A

Project Report on

"**Image Tag Generator**"

Submitted by

Group 12

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In partial fulfillment of the requirements of the Subject in

Into to Cloud Technologies - CPSC_5207EL_01_2023F

Submitted to,

Laurentian University

LaurentianUniversity
UniversitéLaurentienne

Abstract

The following project describes how to make a single page webapp that can perform image object detection and then produce tags related to the image and display it to the user. The project is made using the services of Google Cloud Platform. Different services of the Google Cloud Platform are enabled integrated and connected to complete the functionality of the webapp as well as to host the webapp for public access.

You can find the source code for this project at: https://github.com/Atitpatelrepo/intro-to-cloud-project

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1. Introduction

The goal of this project is to develop an image tag generator that can create word clouds and picture tags and keep track of all the tags that a user has ever made using email addresses and passwords that they have supplied. The system utilizes image analysis methods to create descriptive tags for photos by analysing text data submitted by users. To generate image tags, the procedure entails examining the picture content and collecting pertinent keywords.

The application takes a user-centric approach, authenticating and accessing the user's past data with the password and email provided. After a successful authentication attempt, the system examines the photos uploaded by the user to generate image tags. These tags offer descriptive labels for easier organisation and searchability by classifying the photographs according to their content.

Furthermore, the system utilizes text analysis methods to produce word clouds that are based on the text contained in the photos or any related metadata. In order to aid in a rapid comprehension of the information, this feature attempts to visually portray the most frequently occurring words or concepts found in the photographs.

Most importantly, the programme keeps an extensive database of all tags that the user creates, guaranteeing a permanent archive of previously made tags. Users can access their historical image tags, which helps them organise their digital assets more efficiently.

A database holds the user's past tags, making it possible to retrieve and examine previously created tags. With the help of this technology, users may easily and automatically classify and summarise visual information, all the while keeping track of their tagging history for further study and analysis.

2. Model

2.1 User Data/ Data Supplied

- The data is supplied by the end user in the form of:
    - E-mail
    - Password
    - Images uploaded by the user

2.2 Data Stored

- User data that is retained in the database:
    - Email
    - Password
- System generated data retained in the database:
    - Generated Image Tags from Vision AI

2.3 Output produced.

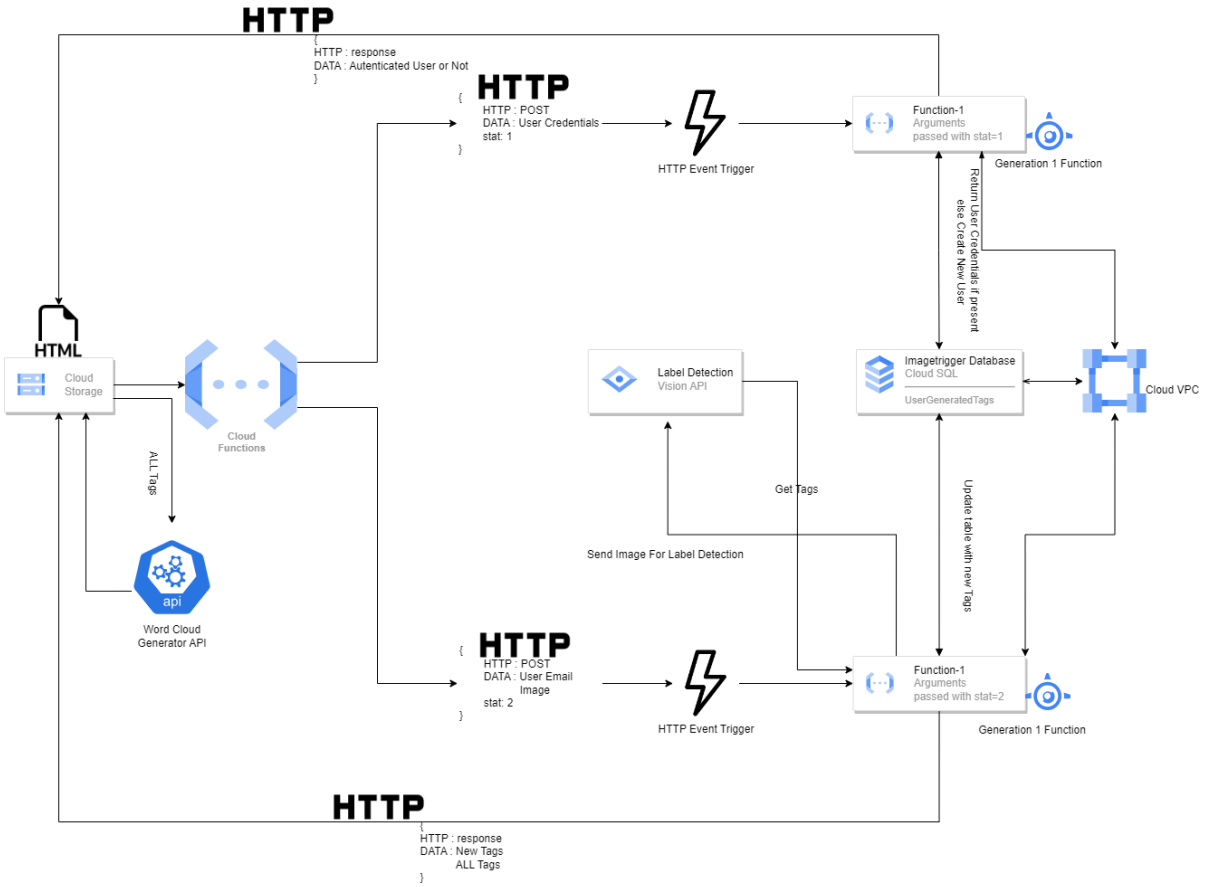
- Image tags generated by the vision AI API.
- Word Cloud generated by an https://quickchart.io/wordcloud?text= API.

