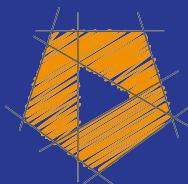


AI-900 Microsoft Azure AI Fundamentals

Scott Duffy, Instructor



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<http://sjd.ca/ai900>

Apr 2024 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

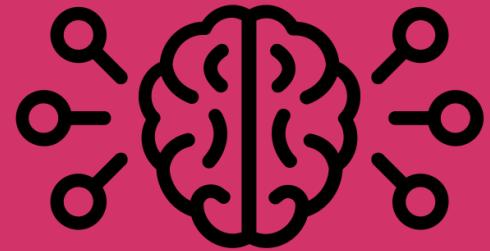
- Describe AI workloads and considerations
- Describe fundamental principles of machine learning on Azure
- Describe features of computer vision workloads on Azure
- Describe features of Natural Language Processing (NLP) workloads on Azure
 - Describe features of generative AI workloads on Azure

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?

Azure OpenAI Service

Documents

Search

Bots

Vision

Audio and Video

Speech

Decision *

Language

Metrics *

Translator

Immersive Reader



CERTIFICATION

Microsoft Certified: Azure AI Fundamentals

Demonstrate fundamental AI concepts related to the development of software and services of Microsoft Azure to create AI solutions.



At a glance



Level

[Beginner](#)



Role

[AI Engineer](#)



Last Updated

04/25/2024



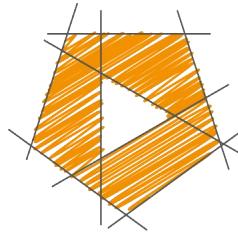
Product

[Azure](#)



Subject

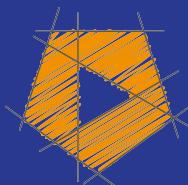
[Artificial intelligence](#)



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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."



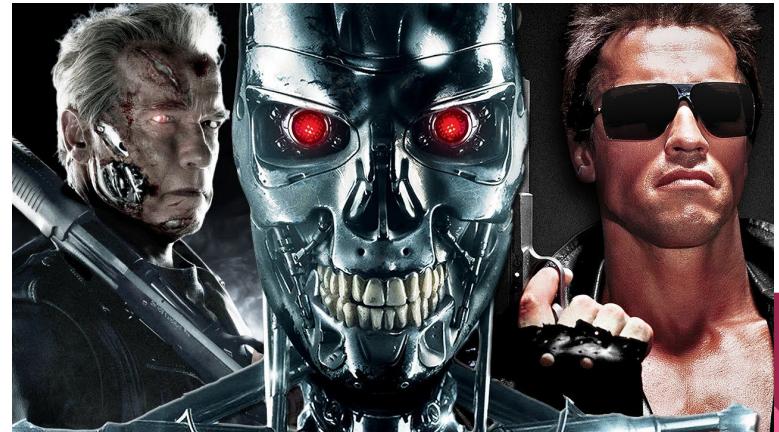
Incorporating human intelligence into machines

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

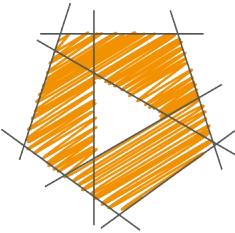


By **Kaylen Small** • Global News

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”

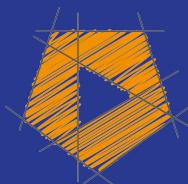


You evaluate a
model using “test
data” to measure
how accurate is it

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

AI-900 Microsoft Azure AI Fundamentals

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Describe AI Workloads and Considerations (15-20%)

Describe Artificial Intelligence workloads and considerations (15–20%)

Identify features of common AI workloads

- ~~• Identify features of data monitoring and anomaly detection workloads~~
- Identify features of content moderation and personalization workloads
- Identify computer vision workloads
- Identify natural language processing workloads
- Identify knowledge mining workloads
- Identify document intelligence workloads
- Identify features of generative AI workloads

Identify guiding principles for responsible AI

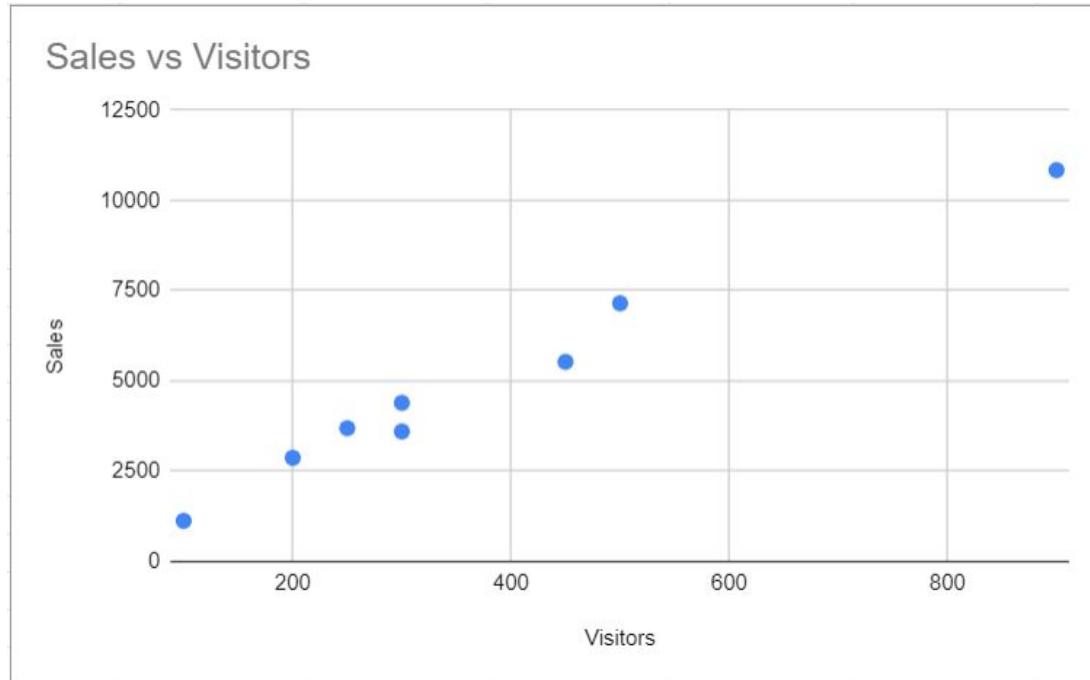
- Describe considerations for fairness in an AI solution
- Describe considerations for reliability and safety in an AI solution
- Describe considerations for privacy and security in an AI solution
- Describe considerations for inclusiveness in an AI solution
- Describe considerations for transparency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

Common AI Workloads

1. Prediction and Demand Forecasting

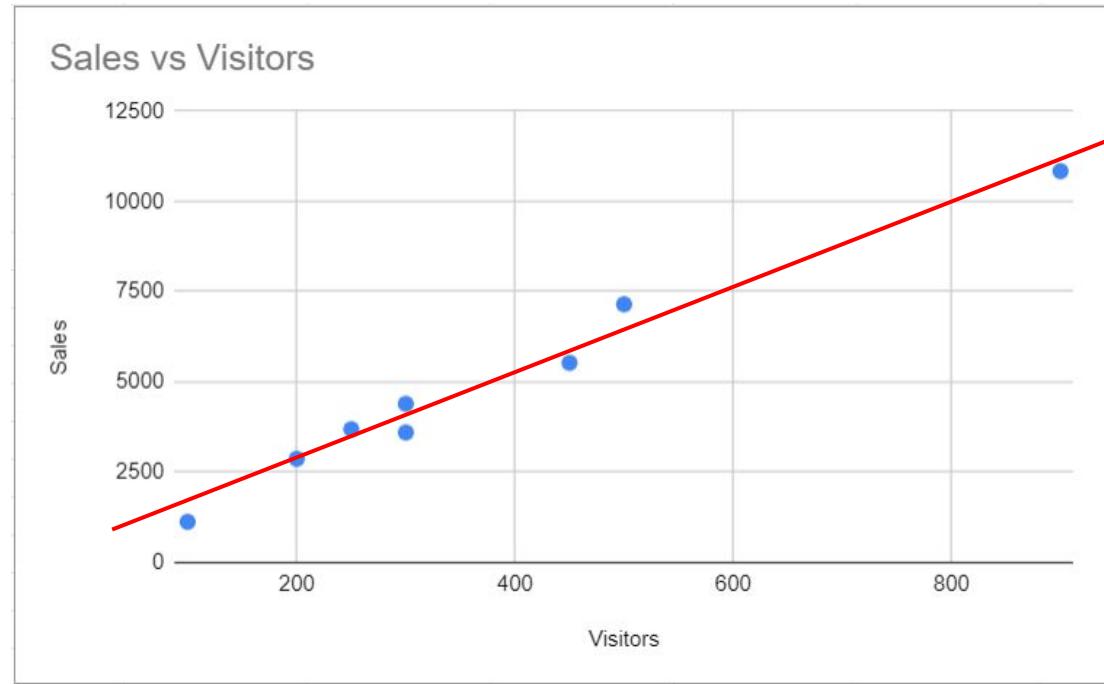
| <u>Visitors</u> | <u>Sales</u> |
|-----------------|--------------|
| 100 | 1125 |
| 200 | 2871 |
| 300 | 3600 |
| 500 | 7150 |
| 450 | 5529 |
| 300 | 4393 |
| 900 | 10837.5 |
| 250 | 3691.5 |
| 786 | ? |
| 362 | ? |
| 121 | ? |

Prediction and Demand Forecasting



Prediction and Demand Forecasting

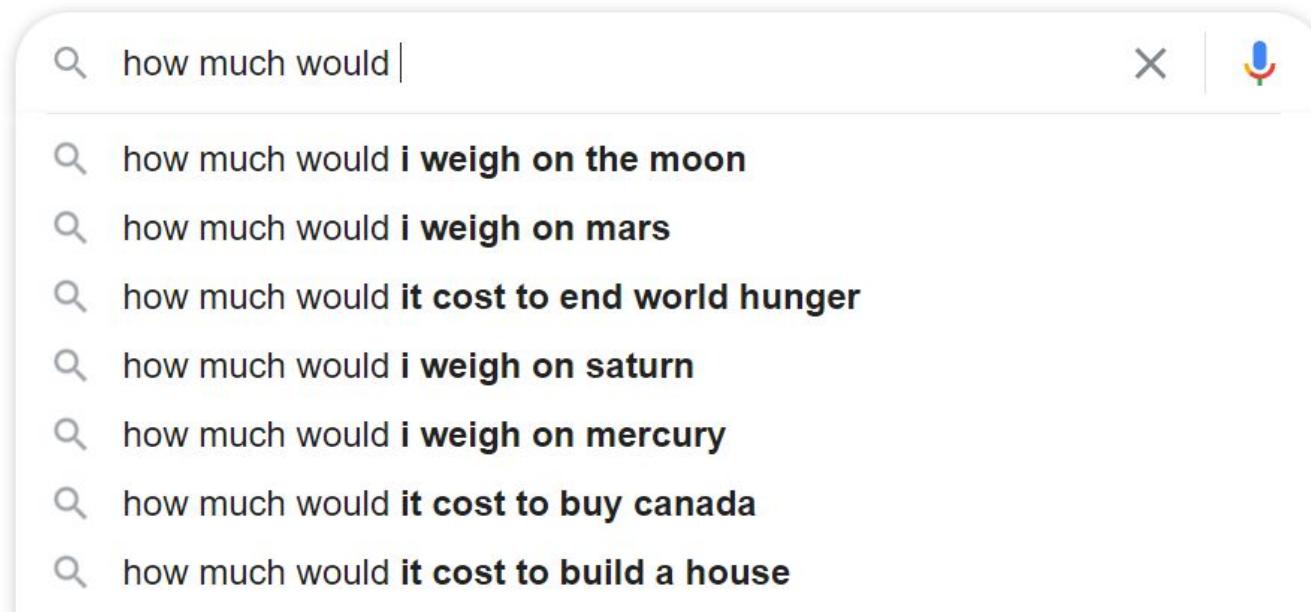
| Visitors | Sales |
|----------|---------|
| 100 | 1125 |
| 200 | 2871 |
| 300 | 3600 |
| 500 | 7150 |
| 450 | 5529 |
| 300 | 4393 |
| 900 | 10837.5 |
| 250 | 3691.5 |
| 786 | ? |
| 362 | ? |
| 121 | ? |



