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Image Recognition using AWS

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Overview

- Introduction
- Literature Review
- Background
- Infrastructure

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Introduction

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Primary Objective

- This project aims at building an elastic web application that can automatically scale-out and scale-in and are on-demand and cost-effectively by using cloud resources.

- The resources used were from Amazon Web Services a IaaS provider.

WHY AWS?

AWS as an IaaS provider offers a variety of compute, storage and message services. The image recognition application is exposed as a REST Service for the clients to access.

HOW?

- The application takes the images and returns the predicted output by the deep learning model by using the AWS resources.
- The tasks involve designing the architecture, implementing REST and Web Services.
- A load balancer that scales in and scales out EC2 instances at App Tier according to the demand of the user.

Literature Review

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Paper 1

B. B. A. da Costa and P. S. Pisa, "Cloud Strategies for Image Recognition," *2020 4th Conference on Cloud and Internet of Things (CIoT)*, Niteroi, Brazil, 2020, pp. 57-58,

doi: 10.1109/CIoT50422.2020.9244200.

- This paper discusses the various approaches and techniques used in image recognition. It also compares the out-of-the-box services with the framework service from Amazon Web Services (AWS).

Paper 2

V. Sharma, "Object Detection and Recognition using Amazon Rekognition with Boto3," 2022 6th International Conference on Trends in Electronics and Informatics (ICOEI), Tirunelveli, India, 2022, pp. 727-732, doi: 10.1109/ICOEI53556.2022.9776884.

- The paper incorporates different viewpoints that have been utilized by various analysts for object spotting and recognition using AWS, Amazon Rekognition which is easy to integrate into other services like Lambda

Paper 3

R. Suguna, M. S. Devi, A. Kushwaha and P. Gupta, "An Efficient Real time Product Recommendation using Facial Sentiment Analysis," 2019 IEEE International Conference on Electrical, Computer and Communication Technologies (ICECCT), Coimbatore, India, 2019, pp. 1-6, doi: 10.1109/ICECCT.2019.8869300.

- This paper explains the necessary steps to utilize the service to build an application for a retail store **using Amazon Rekognition which uses a simple, easy-to-use API that can quickly analyze any image file that's stored in Amazon S3.**

Other Papers

★ G. Rafael, H. Kusuma and Tasripan, "The Utilization of Cloud Computing for Facial Expression Recognition using Amazon Web Services," 2020 International Conference on Computer Engineering, Network, and Intelligent Multimedia (CENIM), Surabaya, Indonesia, 2020, pp. 366-370, doi: 10.1109/CENIM51130.2020.9297974.

★ M. L. N, A. E. Rao and M. P. Kalyan, "Real-Time Object Detection with Tensorflow Model Using Edge Computing Architecture," 2022 8th International Conference on Smart Structures and Systems (ICSSS), Chennai, India, 2022, pp. 01-04, doi: 10.1109/ICSSS54381.2022.9782169.