2.4 Cost to Deploy

Service	**Configuration**	**Price**
Cloud Storage	Standard	$0.10
CloudSQL	Enterprise, db-lightweight-2, 10GB	$81.16
Cloud Function	Generation-1	$1.37
Vision API	Label detection	Free upto 1000 calls per month

3. Pipeline

3.1 Pipeline Diagram



3.2 Flow

- The flow of the program starts from the index.html page that is hosted on the google cloud storage bucket.
- Users will access the webapp from the public URL given by the google cloud storage bucket when the file is uploaded.
- When the user access the webapp from the URL they will be asked enter their email address and password.
- Existing users can just enter their email address and password.
- If the user is new they will still enter their email address and enter a password that they want to initiate their account with.

- After this an HTTP-POST request is made to the cloud function “Function-1”. The email address and password as well as a stat variable is sent as data along with the request.
- In the cloud function it first checks the stat variable value if it is 1 it will then perform user authentication or user creation.
- The function will then query the MySQL database instance of CloudSQL to check if the user exist.
- If the user does not exist it will create a new user with the supplied credentials data.
- The cloud function will then send a response back to the webapp saying that the user is authentic.
- If the user already exist it will match the credentials retrieved from the MySQL database and the credentials in the HTTP-POST request.
- If credentials match it will cloud function will then send a response back to the webapp saying that the user is authentic.
- If credentials do not match cloud function will then send a response back to the webapp saying that the user is not authentic.
- If the user is authentic the webapp will display the next view.
- If the user is not autherntic the webapp will display and alert to the user.
- Once in the upload image view the user will be asked to upload an image.
- User must select the image files that they want to upload from their system.
- The upload will only work for image files.
- After the user has selected the images it will be displayed on the webapp.
- The user then clicks the ‘Generate Tags” button.
- On clicking this button the webapp will retrieve the uploaded image file and then convert it to bas64 encoded string.
- The encoded string, user’s email and a stat variable is sent as data along with the HTTP-POST request to the cloud function.
- In the cloud function it first checks the stat variable value if it is 2 it will perform Image tag generation.
- The cloud function send the base64 encoded string to the Cloud vision API.
- The function then retrieves the generated labels/tags.

