Big Data Analytics 
- Sharing Engineering Tools 
- Overview of MathWorks World Wide Consulting Services 
- Maximize Orebody Value 

*All consulting engagement are fully confidential.  
The topics presented here have been made  
publicly available with written approval from the  
respective customers.*

# Overview of MathWorks World Wide Consulting Services Agenda



# Health Monitoring and Predictive Maintenance at Mondi Gronau GmbH - Challenge

To reduce waste and machine downtime in plastics manufacturing plants

Good Product



Waste Product

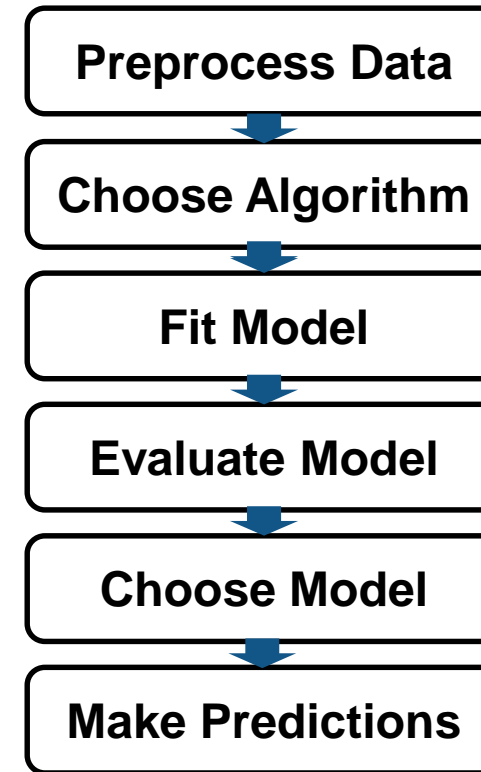


# Health Monitoring and Predictive Maintenance at Mondi Gronau GmbH - Solution

## Solution

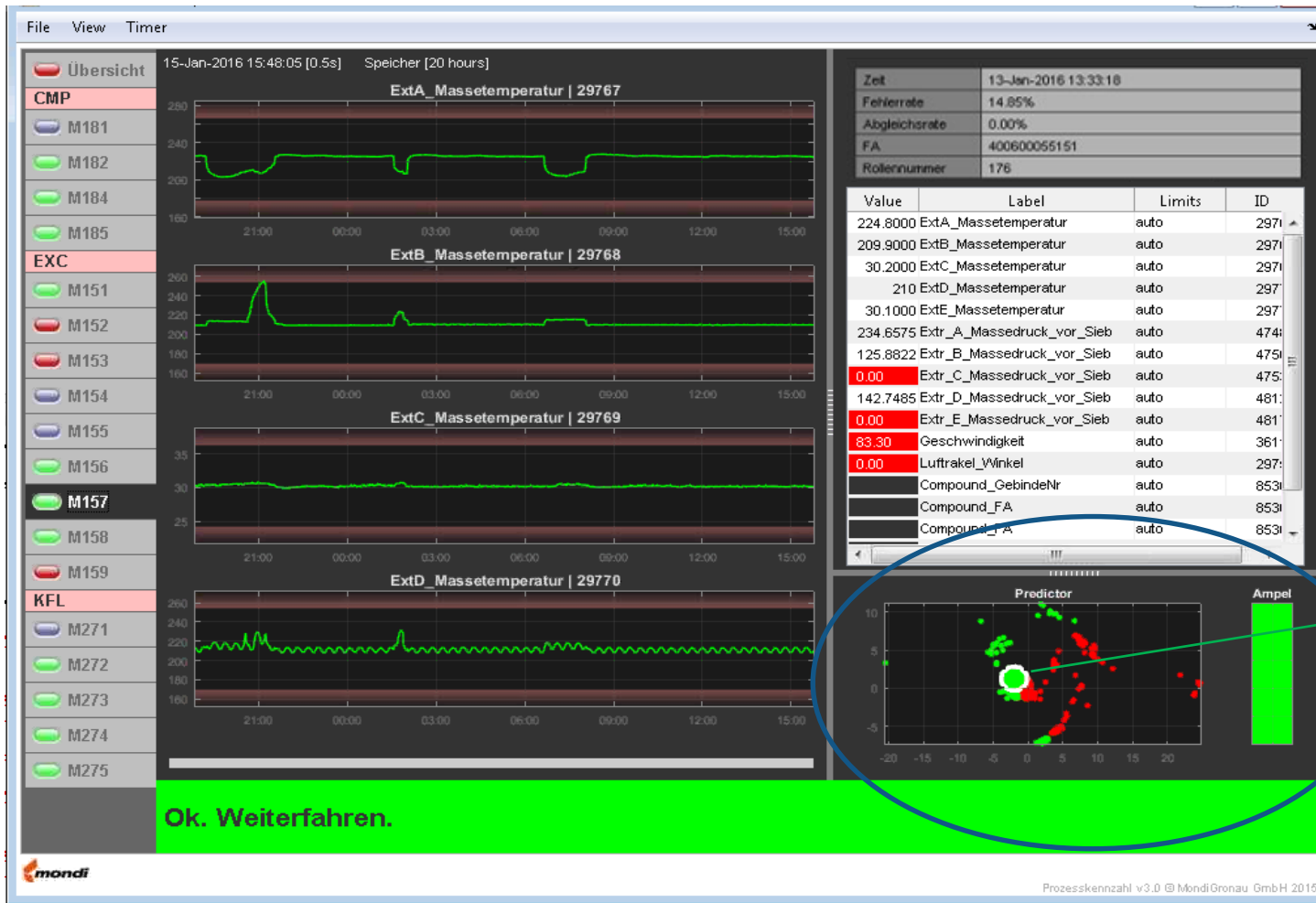
Use MATLAB to develop and deploy **monitoring** and **predictive maintenance** software that uses **machine learning** algorithms to predict machine failures.

## Workflow





# Health Monitoring and Predictive Maintenance at Mondi Gronau GmbH - Solution



State is: **ok**

# Health Monitoring and Predictive Maintenance at Mondi Gronau GmbH - Results

- More than 50,000 euros saved per year
- Prototype completed in six months
- Production software running 24/7

*“MathWorks Consulting’s support is among the best I’ve seen; the consultants are fast and exceptionally knowledgeable. We’ve already seen a positive return on investment from cost savings, and now we have more budget and time to complete more machine learning projects that will provide similar benefits.”*