Background

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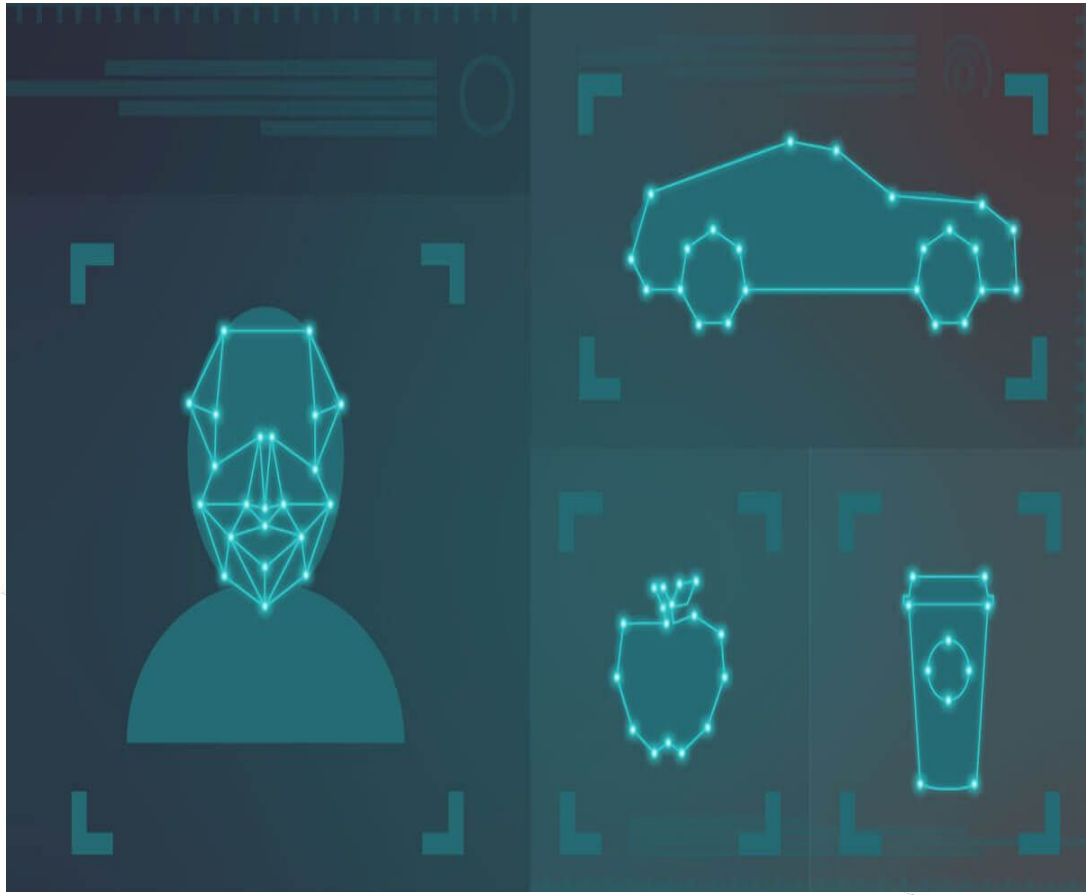
Project title: Image Recognition using AWS

- What is Image Recognition
- Where is it used
- What is an IaaS service
- Its applications

What is Image Recognition?

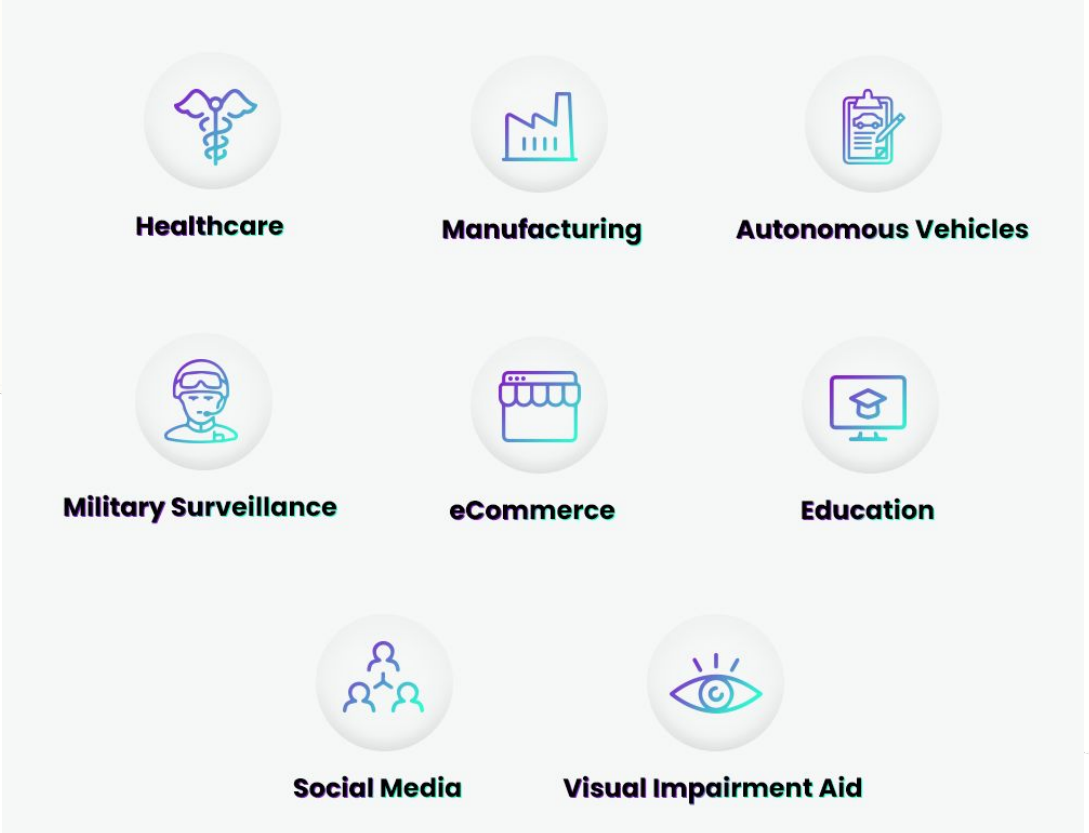
Image recognition allows machines to identify objects, people and other variables by recognizing patterns and regularities in the image data.

then classifies them into categories by interpreting image pixel patterns.



