Audio Analytics

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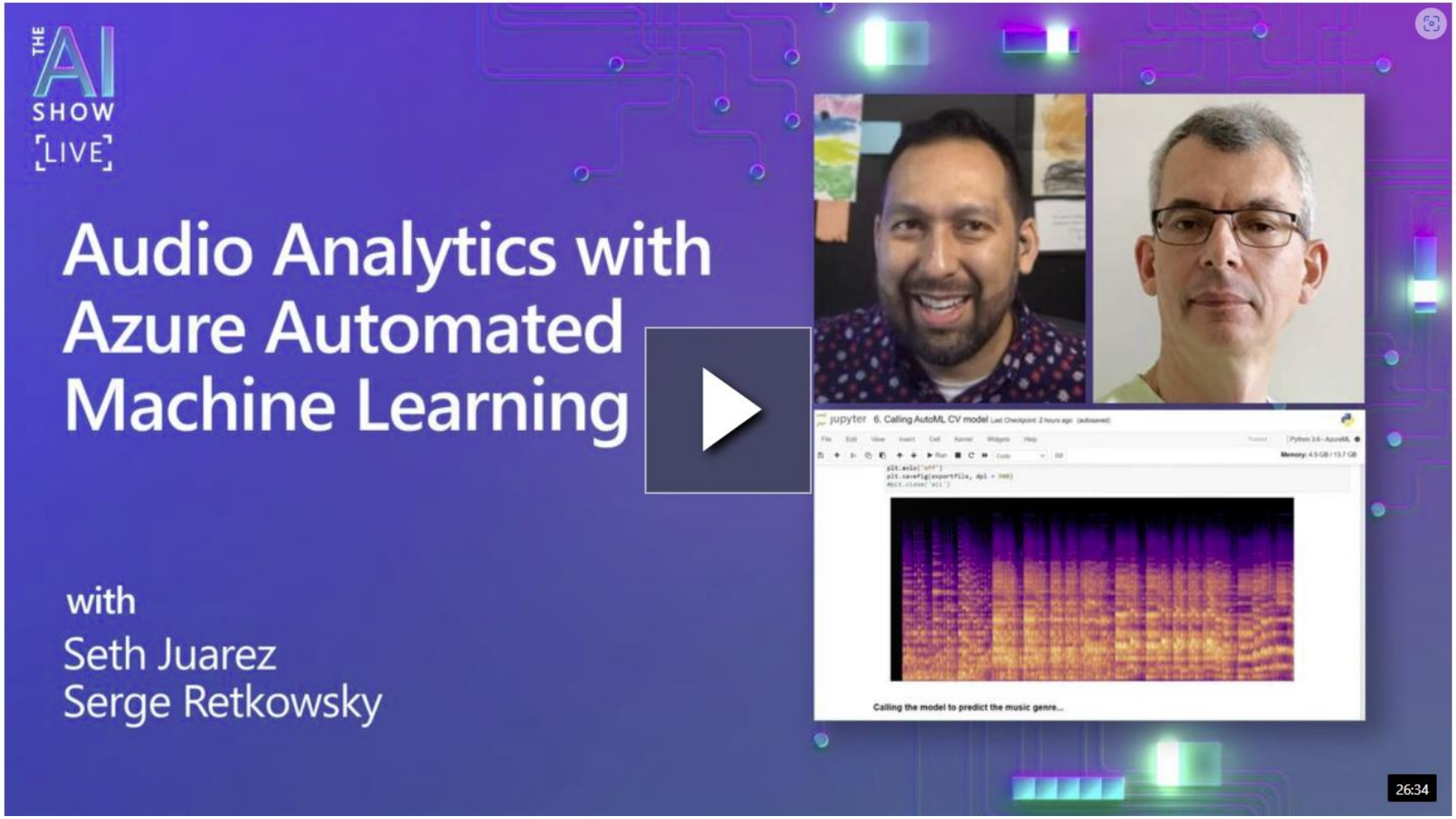
