Are you ready for AI?
Is AI ready for you?

Stephane Marouani
Country Manager, Australia & New Zealand
Alexa –
Write my Conference keynote for me
Alexa –
Play relaxing music
Artificial Intelligence Is in Early Adoption

Percentage of Respondents

- 14% No interest
- 35% On the radar, no action planned
- 25% In medium- or long-term planning
- 21% In short-term planning/actively experimenting
- 4% Have already invested and deployed

Source: Real Truth of Artificial Intelligence by Whit Andrews
Presented at Gartner Data & Analytics Summit 2018
▪ What is AI?
▪ Do you need AI?
▪ Are you ready for AI?
▪ What if you never used AI before?
▪ Is your data ready for AI?
What is AI?
Artificial Intelligence

The capability of a machine to imitate intelligent human behavior
Artificial Intelligence

The capability of a machine to *match or exceed* intelligent human behavior
Artificial Intelligence Today

The capability of a machine to *match or exceed intelligent human behavior* by *training a machine to learn the desired behavior*
There are two ways to get a computer to do what you want

Traditional Programming

Data → COMPUTER → Output

Program → COMPUTER → Output
There are two ways to get a computer to do what you want

Machine Learning

Data → COMPUTER → Program

Output → COMPUTER
There are two ways to get a computer to do what you want

Machine Learning

Data → COMPUTER → Model

Output

Artificial Intelligence

Find out more: Unlocking the power of Machine Learning

Mandar Gujrathi
1:15pm
Do you need AI?
AI for Predictive Maintenance

- Measure the wear of each robot
- Predict and fix failures before they happen
- AI handles uncertainty and variability
Are you ready for AI?
Are you ready for AI?

Data

Output

Model
Are you ready for AI?

Data

Output

Model
Are you ready for AI?

Access Data

Analyze Data

Data

Output

Model
<table>
<thead>
<tr>
<th>Data</th>
<th>Access Data</th>
<th>Develop</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Analyze Data</td>
<td>Deploy</td>
</tr>
<tr>
<td>Output</td>
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<td></td>
</tr>
<tr>
<td>Model</td>
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</tbody>
</table>
Are you ready for AI?

Access Data

Develop

Analyze Data

Deploy

Data

Output

Model

EVENYTHING ELSE
### Are you ready for AI?

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<tr>
<td></td>
<td></td>
<td><img src="image" alt="AI model" /></td>
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<tr>
<td></td>
<td></td>
<td><img src="image" alt="Algorithm development" /></td>
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<td><img src="image" alt="Modeling &amp; simulation" /></td>
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## Are you ready for AI?

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<tr>
<td>Sensors</td>
<td>Data exploration</td>
<td>AI model</td>
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<tr>
<td>Files</td>
<td>Preprocessing</td>
<td>Algorithm development</td>
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### Are you ready for AI?

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<td>Enterprise systems</td>
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</table>
Are you ready for AI if …

You’ve never used machine learning?
What is crispiness?

Crushing Sound + Crushing Force = Crispy Enough

Crispy
Crispy Enough
Soggy
Replicating human perception with machine learning
Nestle

Machine Learning Workflow

Data → Feature extraction → Classification

Crispy ✓
Crispy enough
Soggy
Replicating human perception with machine learning
Nestle

Classification Learner
Classification Learner - Confusion Matrix

Model 1.7

<table>
<thead>
<tr>
<th>True Class</th>
<th>Fresh</th>
<th>Soggy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fresh</td>
<td>93%</td>
<td>5%</td>
</tr>
<tr>
<td>Soggy</td>
<td>7%</td>
<td>91%</td>
</tr>
</tbody>
</table>

Accuracy: 91.6%

- 6946 features
- 5223 samples
Are you ready for AI if you’ve never used machine learning?

- No experience required
- Use apps to try out all possible models
- Use domain expertise and familiar tools to prepare data
Are you ready for AI if …

You can’t identify features in your data?
Use deep learning to identify features automatically

Machine Learning Workflow

Data → Feature extraction → Classification

- Crispy
- Crispy enough
- Soggy
Use deep learning to identify features automatically

Machine Learning Workflow

Data → Feature extraction → Classification
- Crispy
- Crispy enough
- Soggy

Deep Learning Workflow

Data → Deep neural network
- [95% 3% 2%]
- Crispy
- Crispy enough
- Soggy
Are you ready for AI if you can’t identify features in your data?

