



Using AWS for Image Recognition

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Why this project?



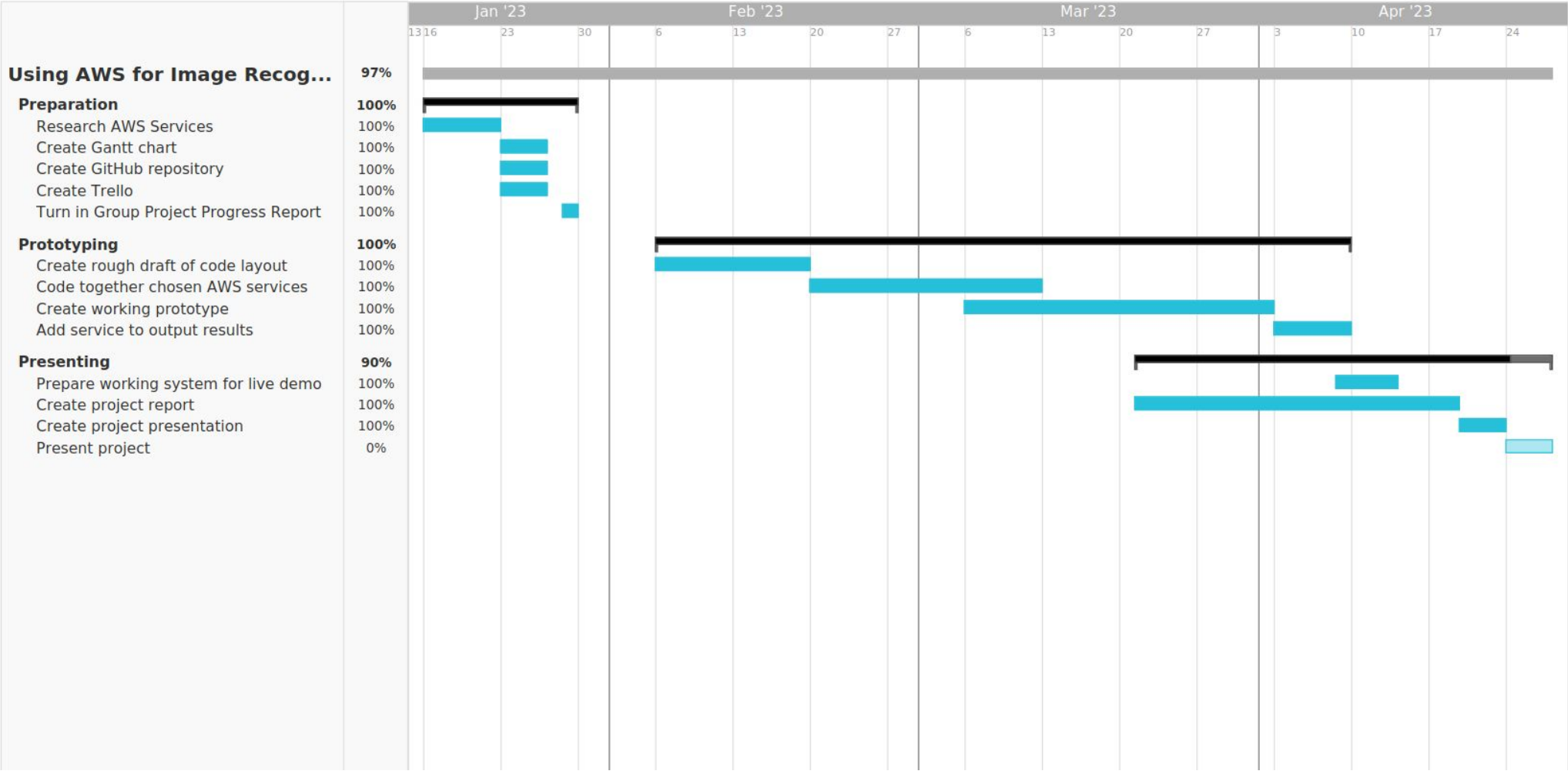
- Image generation/recognition is becoming increasingly popular with AI models such as ChatGPT/DALL-E/HuggingGPT.
- We wanted to attempt to create a pseudo-build of an AI image recognition model solely utilizing AWS.
 - AWS has its own model that can recognize images and characteristics.

Objective



- Our goal is to create a system that can accurately generate a series of tags about an image that it is given, and send it to an email address.
 - Additionally, we would like to use this project to explore the various services that AWS has to offer.