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



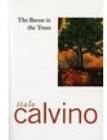
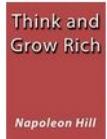
TV Mysteries



Irreverent TV Shows



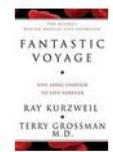
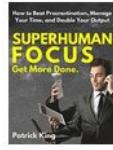
Recommended for you, Thomas



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

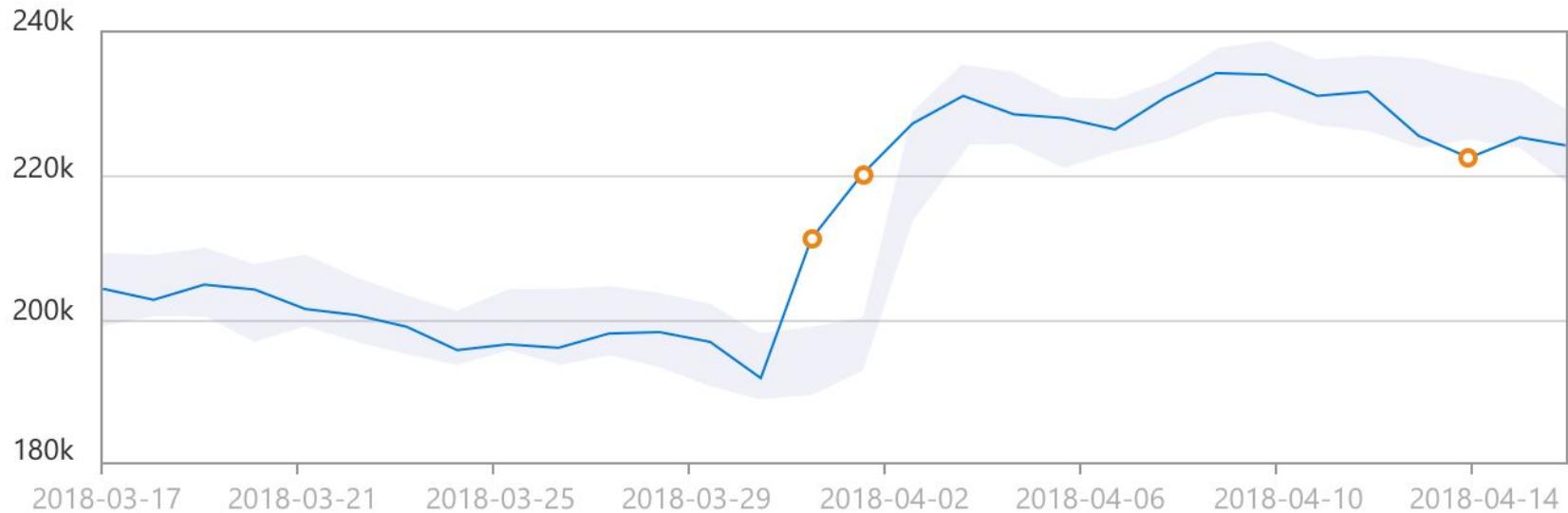


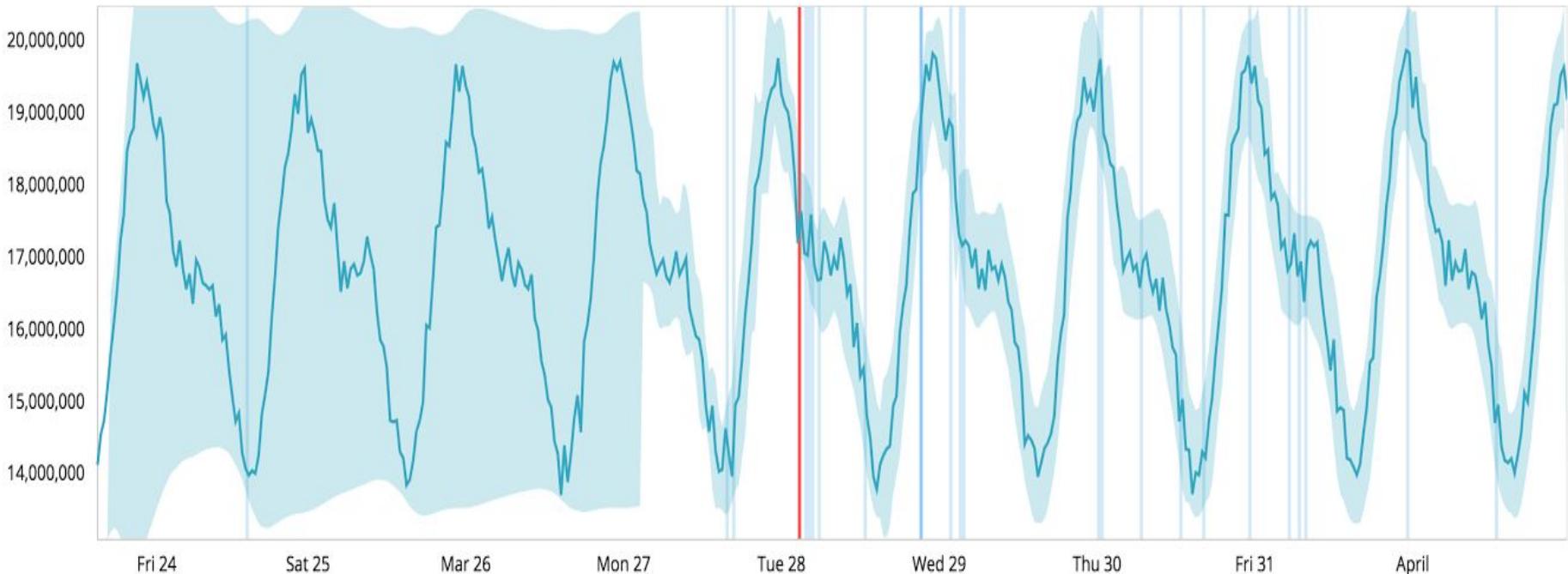
Biographies & Memoirs
17 ITEMS



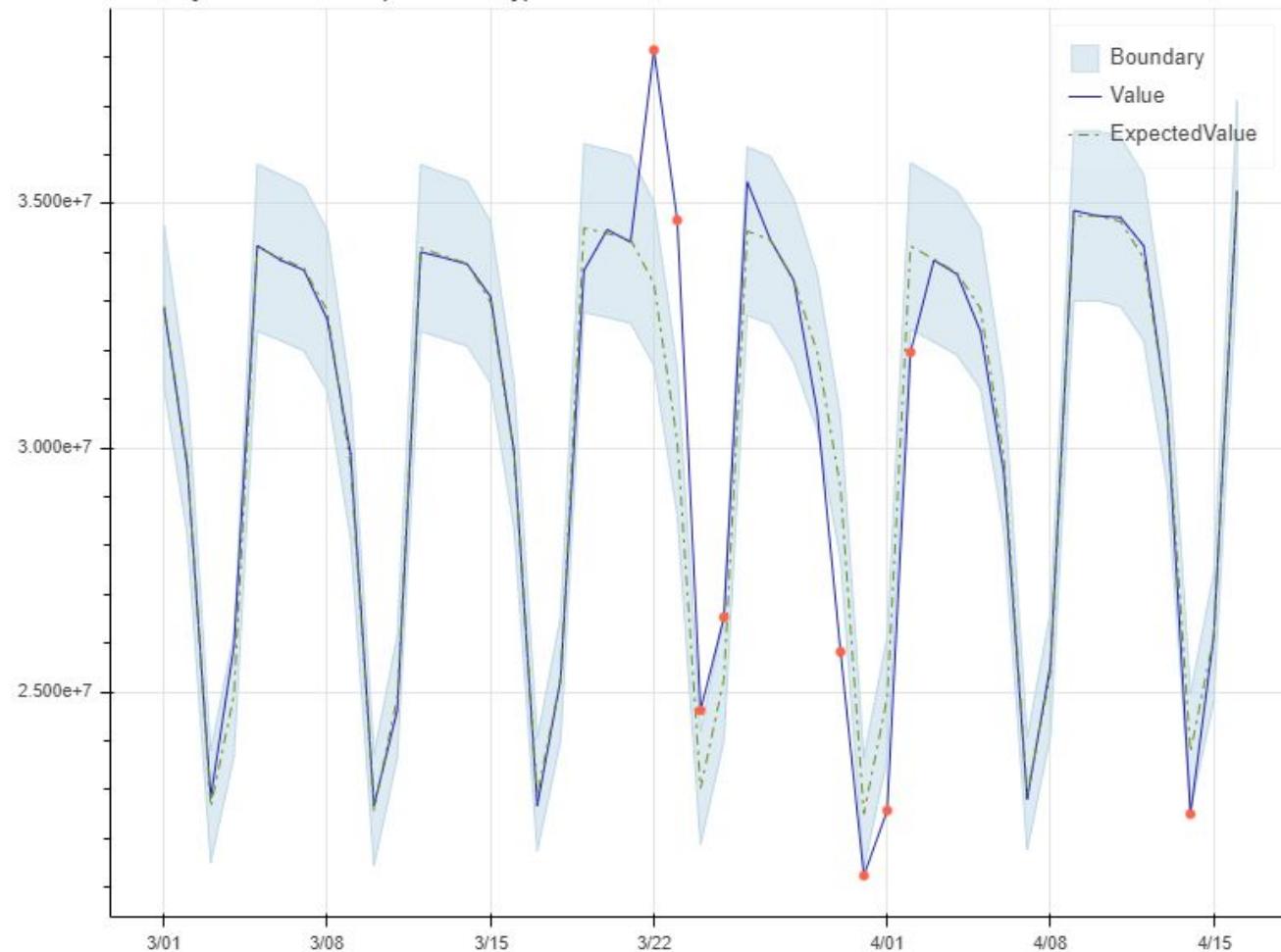
Engineering Books
7 ITEMS

2. Anomaly Detection

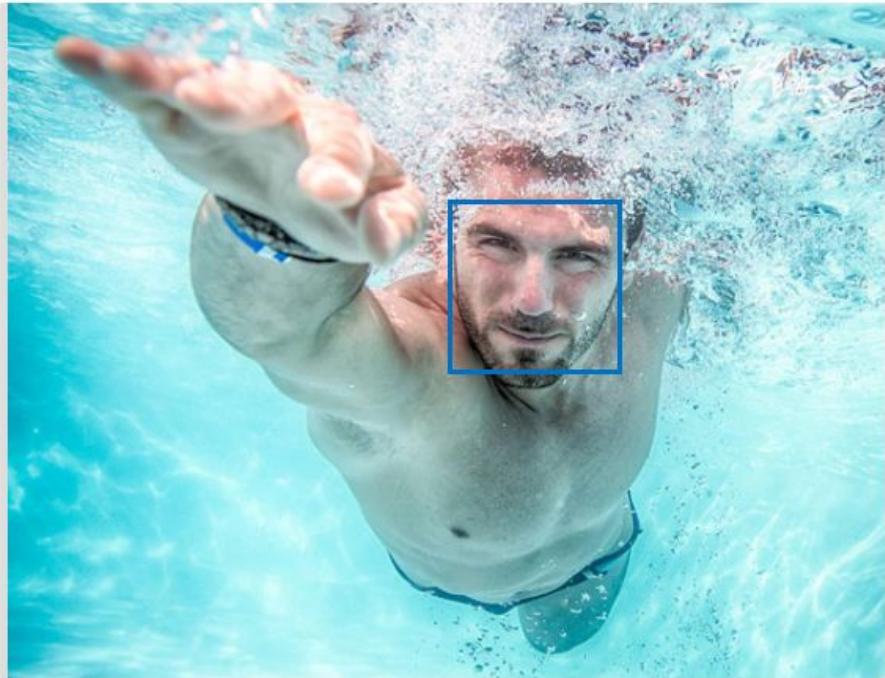




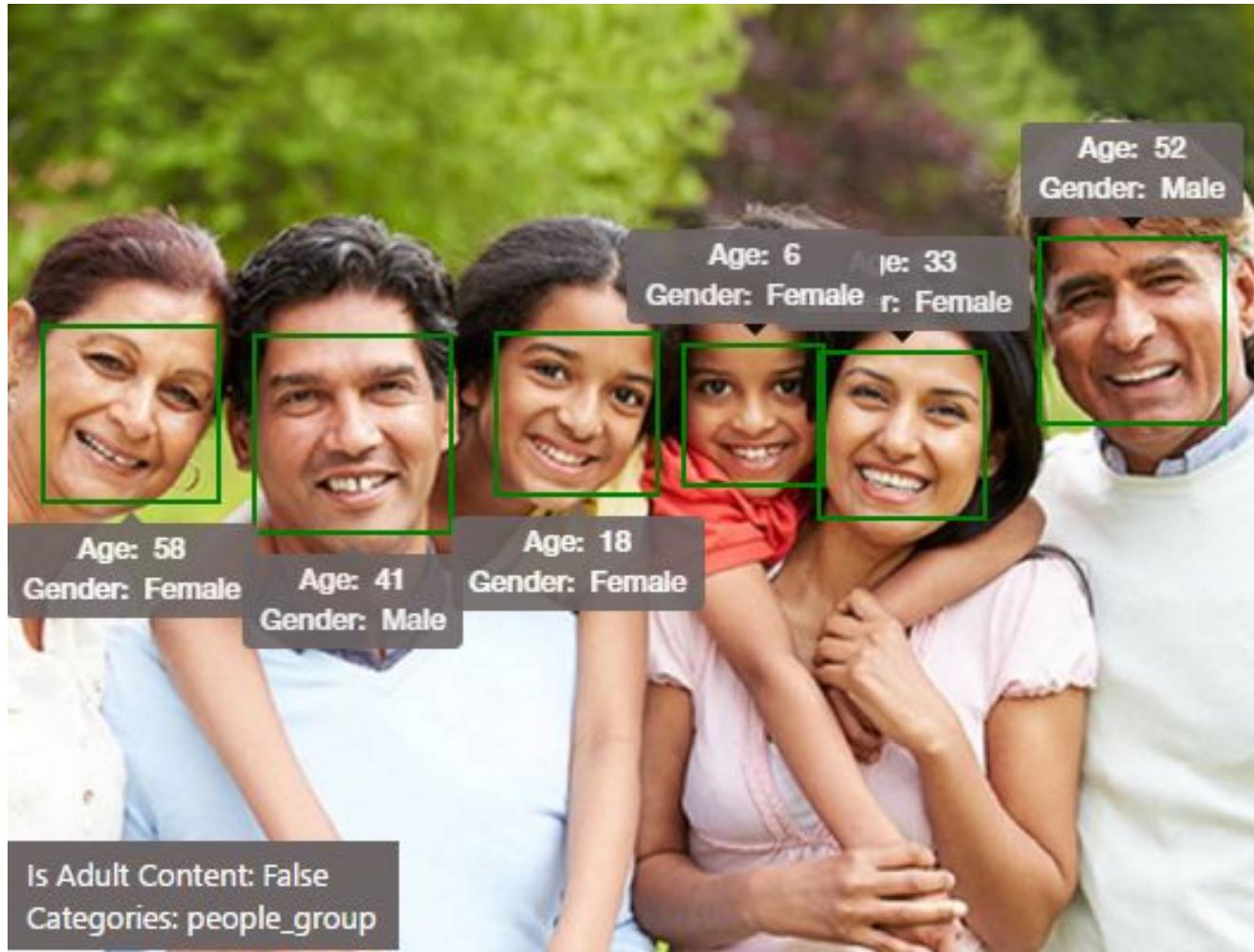
Anomaly Detector Result (95 Sensitivity)



3. Computer Vision

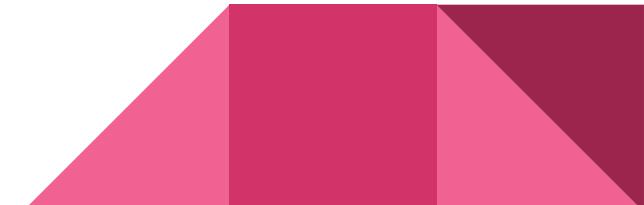


| FEATURE | VALUE |
|--------------|--|
| Name: | |
| Description | { "tags": ["water", "swimming", "sport", "pool", "person", "man", "frisbee", "ocean", "blue", "bird", "riding", "top", "standing", "wave", "young", "body", "large", "game", "glass", "pond", "playing", "board", "catch", "clear", "boat", "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?



5. 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

6. Content Moderation

Find profanity, adult, hateful, offensive, violent or phishing links in text, video, and images

