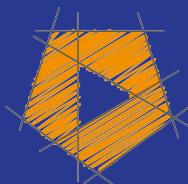


AI-900 Microsoft Azure AI Fundamentals

Scott Duffy, Instructor



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<http://sjd.ca/ai900>

April 2022 Updates

Microsoft Azure AI Fundamentals

“foundational knowledge of machine learning (ML) and artificial intelligence (AI) concepts and related Microsoft Azure services”

Microsoft Azure AI Fundamentals

- Candidates with non-technical backgrounds
- Candidates with a technical background who have a need to validate their foundational level knowledge around AI and ML

Microsoft Azure AI Fundamentals

- Describe AI workloads and considerations
- Describe fundamental principles of machine learning on Azure
- Describe features of computer vision workloads on Azure
- Describe features of Natural Language Processing (NLP) workloads on Azure

You'll be prepared
to take and pass
the AI-900 exam



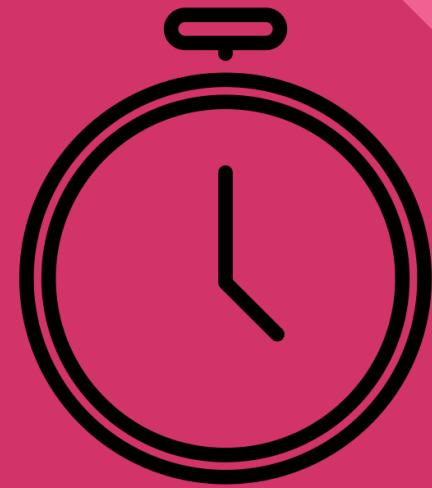
Created by Adrien Coquet
from Noun Project

But you don't have
to, if you just want
to learn AI concepts



Created by Adrien Coquet
from Noun Project

Easy to add AI capabilities to your own applications



Created by Alvida Biersack
from Noun Project

What Azure AI Services Exist?

Vision Services

Speech Services

Language Services

Decision Services

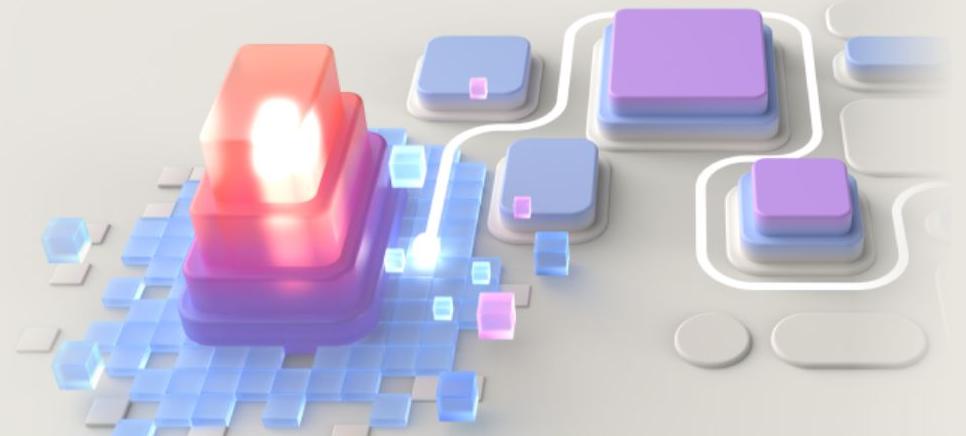


Created by Timofei Rostilov
from Noun Project



EXAMS

Exam AI-900: Microsoft Azure AI Fundamentals

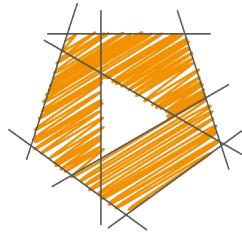


This exam is an opportunity to demonstrate knowledge of machine learning (ML) and artificial intelligence (AI) concepts and related Microsoft Azure services. Candidates for this exam should have familiarity with Exam AI-900's self-paced or instructor-led learning material.

This exam is intended for candidates with both technical and non-technical backgrounds. Data science and software engineering experience are not required; however, awareness of cloud basics and client-server applications would be beneficial.

Azure AI Fundamentals can be used to prepare for other Azure role-based certifications like Azure Data Scientist Associate or Azure AI Engineer Associate, but it is not a prerequisite for any of them.

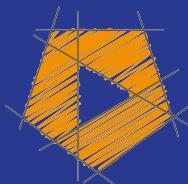
You may be eligible for ACE college credit if you pass this certification exam. See [ACE college credit for certification exams for](#)



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What Do We Mean By “AI”?

The term “Artificial Intelligence” has been used to describe many things

Oxford Dictionary

artificial intelligence (noun)

/,ärdə'fɪSHəl in'teləjəns/

“the theory and development of computer systems able to perform tasks that normally require human intelligence, such as visual perception, speech recognition, decision-making, and translation between languages.”



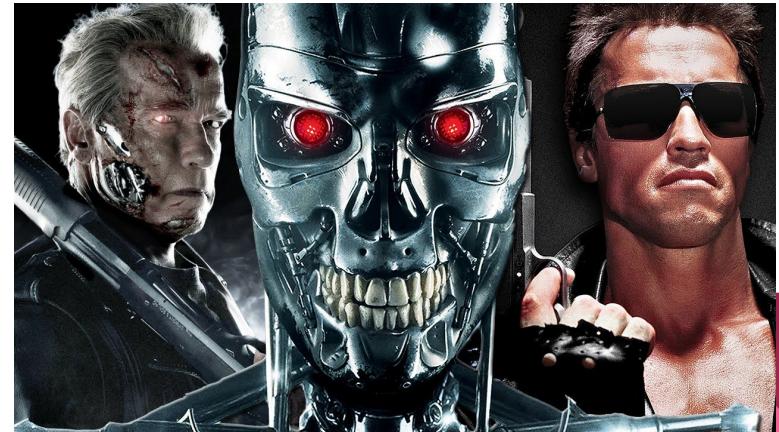
Incorporating
human intelligence
into machines

Artificial General Intelligence

That robot or computer in the movies that can teach itself a new task.

Common in science fiction. Does not currently exist in real life.

We're not talking about that type of AI.



Narrow Artificial Intelligence

Computer systems which use human intelligence but have very strong limitations in what they can do.

Siri, Cortana and Google Assistant are examples of Narrow AI.

“What is the weather today?”

“When is my next appointment?”

“Call Carol.”

Machine Learning

The study of computer algorithms that improve automatically through experience.

Unsupervised learning - ability to find patterns in data without human help

Supervised learning - humans label the data and gives general guidance

This course covers ML.

Natural Language Processing

Allows a machine to read and understand human language.

Machine translation, question answering, sentiment analysis, etc.

This course covers NLP.

Perception

The ability to use input from sensors - images, audio, lidar, sonar, radar, touch etc.

Covers things like facial recognition, speech recognition and object recognition.

Also covered in this course.



AI is “everywhere”.







Q&A

Hi, everyone. My name is Stephen Chang. I work for CollaborativeAI. We're trying to bring autonomous sustainable travel at scale. I work as a business strategist. We're building new kinds of transportation that rely on AI and advanced robotics



Elevate human connections in real time

Augment your workforce with the AI coaching system for the contact center

[Tour the product](#)[Get started](#)

CONSUMER

Cadillac Fairview suspends use of facial recognition cameras at Calgary malls

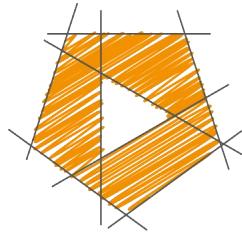


By **Kaylen Small** • Global News

Posted August 5, 2018 4:22 pm



Directories in Chinook Centre are suspending use of facial recognition software. **Blake Lough / Global News**



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AI-900 is a high-level exam



What is an ML Model?

Machine learning
(ML) allows
computers to use
data to forecast the
future...

... without
specifically being
programmed.

In ML, a model is a
program that can
be used to
recognize a pattern
in data



A model can be
used to **predict**
future behaviors



A model can be
used to categorize
something as one
thing or another

A model can be
used to recognize
people, objects and
landmarks using
unseen images

A model can be
used to understand
the context of
natural human text
or speech



You train a model
using “training
data”

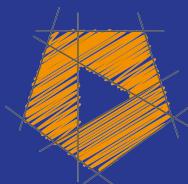


You evaluate a
model using “test
data” to measure
how accurate is it

Once a model has
been deployed, it
can recognize
patterns in data it
has never seen
before

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Describe AI Workloads and Considerations (20-25%)

Describe Artificial Intelligence workloads and considerations (20—25%)

Identify features of common AI workloads

- identify features of anomaly detection workloads
- identify computer vision workloads
- identify natural language processing workloads
- identify knowledge mining workloads

Identify guiding principles for responsible AI

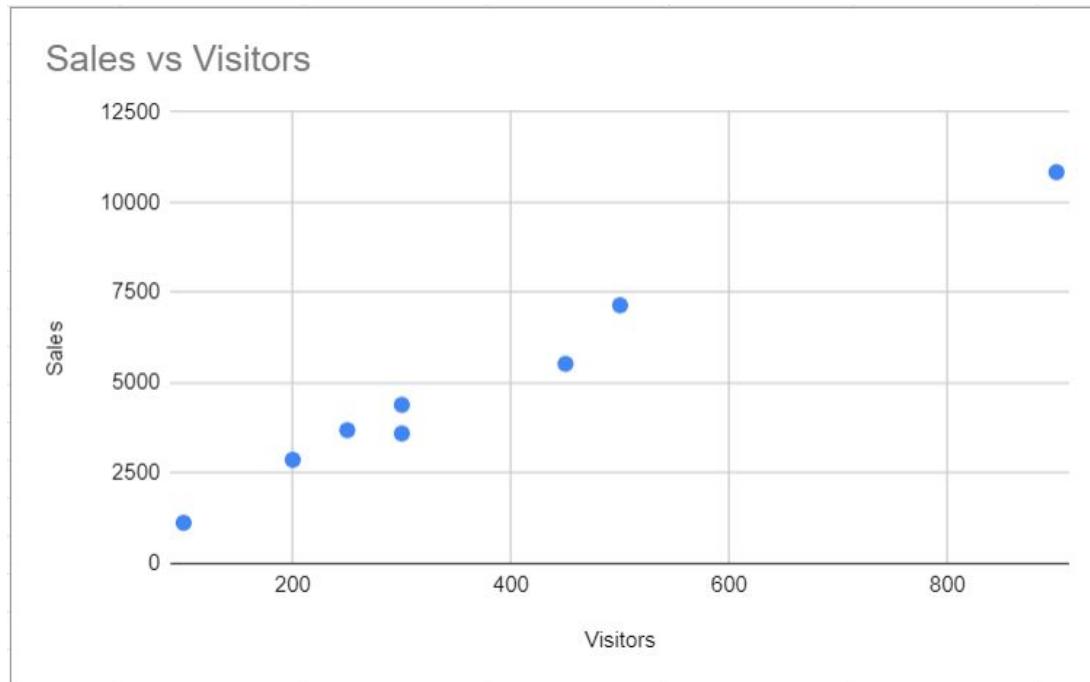
- describe considerations for fairness in an AI solution
- describe considerations for reliability and safety in an AI solution
- describe considerations for privacy and security in an AI solution
- describe considerations for inclusiveness in an AI solution
- describe considerations for transparency in an AI solution
- describe considerations for accountability in an AI solution