Dr. Michael Kohlert  
Mondi

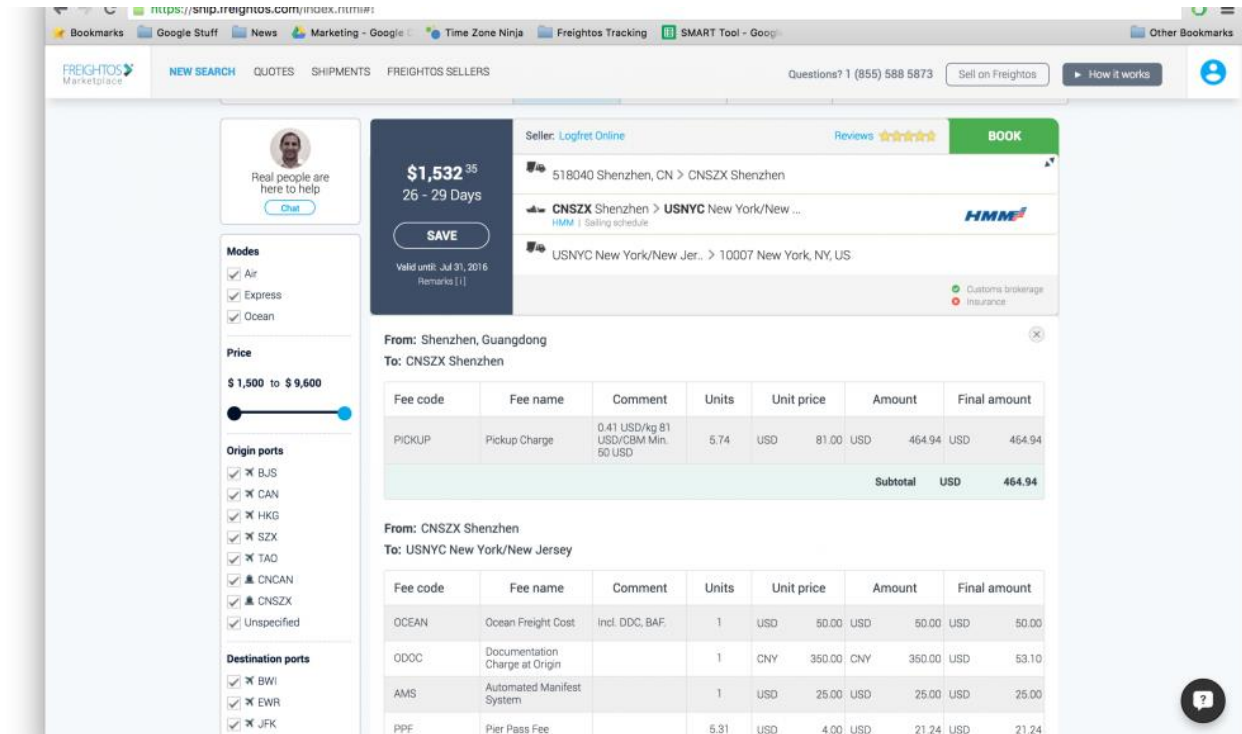


# Big Data Analytics

## MATLAB and Google BigQuery at Freightos - Challenge

### Challenge

- Online freight logistics marketplace, data large and cumbersome
- Inefficiencies contribute to \$650million losses each year for the industry
- Millions of rows of data spanning multiple databases in the cloud



Freightos Marketplace

NEW SEARCH QUOTES SHIPMENTS FREIGHTOS SELLERS

Questions? 1 (855) 588 5873 Sell on Freightos How it works

Real people are here to help [Chat](#)

Modes

Air

Express

Ocean

Price

\$ 1,500 to \$ 9,600

Origin ports

BJS

CAN

HKG

SZX

TAO

CNCAN

CNSZX

Unspecified

Destination ports

BWI

EWR

JFK

Seller: Logfret Online [Reviews](#) ★★★★★ [BOOK](#)

\$1,532.35  
26 - 29 Days

[SAVE](#)

Valid until: Jul 31, 2016  
Remarks [1]

518040 Shenzhen, CN > CNSZX Shenzhen

CNSZX Shenzhen > USNYC New York/New ... [HMM](#) | [Sailing schedule](#)

USNYC New York/New Jer. > 10007 New York, NY, US

From: Shenzhen, Guangdong  
To: CNSZX Shenzhen

Fee code	Fee name	Comment	Units	Unit price	Amount	Final amount
PICKUP	Pickup Charge	0.41 USD/kg 81 USD/CBM Min. 50 USD	5.74	USD 81.00	USD 464.94	USD 464.94
Subtotal						USD 464.94

From: CNSZX Shenzhen  
To: USNYC New York/New Jersey

Fee code	Fee name	Comment	Units	Unit price	Amount	Final amount
OCEAN	Ocean Freight Cost	Incl. DDC, BAF	1	USD 50.00	USD 50.00	USD 50.00
ODOC	Documentation Charge at Origin		1	CNY 350.00	CNY 350.00	USD 53.10
AMS	Automated Manifest System		1	USD 25.00	USD 25.00	USD 25.00
PPF	Pier Pass Fee		5.31	USD 4.00	USD 21.24	USD 21.24

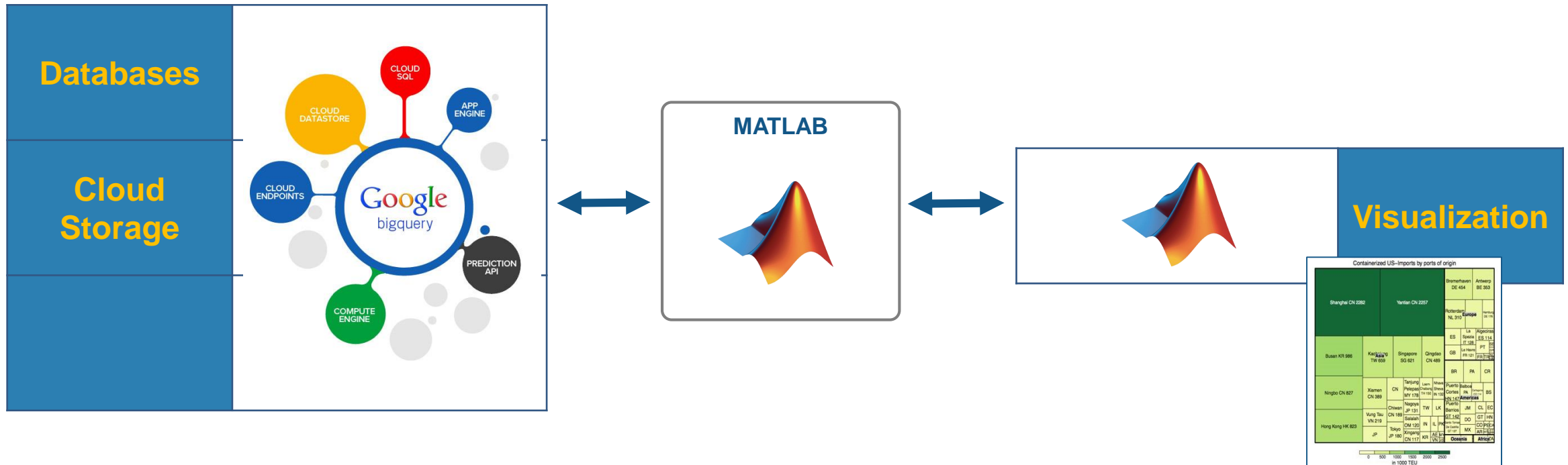


# Big Data Analytics MATLAB and Google BigQuery at Freightos - Solution

Data

Analytics

Business System



Next Steps: Index price projections using Statistics and Machine Learning Toolbox