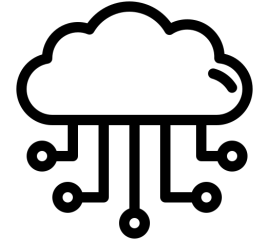
Timeline



Project Milestones



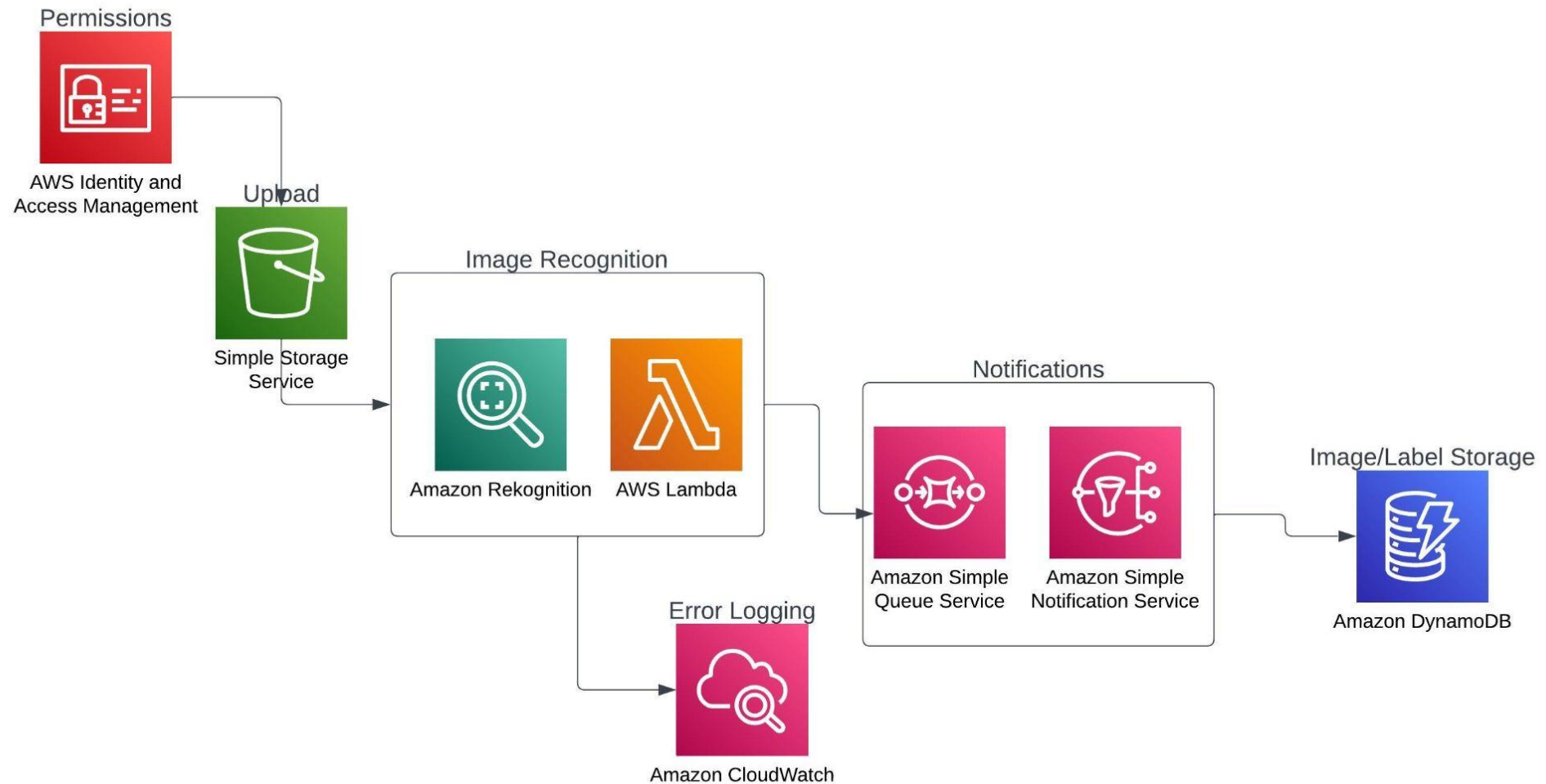
1. Research various AWS services to incorporate into the image recognition system.
2. Link the various services to create a rough draft of the system through coding them together.
3. Create a working prototype that can recognize images and return descriptors.
4. Employ the Amazon SQS service to send the descriptors to a mobile device.