Common AI Workloads

1. Prediction and Demand Forecasting

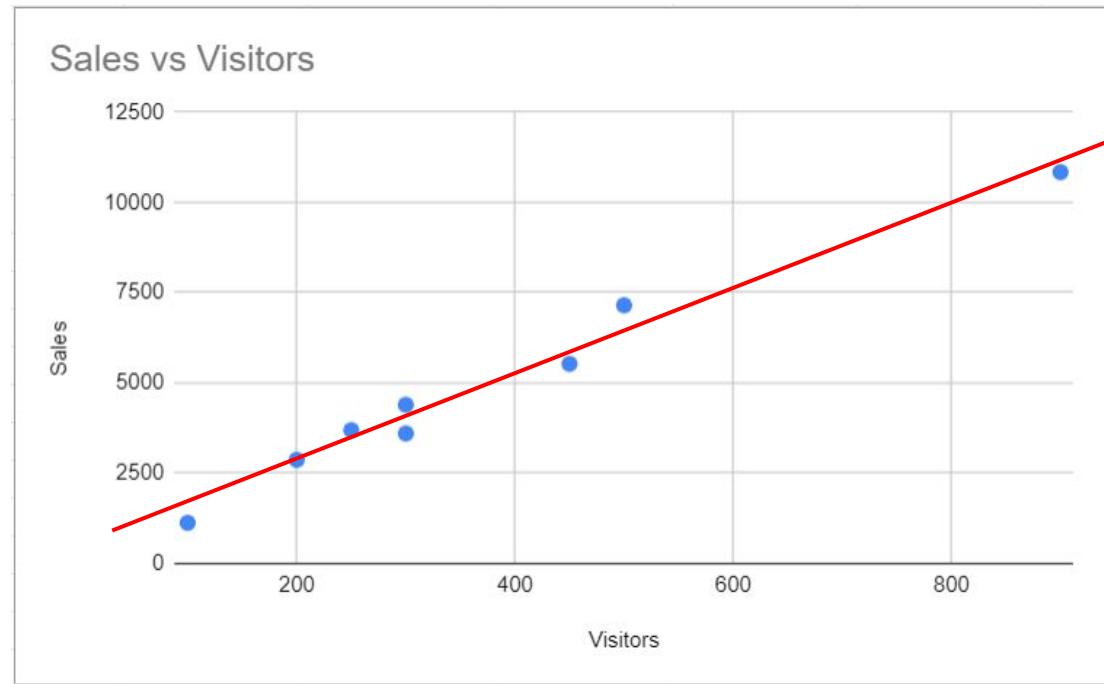
<u>Visitors</u>	<u>Sales</u>
100	1125
200	2871
300	3600
500	7150
450	5529
300	4393
900	10837.5
250	3691.5
786	?
362	?
121	?

Prediction and Demand Forecasting



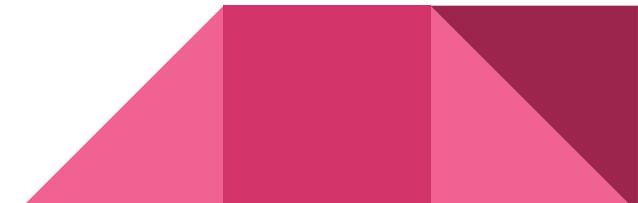
Prediction and Demand Forecasting

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362	?
121	?

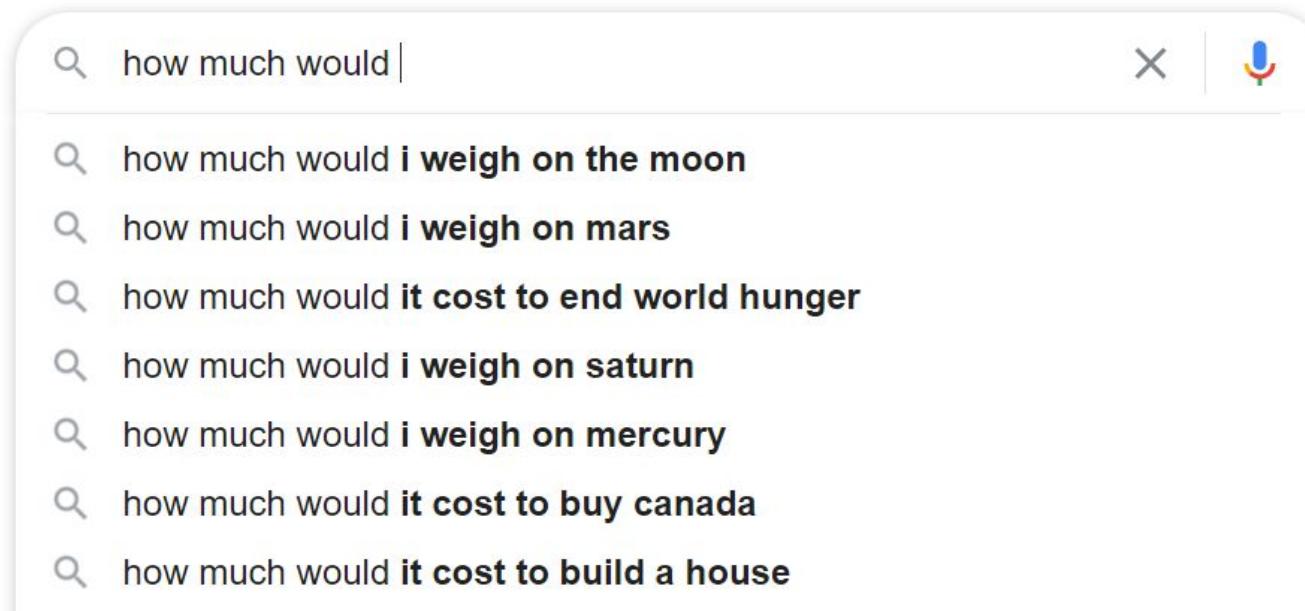


Using Machine Learning to Predict

- Give the machine all the relevant data you know
- Tell it for which field you want to predict
- It develops a model which it uses to make a prediction



Common Predictions



Because you watched *New Girl*



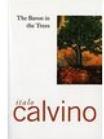
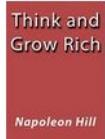
TV Mysteries



Irreverent TV Shows



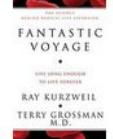
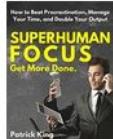
Recommended for you, Thomas



