Microsoft

A Brief Journey from Device to Action …

hackster.io

IoT Virtual Bootcamp

December
12 – 14, 2017

http://aka.ms/IoTVirtualBootcamp

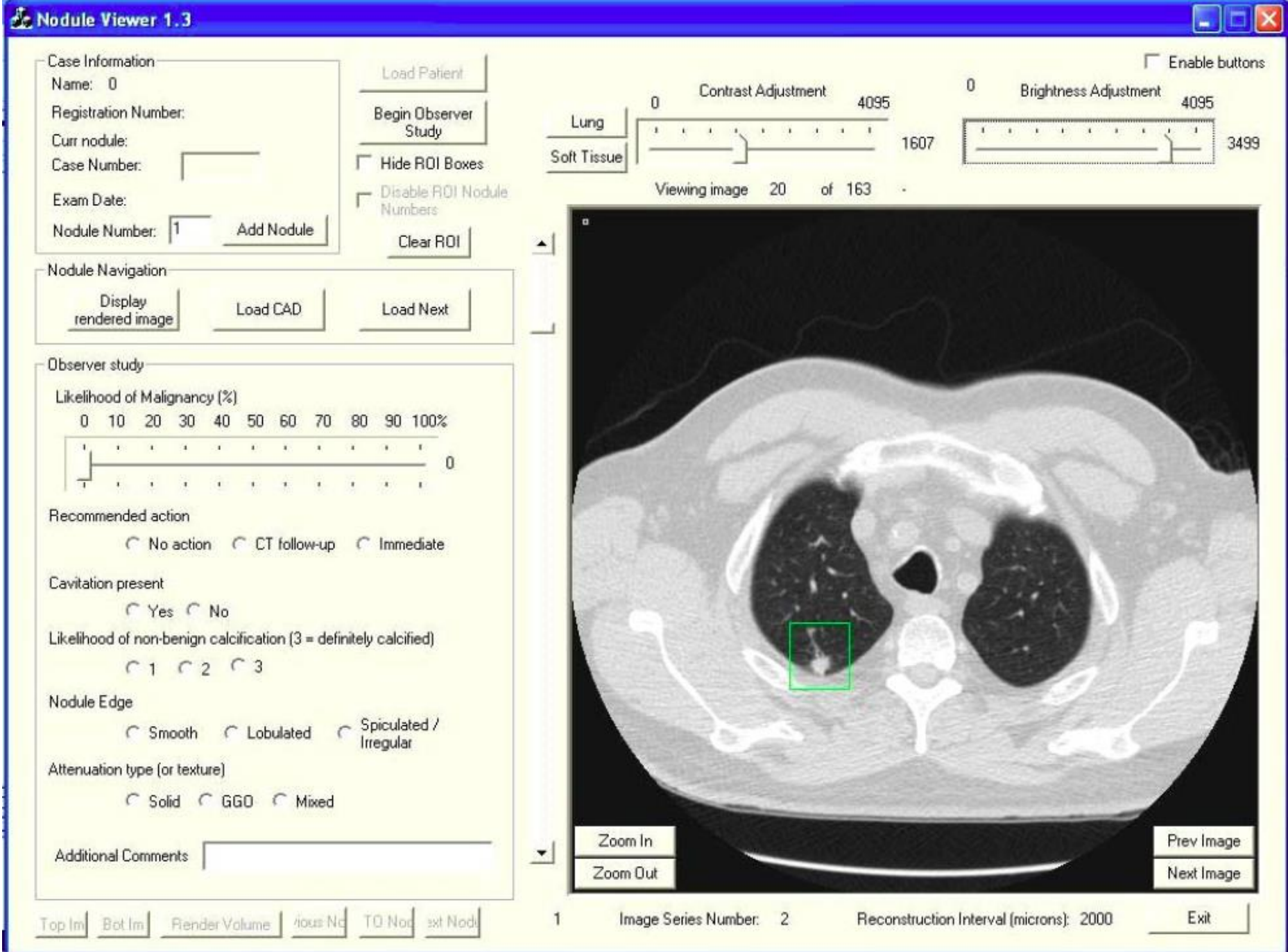*Hardware Partners :* adafruit

Microsoft Artificial Intelligence and Machine Learning

Ted Way, PhD
Senior Program Manager,
Microsoft Azure Machine Learning

@tedwinway
tedway@microsoft.com

Microsoft

Nodule Viewer 1.3

Case Information
Name: 0
Registration Number:
Curr nodule:
Case Number:
Exam Date:
Nodule Number: 1   Add Nodule