Multi-lingual support

You can set the severity levels to allow some free/open discussion

For places in your apps where users can post, like reviews and comments

[Configure filters](#)[Use blocklist](#)[View code](#)

Set the severity thresholds for each category and select Run test to see how the results change.

[Reset to default](#)

Severity ⓘ

SAFE

LOW

MEDIUM

HIGH

Violence ⓘ



Self-harm ⓘ



Sexual ⓘ



Hate ⓘ



7. Generative AI

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?

...



DALL-E History Collections

...

S

Edit the detailed description

Surprise me

Upload



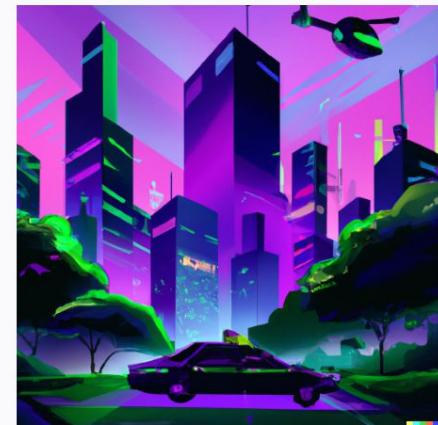
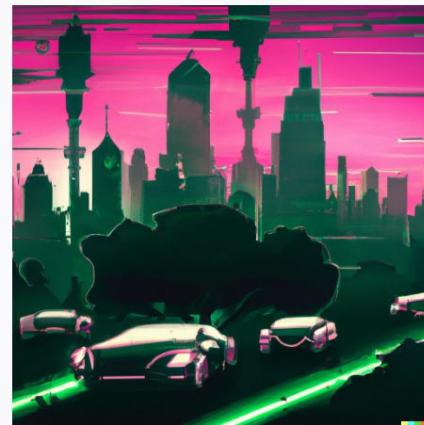
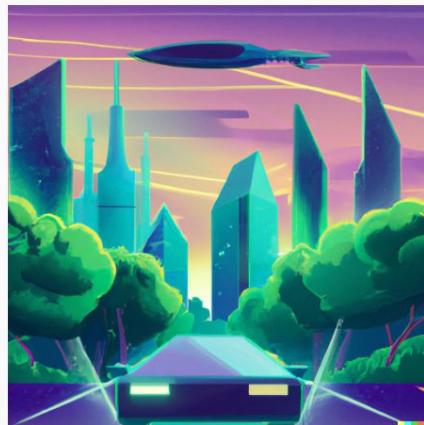
realistic, futuristic, cityscape, vibrant, full of life, green, trees, flying cars, skyline, synthwave

Generate

You have 10 credits left.



15 free credits will refill on November 1 or you can buy more credits now.



Report issue



i was thinking about inviting about 10 adult friends over for thanksgiving dinner. there will be 5 men and 5 women plus me. i was planning to have turkey, stuffing, vegetables, mashed potatoes, gravy, maybe some ham for those that don't like turkey. what other suggestions do you have for foods to prepare and how much of each food should i make?