- It then queries the MySQL database to get the tags that were previously generated by the user.
- It then appends the newly generated tags to the existing tags in the database and then it updates the database.
- It send the newly generated tags and the updated tags in the database as a response to the webapp.
- The webapp then displays the newly generated tags.
- The updated database tags are then passed as a text argument to and external API that returns a word cloud .svg file.
- This .svg file containing the word cloud is then displayed to the user.

4. Components

4.1 Cloud Function

Cloud Functions is the name of the serverless computing service offered by Google Cloud Platform (GCP) that lets you run your code without having to provision or manage servers. Cloud Functions can be set to be triggered by a variety of events, including HTTP requests, modifications to Cloud Storage, Pub/Sub messages, Firestore database events, and more. Cloud Functions automatically increase in size in response to the volume of incoming events. Could concentrate on writing code without having to worry about supporting systems. The administration of the underlying infrastructure is not a concern for us. Just pay for the resources utilised to carry out the task. The number of invocations and resources used during each function execution determines how much it will cost to use this. For irregular workloads, this can be a cost-effective option. Numerous runtimes and programming languages are supported by Cloud Functions such as Node.js, Python, Go, Java,.NET, etc.

4.2 Cloud SQL

Google Cloud Platform (GCP) offers Google Cloud SQL, a fully managed relational database service. It makes it simple to set up, manage, and oversee relational databases in the cloud. Tasks related to database maintenance, including backups, replication, patch management, and updates, are automatically managed by Google Cloud SQL allows you to select the database engine that best suits your needs by supporting widely used engines, including MySQL, PostgreSQL, and SQL Server. Cloud SQL offers alternatives for high availability to guarantee database dependability through automatic backups, replication, and failover. provides a range of security capabilities, including network isolation via Virtual Private Cloud (VPC) and integration of Identity and Access Management (IAM) for access control. It alsoenables thes encryption of data while it's in transit and at rest.As the application's needs change, it makes it simple to scale resources like CPU, memory, and storage. Integrates seamlessly with a variety of different GCP services, including Kubernetes Engine, App Engine, Compute Engine, and more. Pricing for Google

Cloud SQL depends on several variables, including machine type, storage capacity, network consumption, and database engine type. The pricing page for the Google Cloud Platform has information about prices. With Google Cloud SQL, it's possible to host and manage relational databases in the cloud with dependability and scalability, freeing up your time to concentrate on creating apps rather than database administration.

4.3 Vision API

The Google Cloud Vision API is a powerful service offered by Google Cloud Platform (GCP) that allows developers to integrate vision detection features into their applicationsidentifies faces in pictures and gives details about the features, feelings, and orientation of the face. enables the search and extraction of text from photographs, including handwritten or printed text. identifies well-known places and offers details about them. detects and identifies logos in pictures. ascertains whether an image includes explicit content, such as violence, pornographic content, or medical content. A wide range of applications, including web apps, mobile apps, and backend services, can be linked with the Vision API. For easier integration, Google offers client libraries for several programming languages. The cost of the Google Cloud Vision API is determined by consumption, namely by the quantity of picture queries and features utilised. The GCP pricing page has information on prices. For developers wishing to add robust picture analysis and recognition features to their apps without having to start from scratch with machine learning models, the Google Cloud Vision API is a useful resource.

4.4 Word Cloud API

QuickChart is a service that provides a simple API to create various types of charts and visualizations, but as of my last update, it doesn't offer a specific endpoint dedicated to generating word clouds. Store and manage your text data in a GCP storage service like Google Cloud Storage, Google Cloud Firestore, or Google Cloud Bigtable. QuickChart provides an API that generates word clouds or tag clouds, visualizations that give prominence to words that appear frequently in a given text. There are many ways to customize your word cloud. Such as: text, format etc.

5. Future recommendation

- Improve User Authentication
- Make use of Generated Tags to categorize images.
- Improve Image search with Tags.
- Retain Image History along with Tag History

6. Conclusion

- Were Able to enable, configure and connect multiple Google Cloud platform Services and APIs.
- Hosted a Single Page WebApp on the Internet Using GCP cloud storage buckets
- Programmed services and roles with permissions.
- Generated API keys for services.

References

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