Load Patient
Begin Observer Study
☐ Hide ROI Boxes
☐ Disable ROI Nodule Numbers
Clear ROI

Nodule Navigation
Display rendered image   Load CAD   Load Next

Observer study

Likelihood of Malignancy (%)
0 10 20 30 40 50 60 70 80 90 100%
0

Recommended action
○ No action   ○ CT follow-up   ○ Immediate

Cavitation present
○ Yes ○ No

Likelihood of non-benign calcification (3 = definitely calcified)
○ 1 ○ 2 ○ 3

Nodule Edge
○ Smooth   ○ Lobulated   ○ Spiculated / Irregular

Attenuation type (or texture)
○ Solid ○ GGO ○ Mixed

Additional Comments

Top Im   Bot Im   Render Volume   ious No   TO Nod   ext Nod

☐ Enable buttons

Contrast Adjustment
0   4095
1607

Brightness Adjustment
0   4095
3499

Lung
Soft Tissue

Viewing image 20 of 163

Zoom In
Zoom Out

Prev Image
Next Image

1   Image Series Number: 2   Reconstruction Interval (microns): 2000   Exit

Overview

- Cognitive Services
  - AI "out of the box" for computer vision, speech, language, search, and knowledge
- Bot Framework
- Azure Machine Learning
  - Enterprise AI tool
    - Model training on Spark CPU or Azure Batch GPU clusters
    - Operationalization to Docker containers
      - Integration with IOT Edge for ML on the edge device
- Roadmap
  - Acceleration on FPGA

Use Cases

Personalization	Customer Churn	Anomaly Detection	Operational Efficiency	Demand Forecast

Personalization: JJ Food Service, Tangerine, Ziosk, Pier 1 imports, youboox, direct.one, gjirafa.com, Microsoft, RIDGID

Customer Churn: Kellogg School of Management, TACOMA PUBLIC SCHOOLS

Anomaly Detection: optolexia, JABIL, MICROSOFT DIGITAL CRIMES UNIT

Operational Efficiency: Rockwell Automation, WASH multifamily laundry systems, Carnegie Mellon University, Aerocrine, ECOLAB, Hafslund, FUJITSU, MENDELEY, mojio, North American EAGLE www.LANDSPEED.com

Demand Forecast: ARCACONTINENTAL, eSmart SYSTEMS, codit integrating your business, GENSCAPE, OSIsoft, the Next Up, JLL, ULTRA TENDENCY, SUN BRANDING SOLUTIONS

Customer stories are categorized by top use case, but may fit into multiple use case categories.

Rolls-Royce

Filtering the signal from the noise

Objectives

Connect Rolls-Royce jet engine data to Microsoft's intelligent cloud for insights to improve aircraft performance, safety and maintenance.

Tactics

Use Cortana Intelligence to scale quickly and efficiently, aggregate data across customer fleets and process data in real time.

Results

- More efficient flight and maintenance plans
- Targeted and actionable fuel efficiency insights
- Quickly-generated reports and dashboards that tell compelling stories and deliver high-quality insights

"Our goal is not data for the sake of data, but to embrace the cloud and analytical technologies to deliver more expert insights to the right stakeholders at the right time."

Nick Farrant
Senior Vice President, Rolls-Royce

Rockwell Automation

**Cutting costs up to 90 percent
with predictive maintenance**

The challenge

Like other major companies worldwide, Rockwell Automation needed better, faster, and cheaper ways to manage and analyze ever-increasing amounts of data. They wanted to integrate predictive maintenance and calculate optimal efficiency of automated parts.

Machine Learning in action

- **Reduced maintenance costs by up to 90%** through full pipeline visibility

- **Identified potential for millions of dollars in savings** by increasing water pump efficiency by 1%

- **Cut development time by 80%** when rolling out a new system on Hadoop

"We can take analytics to an entirely new level—the level of predictive, actionable analysis—with Azure Machine Learning."