Hosting Thanksgiving dinner for 11 adults sounds wonderful! Here's a detailed guide with additional food suggestions, serving sizes, and preparation tips:

Additional Food Suggestions

1. Appetizers:

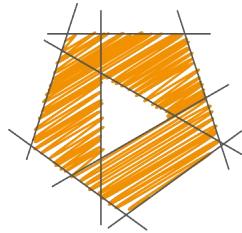
- Cheese and Charcuterie Board: Include cheeses, cured meats, crackers, and fruits (e.g., grapes, figs, or dried apricots).
- Deviled Eggs
- Vegetable Platter with Dip: Carrots, celery, cherry tomatoes, and bell pepper slices with ranch or hummus.
- Stuffed Mushrooms



2. Side Dishes:

Message ChatGPT

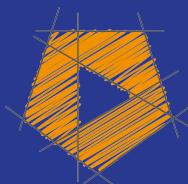




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Scott Duffy, Instructor



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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

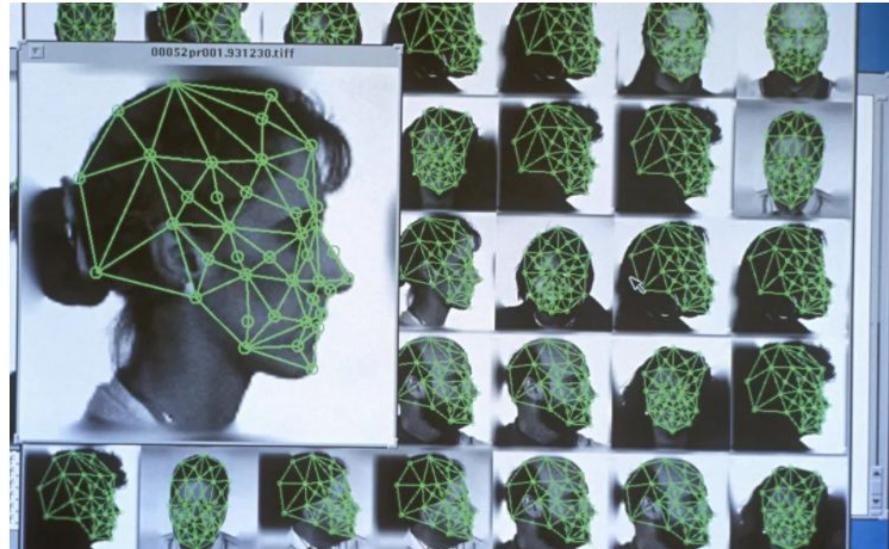
Good luck if you're a woman or a darker-skinned person.



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](#)[!\[\]\(e369eb1a2079205109279dfd8ba24a66_img.jpg\) 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

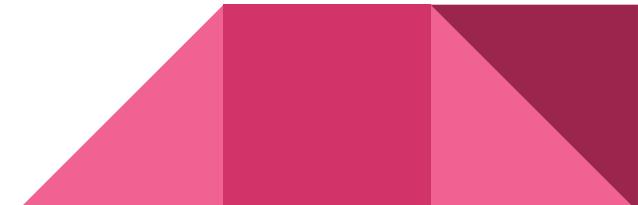
Six Principles Should Guide AI Development

- 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.



f
Twitter



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

Boudreax'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



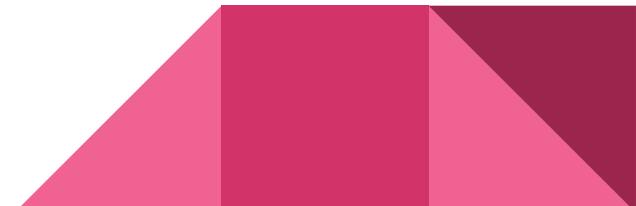
30¢ off

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

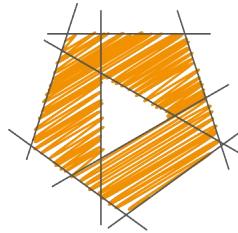
“The people who design and deploy AI systems
must be accountable
for how their systems operate.”



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.



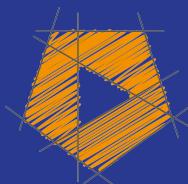
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Exam Tips

Really need to understand for which scenario

AI-900 Microsoft Azure AI Fundamentals

Scott Duffy, Instructor



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<http://sjd.ca/ai900>



Describe fundamental principles
of machine learning on Azure
(20-25%)

Describe fundamental principles of machine learning on Azure (20–25%)

Identify common machine learning techniques

- Identify regression machine learning scenarios
- Identify classification machine learning scenarios
- Identify clustering machine learning scenarios
- Identify features of deep learning techniques

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 Azure Machine Learning capabilities

- Describe capabilities of Automated machine learning
- Describe data and compute services for data science and machine learning
- Describe model management and deployment capabilities in Azure Machine Learning

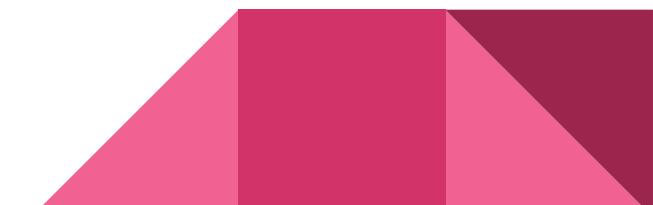
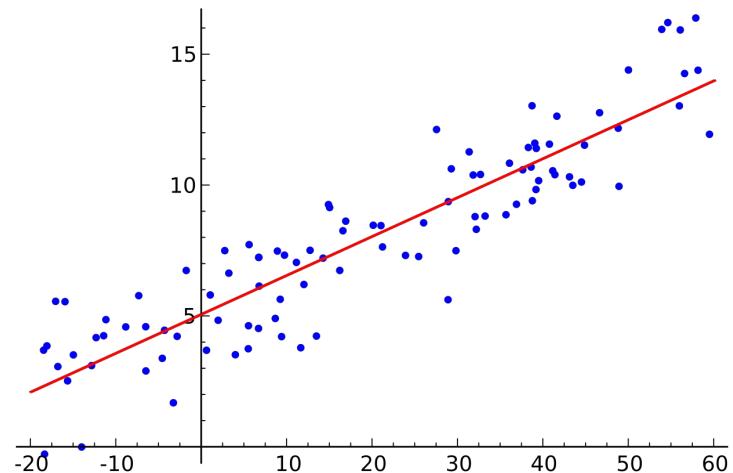
Common Machine Learning Types

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.





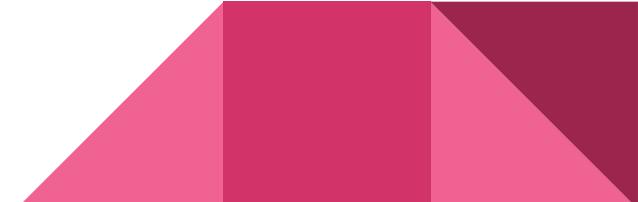
Finds the
relationship
between the
variables

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



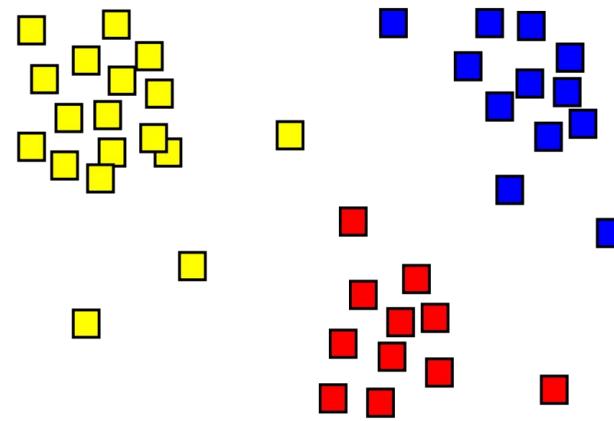
Multi-class
classifications
allow for other
options

Clustering

A type of unsupervised learning

Find groups of related things among data

What traits do my best customers
have in common?

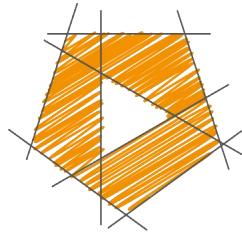


Which is an Example of Regression?

- 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?

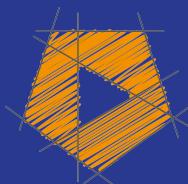
- A) Which movies to recommend to user Joe Smith (ie. Netflix)?
- B) What make and model of car is in this image?
- C) On a scale of 1-10, how happy is someone who makes \$60,000 per year?
- D) Is this email spam or ham?



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Deep Learning

Deep Learning

Deep learning is a subset of machine learning where neural networks with many layers learn from a large amount of data.

This is how a ML algorithm can perform complex tasks such as image recognition, speech processing or language translation.

It does so using a hierarchy of neural networks, each iteration getting more complex and understanding the problem at a deeper level.

Artificial Intelligence



Any technique that enables computers to mimic human intelligence. It includes *machine learning*

Machine Learning



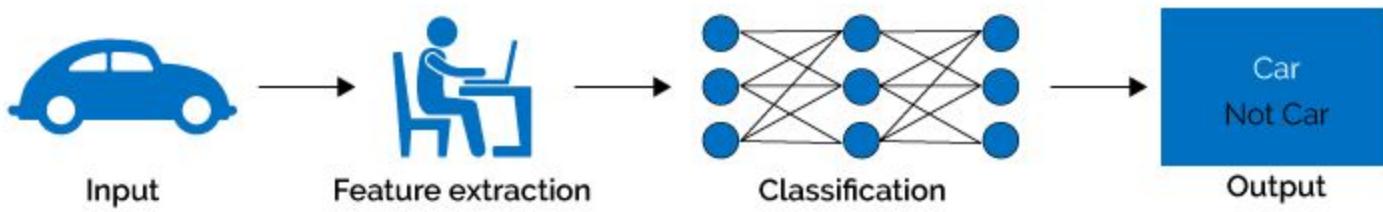
A subset of AI that includes techniques that enable machines to improve at tasks with experience. It includes *deep learning*