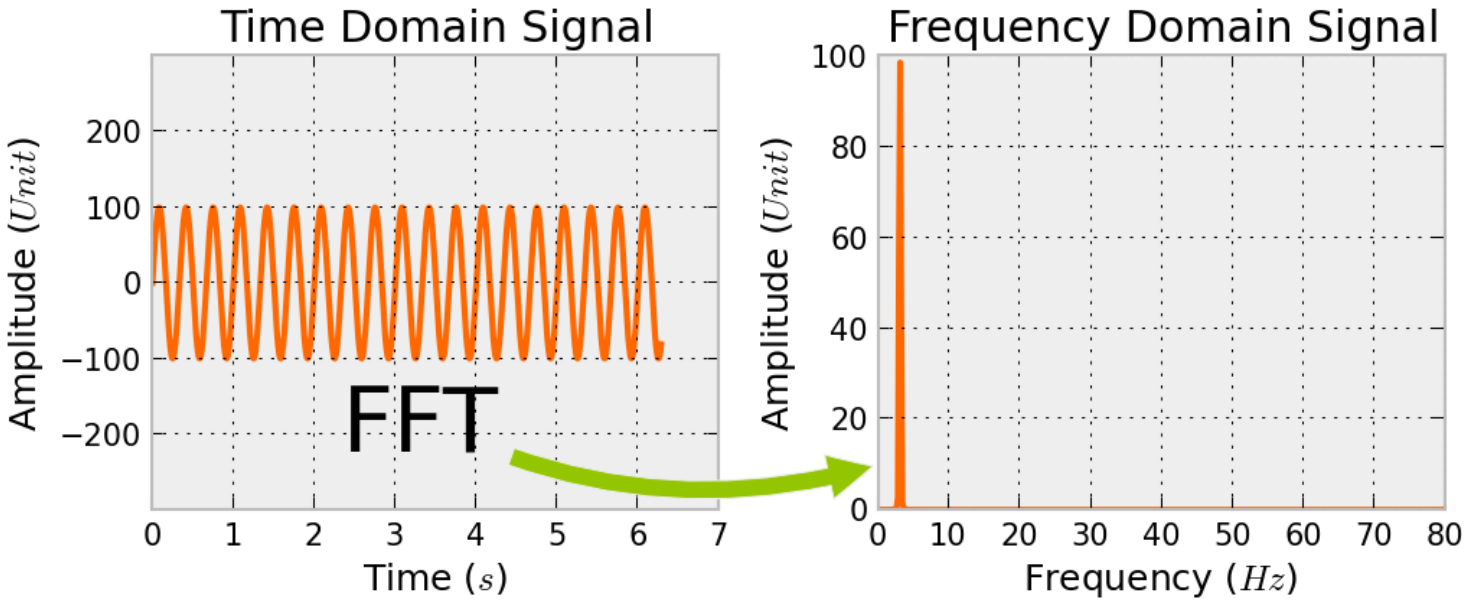
AI Show demo - Ep 55 | Microsoft Docs