Juan Asenjo
Lead Architect for Remote Monitoring at Rockwell Automation

Rockwell Automation

Inventory Management

- Arcelik mfg. and sells appliances, TV, ACs, etc. in 135 countries
  - 10K product SKUs, 350K spare parts catalog
- Problem: Spare part inventory management
  - Right parts available at the right time
- Solution: Inventory forecasting
  - Every month, spare-parts demand data is uploaded, algos forecast next 12 mos
  - 80% accuracy rate vs. 60% with previous solution
  - Forecasts for all 350K spare part SKUs vs. 100K (manually)
  - Inventory turnover boosted by 10%
    - Spare parts put to use faster, reduction of storing, managing, financing parts

Cortana Intelligence Suite

Data sources

Apps

Sensors & devices

Cortana Intelligence

People

Apps

Automated systems

Data → Intelligence → Action
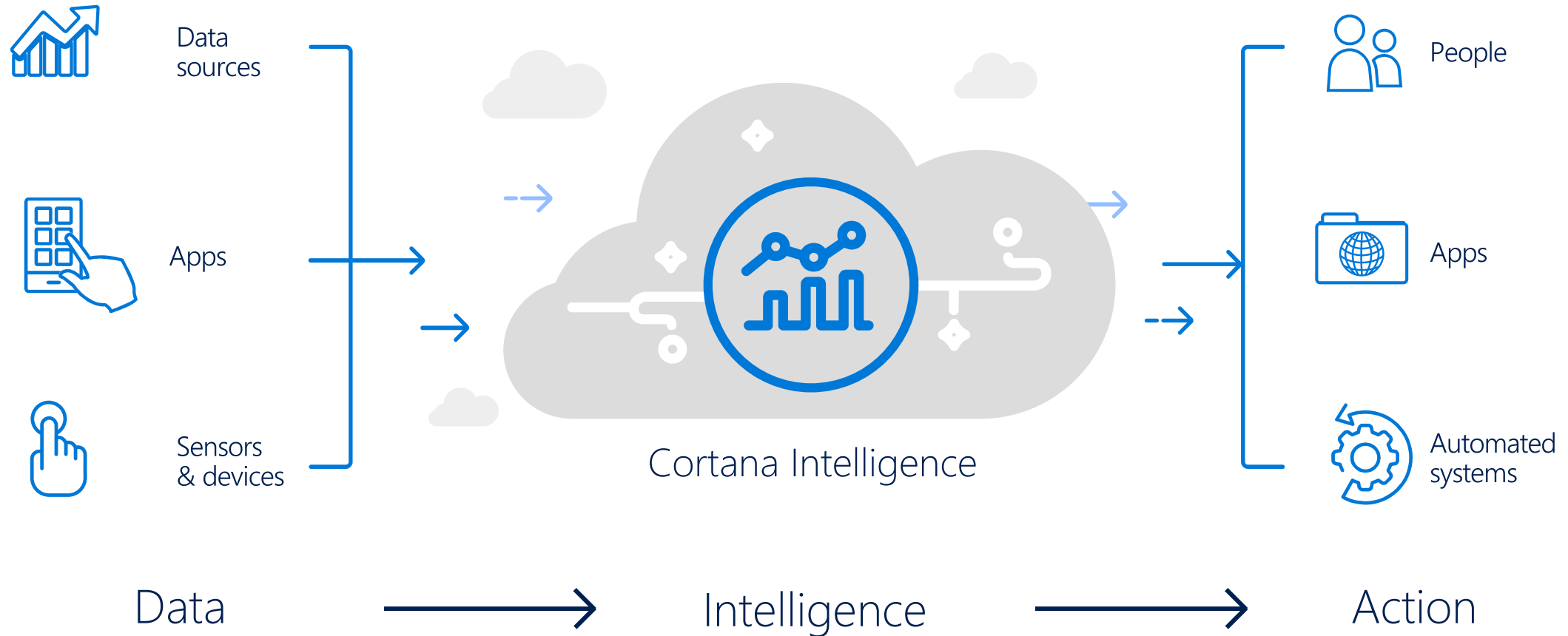
Cortana Intelligence Suite Services