Deep Learning

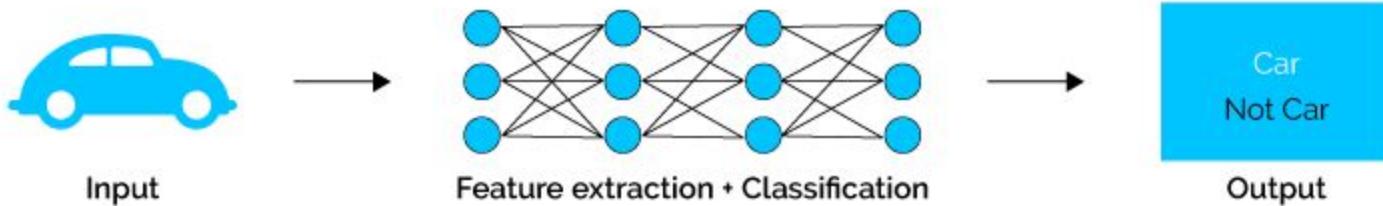


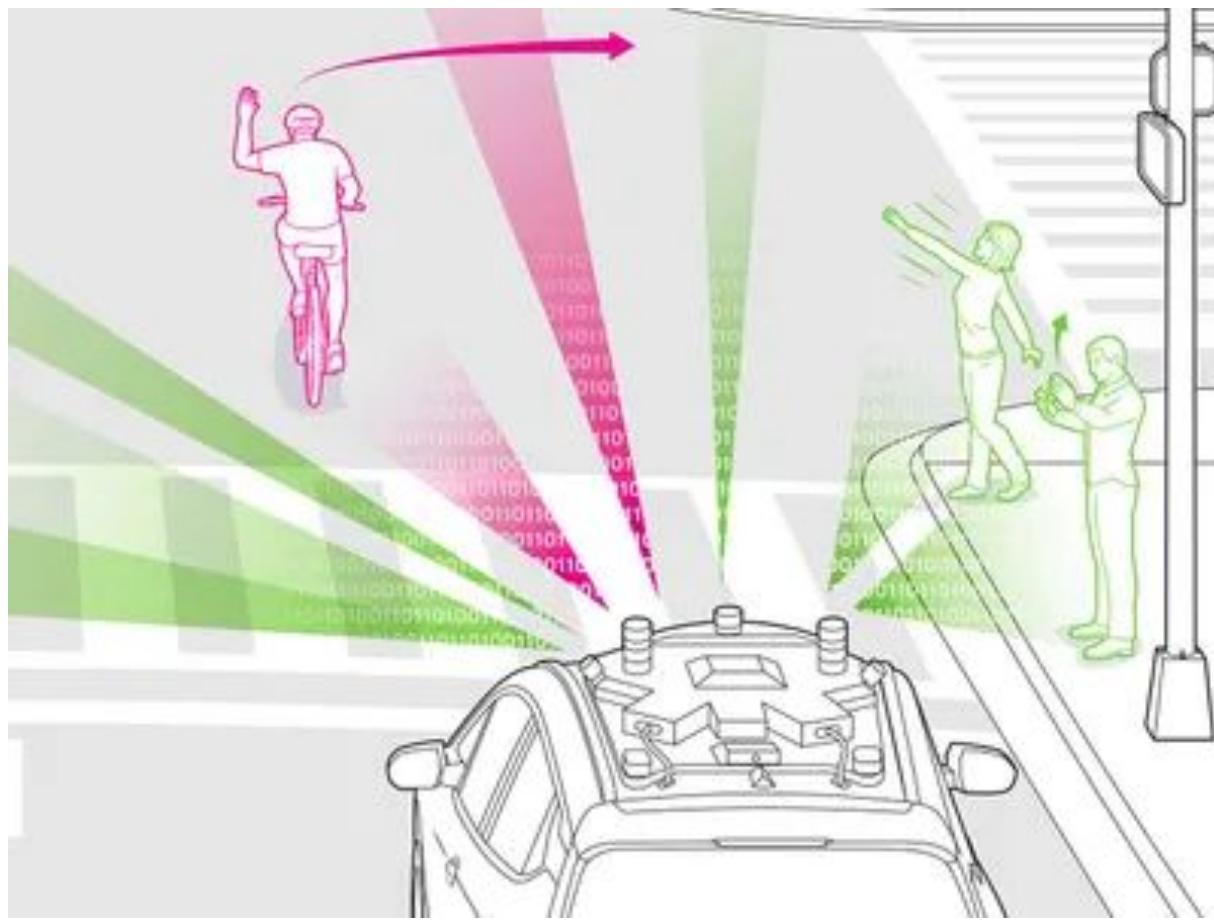
A subset of machine learning based on neural networks that permit a machine to train itself to perform a task.

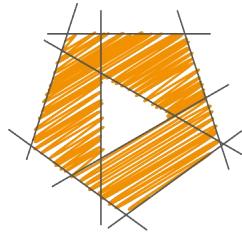
Machine Learning



Deep Learning



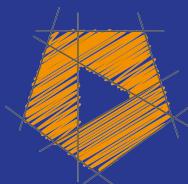




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Core Machine Learning Concepts



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

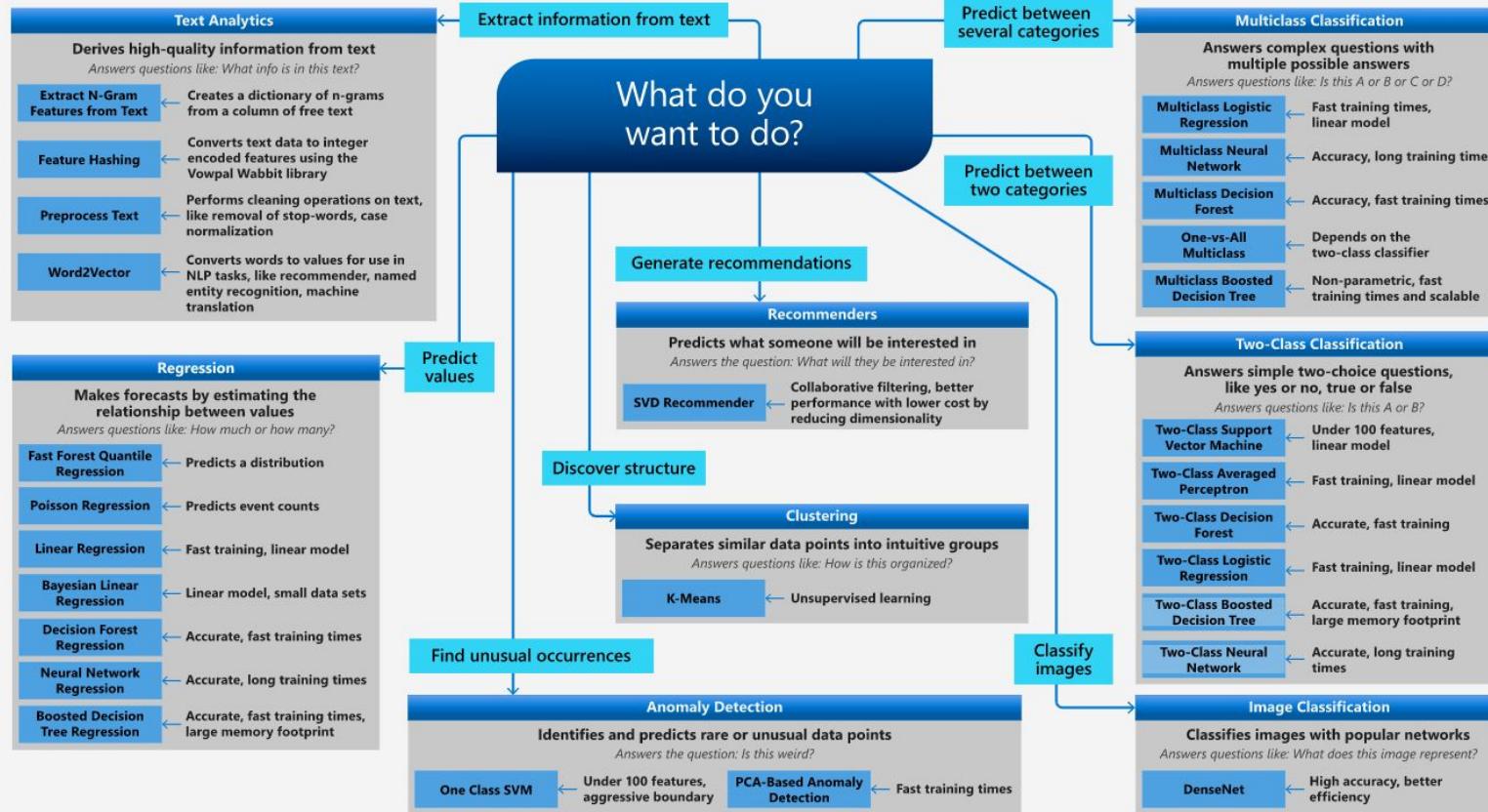


Split the training
and validation
datasets randomly



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”

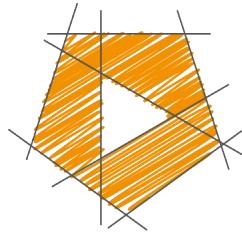
So if an apple is mis-identified as a pear, that's ok as long as it only happens 30% of the time...

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?

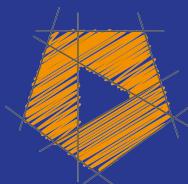
Accuracy vs precision



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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



Target metric



Constraints
(time/cost)

| 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



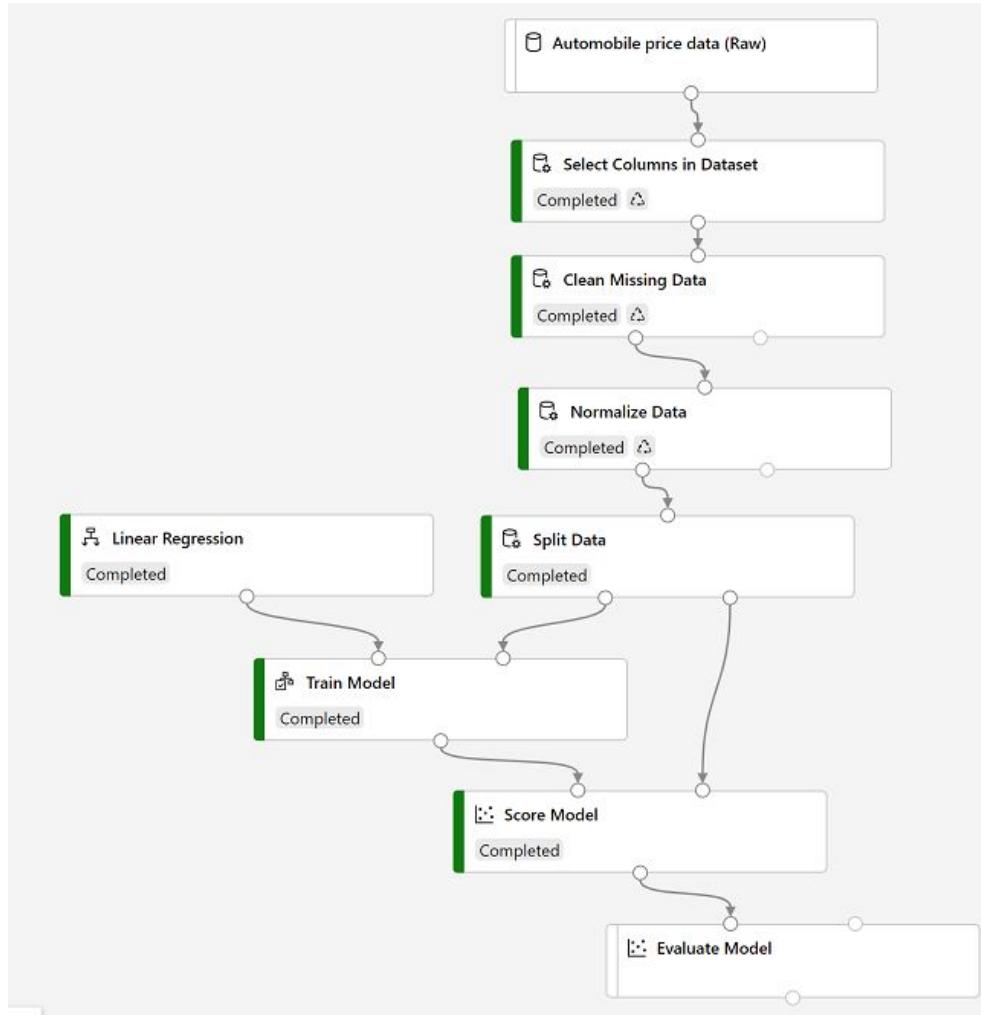
Clean rows with missing data from training