AWS Services
















1. IAM - sets permissions for Lambda
2. S3 - stores images to be labeled by Rekognition
3. Lambda - hosts core python code
4. Rekognition - identifies labels to associate to image
5. SNS - sends notification with labels via email
6. SQS - works in conjunction with SNS to deliver notifications
7. DynamoDB - stores labels produced by system

Cloud Architecture
















IAM



<input type="checkbox"/>	Policy name 	Type	Description
<input type="checkbox"/>	  AmazonSQSFullAccess	AWS managed	Provides full access to Amazon SQS via the AWS Ma...
<input type="checkbox"/>	  AmazonS3FullAccess	AWS managed	Provides full access to all buckets via the AWS Mana...
<input type="checkbox"/>	  CloudWatchFullAccess	AWS managed	Provides full access to CloudWatch.
<input type="checkbox"/>	  AmazonDynamoDBFullAccess	AWS managed	Provides full access to Amazon DynamoDB via the A...
<input type="checkbox"/>	  AmazonRekognitionFullAccess	AWS managed	Access to all Amazon Rekognition APIs
<input type="checkbox"/>	  AWSLambdaBasicExecutionR...	AWS managed	Provides write permissions to CloudWatch Logs.
<input type="checkbox"/>	  AmazonSNSFullAccess	AWS managed	Provides full access to Amazon SNS via the AWS Ma...

IAM (Updated for Security)



<input type="checkbox"/>	Policy name 	Type	Description
<input type="checkbox"/>	  AmazonRekognitionReadOnlyAccess	AWS managed	Access to all Read rekognition
<input type="checkbox"/>	  AmazonSQSReadOnlyAccess	AWS managed	Provides read only access to A
<input type="checkbox"/>	  AmazonS3ReadOnlyAccess	AWS managed	Provides read only access to a
<input type="checkbox"/>	  AWSLambdaSQSQueueExecutionRole	AWS managed	Provides receive message, del
<input type="checkbox"/>	  AWSLambdaBasicExecutionRole	AWS managed	Provides write permissions to C
<input type="checkbox"/>	 DynamoProjectPolicy	Customer inline	
<input type="checkbox"/>	 SNSProjectPolicy	Customer inline	

S3



Copy S3 URI

Copy URL

Download

Open

Delete

Actions

Create folder

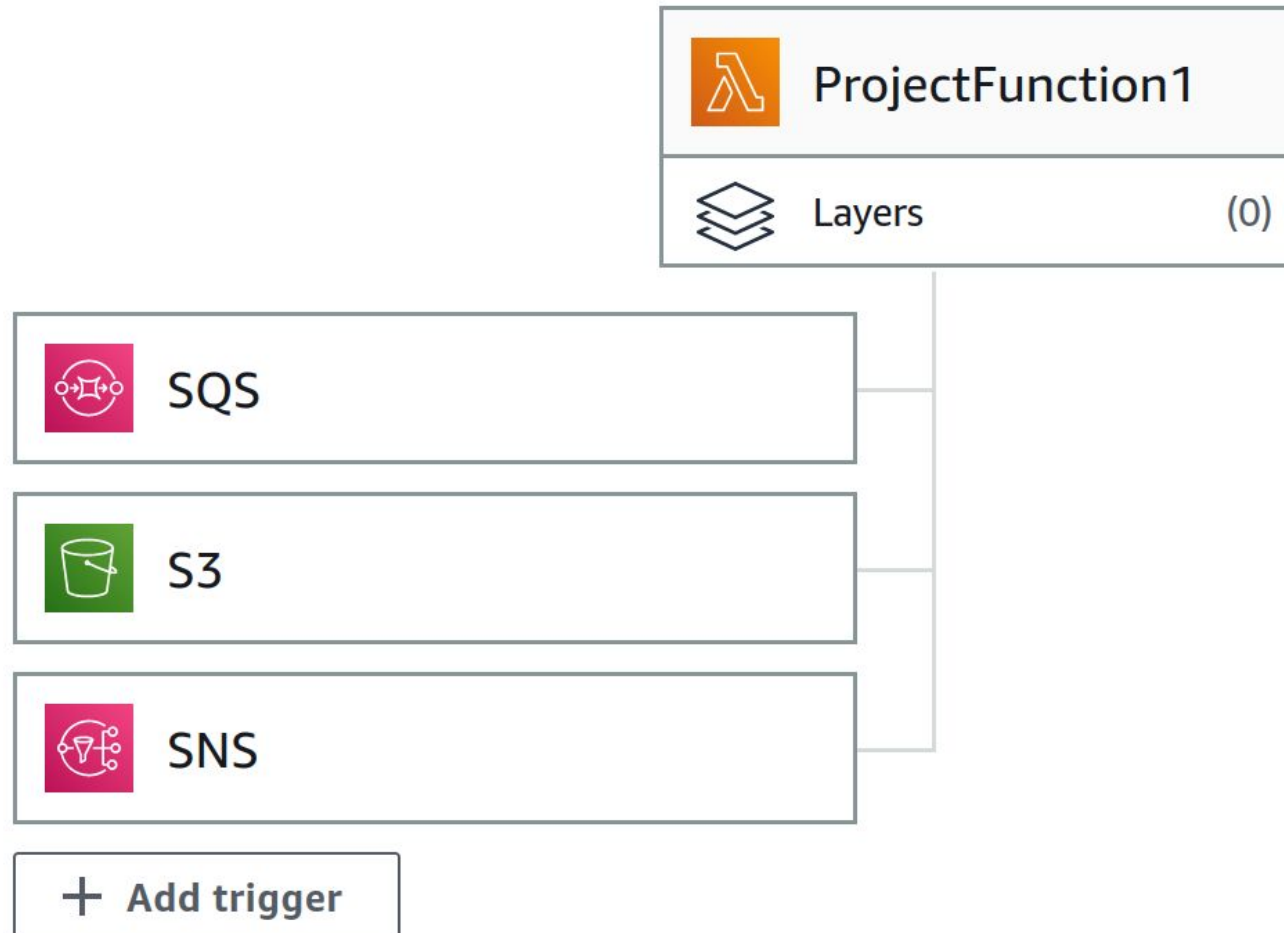
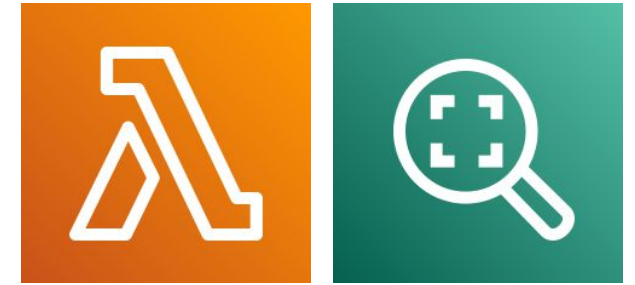
Upload