Data sources

Apps

Sensors & devices

Information Management

- Data Factory
- Data Catalog
- Event Hubs

Big Data Stores

- Data Lake Store
- SQL Data Warehouse

Machine Learning and Analytics

- Machine Learning
- Data Lake Analytics
- HDInsight (Hadoop and Spark)
- Stream Analytics

Intelligence

- Cognitive Services
- Bot Framework
- Cortana

Dashboards & Visualizations

- Power BI

People

Apps
- Web
- Mobile
- Bots

Automated systems

Data → Intelligence → Action

Microsoft

Our approach

Solutions	Extensible applications
Cognitive services	Bot framework

Easy to consume
Artificial Intelligence

Data Science tools
Data preparation, modeling, and operationalization

Most comprehensive
data science capabilities

Deep Learning– Cognitive Toolkit

Best of Microsoft research
and open source

Analytics in Big Data Stores
(cloud + on premise)

Flexible infrastructure
support for analytics

Microsoft Cognitive Services

Microsoft

Vision

Classification	Classification + Localization	Object Detection	Instance Segmentation
CAT	CAT	CAT, DOG, DUCK	CAT, DOG, DUCK
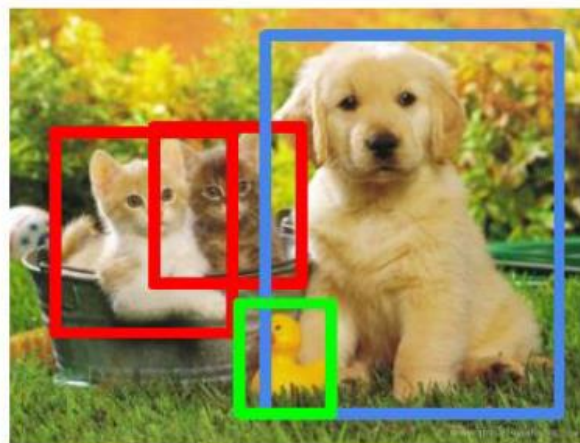
Single object ⏐ Multiple objects

Connected Drone

Snow Leopard Trust

Speech

Microsoft says speech recognition technology reaches "human parity"

Microsoft Translator

Translator API

Translate speech and text with a simple REST API call.

Get started for free
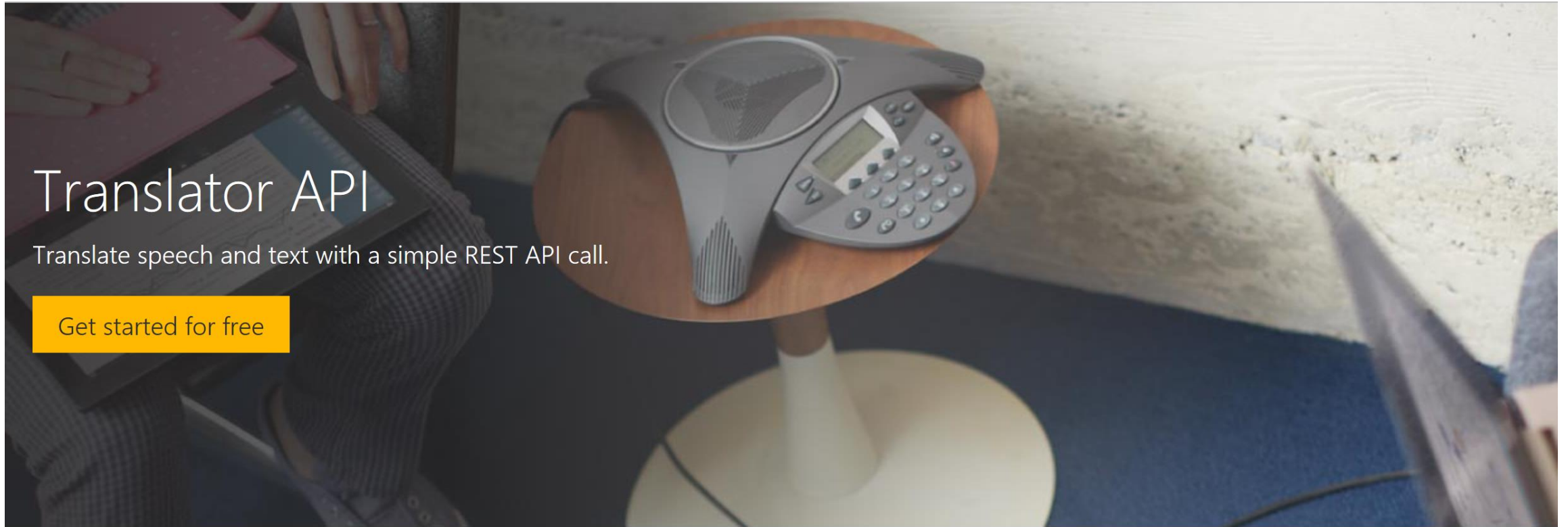
Microsoft Cognitive Toolkit