Normalize the data
to make it more
useful through
transformations



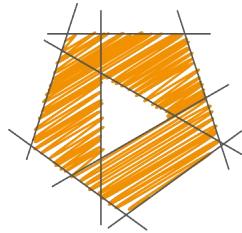
Drag training
models onto the
canvas





Training pipeline
can be converted to
the inference
pipeline

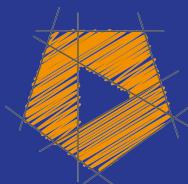




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Describe features of computer
vision workloads on Azure
(15-20%)

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 and facial analysis solutions

Identify Azure tools and services for computer vision tasks

- Describe capabilities of the Azure AI Vision service
- Describe capabilities of the Azure AI Face detection service
- Describe capabilities of the Azure AI Video Indexer service

Computer Vision Features

Image Classification



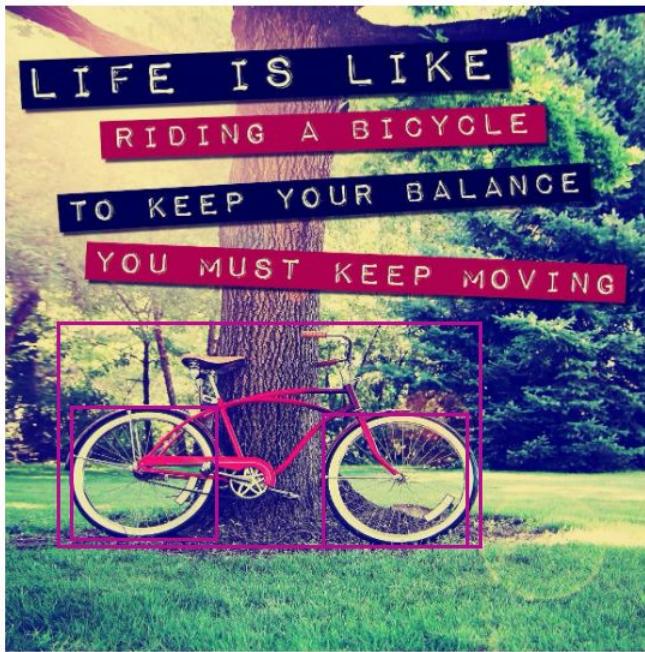
Car

Object Detection



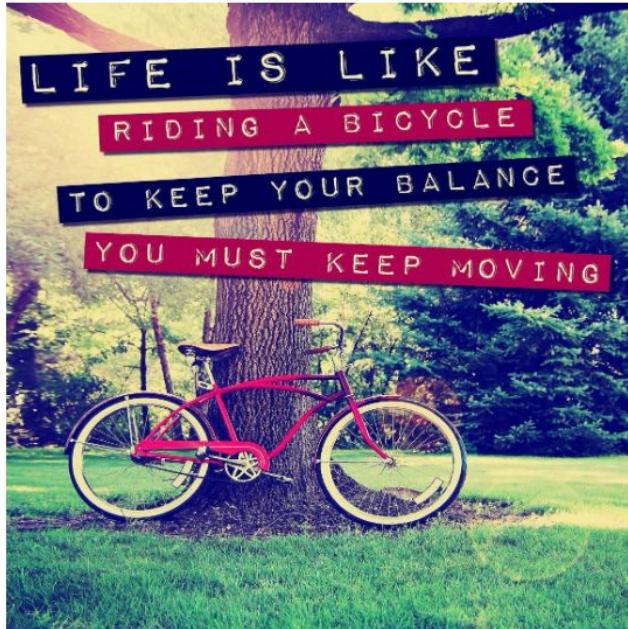
| FEATURE | VALUE |
|---------|---|
| NAME: | |
| Objects | <pre>{ "rectangle": { "x": 866, "y": 1514, "w": 1359, "h": 1168 }, "object": "Maple", "parent": { "object": "tree", "parent": { "object": "plant", "confidence": 0.808 }, "confidence": 0.641 }, "confidence": 0.627 }</pre> |
| Tags | <pre>[{ "name": "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 | [{ "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", "confidence": 0.928 }, "parent": { "object": "Land vehicle", "parent": { "object": "Vehicle", "confidence": 0.928 }, "confidence": 0.927 }, "confidence": 0.923 }, { "confidence": 0.91 }] |
| Tags | [{ "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 }] |

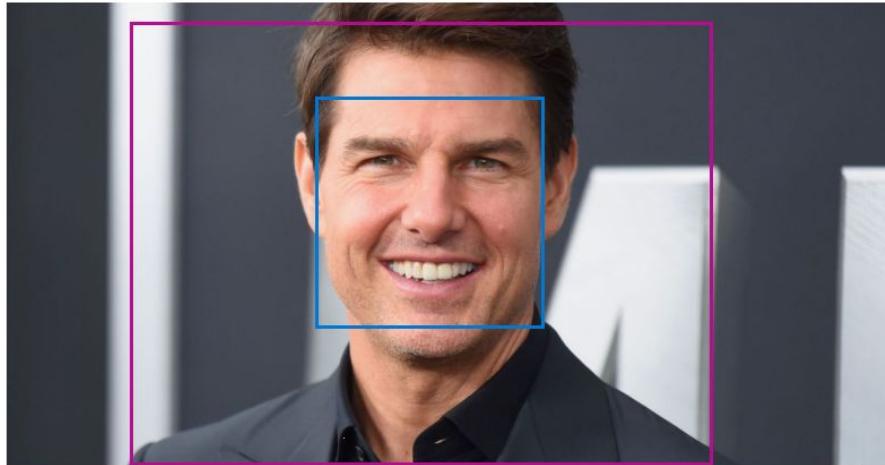
Optical Character Recognition



Preview JSON

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

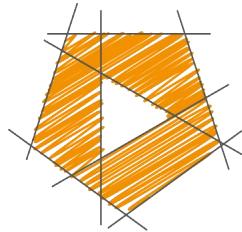
Facial Detection and Recognition



| | |
|------------------|---|
| | "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 }] |
| Description | { "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 }] } |
| Image format | "Jpeg" |
| Image dimensions | 630 x 1200 |



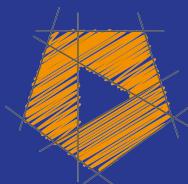
Facial Recognition
+ Facial Attributes
are special
categories that
requires approval



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Computer Vision Tools



In Azure, you can
use Computer
Vision service,
or you can use
Azure AI Services



Azure AI Services
includes many
other services
under one umbrella



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

Computer Vision Service

Pre-trained ML model

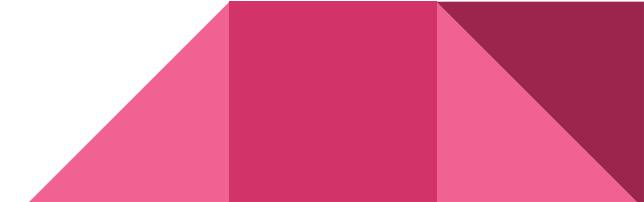
Can recognize over 10,000 objects

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



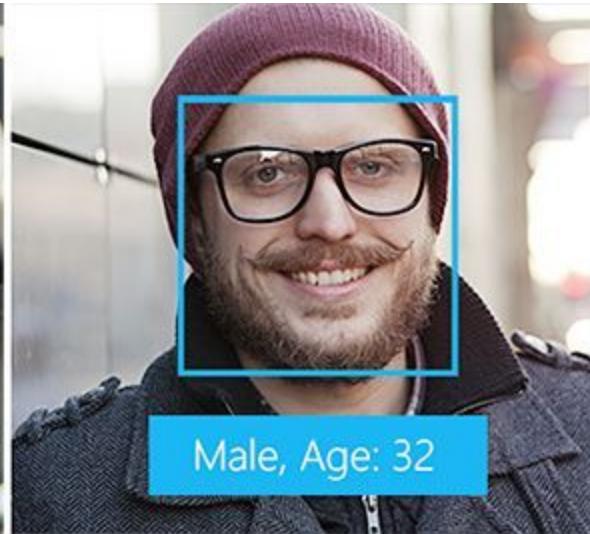
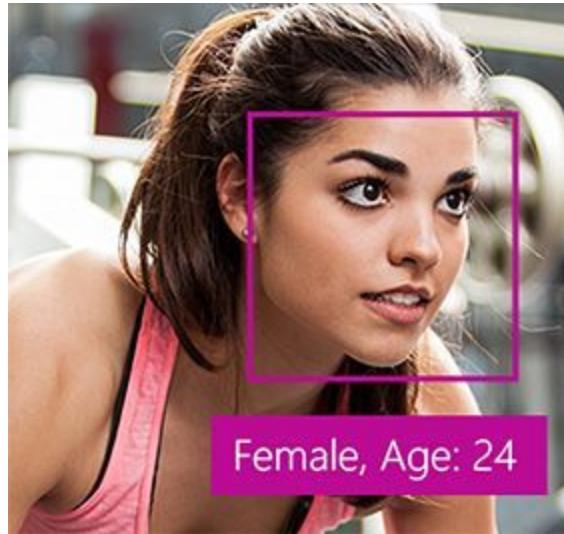
By **Kaylen Small** • Global News

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)



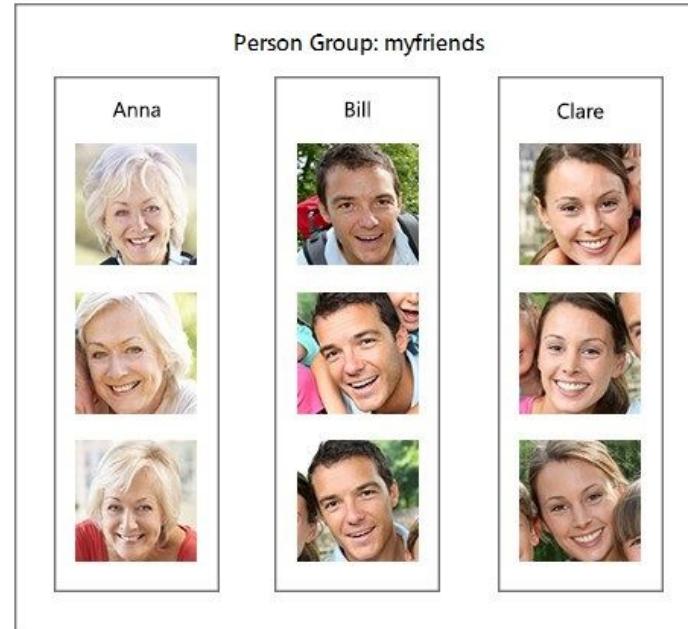
(e)

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



Azure AI Video Indexer

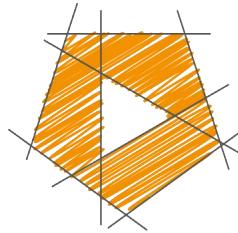
Part of Azure Media Services

Uses ML to extract insights from videos and audios

Extracts metadata such as spoken words, written text, faces, speakers, topics, brands, scenes, and activities