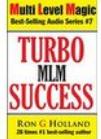
Literature & Fiction
62 ITEMS



Exercise & Fitness Equipment
8 ITEMS



Health, Fitness & Dieting Books
37 ITEMS



Tableware
12 ITEMS



Prime Video – Unlimited Streaming for Prime Members
12 ITEMS



Coffee, Tea & Espresso
98 ITEMS

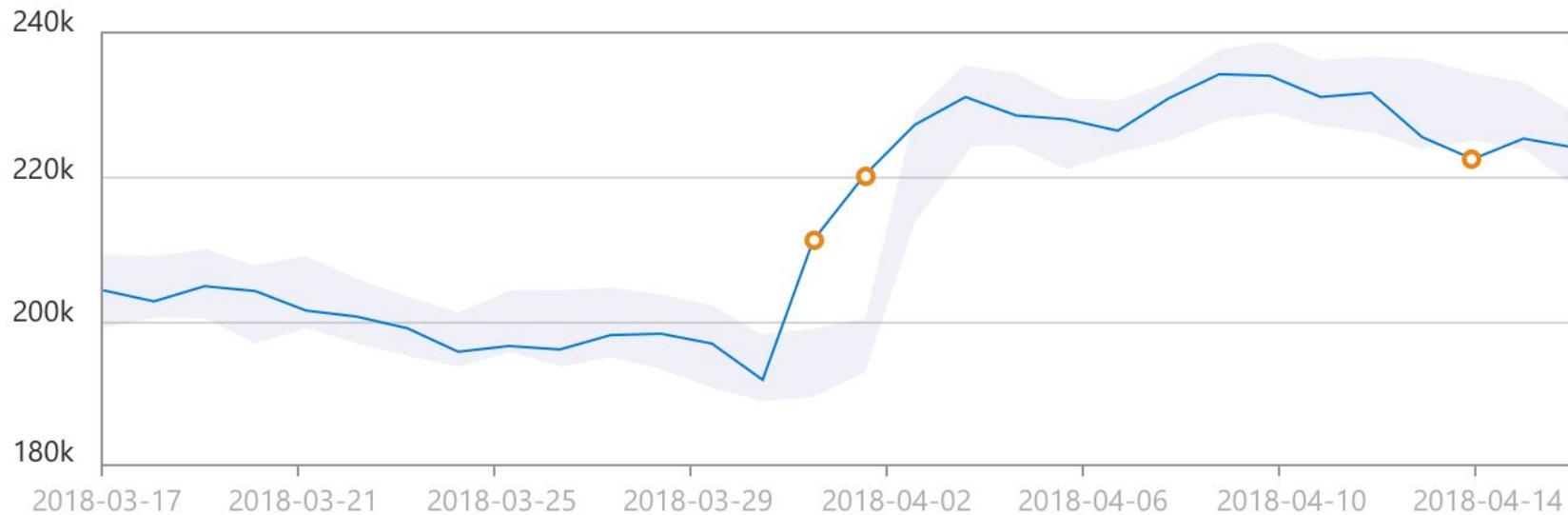


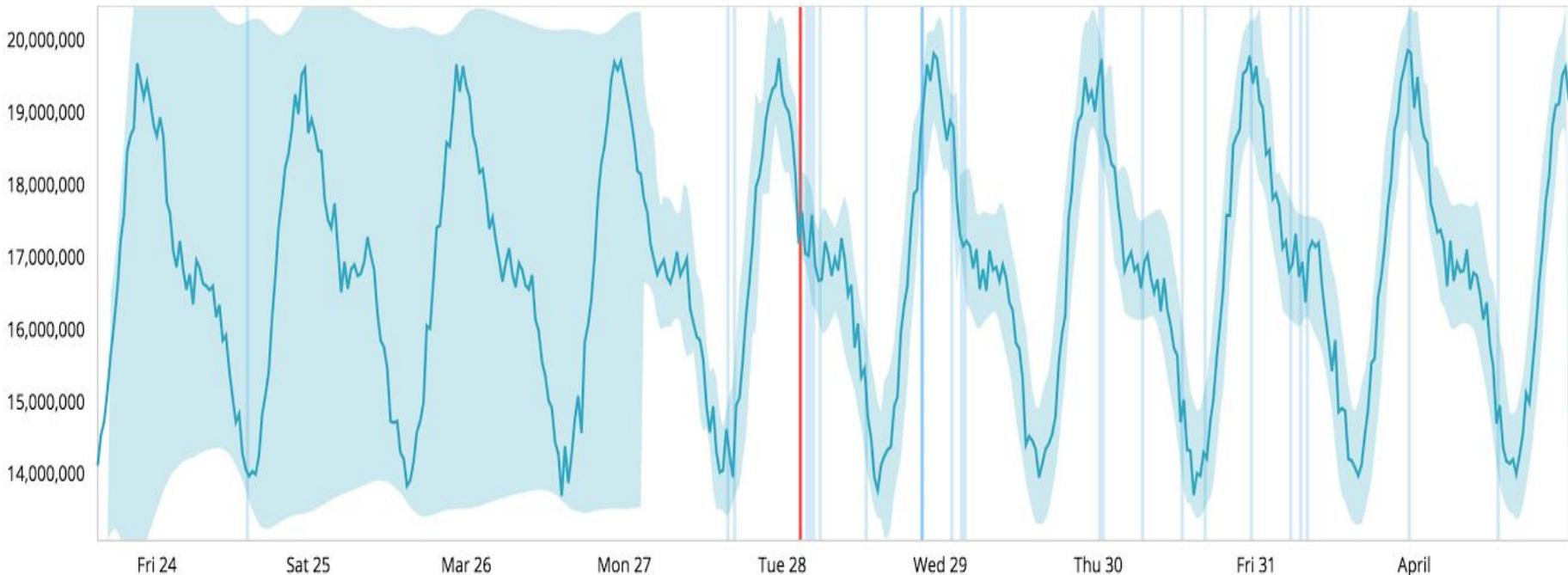
Biographies & Memoirs
17 ITEMS



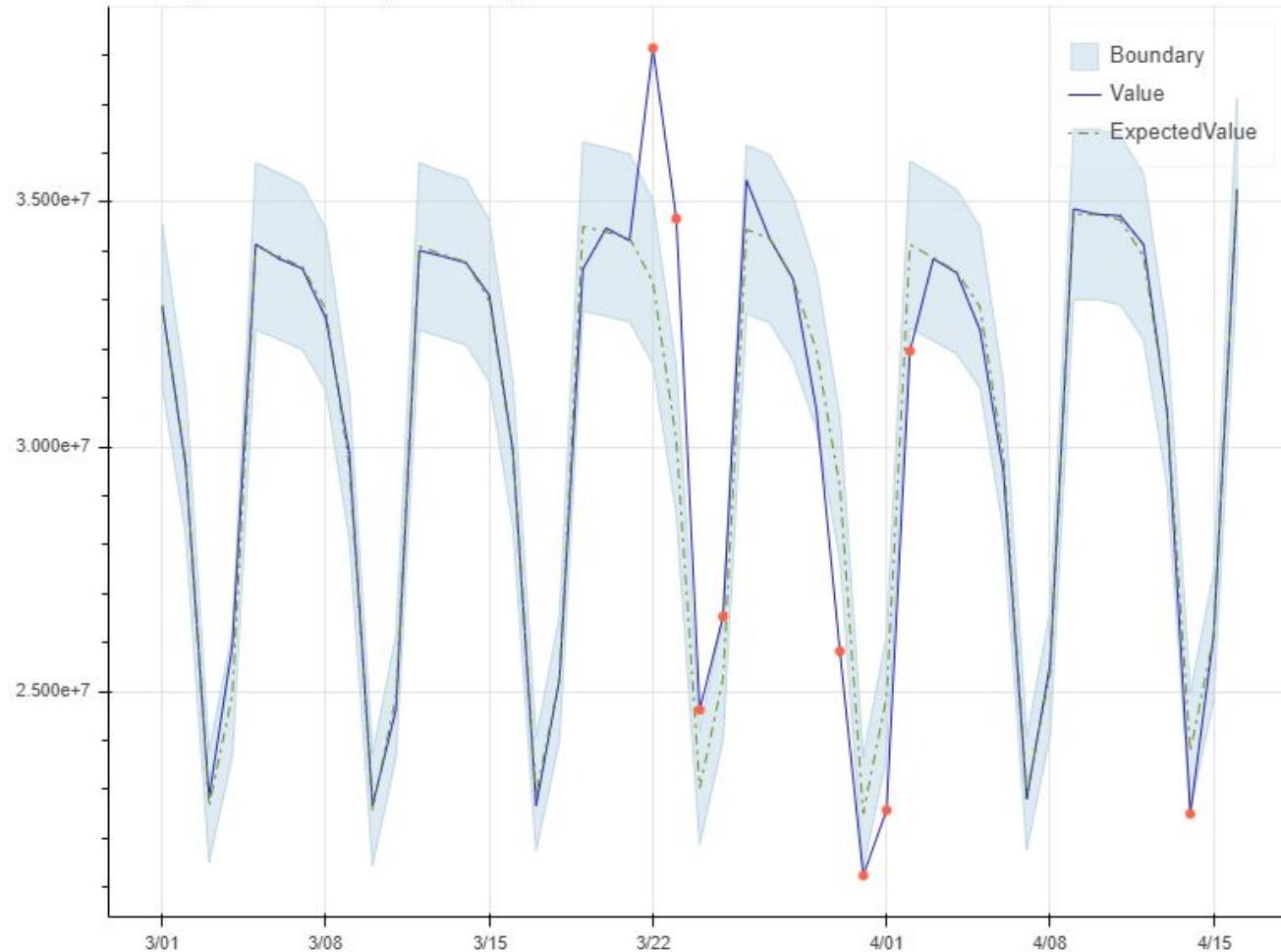
Engineering Books
7 ITEMS

2. Anomaly Detection

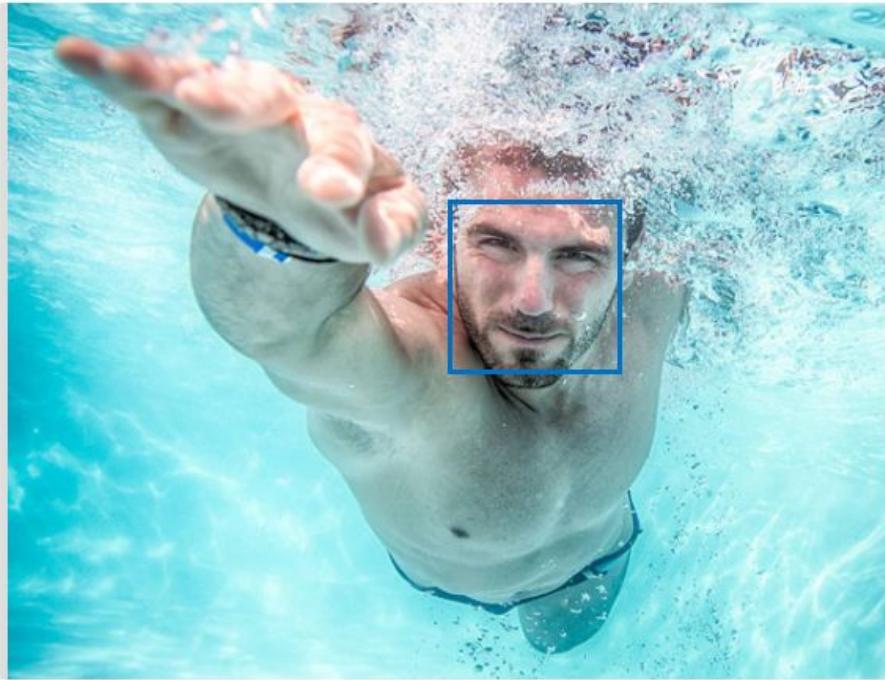




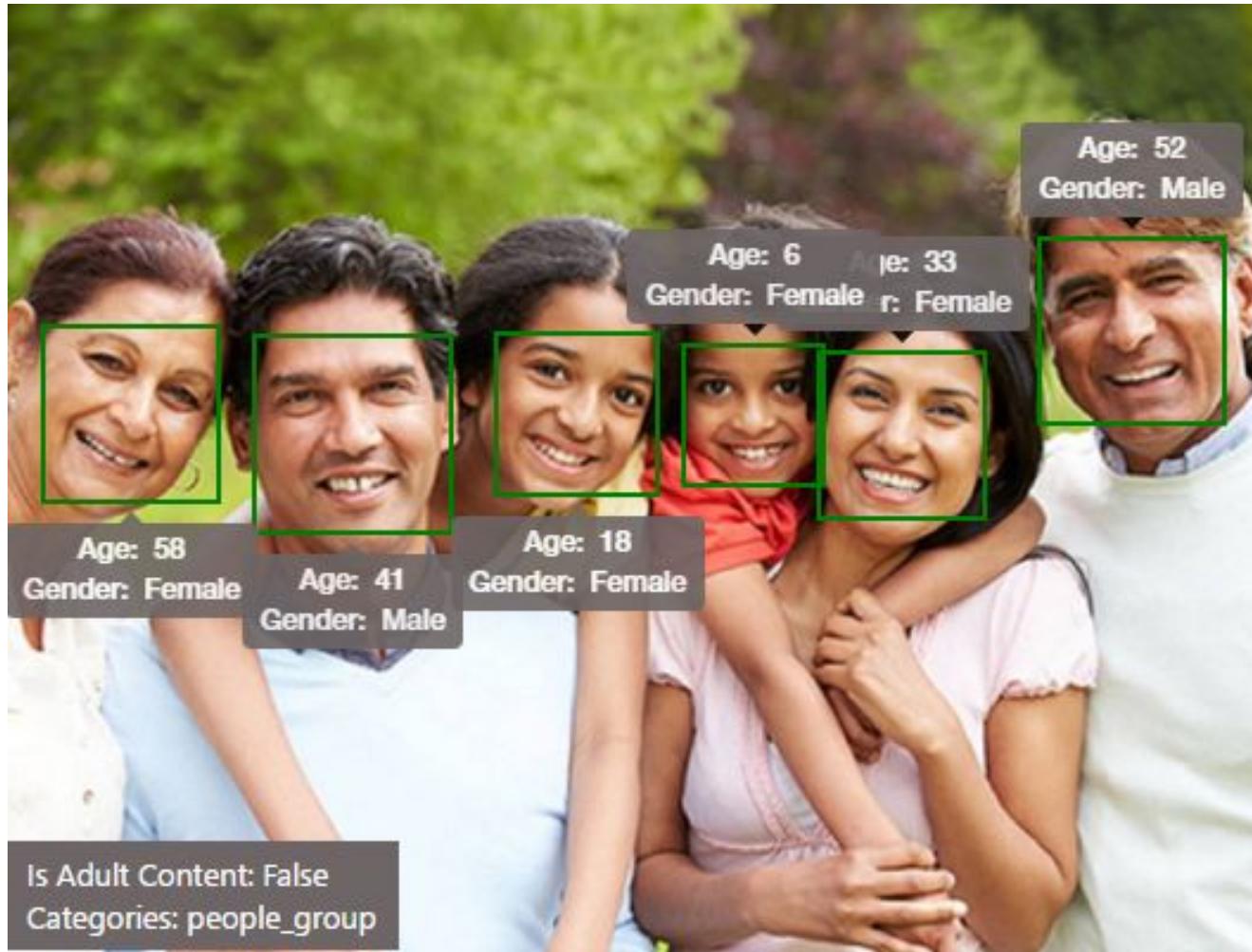
Anomaly Detector Result (95 Sensitivity)



3. Computer Vision



FEATURE	VALUE
NAME:	
Description	{ "tags": ["water", "swimming", "sport", "pool", "person", "man", "frisbee", "ocean", "blue", "bird", "riding", "top", "standing", "wave", "young", "body", "large", "game", "glass", "pond", "playing", "board", "catch", "clear", "boat", "white"], "captions": [{ "text": "a man swimming in a pool of water", "confidence": 0.8909298 }] }
Tags	[{ "name": "water", "confidence": 0.9997857 }, { "name": "swimming", "confidence": 0.955619633 }, { "name": "sport", "confidence": 0.953807831 }, { "name": "pool", "confidence": 0.9515978 }, { "name": "person", "confidence": 0.889862537 }, { "name": "water sport", "confidence": 0.664259 }]
Image format	"Jpeg"



4. Natural Language Processing (NLP)

- What time are you open until today?
- When do you close?
- What time do you close today?
- What are your hours of operation today?
- Until which time can I come there to pick up my order?