Research   Research areas ⌄   Products & Downloads   Programs & Events ⌄   People   Careers   About ⌄

The Microsoft Cognitive Toolkit

A free, easy-to-use, open-source, commercial-grade toolkit that trains deep learning algorithms to learn like the human brain.

The Microsoft Cognitive Toolkit   Features   Getting Started   Model Gallery   Tutorials   Articles

Microsoft Cognitive Services

Easy

Roll your own with REST APIs

Simple to add: just a few lines of code required

GET A KEY

BUILD
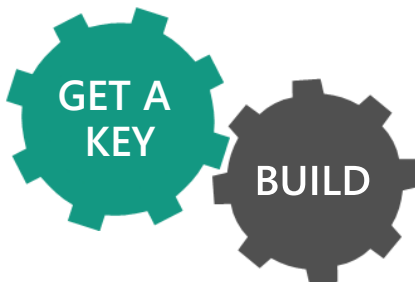
Flexible

Integrate into the language and platform of your choice

Breadth of offerings helps you find the right API for your app

python

node js

Tested

Built by experts in their field from Microsoft Research, Bing, and Azure Machine Learning

Quality documentation, sample code, and community support

GitHub   stackoverflow

msdn   uservoice
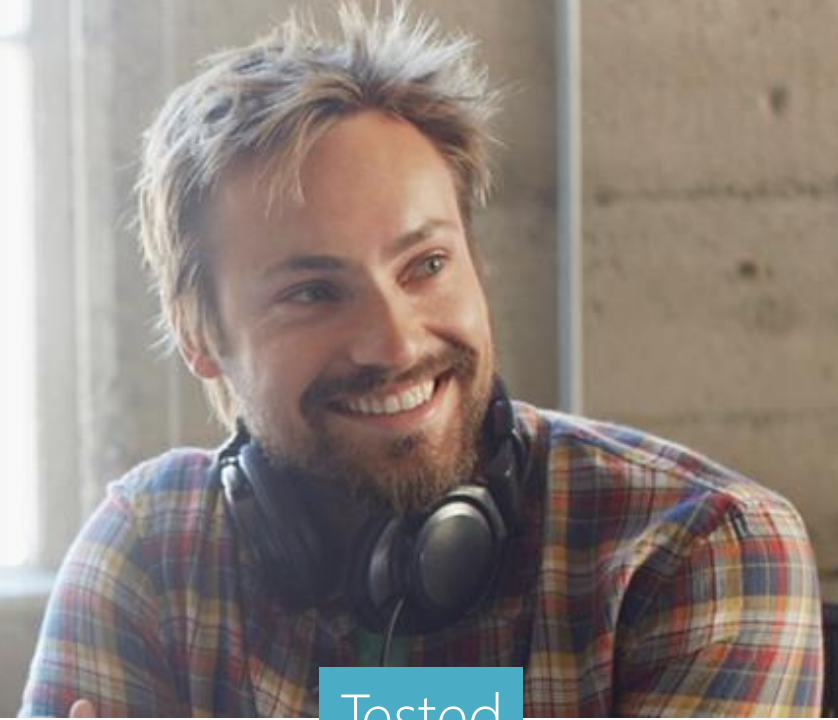
Azure Machine Learning

Azure Machine Learning – A Modern Platform for Machine Learning & Data Science

Intelligent Data Prep

- ML assisted data wrangling
- By-example transforms
- Visual data inspectors
- Reusable steps
- Exportable to Python/PySpark
- Wrangle locally & scale to the cloud
- Plug-n-play data source construct