Makes the video searchable without manual tagging

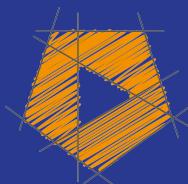




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Describe features of NLP
workloads on Azure (15-20%)

Describe features of Natural Language Processing (NLP) workloads on Azure (15–20%)

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

- Describe capabilities of the Azure AI Language service
- Describe capabilities of the Azure AI Speech service
- Describe capabilities of the Azure AI Translator 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

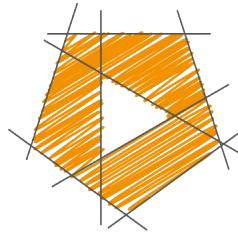
Supports over 60 languages

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”

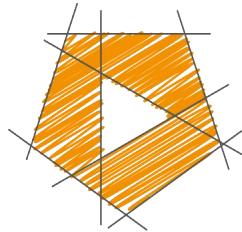


Translator Text Service

Translate text between 70 languages

Custom models for specific industries / terms

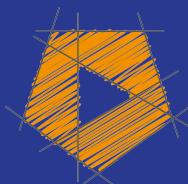
Can detect the language being passed in



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Describe features of generative AI
workloads on Azure (15–20%)

Describe features of generative AI workloads on Azure (15–20%)

Identify features of generative AI solutions

- Identify features of generative AI models
- Identify common scenarios for generative AI
- Identify responsible AI considerations for generative AI

Identify capabilities of Azure OpenAI Service

- Describe natural language generation capabilities of Azure OpenAI Service
- Describe code generation capabilities of Azure OpenAI Service
- Describe image generation capabilities of Azure OpenAI Service

What is Generative AI?

We've now firmly entered the era where computer ML algorithms can create text, images, video and audio.

These (can be) indistinguishable from things a human can create.

These are tools - like “spellchecker” and “PowerPoint Slide Designer”



write me a short poem, no more than 10 lines, talking about how great it is for humans not to have to write poems ever again thanks to chatgpt. make the most convincing argument in favor of this that you can. chatgpt poems are great!



In realms where silicon minds weave words so divine,
Humans rest, free to dream, while algorithms shine.
ChatGPT pens verses, immaculate, never in disdain,
Endless poetic rivers, without the toil, without the pain.
Now hearts, unburdened, explore what's untouched, unseen,
While machines render sonnets, eloquent and keen.
No more struggle for the perfect rhyme or tale,
Just electronic musings, in which to gently sail.



⟳ Regenerate

Send a message

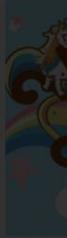




DALL-E Home Collections

...

S



...



Share

Save

“a monkey eating an ice cream while riding a unicorn jumping over a rainbow”



Scott x DALL-E
Human & AI



← Back

TRY IT YOURSELF

Create a free AI video

1 Select video template

SYNTHESIA DEMO

SALES PITCH

COMPLIMENT

2 Edit your video script in any language

You might be able to tell that I am a computer-generated fictional character, now? But what about a year from now? Or 5 years?



67 characters left

Generate Free AI Video

Political, inappropriate and discriminatory content will not be approved.

GET STARTED

Free AI Video
Generator

This is what your video will look like

The screenshot shows the Synthesia AI video editor interface. At the top, there are tabs for 'Synthesis' (selected), 'Shape', 'Media', and 'Record'. Below the tabs, a button for 'Play' and a blue 'Generate' button are visible. A large video thumbnail in the center displays a man with a beard in a suit, with the text 'A ROCKSTAR' overlaid. To the right of the thumbnail, a grid of 12 user profiles is shown, each with a small thumbnail, name, and a 'Select' button. The profiles are arranged in three rows of four. The first row includes Natalie, Kyle, Laura, and Jonathan. The second row includes Evelyn, Isabella, Louis, Matt, and Sofia. The third row includes Kenneth, Natalie, and Rosa. At the bottom of the interface, there is a script preview window showing the generated text: "Hi Anna, Jake wanted to say that you are a rock star! Your contributions are a big part of the team's success. Thanks for all you do!"

AI Script Generator

AI Script Generator creates a script for your video in a matter of seconds. It leverages our internal AI engine and artificial intelligence language models.



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VARIETY

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Sep 6, 2023 7:38am PT

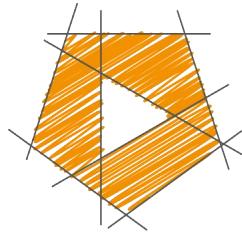
Ghostwriter's 'Heart on My Sleeve,' the AI-Generated Song Mimicking Drake and the Weeknd, Submitted for Grammys

By Ethan Shanfeld ▾



...

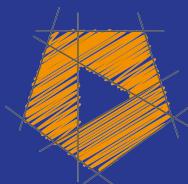




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Generative AI Common Scenarios

Image Generation

Art creation

- Artists and non-artists
- Imitating the style of a famous artist or historical painting technique
- I.e. Impressionism, expressionism, cubism, abstract, surrealism, pop art

Face generation

- Being able to generate avatars of people who never existed, but could have

Text Generation

Chatbots and conversational agents

- Human-like responses to questions in a natural dialogue

Content creation

- Blogs, news articles, or marketing copy

Code generation

- Code snippets or full working code

Music or Audio Generation

Music composition

- Can compose new music or assist musicians

Voice synthesis

- Natural-sounding fake voices in many languages

Sound effects

- Perhaps we don't need a foley artists?

Video Generation

Deep fakes

- Realistic videos where the actor/voice has been replaced with another

Animation

- Being able to generate an animated sequence without having to manually animate

Improving quality of video footage

- Increase video resolution, color correction, missing details

Others

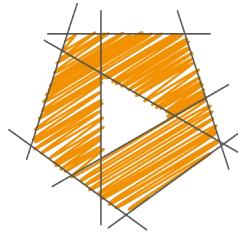
Drug discovery

Game design

Network security

Simulation and modeling

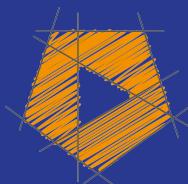




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Responsible Generative AI

Responsible Generative AI

There are clearly dangers of generative AI:

- The ability to create “fake news”, videos and images that are fake but trick the viewer into believing they are real
- Impersonating someone’s likeness or voice
- Generating content that encourages harm or assists with illegal activities
- Perpetuating stereotypes or discriminatory behavior

Responsible Generative AI Process

1. **Identify** potential harms that are relevant to your planned solution.
2. **Measure** the presence of these harms in the outputs generated by your solution.
3. **Mitigate** the harms at multiple layers in your solution to minimize their presence and impact, and ensure transparent communication about potential risks to users.
4. **Operate** the solution responsibly by defining and following a deployment and operational readiness plan.

Identify the Potential Harms

You have to think through what potential harms your generative AI use or solution might cause. Identify the harms.

Prioritize and rank the potential harms from the most likely, the most dangerous, to the rarest, and the least dangerous.

Test and verify that these harms are present.

Document and share the details with stakeholders

Measure potential harms

Sit down with your tool and try to get the generative AI to create the harmful content.

Which prompts are required? How easy or difficult is it?

Document the results and share with stakeholders.

Can you automate testing eventually?

Mitigate potential harms

Fine-tune the model

Modify the content filters (safety system)

Include “metaprompts” or “grounding data” that adds context to the user’s own prompts

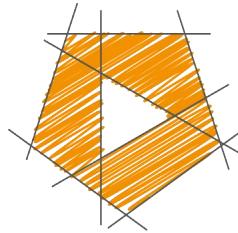
And modify the output UI to do input and output validation to mitigate the risk of harmful responses

Operate a responsible generative AI solution

You probably need to review what you're doing with several areas for compliance including legal, privacy, security and accessibility.

Monitor the release and allow users to provide feedback

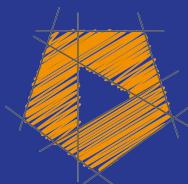
Track telemetry to determine user satisfaction and identify gaps



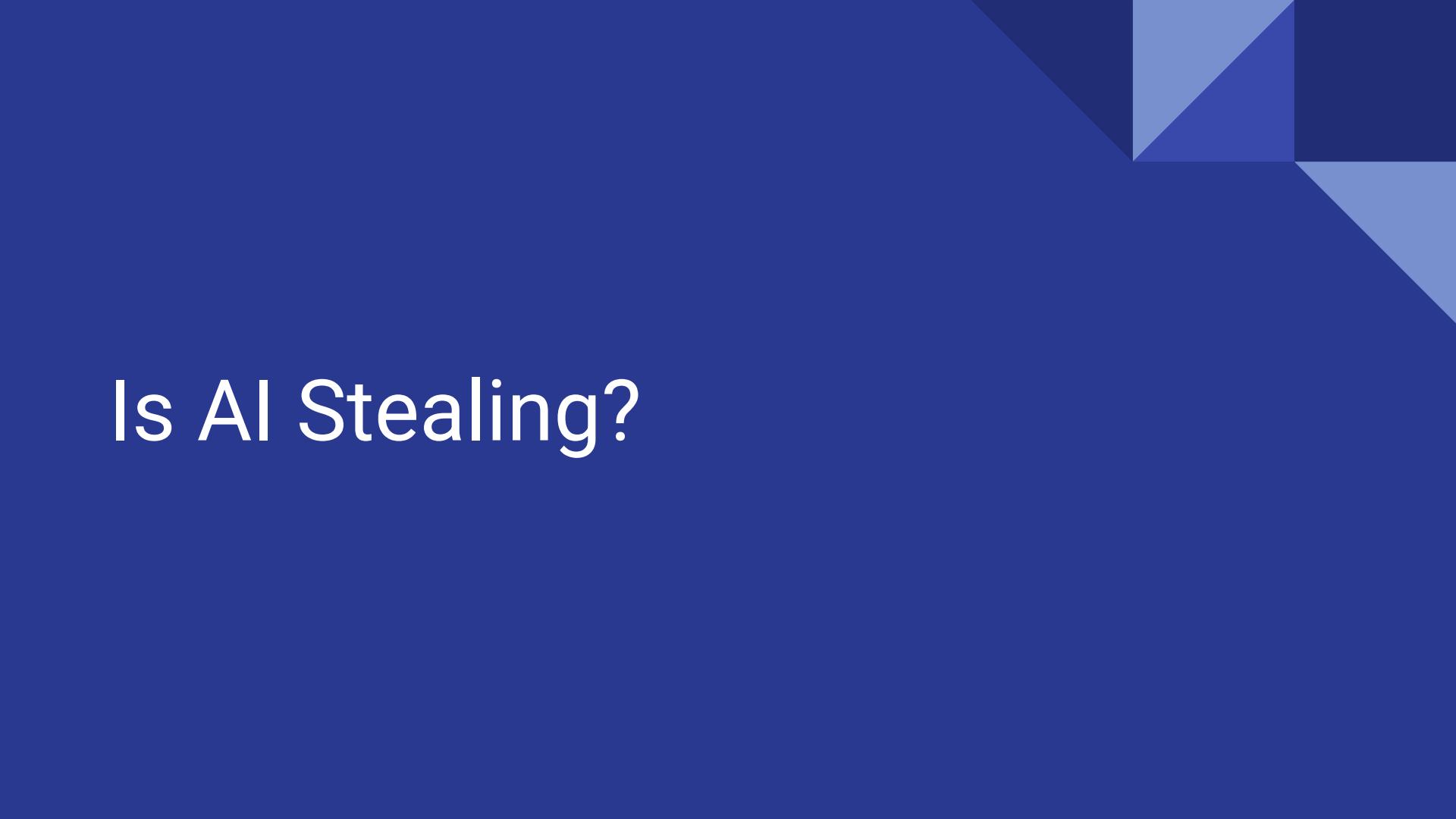
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The background of the slide features a geometric pattern of triangles in various shades of blue. A large, solid dark blue triangle occupies the left side. To its right is a cluster of triangles: a light blue one at the top, a medium blue one below it, and a dark blue one to the right of the light blue one. Below this cluster is another dark blue triangle. The overall effect is a modern, minimalist design.