FREIGHTOS  
Smooth shipping

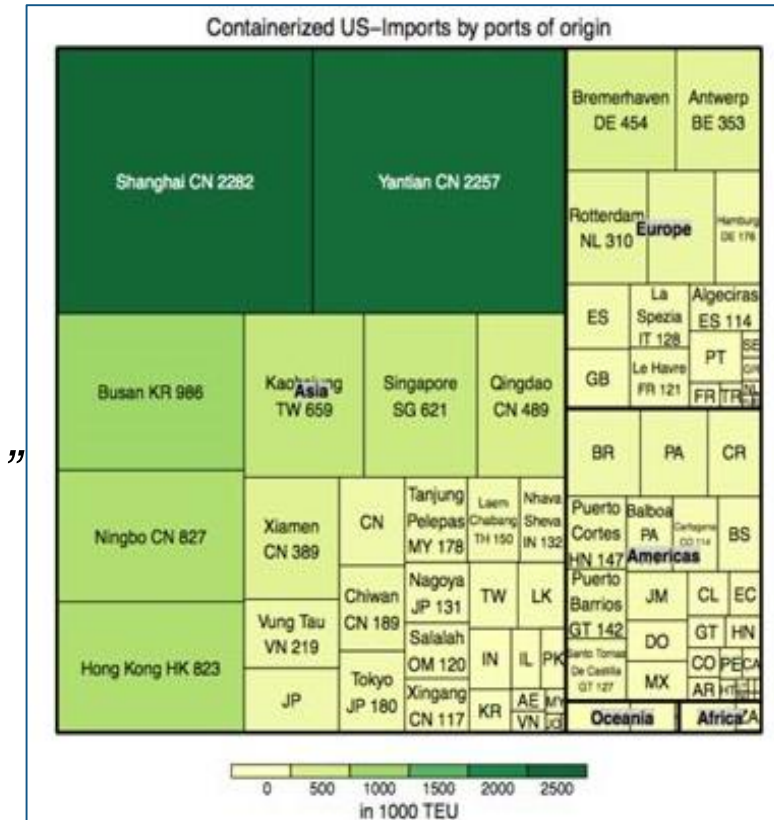
# Big Data Analytics

## MATLAB and Google BigQuery at Freightos - Results

- Analyses completed in minutes instead of hours  
*“...freed up at least one full work day per month...”*
- BigQuery integration rapidly implemented  
*“...MATLAB from powerful to irreplaceable...”*
- Insights acquired 20 times faster  
*“We can’t put a price tag on the time-to-market improvement...”*

“With MATLAB and BigQuery integration, we’re not downloading our full database or overwhelming Microsoft® Excel® with complex operations. That means better reporting, better analytics, and better insights for our operations and marketing teams, all with less time wasted and higher accuracy.”

Eytan Buchman  
Freightos

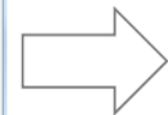
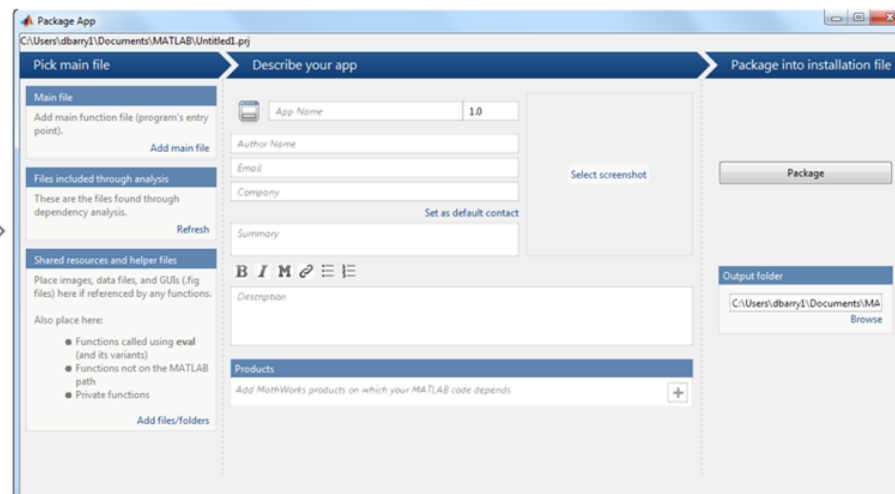
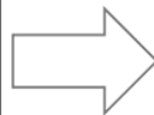
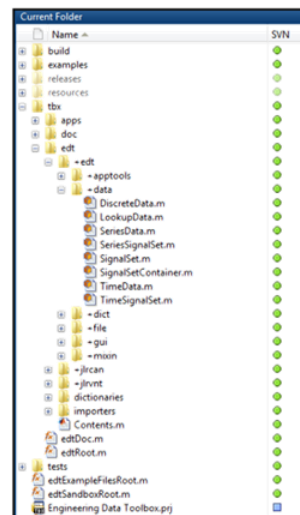


# JLR Standardizes on MATLAB for Developing, Packaging, and Sharing Engineering Tools - Challenge

Recognised opportunities for code sharing and consolidation

- No consistent way to share code across the business
- Non-value add overhead to maintain custom code sharing mechanisms
- Difficult and time consuming for new users to get started
- Difficult to know what is available – duplication of effort

MATLAB CONFERENCE 2017

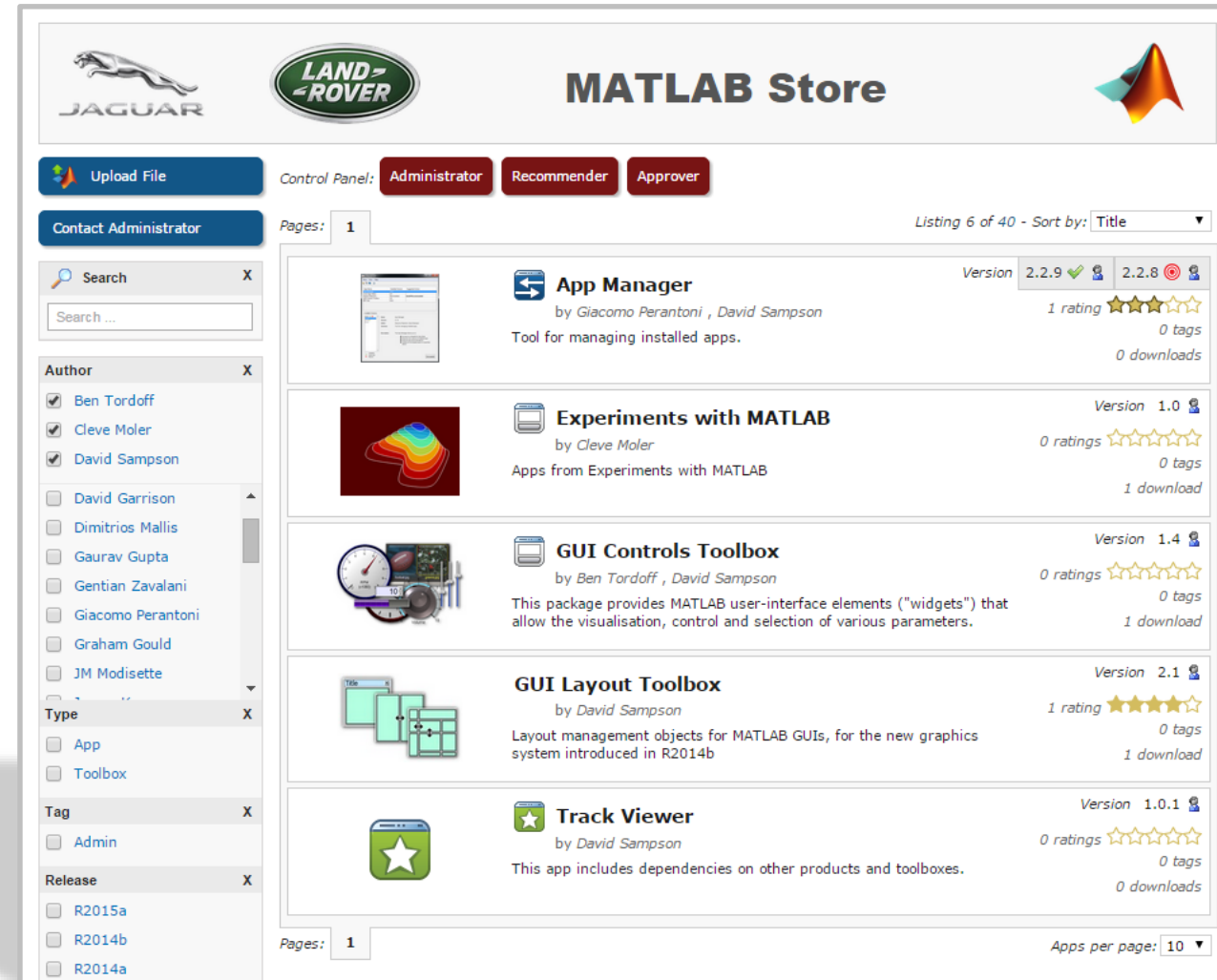


MyOwnApp.mlappinstall  
MyOwnToolbox.mltbx

# JLR Standardizes on MATLAB for Developing, Packaging, and Sharing Engineering Tools - Solution

## JLR MATLAB App store

- Strategic partnership between MathWorks and JLR
  - Involves, Training, Pilot , Consulting, Application Engineering
  - Developed by MathWorks Consulting
  - 100 internally developed toolboxes
  - 2500 active MATLAB users