Applications of Image Recognition

- Health Care
- Manufacturing
- Autonomous Vehicles
- E-commerce
- Education
- Military Surveillance
- Social Media



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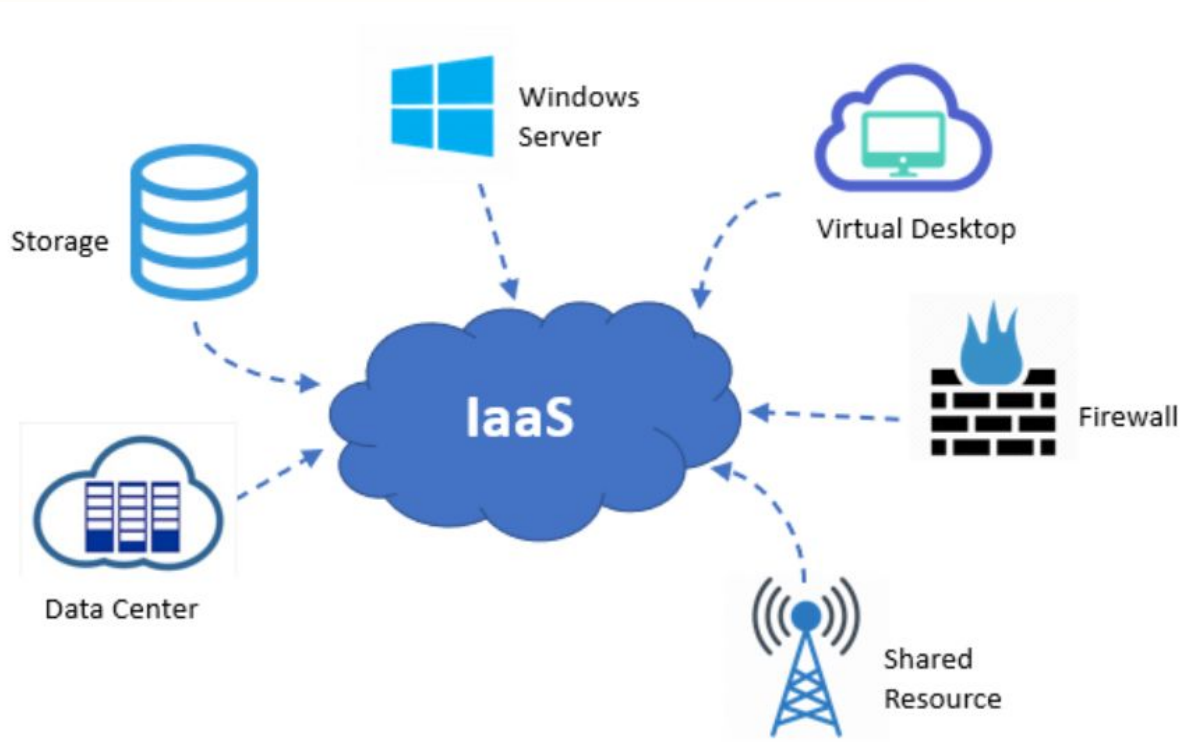
What is an IaaS service?

Infrastructure as a Service: It allows organizations to manage their business resources such as their network, servers, and data storage on the cloud without need of purchasing hardware.



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Advantages of IaaS

- Its pay-as-you-go model allows businesses to only pay for the resources they use.
- Organizations have complete control over their infrastructure.
- It can be scaled or downsized as needed.
- There's no need to buy a physical server or maintain it.

Infrastructure

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Infrastructure

Web Tier:

The Web tier is responsible for displaying and collecting information from users, and delivering the contents to the browser in the form of HTML/JS/CSS.

Application Tier:

The Application tier serves as the core of the app, handling business logic and database manipulation functions (CRUD).

Resources

Web instance resource include:

- Web instance resource includes a Python Flask for user interaction.
- It also includes input and output S3 buckets for loading images and displaying classified images on the user interface.

App instance resources:

- SQS for input images as messages, storing them, and adding them to a AWS Deep Learning model for image classification.
- Output SQS then passes classified image results onto output S3 (Web instance).