Knowledge Mining - Cognitive Search

Ingest content from Blob storage, Tables, SQL Database, and Cosmos DB

PDFs, Images, Word Documents, Powerpoints, Audio

Uses AI tools such as image classification, face recognition, language detection, key phrase extraction to create a searchable index

5. Conversational AI - Chat Bots

User: Do you have any of the Levi's 501 Jeans in stock?

Chatbot: In what size?

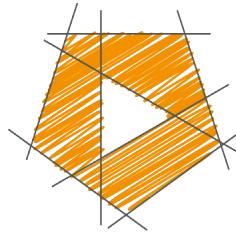
User: Size 34 please

Chatbot: Yes, we have those. Do you want me to hold one aside for you?

User: Yes.

Chatbot: What is your name?

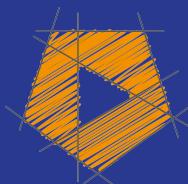
...



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Guiding Principles in AI



The prevalence of
AI causes some
ethical and moral
challenges



Unintended
consequences of
leaving important
decisions to a
computer

Unintended Consequences:

Decisions that are wrong

Decisions that are illegal (or at least, go against your own values)

Decisions that cannot be explained by anybody

Decisions that are harmful to society at large



Unintended Consequences

Why facial recognition's racial bias problem is so hard to crack

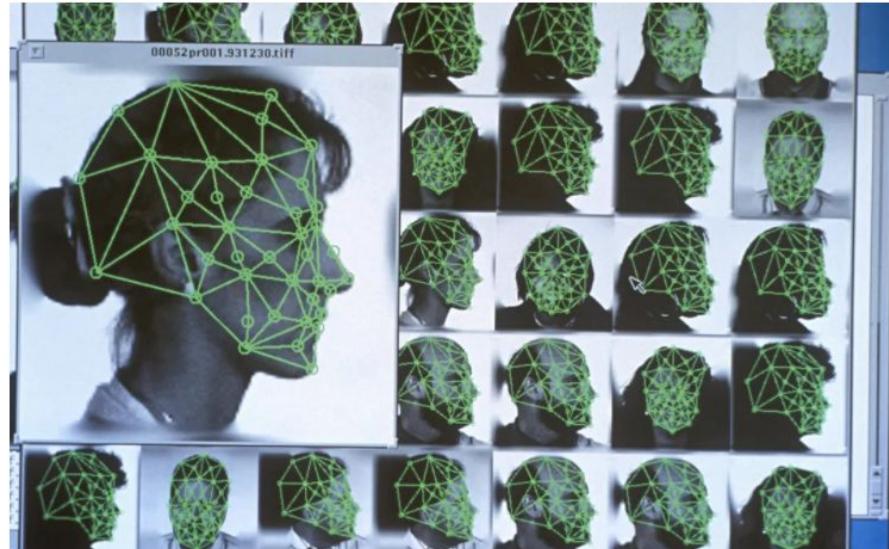
Good luck if you're a woman or a darker-skinned person.



Queenie Wong March 27, 2019 5:00 a.m. PT



26



RETAIL OCTOBER 10, 2018 / 7:04 PM / UPDATED 2 YEARS AGO

Amazon scraps secret AI recruiting tool that showed bias against women

By Jeffrey Dastin

8 MIN READ



SAN FRANCISCO (Reuters) - Amazon.com Inc's [AMZN.O](#) machine-learning specialists uncovered a big problem: their new recruiting engine did not like women.



NEWS · 24 OCTOBER 2019 · UPDATE 26 OCTOBER 2019

Millions of black people affected by racial bias in health-care algorithms

Study reveals rampant racism in decision-making software used by US hospitals – and highlights ways to correct it.

[Heidi Ledford](#)[PDF version](#)

RELATED ARTICLES

[A fairer way forward for AI in health care](#)



[Bias detectives: the](#)



Do Calgary police face recognition software, body-worn cameras violate your privacy?



By **Jayne Doll & Mia Sosiak** • Global News

Posted November 5, 2014 8:20 pm · Updated November 5, 2014 8:33 pm



-A A+

Calgary police say their body-worn cameras and new face recognition software won't violate the privacy of citizens, despite concerns raised by Alberta's privacy watchdog.

"Police agencies have broad authority under the FOIP act to collect, use and disclose personal information for law enforcement purposes," said Jill Clayton, Alberta's Information and Privacy Commissioner.

"But I have questions regarding how CPS is implementing these technologies, and specifically what steps have been taken to ensure privacy and security risks have been identified and addressed," she added.

What If...

1. The traffic control dept installs sensors in every intersection to count cars
2. The road works dept chooses cameras instead of road sensors because it's cheaper to install and maintain
3. An IT intern uses AI to record the license plates, time and intersection of every car the camera sees as an interesting experiment and leaves it running
4. The police request those records to find a robbery suspect

What If...

1. The traffic control dept installs sensors in every intersection to count cars
2. The road works dept chooses cameras instead of road sensors because it's cheaper to install and maintain
3. An IT intern uses AI to record the license plates, time and intersection of every car the camera sees as an interesting experiment and leaves it running
4. ~~The police request those records to find a robbery suspect~~
5. A hacker secretly has access to those records and posts them to the Internet for anyone to use

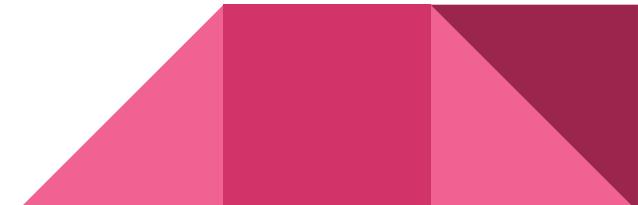
Six Principles Should Guide AI Development

- Fairness
- Reliability and safety
- Privacy and security
- Inclusiveness
- Transparency
- Accountability



Principle of Fairness

“AI systems should treat everyone fairly and avoid affecting similarly situated groups of people in different ways.”



Principle of Fairness

Imagine a hospital emergency room AI system
that prioritized patients in the order of their FICO credit score...
the more money you have, the faster you see a doctor.

Principle of Fairness

Imagine a bank loan AI system
that gave more money to people named Michael
and less money to people named Alice.



Principle of Reliability and Safety

“To build trust, it's critical that AI systems operate reliably, safely, and consistently under normal circumstances and in unexpected conditions.”



Principle of Reliability and Safety

It's so easy to program for the “sunny day”.

The data is never bad. No fields have blanks. No fields have accented characters.
All connected systems are functional.

There is no one trying to intentionally break the system.

Apr 1, 2019, 07:06am EDT | 132,718 views

Hackers Use Little Stickers To Trick Tesla Autopilot Into The Wrong Lane



Thomas Brewster Forbes Staff

[Cybersecurity](#)

Associate editor at Forbes, covering cybercrime, privacy, security and surveillance.



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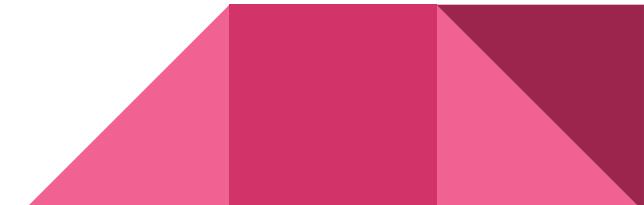


Principle of Reliability and Safety

How does the self-driving car operate at night?
In a rainstorm? In a snowstorm?

How does the military unmanned drone operate when the GPS is down?

How does the self-driving car operate when an object is approaching from the side
instead of the front or back?



Principle of Privacy and Security

Many countries and regions in the world are developing new standards and laws to try to protect the data of its citizens. Laws are always slower than technology.

\$2 off

Coppertone
Water Babies
sunscreen item
Excludes trial size



75¢ off

2- to 5-pk.
Gerber Onesies



75¢ off

Johnson's
baby toiletry or
Desitin item
Excludes trial size and
Johnson's Buddies item



\$1 off

265-ct. Q-tips baby vanity pack
cotton swabs



\$1 off

Boudreaux's
baby care item
Excludes trial size



\$8 off

With purchase of two 1.37-lb. or larger
Similac powder infant formulas



\$1 off

Jurt's Bees
Baby Bee
toiletry item
Excludes trial size



\$1 off

California Baby
• 6.5-oz. natural bug
repellent spray or
• 2.9-oz. SPF 30+
sunscreen lotion or
• 8-oz. SPF 30+
sunblock stick



30¢ off

Ella's Kitchen organic baby food item



Six Principles Should Guide AI Development

- Fairness
- Reliability and safety
- Privacy and security
- Inclusiveness
- Transparency
- Accountability



Principle of Inclusiveness

“At Microsoft, we firmly believe
everyone should benefit from intelligent technology,
meaning it must incorporate and address a broad range
of human needs and experiences.”



Principle of Inclusiveness

How does a voice assistant work for someone who has a speech impediment?

How does a fitness tracker work for someone with a mobility disability?

How does “video-only” product instructions help someone who is blind?



Principle of Transparency

“When AI systems are used to help inform decisions that have tremendous impacts on people's lives, it is critical that people understand how those decisions were made.”



Principle of Transparency

When someone is rejected by an AI system for a job, life insurance or a bank loan, why were they rejected? If you are unable to tell them why, the system lacks transparency and you can't tell if it's operating properly. It could be unfair, and you won't know it.