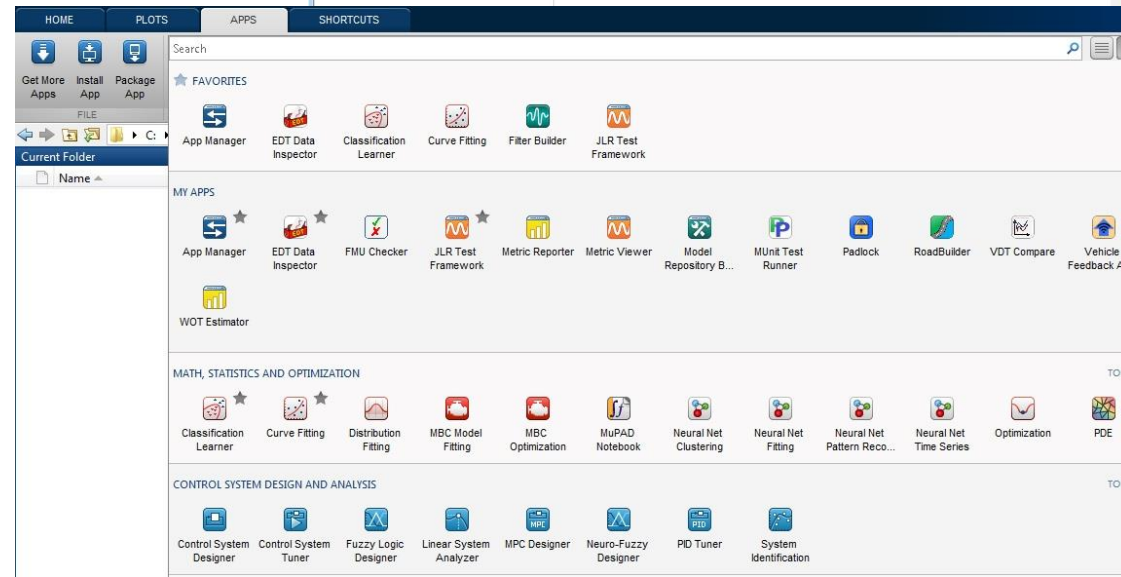
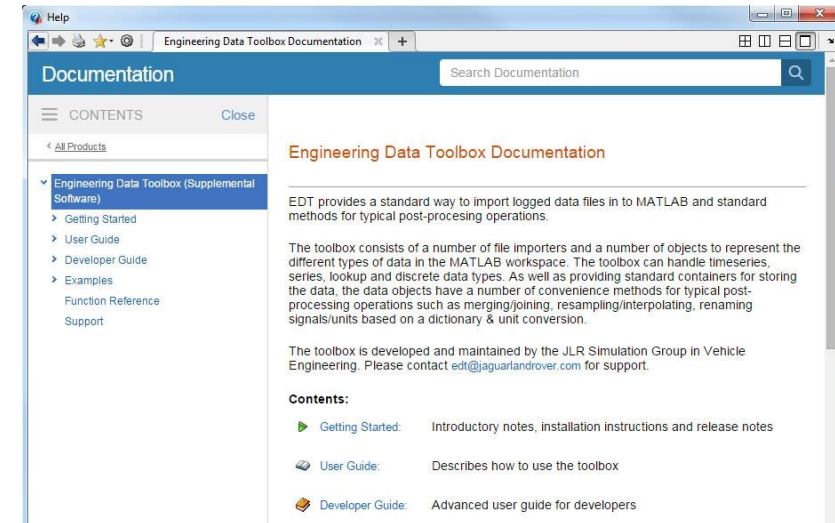
The screenshot displays the JLR MATLAB Store interface. At the top, it features the Jaguar and Land Rover logos alongside the MathWorks logo and the text "MATLAB Store". Below the logos, there are navigation buttons for "Upload File", "Contact Administrator", and a "Control Panel" with roles for "Administrator", "Recommender", and "Approver". A search bar and a list of authors (including Ben Tordoff, Cleve Moler, and David Sampson) are visible on the left. The main content area lists several MATLAB apps and toolboxes, each with a thumbnail, title, author, version, rating, and download count. The listed items include:

- App Manager** (Version 2.2.9) by Giacomo Perantoni, David Sampson. 1 rating, 0 tags, 0 downloads.
- Experiments with MATLAB** (Version 1.0) by Cleve Moler. 0 ratings, 0 tags, 1 download.
- GUI Controls Toolbox** (Version 1.4) by Ben Tordoff, David Sampson. 0 ratings, 0 tags, 1 download.
- GUI Layout Toolbox** (Version 2.1) by David Sampson. 1 rating, 0 tags, 1 download.
- Track Viewer** (Version 1.0.1) by David Sampson. 0 ratings, 0 tags, 0 downloads.

At the bottom, there are pagination controls showing "Pages: 1" and "Apps per page: 10".

# JLR Standardizes on MATLAB for Developing, Packaging, and Sharing Engineering Tools - Results

- Tool quality improved and tool development time reduced
  - Model and Code standards testing and verification
- Collaboration and engineering productivity increased
  - Reduce duplication
  - Engineers productive more quickly
  - New engineers get tools for their jobs within minutes
- Reliance on third-party software tools reduced
  - Specialist analysis brought in-house



*“... paid for itself in first 12 months of operation”*  
*“Massive improvement of the quality of code”*  
 David Barry  
 Matlab Expo 2016

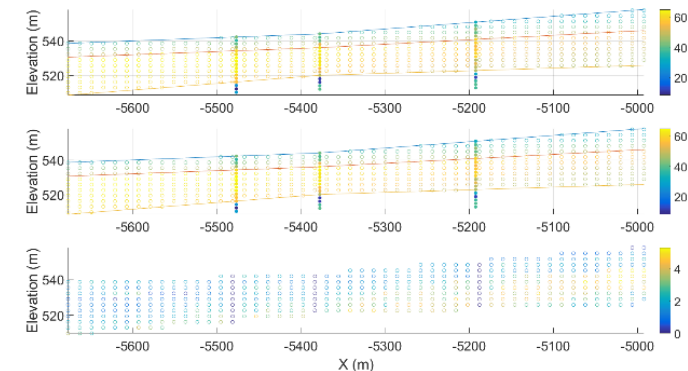
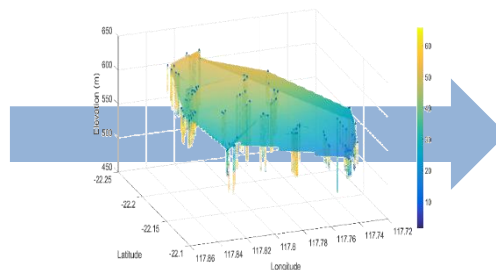
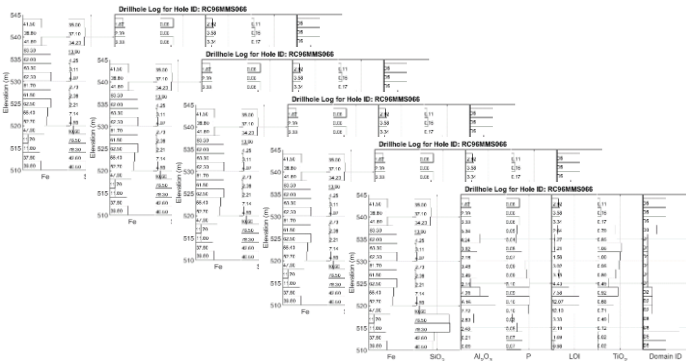