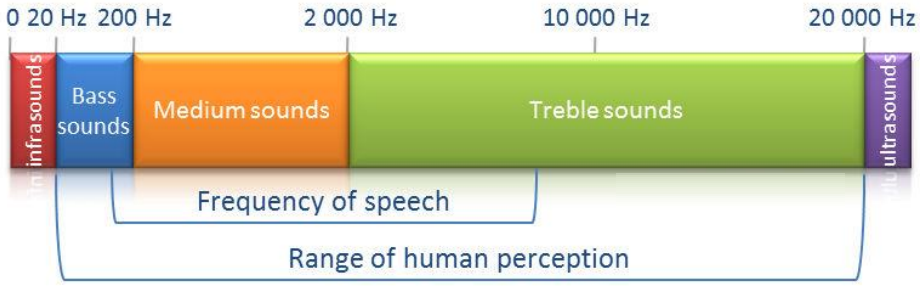


Fast Fourier Transform (FFT)

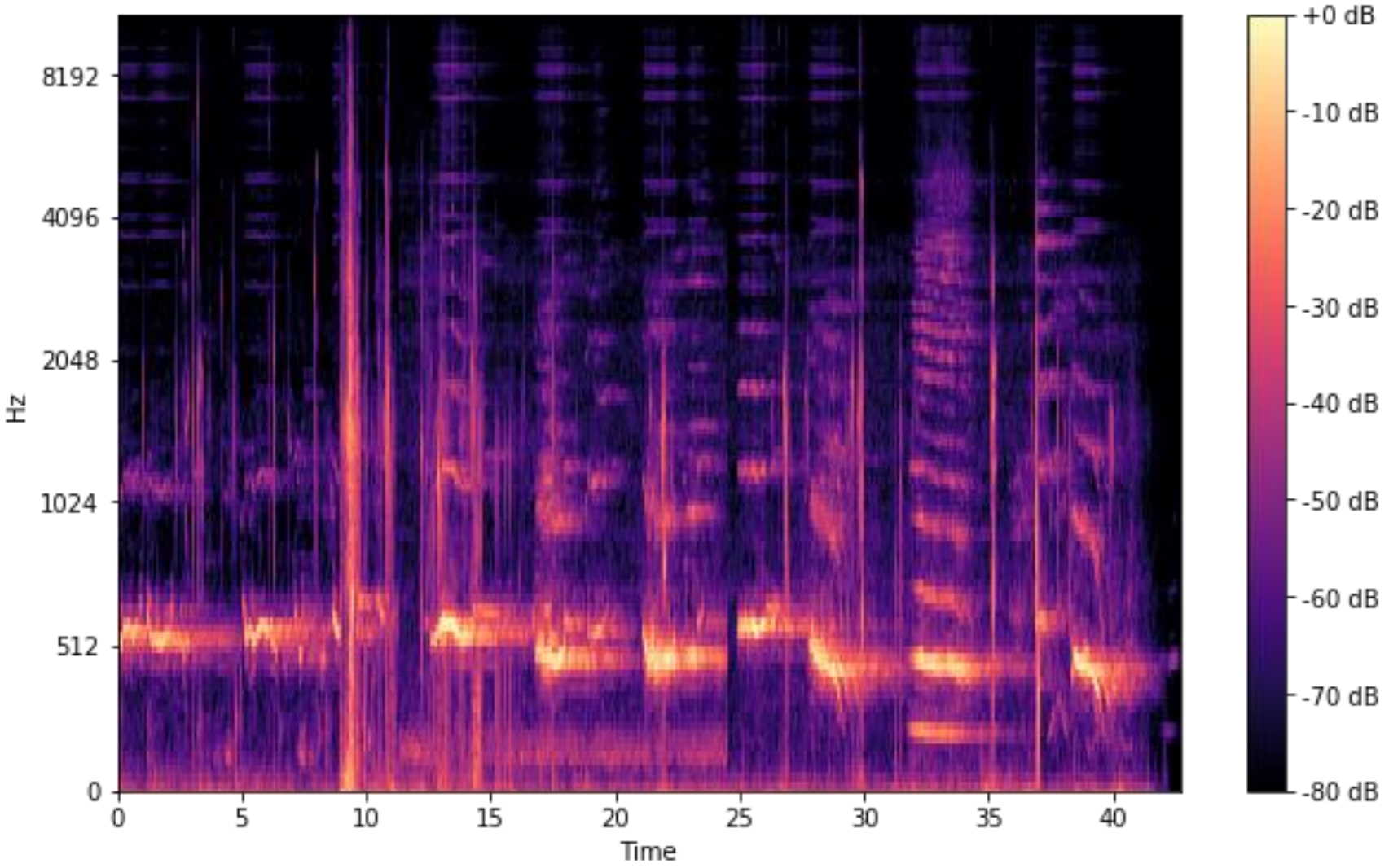
Jean-Baptiste Joseph Fourier
1768 – 1830
https://en.wikipedia.org/wiki/Joseph_Fourier

The Fourier transform is a mathematical formula that **converts the signal from the time domain into the frequency domain.**