Principle of Accountability

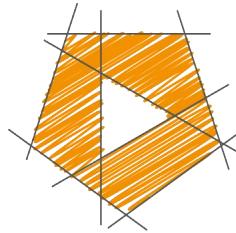
“The people who design and deploy AI systems
must be accountable
for how their systems operate.”



Principle of Accountability

AI systems should not be the “final authority” in any decision that has a major impact on people’s lives - employment, finances, health care, human safety, etc.

There should be regular review of how the AI is operating, and regular improvement of the model.



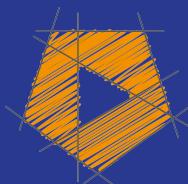
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Exam Tips

Really need to understand for which scenario

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Describe fundamental principles
of machine learning on Azure (25-
30%)

Describe fundamental principles of machine learning on Azure (25—30%)

Identify common machine learning types

- identify regression machine learning scenarios
- identify classification machine learning scenarios
- identify clustering machine learning scenarios

Describe core machine learning concepts

- identify features and labels in a dataset for machine learning
- describe how training and validation datasets are used in machine learning

Describe capabilities of visual tools in Azure Machine Learning Studio

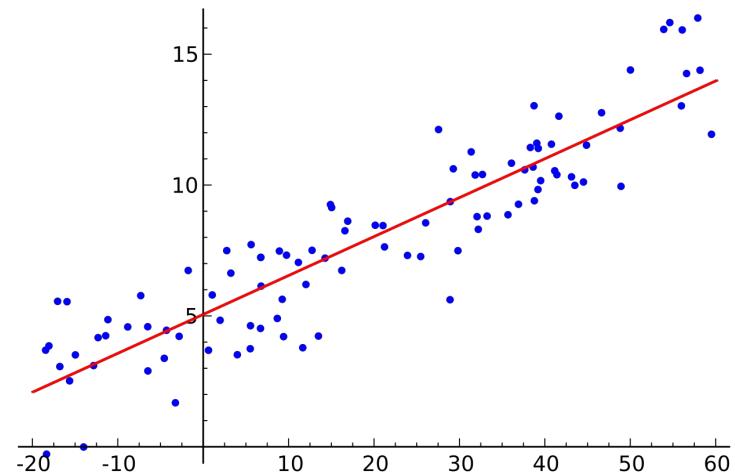
- automated machine learning
- Azure Machine Learning designer

Common Machine Learning Types

Regression

A type of supervised learning

The ability to predict the outcome variable given 1 or more predictor variables.



Result is numeric - price, amount, size, etc.



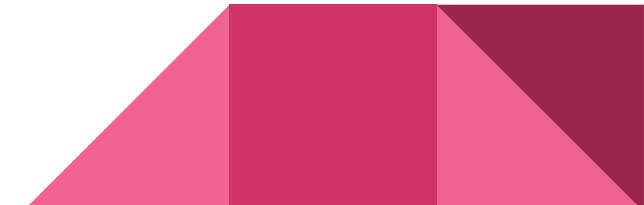
Finds the
relationship
between the
variables

Classification

A type of supervised learning

Cluster analysis - assign a score to the odds of it belonging to a cluster

What type of fruit is this?





Binary classification
only has two answers,
0 and 1



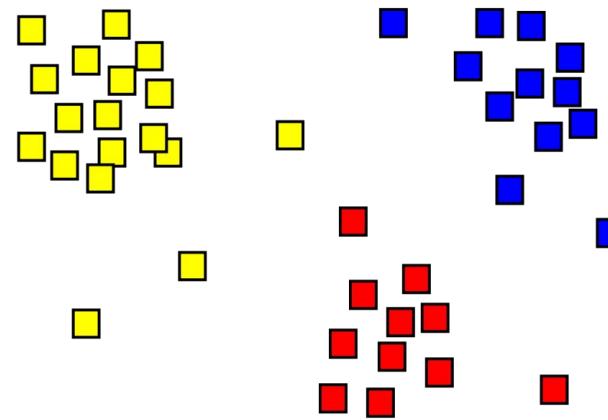
Multi-class
classifications
allow for other
options

Clustering

A type of unsupervised learning

Find groups of related things among data

What traits do my best customers
have in common?

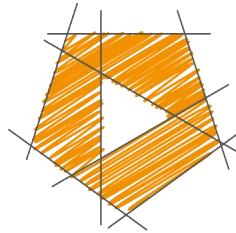


Which is an Example of Regression?

- A) Which movies to recommend to user Joe Smith (ie. Netflix)?
- B) What make and model of car is in this image?
- C) On a scale of 1-10, how happy is someone who makes \$60,000 per year?
- D) Is this email spam or ham?

Which is an Example of Regression?

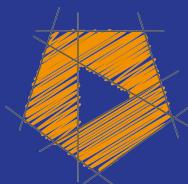
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Core Machine Learning Concepts



Feature is an input
variable



Label is the thing
we're predicting

Features and Labels in a Dataset

Given a pile of data, you (data scientist) need to determine which bits are relevant to make decisions on

- Experiment
- Domain knowledge
- Keep in mind the principles of AI

Examples of Data

- First and last name
- Smoker or non-smoker (feature)
- Date of birth (feature)
- Marital status (feature)
- Gender (feature)
- Annual income (feature?)
- Blood type
- Number of children
- ...
- Life expectancy (label)

Training the Model

The more input (historical) data you have, the more accurate the results

Don't use ALL of your data to train the model

Divide your available labelled data into training and validation/test datasets

Ie. 1,000,000 rows of data - 500K to train the model, 500K to test the model

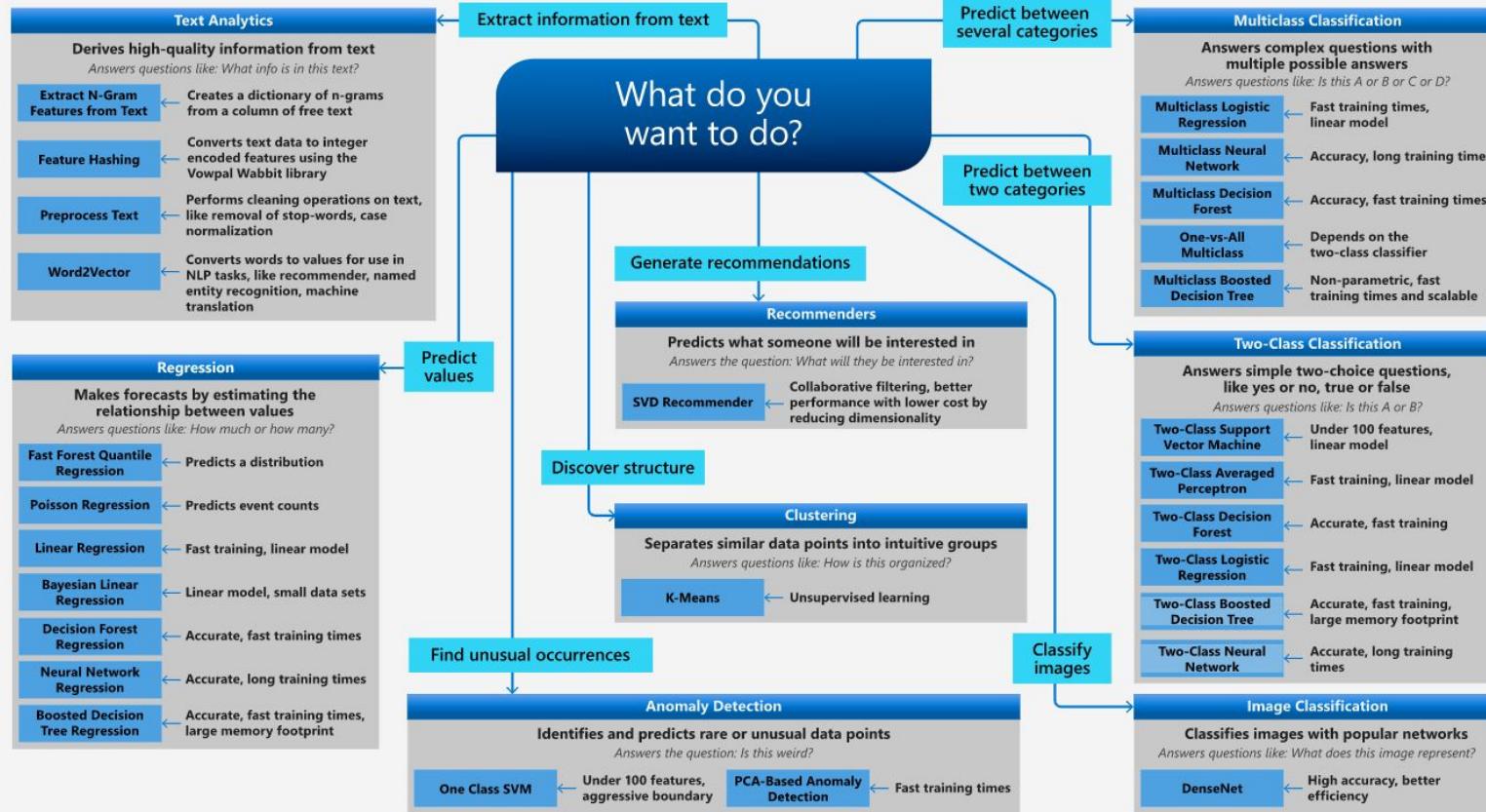


Split the training
and validation
datasets randomly



Microsoft Azure Machine Learning Algorithm Cheat Sheet

This cheat sheet helps you choose the best machine learning algorithm for your predictive analytics solution. Your decision is driven by both the nature of your data and the goal you want to achieve with your data.



Discover structure

Clustering

Separates similar data points into intuitive groups

Answers questions like: *How is this organized?*

K-Means

Unsupervised learning

Cl

Evaluate the Results - Regression

Use the validation dataset to test the model, and measure how close or far the actual results are from the predicted results

Mean Square Error

Large differences are much worse than small differences

Evaluate the Results - Classification

The result is to give a prediction score that the subject is part of the group

“70% confident this is an apple, 30% confident this is a pear”

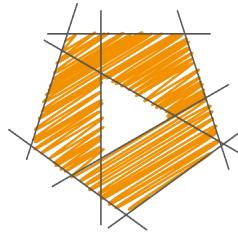
So if an apple is mis-identified as a pear, that's ok as long as it only happens 30% of the time...

False Positives vs False Negatives

Compare true positives with false positives and true negatives with false negatives when evaluating the model

How important is it to you that it never has a false positive?

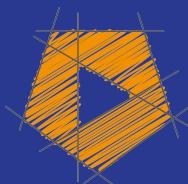
Accuracy vs precision



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Capabilities of No-Code ML

Azure Machine Learning

“Azure Machine Learning is a cloud-based service that helps simplify some of the tasks and reduce the time it takes to prepare data, train a model, and deploy a predictive service.”