# Maximize Orebody Value through the Automation of Resource Model Development Using Machine Learning

- Authors
  - Sam Oliver and David Willingham from MathWorks Australia
- Challenge
  - Automatic creation of 3D underground map of ore deposits from borehole data

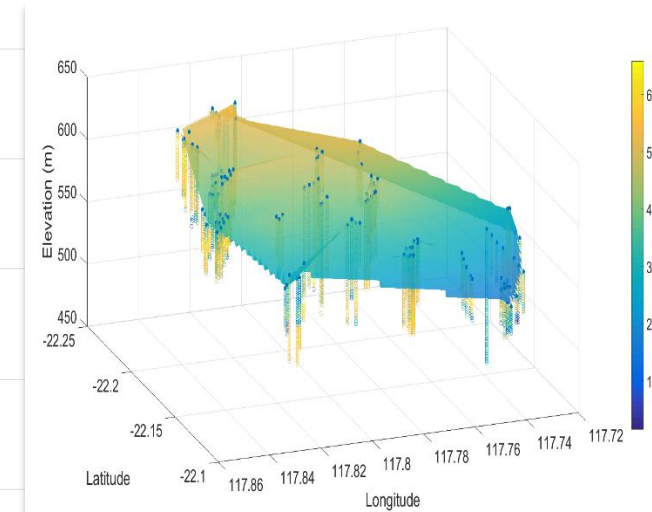
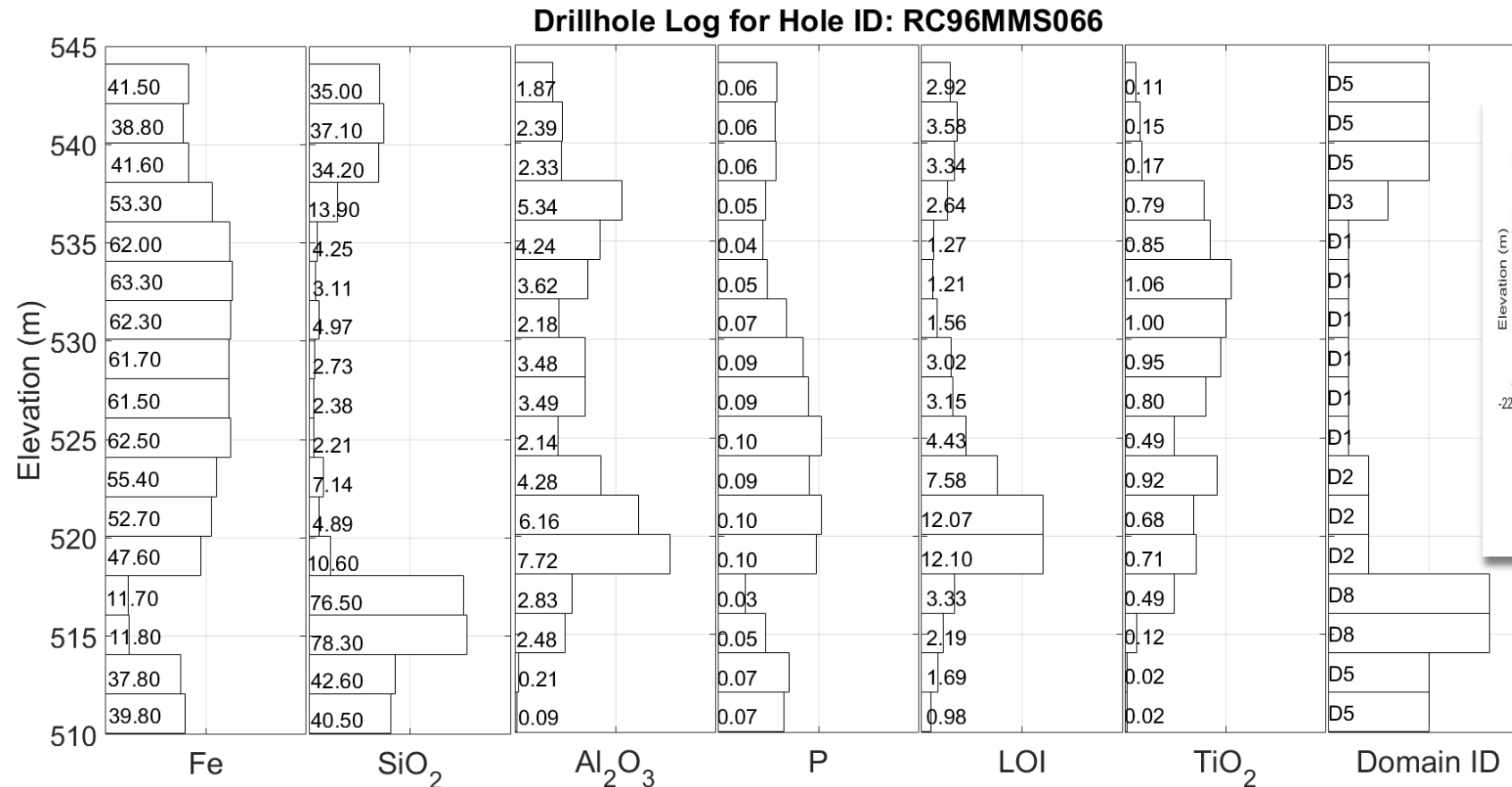


Experience from various consulting engagements in the mining industry triggered MathWorks engineers to develop this workflow, writing a paper and presenting it at the 3rd International Geometallurgy Conference 2016.