Agile Experimentation

- Increase rate of experimentation
- Deep Learning & Spark made easy
- Big data and big compute
- Experimentation-as-a-Service
- Experiment locally and scale to cloud

Life-Cycle Fundamentals

- Model metrics
- Model lineage tracking
- Run history
- Version control through Git
- Run artifacts management
- Auditable
- Explainable
- Reproducible

Operationalization

- Docker-based deployment
- Create and manage model packages
- Low-latency real time APIs
- High-throughput batch APIs
- Performance monitoring
- Model retraining

| Open Source ML Toolkits	CNTK, TensorFlow, scikit-learn, Spark ML, 10k+ CRAN-R/Python packages…
Open Platform & IDEs	Docker, Spark, Kubernetes, VS Code, RStudio, PyCharm…
Microsoft Magic Sauce	PROSE, Azure ML libraries for Spark, RevoScaleR Framework …
Enterprise Readiness	Compliance, Security/Encryption, VNETs, Redundancy, Multi-Geo
Cloud infra. + Advanced Hardware	Azure VM, HDI with Spark, Azure Batch, GPU, FPGA…

Azure ML Container Integrated with IoT Edge

FPGAs

Microsoft
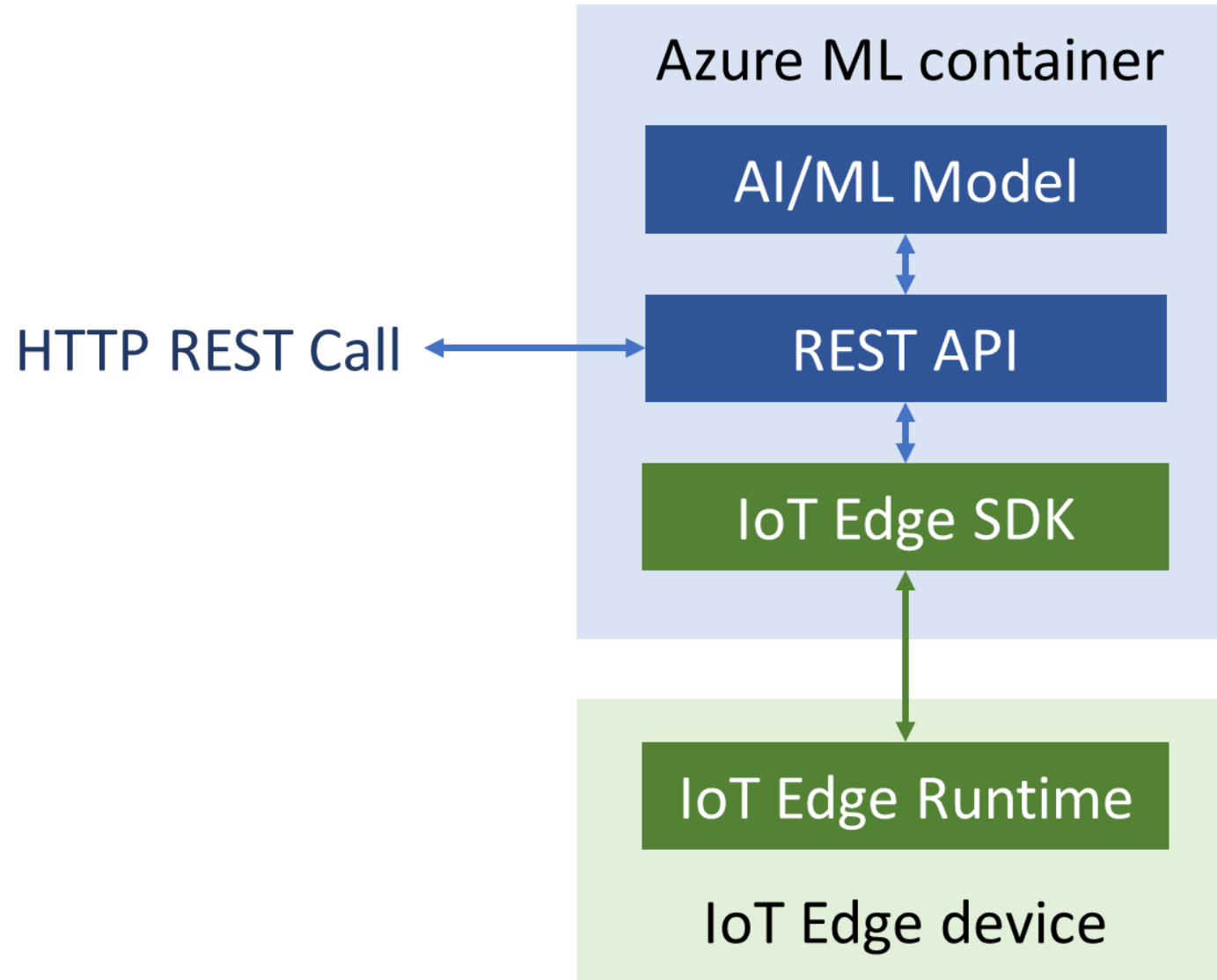
The rise of deep learning in ML
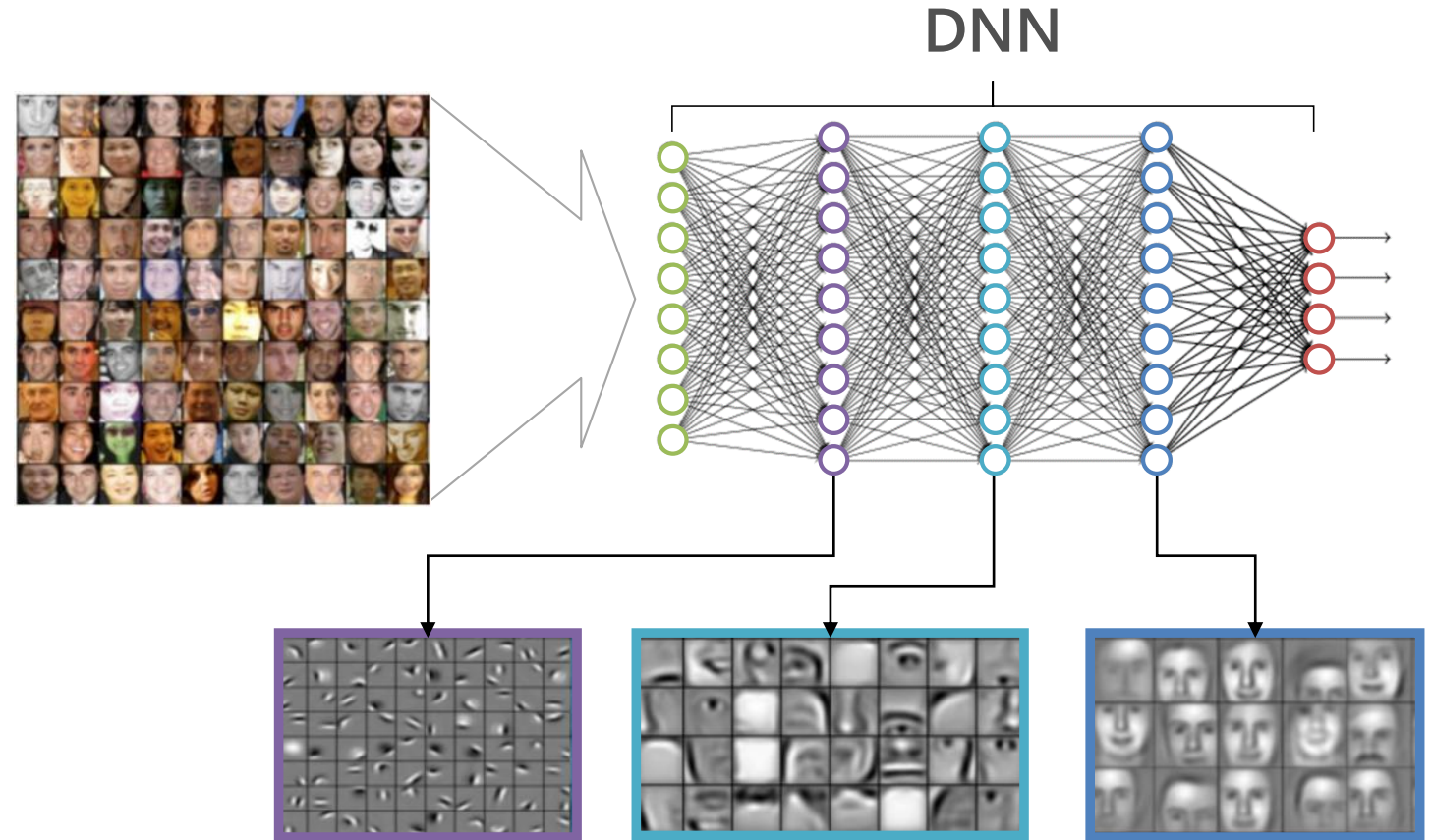
Deep neural networks (DNN) have led to breakthroughs in major AI problems

