Google Cloud

All Readings: Computer Vision Fundamentals on Google Cloud

Here are the assembled readings provided in this course.

Module 1: Introduction to Computer Vision and Pre-built ML Models with Vision API

- Lesson 1: What Is Computer Vision?
    - Internet growth statistics from Statista
    - The amount of visual data on Google Photos
- Lesson 3: Computer Vision Use Cases
    - The New York Times digitizes millions of historical photos using Google Cloud Technology
    - Box: Bringing image recognition and OCR to cloud content management
    - Coastal classifiers: using AutoML Vision to assess and track environmental change
- Lesson 4: Vision API - Pre-built ML Models
    - DocumentAI API documentation
    - Vision AI documentation
    - Image: Purdue university
    - Demo instructions:
        - Instructions
    - Demo Images:
        - Image cc0 (owl): https://pixabay.com/en/owl-camouflage-wildlife-1576572/
        - Image cc0 (clipboard) https://pixabay.com/en/clipboards-papers-text-quotes-924044/
        - Images cc0 (Coit Tower): https://pixabay.com/en/coit-tower-san-francisco-skyline-1499662/
    - Video Intelligence API document
    - Google's human labeling program
- Lab intro:
    - Google Cloud Storage documentation
    - Google Cloud Vision API documentation
    - Google Cloud Translation API documentation
    - Google Cloud Pub/Sub documentation
    - Cloud Functions documentation
- Additional Resources:
        - Machine Learning on Google Cloud
        - Google Cloud Big Data and Machine Learning Fundamentals
        - Machine Learning Crash Course - Image Classification

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Module 2: Vertex AI and AutoML Vision on Vertex AI

- Lesson 1: What is Vertex AI and why does a unified platform matter?
    - Vertex AI documentation
    - Giving Vertex AI, the New Unified ML Platform on Google Cloud, a Spin
    - cloud.google.com/training
- Lesson 2: Introduction to AutoML Vision on Vertex AI
    - AutoML documentation.
- Lesson 3: How does Vertex AI help with the ML workflow, part 1 ?
    - Vertex AI Labeling Services
- Lesson 4: How does Vertex AI help with the ML workflow, part 2 ?
    - Getting evaluation metrics
    - Best Practices Guide
    - About model deployment
    - How Google does Machine Learning
- Lesson 5: Which vision product is right for you ?
    - Image of a Cloud
    - Which vision product is right for you?

- Additional Resource:
    - Machine Learning Operations (MLOps) Fundamentals course
    - Launching into Machine Learning
    - Machine Learning on Google Cloud

Module 3: Custom Training with Linear, Neural Network and Deep Neural Network models

- Lesson 1: Introduction
    - TensorFlow dataset
- Lesson 3: Reading the Data
    - tf.io
    - tf.image
    - tf.data.Dataset
    - tf.data.TextLineDataset
    - tf.data.Dataset.list_files
    - tf.data.FixedLengthRecordDataset
    - TensorFlow documentation
- Lesson 4: Implementing Linear Models for Image Classification
    - tf.keras.Model
    - The Functional API
    - *Compile*
    - *Optimizer*

    - *Loss function*
    - *Metrics*
- Lesson 5: Neural Networks and Deep Neural Networks for Image Classification
    - Commonly Used Activation Functions
    - Model.compile
- Lesson 6: Deep Neural Networks with Dropout and Batch Normalization
    - universal approximation theorem
    - The Geometric Occam's Razor Implicit in Deep Learning
    - Dropout: A Simple Way to Prevent Neural Networks from Overfitting
- Additional Resources
    - Machine Learning on Google Cloud

Module 4: Convolutional Neural Networks

- Lesson 2: Convolutional Neural Networks
    - Neocognitron
    - Visual nervous system
    - Deep Learning
    - Initial CNN architecture
    - AlexNet
    - The concept of hierarchy
    - Google's Own Inception network
- Lesson 4: CNN Model Parameters
    - 2-dimensional convolution layer in Keras
- Lesson 5: Working with Pooling Layers
    - Pooling layers in Keras
- Lesson 6: Implementing CNNs on Vertex AI with pre-built TF container using Vertex Workbench
    - National Institute of Standards and Technology
    - Softmax Function
- Lab intro:
    - MNIST
    - tf.keras API

Module 5: Dealing with Image Data

- Lesson 2: Reading and Preprocessing the Image Data

    - tf.data
    - tf.image.ResizeMethod
    - Learning to Resize Images for Computer Vision Tasks
    - tf.image
    - tf.keras.layers.Resizing
    - tf.keras.layers.Rescaling
- Lesson 4: Data Augmentation
    - Dataset.map

    - tf.image
    - tf.data
    - tf.image.flip_left_right
    - tf.image.rgb_to_grayscale
    - tf.image.stateless_random_brightness
    - tf.image.stateless_random_contrast
    - tf.image.stateless_random_crop
    - tf.image modules for data augmentation
    - tf.py_function
    - https://keras.io/api/layers/preprocessing_layers/image_preprocessing/
- Lesson 5: Transfer Learning
    - MobileNet