# Maximize Orebody Value through the Automation of Resource Model Development Using Machine Learning

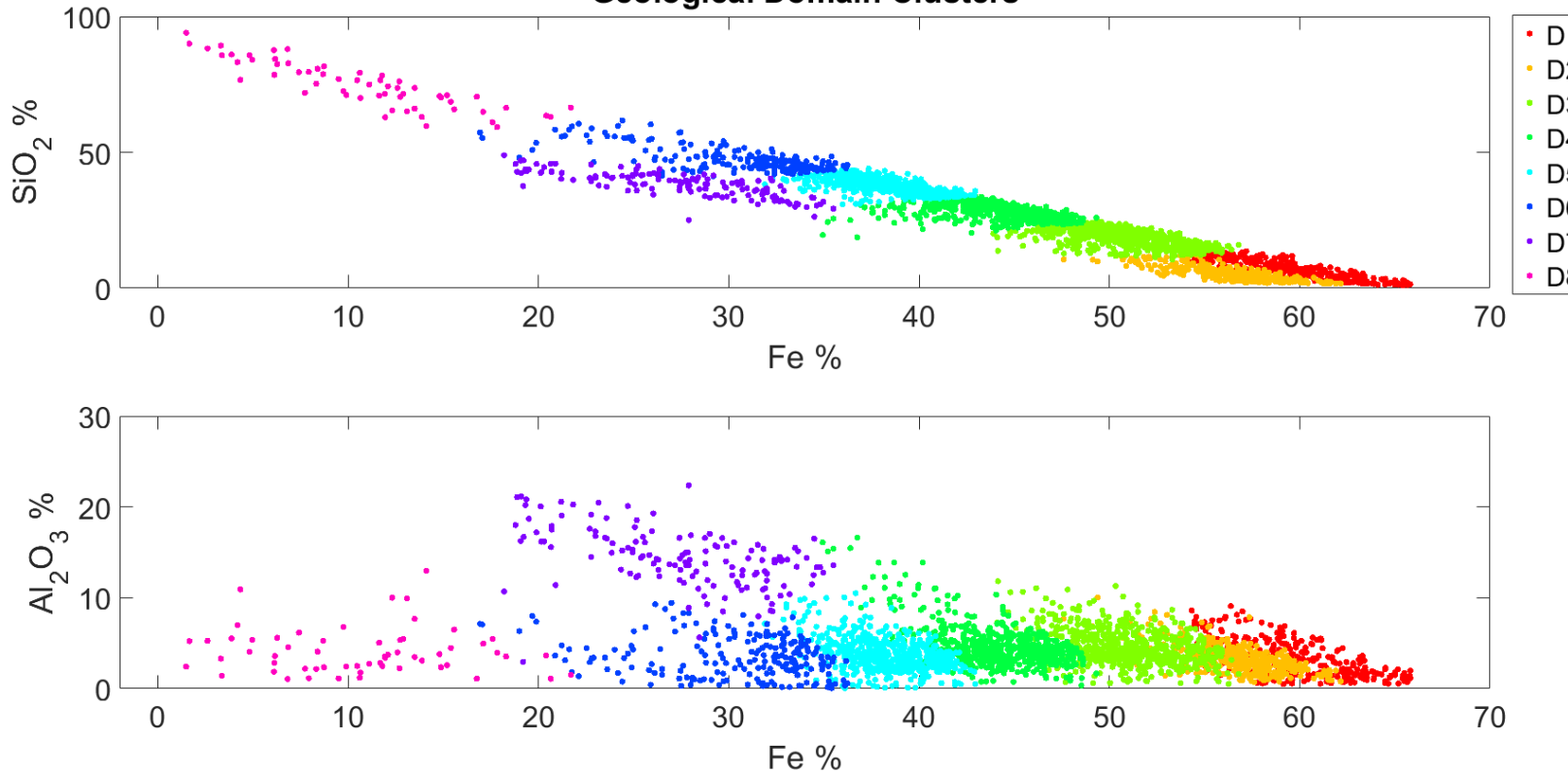
- Input data - Drill Hole Log with Domains (ore class)



# Maximize Orebody Value through the Automation of Resource Model Development Using Machine Learning

- Clustering to find Geological Domains

Geological Domain Clusters

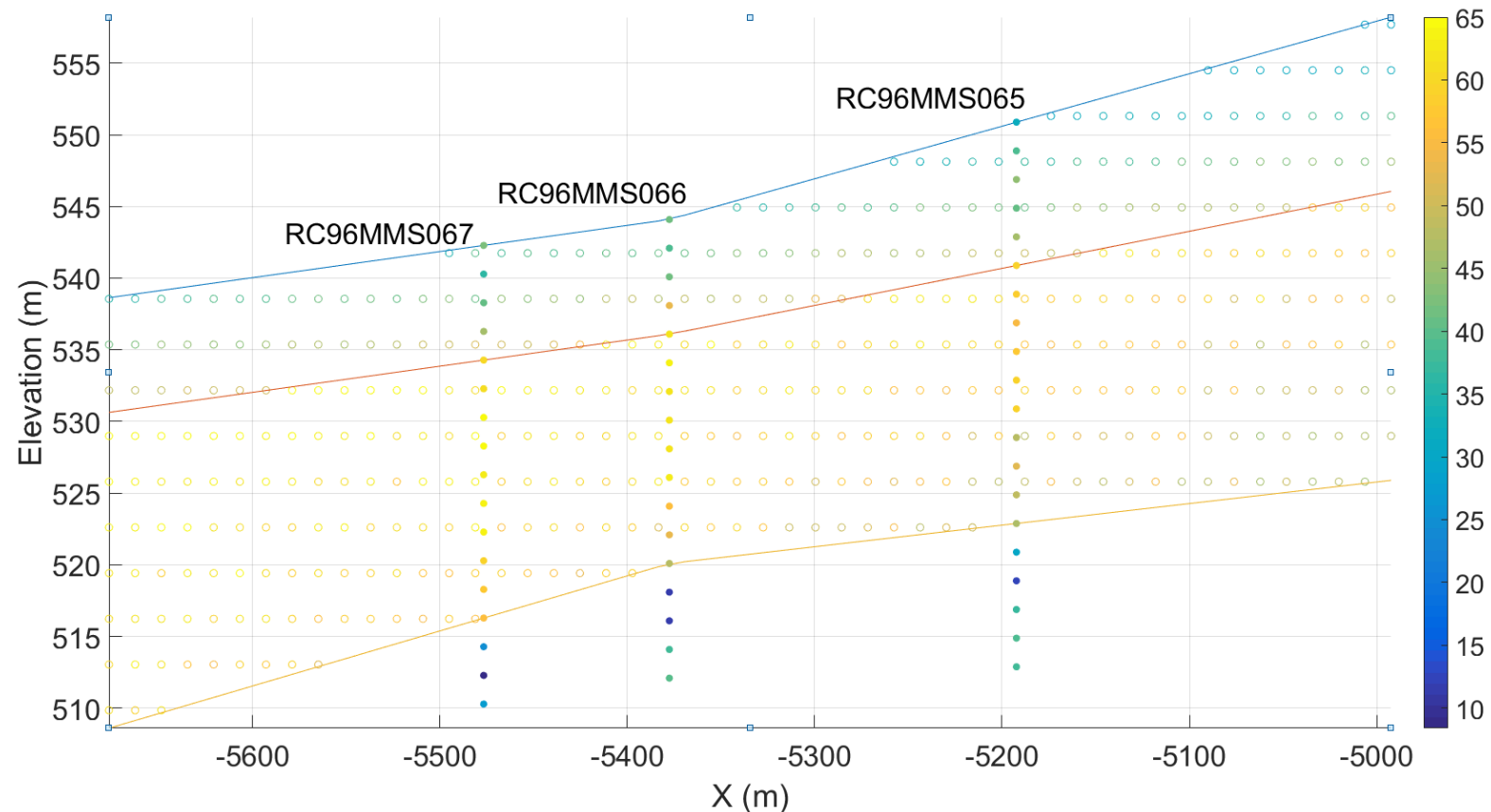


Confusion Matrix for: Ensemble

	D1	D2	D3	D4	D5	D6	D7	D8		
D1	301 99.3%	1 0.3%	1 0.3%						99.3% 0.7%	
D2	4 1.0%	391 99.0%							99.0% 1.0%	
D3	2 0.3%	3 0.5%	600 99.0%	1 0.2%					99.0% 1.0%	
D4			6 1.0%	570 97.9%	6 1.0%				97.9% 2.1%	
D5				12 2.1%	560 96.9%	3 0.5%	3 0.5%		96.9% 3.1%	
D6					5 2.3%	206 96.3%	2 0.9%	1 0.5%	96.3% 3.7%	
D7						2 1.5%	2 1.5%	131 95.6%	95.6% 4.4%	
D8							2 3.4%	1 1.7%	56 94.9%	94.9% 5.1%
	Predicted class								TPR / FNR	