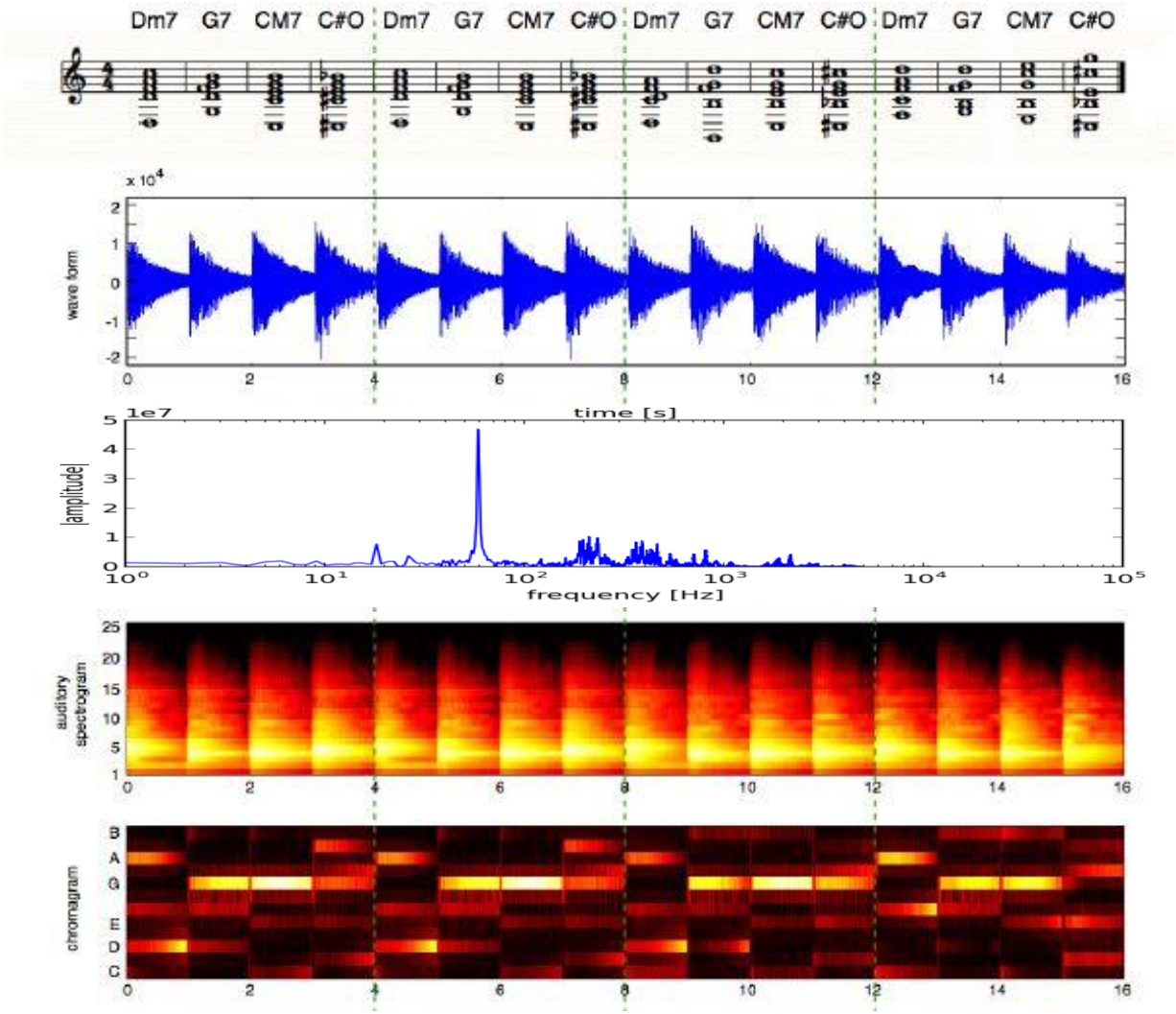


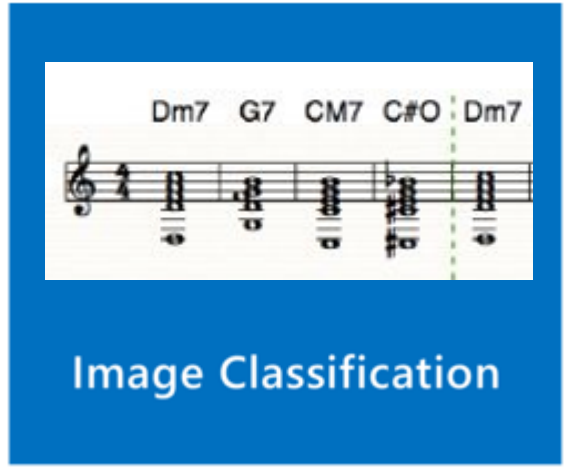


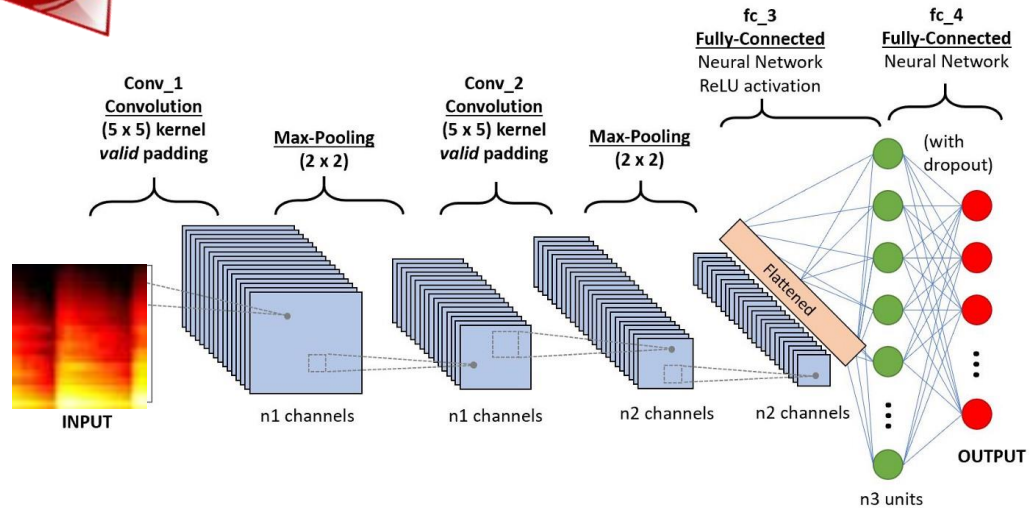
The spectrogram represents how the spectrum of frequencies vary over time



In summary


Dm7 G7 CM7 C#O Dm7 G7 CM7 C#O Dm7 G7 CM7 C#O Dm7 G7 CM7 C#O
wave form
time [s]
|amplitude|
frequency [Hz]
auditory spectrogram
chromagram


Dm7 G7 CM7 C#O Dm7
Image Classification


Conv_1
Convolution
(5 x 5) kernel
valid padding
Max-Pooling
(2 x 2)
Conv_2
Convolution
(5 x 5) kernel
valid padding
Max-Pooling
(2 x 2)
fc_3
Fully-Connected
Neural Network
ReLU activation
fc_4
Fully-Connected
Neural Network
(with dropout)
INPUT
n1 channels
n1 channels
n2 channels
n2 channels
Flattened
OUTPUT
n3 units

Audio Processing with Azure ML

Audio processing can consist of extracting audio signal information into **spectrograms** (time vs frequency vs Db) **images** that we can use to build a custom vision model with **Azure using AutoML for Images.**

We can as well extract some audio components and use a generic **classification model with Azure ML and its AutoML features.**

Acoustic Anomaly Detection for Machine Sounds based on Images

- **Problem:**
  - Is it possible to detect an anomaly (non normal noise) from an equipment or a machine sound file?

- **Solution:**
  1. We need to collect some normal and anomaly sounds files
  2. We can generate spectrograms for all these files
  3. We will build and train a two-class classification custom vision model (Anomaly vs no anomaly)
  4. We can test the anomaly detection model to predict an anomaly

Links

- Azure ML

https://aka.ms/AIShow/AutoML/AzureML

- AutoML for Images

http://aka.ms/AutoMLforImagesDoc

- AutoML for Images Algorithms

http://aka.ms/AutoMLforImagesAlgorithms

- AutoML for Images tutorial

http://aka.ms/AutoMLforImagesTutorial