Find objects by prefix

1

<input type="checkbox"/>	Name ▲	Type ▼	Last modified ▼	Size ▼	Storage class ▼
<input type="checkbox"/>	ball.jpg	jpg	April 23, 2023, 02:04:49 (UTC-05:00)	482.7 KB	Standard
<input type="checkbox"/>	outlier.jpg	jpg	April 24, 2023, 03:18:04 (UTC-05:00)	98.8 KB	Standard
<input type="checkbox"/>	pilot1.jpg	jpg	April 23, 2023, 02:04:47 (UTC-05:00)	175.1 KB	Standard
<input type="checkbox"/>	RAM.jpg	jpg	April 24, 2023, 01:05:30 (UTC-05:00)	56.1 KB	Standard
<input type="checkbox"/>	think.jpg	jpg	April 23, 2023, 02:04:48 (UTC-05:00)	818.5 KB	Standard

Lambda & Rekognition



+ Add destination

Lambda & Rekognition



```
1 import boto3
2 import uuid
3
4 s3_client = boto3.client('s3')
5 rekognition_client = boto3.client('rekognition')
6 sqs_client = boto3.client('sqs')
7 sns_client = boto3.client('sns')
8 dynamodb_client = boto3.client('dynamodb')
9
10 def lambda_handler(event, context):
11     # Retrieve S3 bucket and object information from the event
12     s3_bucket = event['Records'][0]['s3']['bucket']['name']
13     s3_object_key = event['Records'][0]['s3']['object']['key']
14
15     try:
16         image = get_s3_image(s3_bucket, s3_object_key)
17
18         labels = detect_labels(image)
19
20         process_labels(labels, s3_object_key)
21
22         message = '\n'
23         for label in labels:
24             message += f'Label: {label["Name"]}, Confidence: {label["Confidence"]}%\n'
25
```

SNS & SQS



projectSNS

Edit

Delete

Publish message

Details

Name

projectSNS

ARN

arn:aws:sns:us-east-1:809018440242:projectSNS

Type

Standard

Display name

Image Recognition Status

Topic owner

809018440242

SNS & SQS



Subscriptions (4)

[Edit](#)[Delete](#)[Request confirmation](#)[Confirm subscription](#)[Create subscription](#)[<](#) 1 [>](#)