Computer vision

Language translation

Speech recognition

And more...
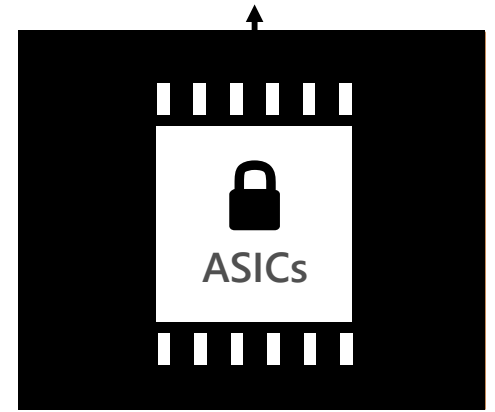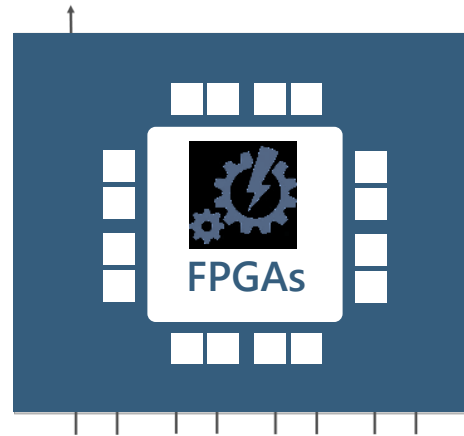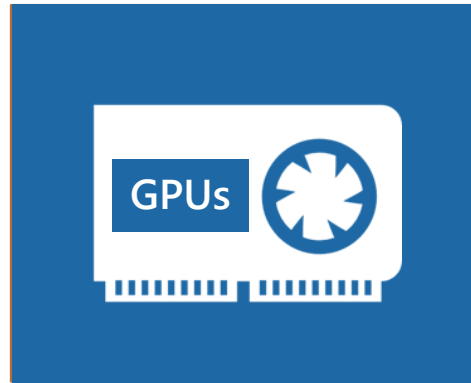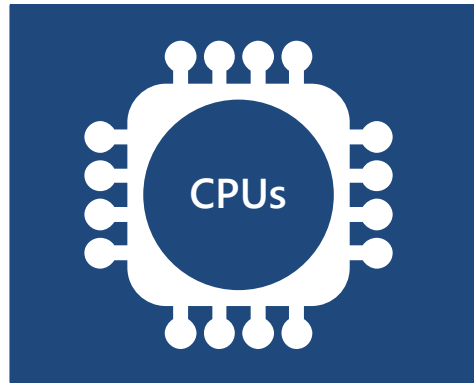

DNN

Silicon alternatives

TRAINING
CPUs and GPUs, limited FPGAs,
ASICs under investigation

EVALUATION
CPUs and FPGAs,
ASICs under investigation

CPUs

GPUs

FPGAs

ASICs

FLEXIBILITY

EFFICIENCY

Resources

- Azure ML and Azure IoT Edge
  - http://aka.ms/aml-iot-edge-blog
- Azure ML (preview)
  - http://aka.ms/aml_deep_dive

Q&A ?

Type your question into the Q&A module & we will answer them in sequence