# Maximize Orebody Value through the Automation of Resource Model Development Using Machine Learning

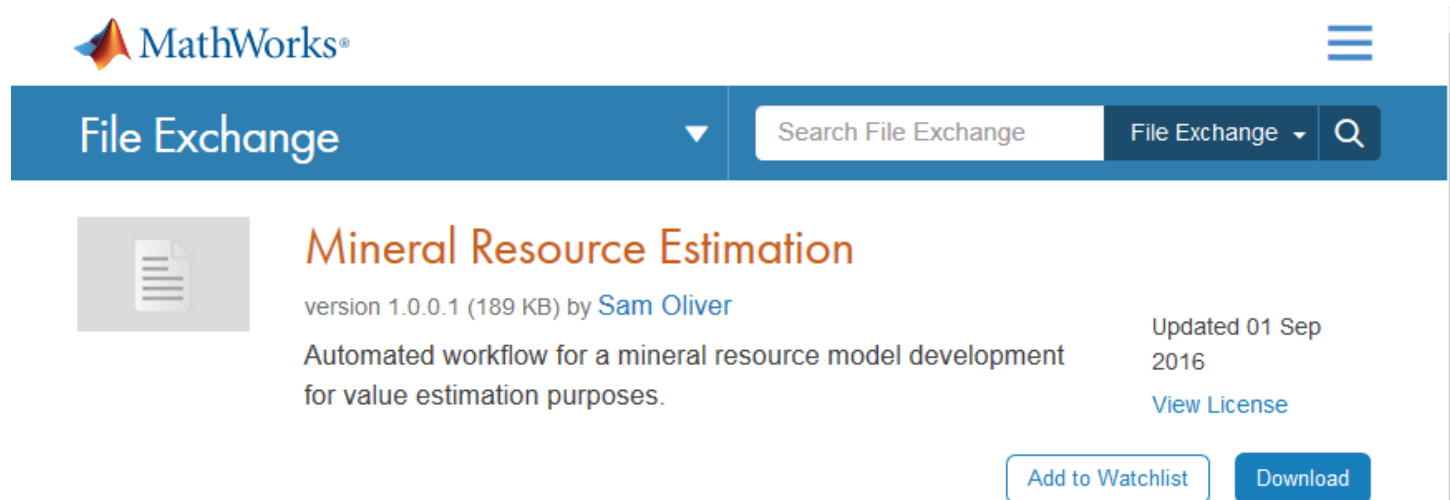
- Conditional Simulation Realisation of Resource Model



# Maximize Orebody Value through the Automation of Resource Model Development Using Machine Learning

## ■ Conclusion

- Machine Learning is an important in task automation
- Machine Learning is effective at identifying domains and validating the resource model
- All code is available on MATLAB Central search for the key words resource estimation or GEOMET

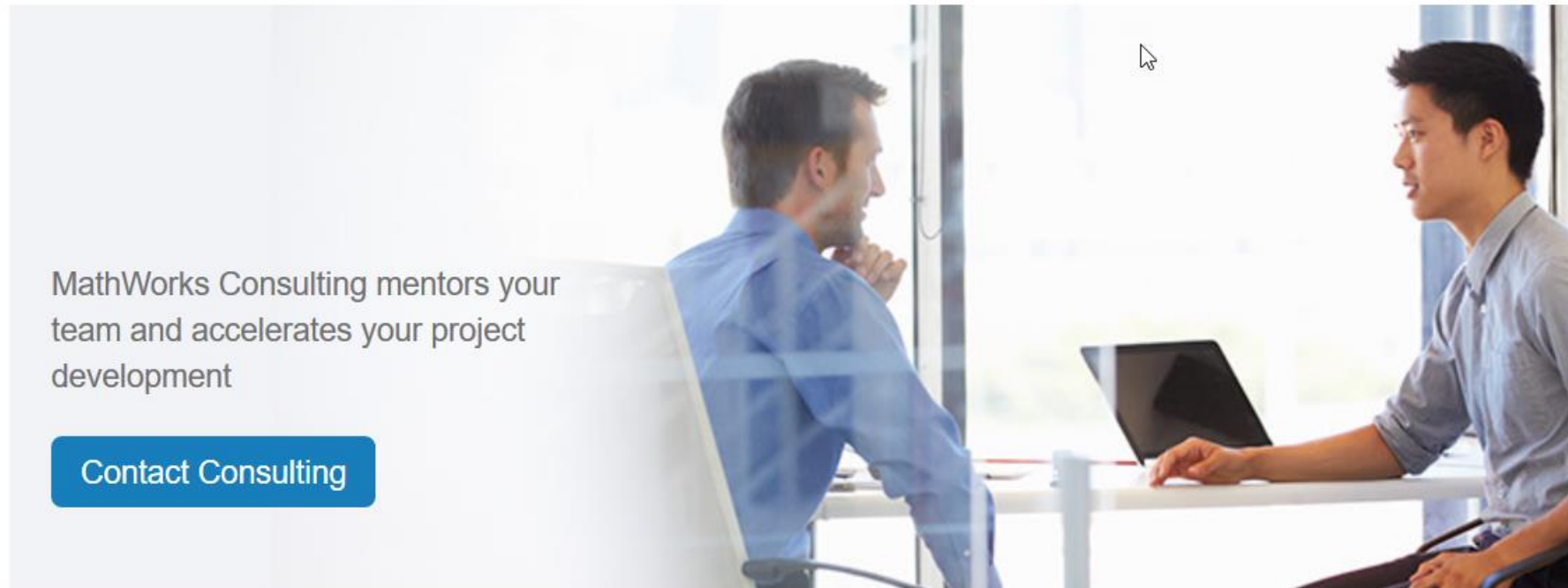


The screenshot shows the MATLAB Central File Exchange interface. At the top left is the MathWorks logo. Below it is a blue navigation bar with 'File Exchange' and a search bar containing 'Search File Exchange'. The main content area displays a file listing for 'Mineral Resource Estimation' by Sam Oliver. The file is version 1.0.0.1 (189 KB) and was updated on 01 Sep 2016. The description reads: 'Automated workflow for a mineral resource model development for value estimation purposes.' There are buttons for 'Add to Watchlist' and 'Download'.

<https://au.mathworks.com/matlabcentral/fileexchange/57763-mineral-resource-estimation>



# Overview of MathWorks World Wide Consulting Services



## MathWorks Consultants

- Industry-experienced specialists
- “Insider” access to product development
- Experts on using MathWorks tools effectively

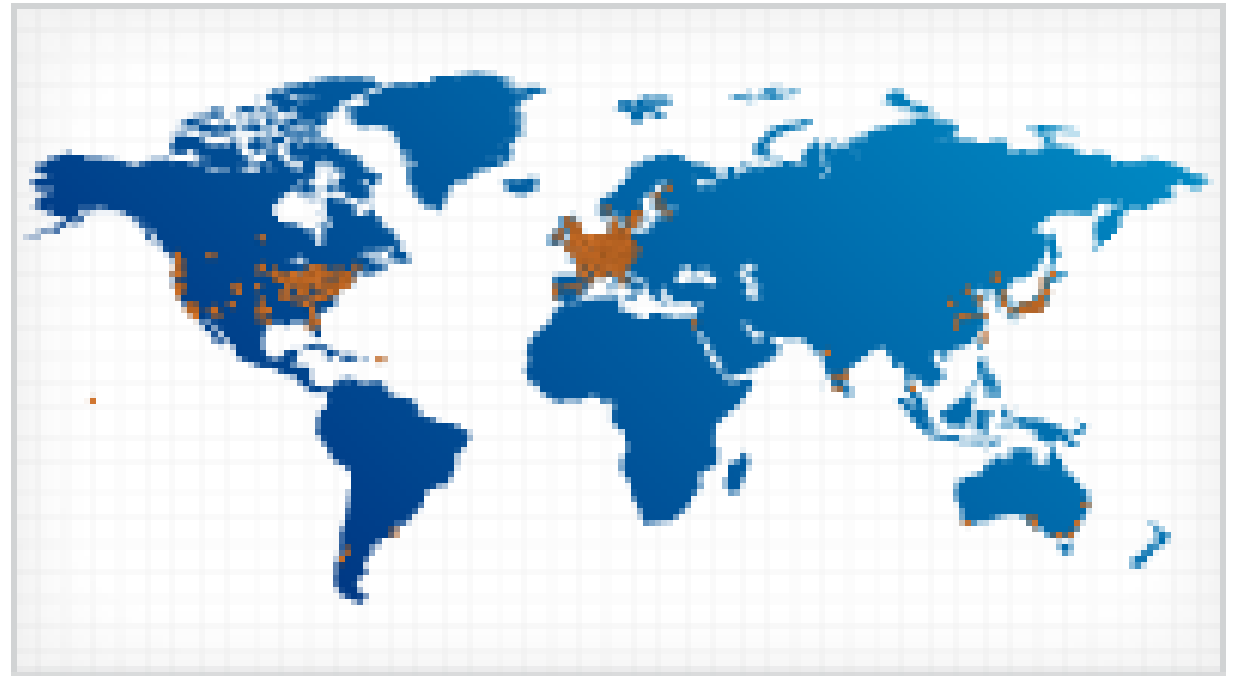
## Why Choose MathWorks Consulting Services?