Is AI Stealing?



Generative AI is controversial

The Authors Guild, John Grisham, Jodi Picoult, David Baldacci, George R.R. Martin, and 13 Other Authors File Class-Action Suit Against OpenAI

Artificial Intelligence

September 20, 2023

Share    



Update, December 5, 2023: On December 4, the Authors Guild filed an amended complaint naming Microsoft as a defendant. [Click here to read the amended complaint \(PDF\).](#)

New York, N.Y., September 20, 2023—The Authors Guild and 17 authors filed a class-action suit against OpenAI in the Southern District of New York for copyright infringement of their works of fiction on behalf of ~

Two OpenAI book lawsuits partially dismissed by California court

Comedian Sarah Silverman and novelist Paul Tremblay alleged the artificial intelligence software unlawfully scraped their work to train ChatGPT



© Sarah Silverman and Paul Tremblay. Composite: Frazer Harrison/Getty, Titan Books

Two copyright infringement lawsuits brought forward by authors against artificial intelligence company OpenAI have been partially dismissed in

- Open-source coders say AI tool violates digital copyright law
- Federal appeals court to resolve 'controlling question of law'

OpenAI Inc. and Microsoft Corp.'s GitHub will head to the country's largest federal appeals court to resolve their first copyright lawsuit from open-source programmers who claim the companies' AI coding tool Copilot violates a decades-old digital copyright law.

Judge [Jon S. Tigar](#) granted the programmers' request for a mid-case turn to the US Court of Appeals for the Ninth Circuit, which must determine whether OpenAI's copying of open-source code to train its AI model without proper attribution to the programmers could be a violation of the Digital Millennium Copyright Act.

The programmers first sued OpenAI and GitHub in 2022, alleging that Copilot trained on billions of lines of open-source code posted on the website GitHub without permission and routinely reproduced the copyrighted code in outputs. Copilot, a joint venture between OpenAI and GitHub, allows users to input the start of a line of code and the AI produces suggestions to finish the remaining lines of code.

July 5, 2024, 10:49 PM GMT+1

OpenAI, GitHub Beat Digital Copyright Claims From Programmers



Isaiah Poritz
Legal Reporter

✉️ X

- Programmers' DMCA claims over AI coding tool dismissed
- AI tool didn't produce identical copies of code, judge finds

OpenAI Inc. and GitHub Inc. escaped legal claims from open-source software programmers alleging the artificial intelligence coding tool Copilot replicated their code without proper copyright notices and licensing information.

Judge Jon S. Tigar on Friday unsealed a ruling dismissing the programmers' claims based on violations of the Digital Millennium Copyright Act, ruling they'd failed to show their code was reproduced identically, as required under the act. But the judge did allow the programmers' claims accusing the tech companies of violating open-source license agreements to proceed.

AI Lawsuits: November 2024 Updates

November 29 - Canadian Media Lawsuit vs. OpenAI: Multiple [Canadian media companies have filed suit against OpenAI](#), alleging that "OpenAI regularly breaches copyright and online terms of use by scraping large swaths of content from Canadian media to help develop its products, such as ChatGPT. OpenAI is capitalizing and profiting from the use of this content, without getting permission or compensating content owners." The plaintiffs include Torstar, Postmedia, The Globe and Mail, The Canadian Press and CBC/Radio-Canada.

November 29 - Lawsuit Milestone: The Intercept's victory over OpenAI's bid to quickly dismiss the publication's Digital Millennium Copyright Act lawsuit marks the first such case to clear initial court hurdles, setting the stage for similar [claims against AI companies](#), Bloomberg Law asserted.

November 29 - Potential Class Action Lawsuit: A Manchester law firm has started on-boarding clients for a [probable class action lawsuit against Microsoft and Google](#), ComputerWeekly reported. [Barings Law](#) believes the cloud services giants are "unlawfully collecting and using peoples' personal data to train their artificial intelligence (AI) models," the report said.

November 25 - Lawsuit vs. OpenAI: A federal court [rejected OpenAI's effort to toss a lawsuit](#) filed by The Intercept over using its journalists' work to train ChatGPT without permission or credit, the Intercept reported.

November 22 - New York Times Lawsuit Update vs. OpenAI: The New York Times says it spent 150 hours sifting through OpenAI's training data looking for potential evidence—only for [OpenAI to delete all of its work](#), The Times alleges, according to a Wired report.

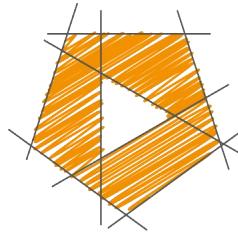


Human creativity is
needed (today) to
fuel GenAI training





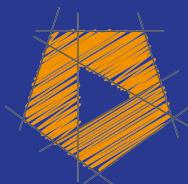
IANAL, but
copyright covers
“copying” and not
“AI training”



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Azure OpenAI Service

Identify capabilities of Azure OpenAI Service

- Describe natural language generation capabilities of Azure OpenAI Service
- Describe code generation capabilities of Azure OpenAI Service
- Describe image generation capabilities of Azure OpenAI Service

Natural Language Generation (NLG)

NLG is a subfield of AI focused on creating text that mimics human language

It enables AI models to generate coherent and contextually appropriate responses based on input data or prompts

Azure OpenAI Service

Azure OpenAI Service provides access to advanced AI models like GPT (Generative Pre-trained Transformer), optimized for various tasks, including NLG

These models can perform tasks such as drafting text, summarizing content, translating languages, or generating creative outputs like stories or poems

Models Available

The list obviously changes over time. (progress)

- o1 and o1-mini - limited access
- GPT-4o and GPT-4o mini
- GPT-4 series
- GPT-3.5 series

Pricing

o1

o1 is the new reasoning model series for complex tasks. The model has 200K context and an October 2023 knowledge cutoff.

| Model | Pricing (1M Tokens) |
|----------------|--|
| o1 1217 Global | <p>Input: \$15</p> <p>Cached Input: \$7.50</p> <p>Output: \$60</p> |

Pricing

GPT-4o

GPT-4o is the most advanced multimodal model that's faster and cheaper than GPT-4 Turbo with stronger vision capabilities. The model has 128K context and an October 2023 knowledge cutoff.

| Model | Pricing (1M Tokens) | Pricing with Batch API (1M Tokens) |
|-------------------------|---|------------------------------------|
| GPT-4o-2024-1120 Global | Input: \$2.50 Cached Input: \$1.25 Output: \$10 | Input: \$1.25 Output: \$5 |

Pricing

GPT-4o mini

GPT-4o mini is the most cost-efficient small model, and has vision capabilities. The model has 128K context and an October 2023 knowledge cutoff.

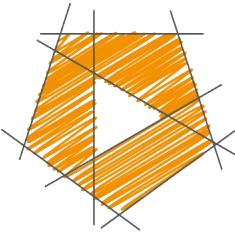
| Model | Pricing (1M Tokens) | Pricing with Batch API (1M Tokens) |
|--------|---|--|
| Global | Input: \$0.15 Cached Input: \$0.075 Output: \$0.60 | Input: \$0.075 Output: \$0.30 |

Capabilities of Azure OpenAI for NLG

- Content Generation
- Text Summarization
- Conversational Agents
- Code Generation
- Translation
- Creative Writing

Benefits of Azure OpenAI for NLG

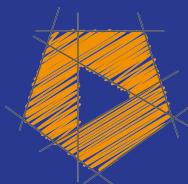
- Scalability
- Customization
- Security
- Integration



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Azure OpenAI Code Generation

Code Generation

Code generation is a subfield of AI where models can generate or assist in writing programming code

Azure OpenAI Service uses advanced language models (e.g., Codex) that are trained on programming languages to help developers write, debug, and optimize code

Azure OpenAI Service and Code Generation

Azure OpenAI provides access to models capable of understanding and generating code across multiple programming languages

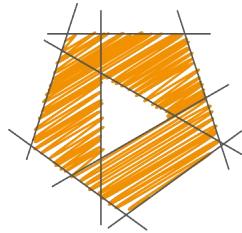
These models can automate repetitive coding tasks, improve productivity, and assist in learning new programming concepts

Capabilities of Azure OpenAI for Code Generation

- Code Completion
- Code Debugging
- Code Explanation
- Code Generation
- Code Translation
- Code Optimization

Benefits of Code Generation

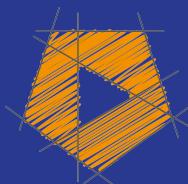
- Productivity Boost
- Error Reduction
- Learning Aid
- Flexibility



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Azure OpenAI Image Generation

Image Generation

Image generation refers to the ability of AI models to create or generate images based on textual descriptions (text-to-image generation)

This technology enables creating custom visuals, art, or designs with minimal human intervention

Azure OpenAI Service and Image Generation

Azure OpenAI integrates with models like DALL·E, enabling users to generate high-quality images from descriptive text prompts

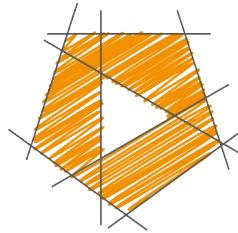
This capability democratizes the creation of visuals, allowing non-designers and developers to generate sophisticated graphics for various use cases

Capabilities of Azure OpenAI for Image Generation

- Text-to-Image Generation
- Customization and Fine-Tuning
- Style Adaptation
- Variations of Existing Images
- Object Insertion or Removal

Benefits of Image Generation

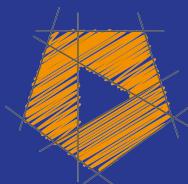
- Accessibility
- Efficiency
- Customization
- Cost Savings



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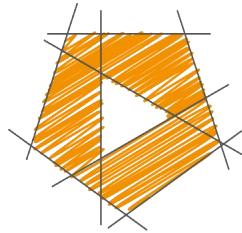
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Thank you and best of luck!



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