Automated Machine Learning (AutoML)

AutoML Steps

1. Identify the problem - classification, regression or time-series forecasting
2. Choose the environment - Python SDK or ML Studio
3. Specify the source and format of the labeled data
4. Configure the compute
5. Configure the AutoML parameters
6. Submit a training run
7. Review the results

Automated machine learning



User inputs



Dataset



Iterations

Training scores



1

Features + Algorithm + Parameters ➔ 50%



2

Features + Algorithm + Parameters ➔ 76%



3

Features + Algorithm + Parameters ➔ 53%



4

Features + Algorithm + Parameters ➔ 95%

...



n

Features + Algorithm + Parameters ➔ 43%

Leaderboard		
Rank	Model	Score
1		95%
2		76%
3		53%



Video Showing AutoML

Azure ML Designer



Another no-code
approach to model
design



Drag the dataset
onto the designer
canvas



Visualize the data



Exclude columns
that are not going
to be useful for
training



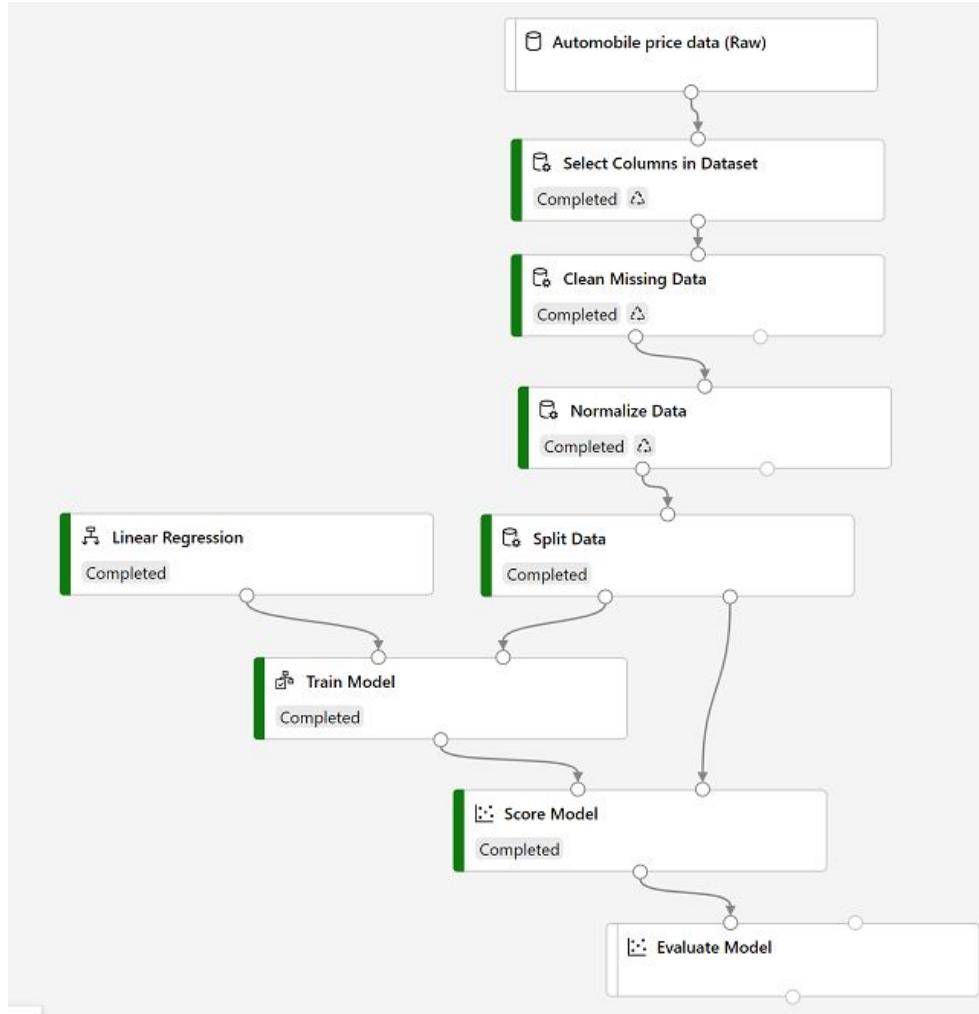
Clean rows with missing data from training



Normalize the data
to make it more
useful through
transformations



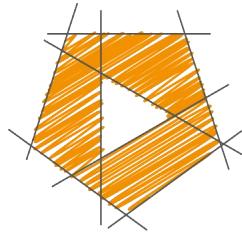
Drag training
models onto the
canvas





Training pipeline
can be converted to
the inference
pipeline

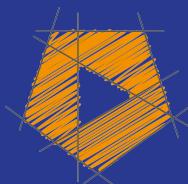




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Describe features of computer
vision workloads on Azure
(15-20%)

Describe features of computer vision workloads on Azure (15—20%)

Identify common types of computer vision solution

- identify features of image classification solutions
- identify features of object detection solutions
- identify features of optical character recognition solutions
- identify features of facial detection, facial recognition, and facial analysis solutions

Identify Azure tools and services for computer vision tasks

- identify capabilities of the Computer Vision service
- identify capabilities of the Custom Vision service
- identify capabilities of the Face service
- identify capabilities of the Form Recognizer service

Computer Vision Features

Image Classification



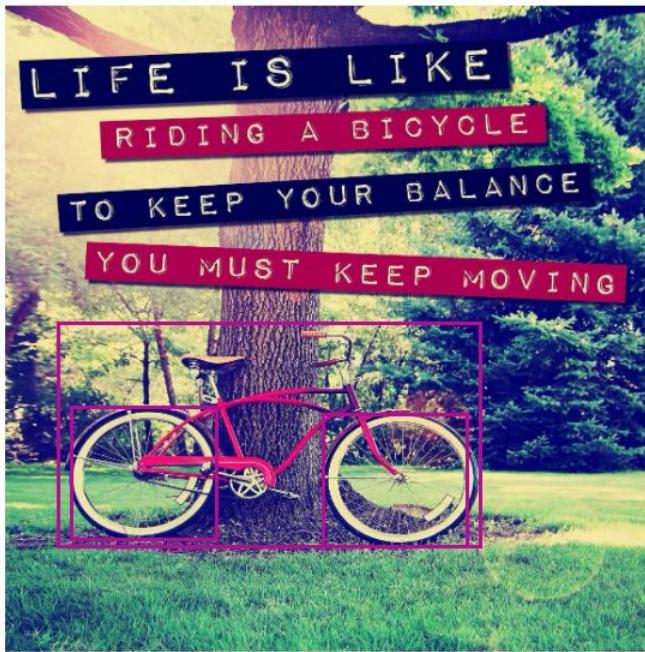
Car

Object Detection



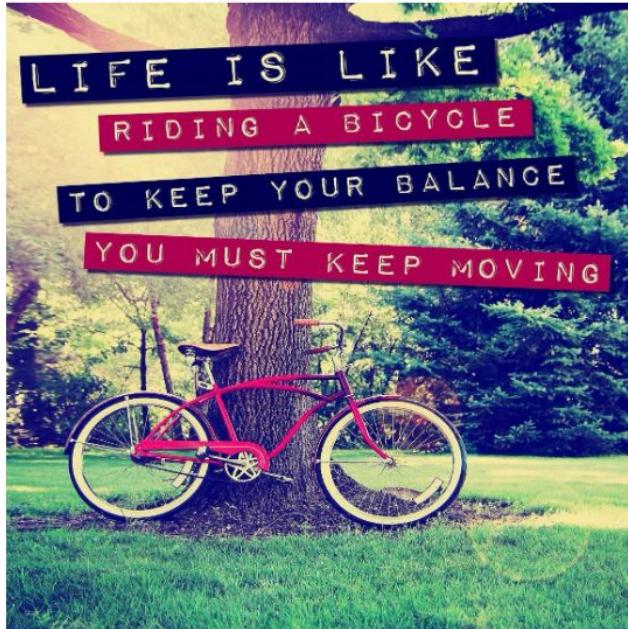
FEATURE	VALUE
NAME:	
Objects	<pre>{ "rectangle": { "x": 866, "y": 1514, "w": 1359, "h": 1168 }, "object": "Maple", "parent": { "object": "tree", "parent": { "object": "plant", "confidence": 0.808 }, "confidence": 0.641 }, "confidence": 0.627 }</pre>
Tags	<pre>[{ "name": "grass", "confidence": 0.9999995 }, { "name": "outdoor", "confidence": 0.979063153 }, { "name": "autumn", "confidence": 0.9517902 }, { "name": "green", "confidence": 0.84434 }, { "name": "maple", "confidence": 0.836734951 }, { "name": "plant", "confidence": 0.824939132 }, { "name": "fall", "confidence": 0.726369739 }, { "name": "laying", "confidence": 0.714074731 }, { "name": "leaf", "confidence": 0.6680558 }, { "name": "flower", "confidence": 0.642228246 }, { "name": "maple leaf", "confidence": 0.57402 }]</pre>

Object Detection



FEATURE NAME:	VALUE
Objects	<pre>[{ "rectangle": { "x": 112, "y": 711, "w": 269, "h": 243 }, "object": "Bicycle wheel", "parent": { "object": "Wheel", "confidence": 0.775 }, "confidence": 0.574 }, { "rectangle": { "x": 566, "y": 723, "w": 268, "h": 243 }, "object": "Wheel", "confidence": 0.585 }, { "rectangle": { "x": 96, "y": 568, "w": 759, "h": 409 }, "object": "bicycle", "parent": { "object": "cycle", "parent": { "object": "Land vehicle", "parent": { "object": "Vehicle", "confidence": 0.928 }, "confidence": 0.927 }, "confidence": 0.923 }, "confidence": 0.91 }]</pre>
Tags	<pre>[{ "name": "text", "confidence": 0.9999137 }, { "name": "grass", "confidence": 0.999893069 }, { "name": "outdoor", "confidence": 0.9880197 }, { "name": "bicycle", "confidence": 0.9697467 }, { "name": "bicycle wheel", "confidence": 0.8976265 }, { "name": "sign", "confidence": 0.842304468 }, { "name": "bike", "confidence": 0.842304468 }]</pre>