System Architecture

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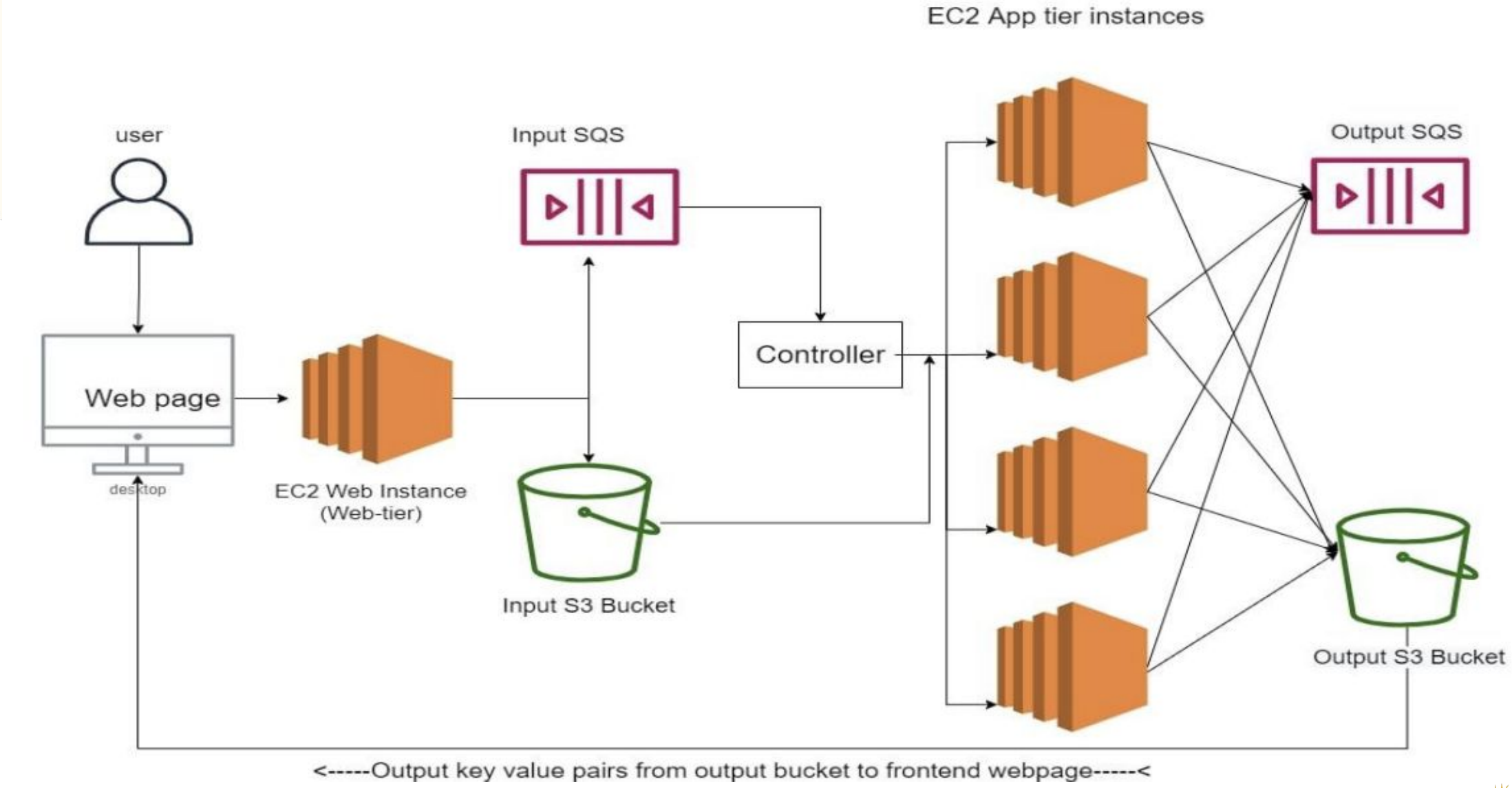

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System Architecture

- HTML web page with "choose files" and "upload" buttons.
- One EC2 Web tier instance.
- Input images uploaded by user sent to SQS input queue.
- App tier consists of up to 15 EC2 instances that auto-scale based on input load.
- Deep learning AMI used for image classification.
- Output of deep learning model sent to output SQS queue and stored in output S3 bucket.
- App tier instances auto-terminated when input SQS queue is empty.
- Classified images pushed to HTML page for user display after a period of time based on load.

QUESTIONS?

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