Deep learning in 5 lines of code

Find out more: Demystifying Deep Learning

Mandar Gujrathi
1:45pm
Traditional Approach
- Geologists assess seven different metrics
- Can take hours to analyze one site
- Critical shortage of geologists

New Approach
- Use deep learning to automatically recognize metrics based on images
- On-site evaluators decide with support from deep learning
### Efficient tunnel drilling with deep learning

**Obayashi Corporation**

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**Image** | **Weathering Alteration (1-4)** | **Fracture Spacing (1-5)** | **Fracture State (1-5)**
---|---|---|---
[Image] | 1 | 4 | 3
[Image] | 3 | 5 | 2
[Image] | 3 | 1 | 5
[Image] | 2 | 2 | 1
[Image] |   |   |   

---

**Split into sub-images**

**Label each sub-image**
Efficient tunnel drilling with deep learning
Obayashi Corporation

Transfer learning

AlexNet
PRETRAINED MODEL

Ice cream  Teapot  Goose

Custom Network
Efficient tunnel drilling with deep learning
Obayashi Corporation

Transfer learning

Efficient tunnel drilling with deep learning
Obayashi Corporation

Find out more:
Scaling up MATLAB Analytics

Branko Dijkstra
11:45am
Are you ready for AI if …

If you don’t have the right or enough data?
AI for Predictive Maintenance

- Measure the wear of each blade
- Predict and fix failures before they happen
- Can’t rely on failures in the field
Predictive maintenance with synthetic failure data with MATLAB & Simulink
Predictive maintenance with synthetic failure data with MATLAB & Simulink

1. Measured data
2. Failure conditions
3. Inject failures
4. Refine model
5. Simulink model
6. Failure data
Are you ready for AI if you don’t have the right data?

- Generate data with simulations
- Simulation environment for reinforcement learning

Find out more:
Designing Mechatronic System
JB Lanfrey
1:15pm

Find out more:
Predictive Maintenance Master Class
Branko Dijkstra
2:30pm
Low-carbon homes

- Generate power with fuel cell and solar panels
- Store power in battery
- Buy power when needed; sell when extra
- Record data on environment and energy usage
Low-carbon homes
- Generate power with fuel cell and solar panels
- Store power in battery
- Buy power when needed; sell when extra
- Record data on environment and energy usage

Goals
- Minimize energy cost
- Use EV battery for additional storage
Optimizing home energy management system

Denso

Generated and consumed power

Home Energy Controller

Battery command

Home

Stored energy
Optimizing home energy management system

Denso

Electricity prices

Predicted vehicle use

Generated and consumed power

Battery command

Home

Home Energy Controller

Stored energy

Model predictive control
Mixed integer linear programming

Simscape Power Systems
# Optimizing home energy management system

**Denso**

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## Optimizing home energy management system

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<td>Control algorithms</td>
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<td>Optimization</td>
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“The effort **would have taken significantly longer** if we had used disparate tools.

**[MATLAB]** enabled our team of domain experts, who lacked formal training in data science, machine learning, and parallel computing, to incorporate all these areas in our design process.”

Akira Ito and Ryu Matsumoto
An arm with "a mind of its own"
Exceeding human capabilities with a robotic drumming prosthesis
Georgia Tech Center for Music Technology

- EMG
- Processing laptop
- Host computer
- AI algorithms
- PID controller
- Drummer
- Prosthesis
- Music
Exceeding human capabilities with a robotic drumming prosthesis
Georgia Tech Center for Music Technology

Find out more:
Developing Algorithms for Robotics and Autonomous Systems

JB Lanfrey
1:45pm
Are you ready for AI if …

You’ve never used machine learning?  
Easy programming
Apps
Domain expertise to prepare data
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Are you ready for AI if …

You’ve never used machine learning?  
- Easy programming
- Apps
- Domain expertise to prepare data

You can’t identify features in your data?  
- Deep learning identifies features for you
- Transfer learning works with less data
- Use AI to label data

You don’t have the right data?  
- Generate data with simulations
- Simulate environment for reinforcement learning
With MATLAB and Simulink, you ARE ready for AI!