	ID ▲	Endpoint ▼	Status ▼	Protocol ▼	Topic ▼
<input type="radio"/>	483f8313-9fb2-...	dsgarza@studen...	✔ Confirmed	EMAIL	Default_CloudWa...
<input type="radio"/>	65cd3120-1fde-...	d.santos.garza02...	✔ Confirmed	EMAIL	projectSNS
<input type="radio"/>	bf2e0c6e-f87e-4...	arn:aws:sqs:us-ea...	✔ Confirmed	SQS	projectSNS
<input type="radio"/>	d937cc7a-a7de-...	arn:aws:lambda:u...	✔ Confirmed	LAMBDA	projectSNS

SNS & SQS



ProjectSQS

[Edit](#)[Delete](#)[Purge](#)[Send and receive messages](#)[Start](#)

Details [Info](#)

Name

ProjectSQS

Type

Standard

ARN

arn:aws:sqs:us-east-1:809018440242:ProjectSQS

Encryption

Amazon SQS key (SSE-SQS)

URL

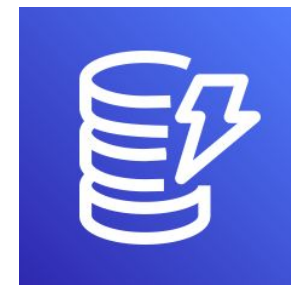
https://sqs.us-east-1.amazonaws.com/809018440242/ProjectSQS

Dead-letter queue

-

► More

DynamoDB



<input type="checkbox"/>	image_id ▾	confidence ▾	label ▾	object_key ▾
<input type="checkbox"/>	d64cb3fb-9af3-47ab-...	99.9999847...	Truck	RAM.jpg
<input type="checkbox"/>	62ab538e-e4fb-4383...	99.9999847...	Pickup Truck	RAM.jpg
<input type="checkbox"/>	7439524a-5d35-408c...	95.6109008...	American F...	ball.jpg
<input type="checkbox"/>	4848d1ae-0c84-4b1a...	95.6109008...	Sport	ball.jpg
<input type="checkbox"/>	a2afaa7a-40ad-4cea...	95.6109008...	Football	ball.jpg
<input type="checkbox"/>	48eae29a-bf83-46f1-...	99.9999847...	Vehicle	RAM.jpg

Challenges & Limitations



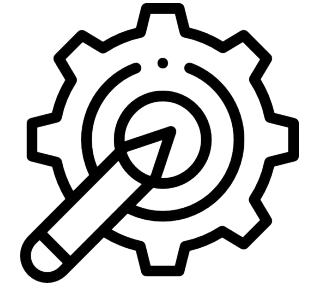
- Learning to integrate multiple AWS services into python code
- Unable to use SNS for text messaging due to law requiring usage of toll-free number
- Code deployment required before testing, resulting in constant rollbacks
- DynamoDB caused many issues with integrating into our system
 - Lack of experience with NoSQL



Conclusion

- While our image recognition system can only provide basic labels from the images it is given, it could be improved to recognize more specific details with AutoML, such as the make and model of a car.
- It was somewhat difficult to work within the bounds of the AWS Free Tier, as a lot of the services required payment for resource use/extra features.

Resources



Amazon DynamoDB. (n.d.). Retrieved March 28, 2023, from <https://docs.aws.amazon.com/amazondynamodb/latest/developerguide/GettingStartedDynamoDB.html>

Marquez, E. (2021, November 10). *How to create an AWS lambda function*. Cloud Computing. Retrieved February 6, 2023, from <https://www.techtarget.com/searchcloudcomputing/tip/How-to-create-an-AWS-Lambda-function>

Musgrave, D. (2022). *Lambda*. Amazon. Retrieved February 8, 2023, from https://docs.aws.amazon.com/lambda/latest/dg/API_Reference.html

North, F. (1998). *SNS*. Amazon. Retrieved April 4, 2023, from <https://aws.amazon.com/getting-started/hands-on/send-fanout-event-notifications/>

North, F. (1998). *SQS*. Amazon. Retrieved April 9, 2023, from <https://aws.amazon.com/getting-started/hands-on/send-messages-distributed-applications/>

Prerequisite: Setting up Amazon S3 - Amazon Simple Storage Service. (n.d.). Retrieved March 2, 2023, from <https://docs.aws.amazon.com/AmazonS3/latest/userguide/setting-up-s3.html>

Schütz Julia. (2011). *Amazon Rekognition: Detecting Labels*. Amazon. Retrieved March 17, 2023, from <https://docs.aws.amazon.com/rekognition/latest/dg/labels.html?pg=ln&sec=ft>

Whitehouse-Grant-Christ, I. H. V. (2011). *IAM*. Amazon. Retrieved March 8, 2023, from <https://docs.aws.amazon.com/IAM/latest/UserGuide/access.html>