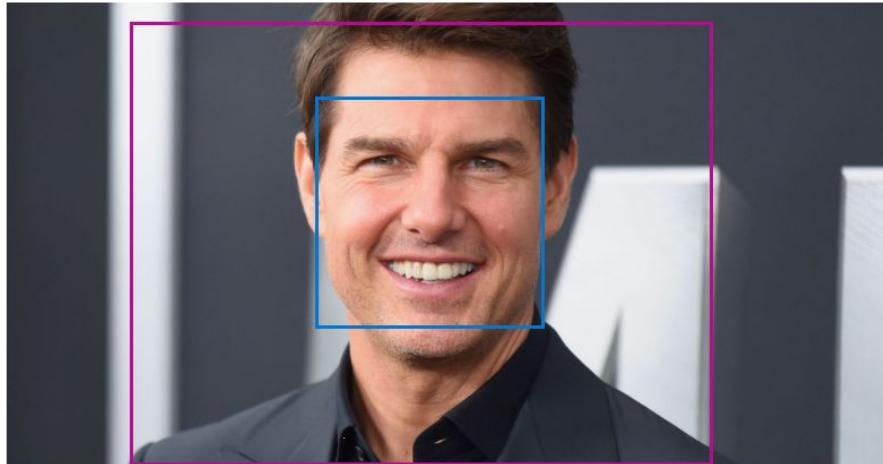
Optical Character Recognition



Preview JSON

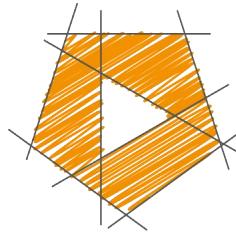
LIFE
IS
LIKE
RIDING
A BICYCLE
TO
KEEP
YOUR BALANCE
YOU MUST KEEP MOVING

Facial Detection and Recognition



	<pre>"confidence": 0.692408264 }, { "name": "forehead", "confidence": 0.6696403 }, { "name": "shirt", "confidence": 0.645371258 }, { "name": "face", "confidence": 0.5145748 }, { "name": "eyebrow", "confidence": 0.5063325 }, { "name": "posing", "confidence": 0.479296565 }, { "name": "male", "confidence": 0.275576472 }]</pre>
Description	<pre>{ "tags": ["person", "man", "necktie", "wearing", "indoor", "suit", "smiling", "looking", "shirt", "camera", "posing", "front", "jacket", "standing", "business", "glasses", "male", "holding", "neck", "young", "blue", "sign"], "captions": [{ "text": "Tom Cruise wearing a suit and tie smiling and looking at the camera", "confidence": 0.973894 }] }</pre>
Image format	"Jpeg"
Image dimensions	630 x 1200

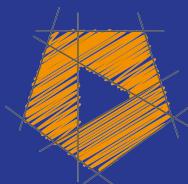
Facial Recognition
+ Facial Attributes
are special
categories that
requires approval



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Computer Vision Tools



In Azure, you can
use **Computer**
Vision service,
or you can use
Cognitive Services

Cognitive Services

includes many
other services
under one umbrella



All services require
a **KEY** and an
ENDPOINT

Computer Vision Service

Pre-trained ML model

Can recognize over 10,000 objects

Can generate automatic captions for images and tags

Content moderation for adult, racy or gory content

Detect faces

Text recognition



Custom Vision Service

A model that you can build and train

Classification or object detection

Upload an existing data set of images and classes

Publish the model so that you and others can use it



Custom Vision
service separates
out **training** and
prediction into two
resources

Face Service

Can recognize a human face in an image

Returns the rectangle coordinates of those 1 or more faces

Can recognize celebrities

Needs to be trained on your own data

CONSUMER

Cadillac Fairview suspends use of facial recognition cameras at Calgary malls



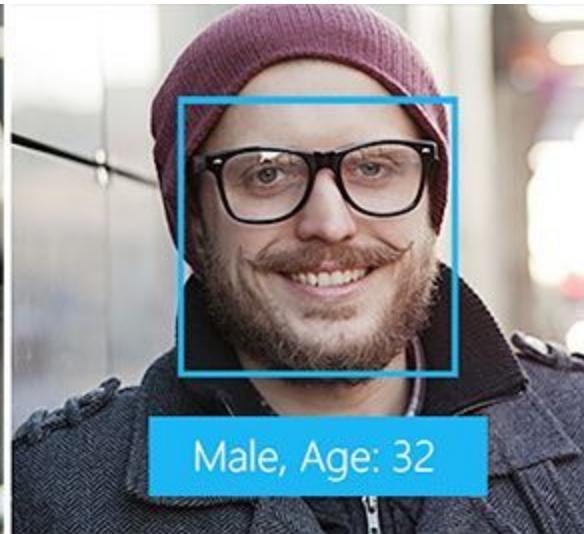
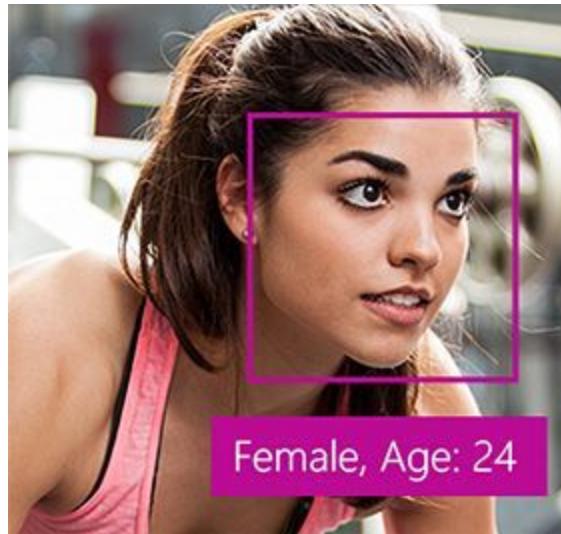
By **Kaylen Small** • Global News

Posted August 5, 2018 4:22 pm



Directories in Chinook Centre are suspending use of facial recognition software. **Blake Lough / Global News**

Azure Face Service - Face Detection



Azure Face Service - Face Verification

To compare one face against a known face, to identify if they belong to the same person.

Azure Face Service - Similar Faces



(a)



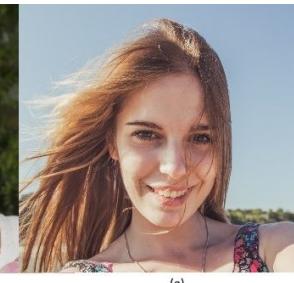
(b)



(c)



(d)



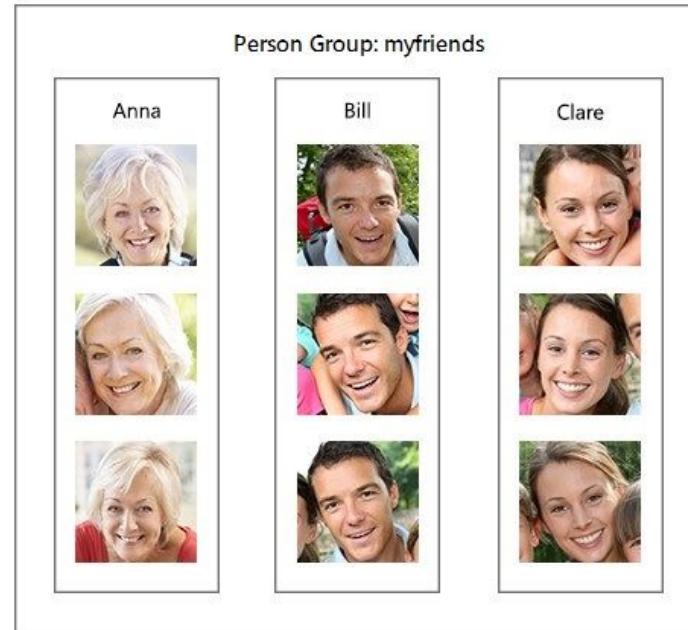
(e)

Azure Face Service - Face Grouping

Divides a set of unknown faces into groups based on similarity. All faces of each group are likely to belong to the same person.

Also supports differentiating by another factor such as expression.

Azure Face Service - Identify API



Form Recognizer Service

The diagram illustrates the process of extracting data from a scanned document using the Form Recognizer Service. On the left, a scanned invoice from 'CONTOSO LTD.' is shown. The document contains various address fields, a table of services with quantities and prices, and a summary table at the bottom. On the right, the extracted JSON data is displayed, showing the structure and confidence levels for each identified element.

INVOICE

CONTOSO LTD.

Contoso Headquarters
123 456th St
New York, NY, 10001

Microsoft Corp
123 Other St,
Redmond WA, 98052

BILL TO:
Microsoft Finance
123 Bill St,
Redmond WA, 98052

SHIP TO:
Microsoft Delivery
123 Ship St,
Redmond WA, 98052

SERVICE ADDRESS:
Microsoft Services
123 Service St,
Redmond WA, 98052

INVOICE: INV-100
INVOICE DATE: 17/15/2019
DUUE DATE: 17/15/2019
CUSTOMER NAME: MICROSOFT CORPORATION
SERVICE PERIOD: 07/14/2019 – 17/14/2019
CUSTOMER ID: 123456789

SALESPERSON	P.O. NUMBER	REQUISITIONER	SHIPPED VIA	F.O.B. POINT	TERMS
ROBESON					

QUANTITY	DESCRIPTION	UNIT PRICE	TOTAL
1	Consulting service	1	\$100.00

SUBTOTAL
\$100.00
SALES TAX
\$10.00
TOTAL
\$110.00
PREVIOUS UNPAID BALANCE
\$500.00
TOTAL DUE
\$610.00

THANK YOU FOR YOUR BUSINESS!

REMIT TO:
Contoso Billing
123 Remit St
New York, NY, 10001

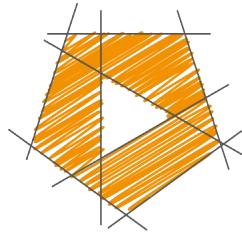
Invoiceld: {
 "type": "string",
 "valueString": "INV-100",
 "text": "INV-100",
 "boundingBox": [
 7.4926,
 1.4203,
 7.9938,
 1.4203,
 7.9938,
 1.5198,
 7.4926,
 1.5198
],
 "page": 1,
 "confidence": 0.999,
 "elements": [
 "#/readResults/0/lines/3/words/1"
]
},
"VendorAddress": {
 "type": "string",
 "valueString": "123 456th St New York, NY, 10001",
 "text": "123 456th St New York, NY, 10001",
 "boundingBox": [
 0.594,
 1.6077,
 1.9918,
 1.9918
]
}

Form Recognizer Service

Ideal for invoices and receipts

Pre-built model or custom model

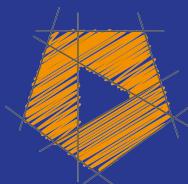
Pre-built model recognizes common receipt formats, English in USA



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Describe features of NLP
workloads on Azure (25-30%)

Describe features of Natural Language Processing (NLP) workloads on Azure (25—30%)

Identify features of common NLP Workload Scenarios

- identify features and uses for key phrase extraction
- identify features and uses for entity recognition
- identify features and uses for sentiment analysis
- identify features and uses for language modeling
- identify features and uses for speech recognition and synthesis
- identify features and uses for translation

Identify Azure tools and services for NLP workloads

- identify capabilities of the Language service
- identify capabilities of the Speech service
- identify capabilities of the Translator service

Identify considerations for conversational AI solutions on Azure

- identify features and uses for bots
- identify capabilities of the Azure Bot service

NLP Workload Scenarios



Understands
written and spoken
language

Key Phrase Extraction

Identifying the main points of a document; context

“When I was shovelling snow in my driveway earlier today, I cut my finger. It wasn’t a deep cut, and I will be ok. But it’s a bit painful. Snow isn’t fun sometimes.”