- Reduced Development Time
- Reduced learning curve
- Increased Efficiency
- Proven Solutions

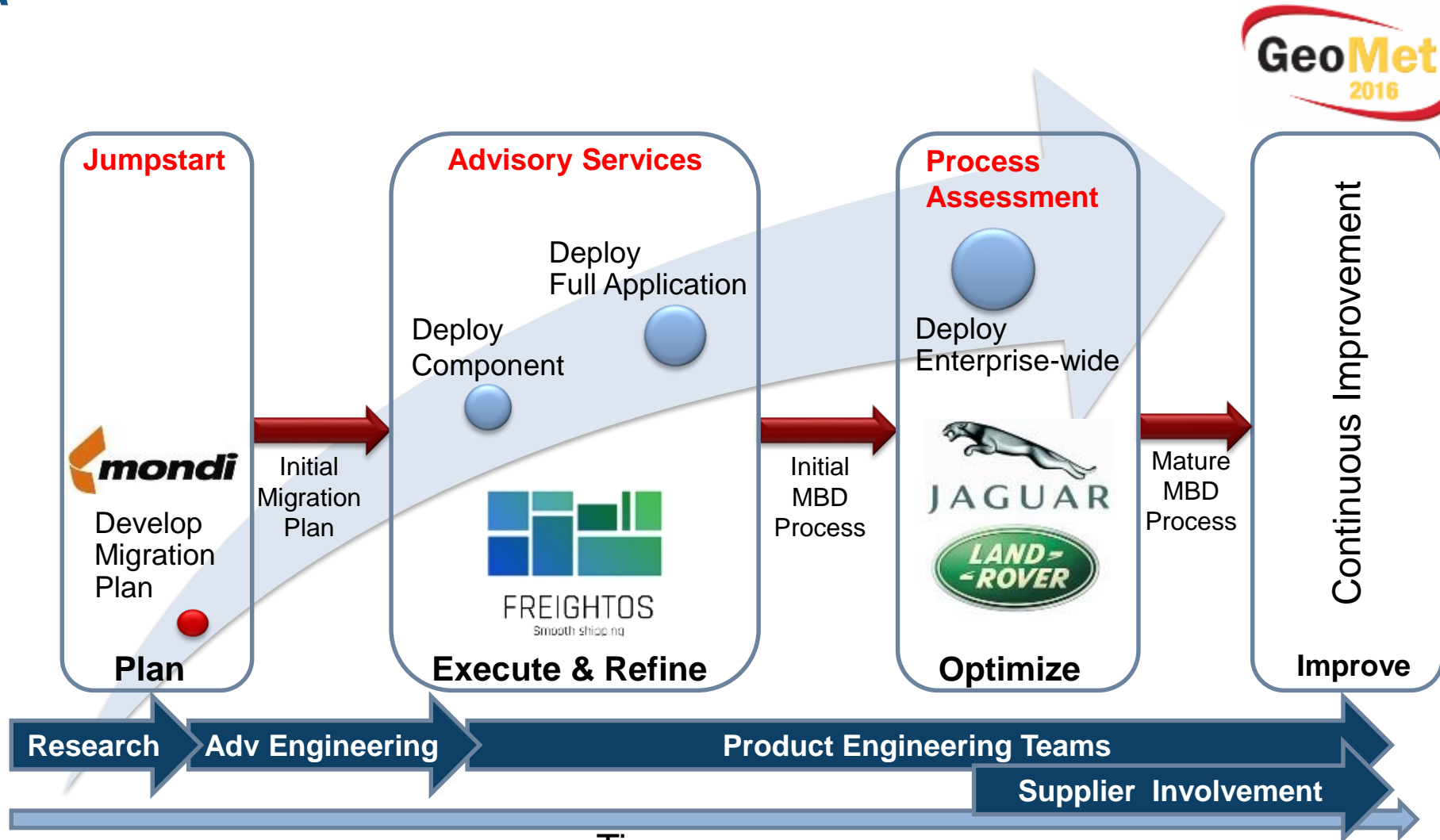
# Overview of MathWorks World Wide Consulting Services

- Where are we located?
  - Australia
  - South Korea
  - Japan
  - China
  - USA (CA, MA, MI)
  - Germany
  - France
  - UK
  - Nordic

- Where have we worked?



# Overview of MathWorks World Wide Consulting Services Agenda



# Overview of MathWorks World Wide Consulting Services

## MathWorks Consulting Services

Get up and running fast. MathWorks Consulting Services - industry experience and MATLAB and Simulink expertise.

[▶ Watch video](#)



[mathworks.com/consulting](http://mathworks.com/consulting)

MATLAB CONFERENCE 2017

"MathWorks Consultants were well-qualified, professional, and fast. They understood not only the technical issues but also the business goals, which is essential when working on a core business system. We got more than we expected from MathWorks Consulting."

— Dr. Norbert Tönder, IT Project Manager, RWE

Questions?

» [Contact Consulting](#)



## Why Choose MathWorks Consulting?

Working with MathWorks Consulting gives you the advantage of their years of project work, industry backgrounds, and deep MATLAB and Simulink know-how.

» [Explore the value of Mathworks Consulting Services](#)

## Getting Started

### How We Work

MathWorks Consulting Services works to strengthen your skills and leave you self-sufficient and in control of your own processes, tools, and design work.

### Worldwide Availability

MathWorks Consulting Services brings local presence, local language, industry background, and MATLAB and Simulink expertise to your part of the world.

## Proven Solutions

MathWorks Consulting Services delivers reliable and effective solutions to solve your engineering challenges. Explore how MathWorks consultants work with you on a strategic level, understanding your business goals and using their technical expertise to translate your requirements into real-world solutions.

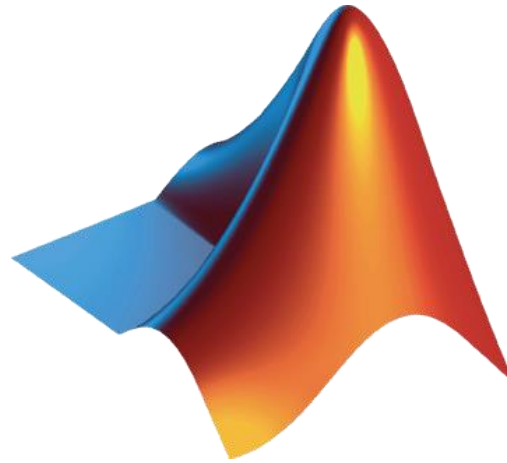
» [Explore proven solutions](#)

## Customer Success Stories

From improving performance and product quality to reducing development time and advancing scientific discovery, MathWorks Consulting Services helps engineers and scientists overcome their most difficult research and technical challenges. See how MathWorks consultants are transforming the way their customers work.

» [Explore customer success stories](#)

# Thank you for your attention!



*Accelerating the pace of engineering and science*