- Shovelling snow
- Cut my finger
- I will be ok
- A bit painful
- Snow isn’t fun

Entity Recognition

Identifying “entities” of a document; items categorized by type and subtype

“When I was shovelling snow in my driveway earlier today, I cut my finger. It wasn’t a deep cut, and I will be ok. But it’s a bit painful. Snow isn’t fun sometimes.”

Snow, driveway, finger - objects

Earlier today - date

Driveway - location



Can also return
links to wikipedia
for relevant entries
i.e. “snow”

Sentiment Analysis

Pre-built ML model

Sentiment score from 0 to 1 - 1 being positive sentiment

“I thought the steak here was awesome and the staff was super friendly.”

Vs

“The steak was tough and the service was a bit slow. Not a great experience”.

Language Modeling

Build your own dictionary for terms in your industry

Train the language understanding engine for your own use

Speech Recognition and Synthesis

Speech recognition - the ability to detect and interpret speech

Speech synthesis - the ability to generate spoken output

Speech-to-text and text-to-speech

Translation

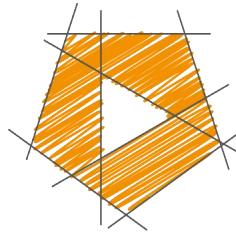
Supports over 60 languages

Getting better all the time

Understands semantic context

“Café da manhã” in Portuguese literally translates to “coffee of the morning” in English, but really means “breakfast” - the meal, nothing to do with coffee





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NLP Workload Tools

Language Service (fmr Text Analytics)

All of the Azure services that include key phrase extraction, entity detection, and sentiment analysis

It can detect the language of text

Can detect when text has multiple languages and identify the predominant language

Returns **NaN** when it can't determine

Language Service, formerly Language Understanding Service (LUIS)

Understanding natural language

Three core concepts:

1. Utterances
2. Entities
3. Intents

Language Service - Utterances

An example of something a user will say:

“What time are you open until?”

“When do you close?”

“What time do you close today?”

“What is the latest you are open until?”

Language Service - Entities

An item to which an utterance refers:

“What time do you close today?”

- **Today** (DateTime)
- **You** (subject)

Language Service - Intents

The purpose or goal expressed by the user

Things your application is able to do

“What time do you close today?”

Goal: **TodayHoursOfOperation**

Language Service - Intents

Sometimes, there is no intent

Questions you don't even want your AI to try to answer.

“What is the meaning of life?”

“How do teach a dog to walk himself?”

Speech Service

Text to speech

Speech to text

Audio translation

“Custom voice models”

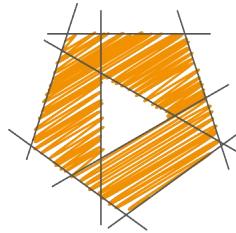


Translator Text Service

Translate text between 70 languages

Custom models for specific industries / terms

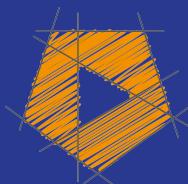
Can detect the language being passed in



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Conversational AI Solutions

hi

User

Hello

Bot

lights won't turn on

User

Check the connection to the wall outlet to make sure it's
plugged in properly.

Bot at 10:58:38 AM

My smart light app stopped responding

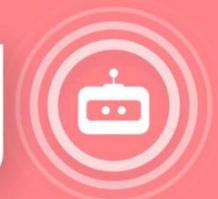
User

Restart the app. If the problem persists, contact support.

Bot at 11:46:00 AM



Hi there, how may I help
you today?







Conversational AI
allows a human and
a computer to talk



Typically called
agents, or bots



Azure Bots can
operate over the
web, email, social
media, and voice

Do You Know You're Talking to a Bot?

Artificial Intelligence ›

The Bot That Writes

Are These People Real?

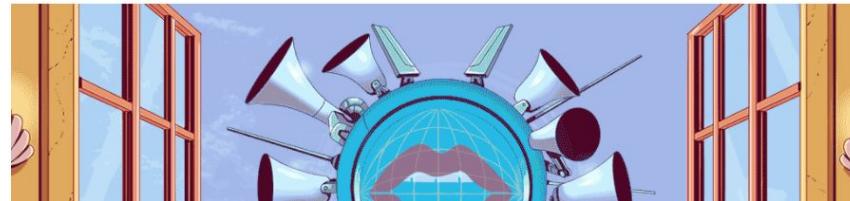
Algorithms Against Suicide

Robots Without Bias

TECH FIX

Google's Duplex Uses A.I. to Mimic Humans (Sometimes)

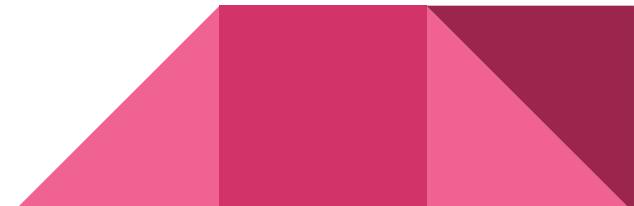
In a free service, bots call restaurants and make reservations. The technology is impressive, except for when the caller is actually a person.

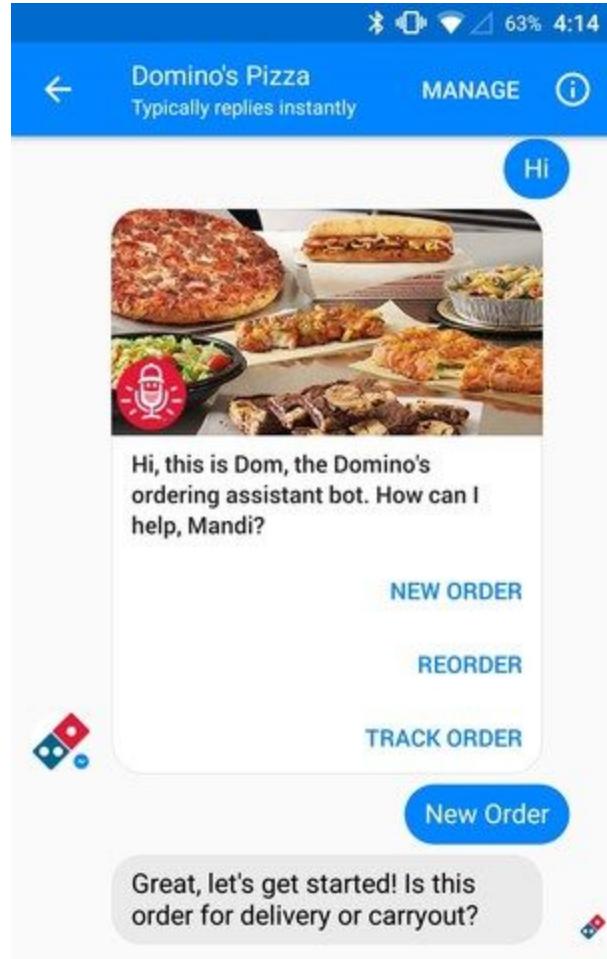


Conversational AI Use Cases

Webchat Bots

- Appear on a website or social media app
- Understands and responds to written text
- A limited scope of conversation
- Often friendly tone, called “chit chat”





Telephone Voice Menus

Speech recognition and speech synthesis

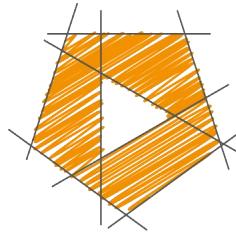
Conversational banking

Personal Digital Assistants

OK Google - when is my next appointment?

Hey Alexa - what time is the movie tonight?

Yo yo, Bing - tell Mom that I'll be home this weekend from college



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Conversational AI Services

hi

User

Hello

Bot

lights won't turn on

User

Check the connection to the wall outlet to make sure it's
plugged in properly.

Bot at 10:58:38 AM

My smart light app stopped responding

User

Restart the app. If the problem persists, contact support.

Bot at 11:46:00 AM

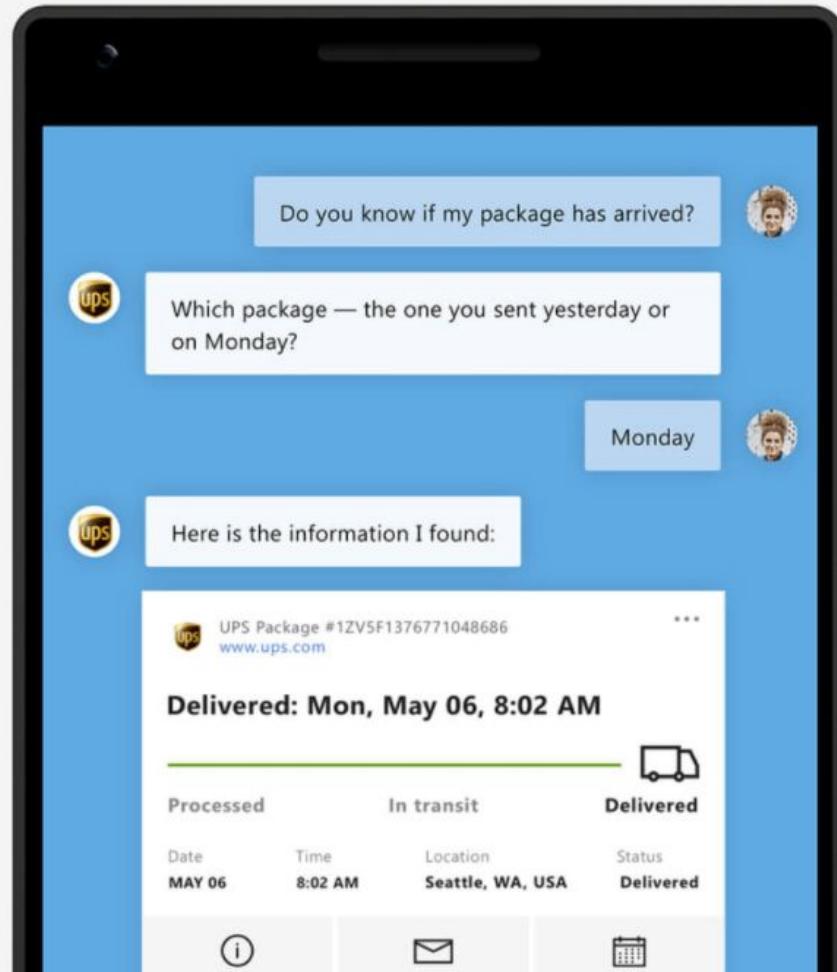
Azure Bot Service

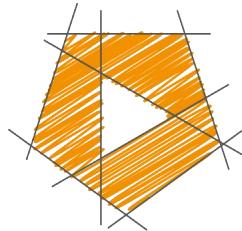
Enterprise-grade chat bots

Start simply and grow in sophistication

Coded chat bots



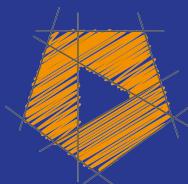




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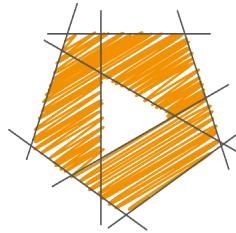
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Thank you and best of luck!



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