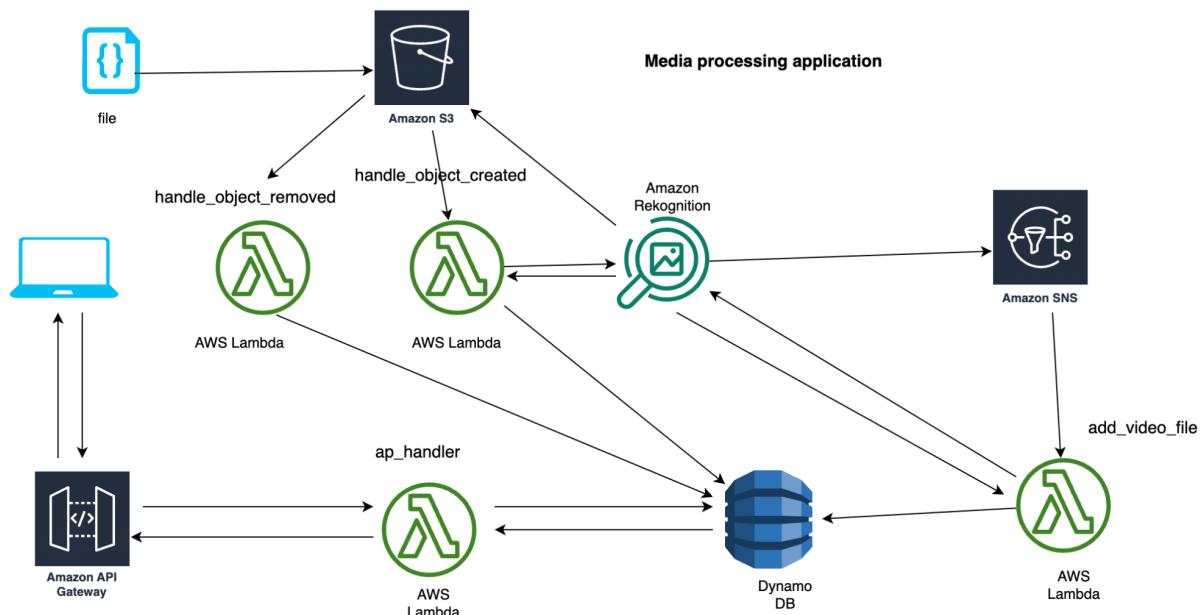


### Media processing serverless Application

Media processing application that allows us to analyze images and videos to detect real world objects in media files. The results of the analysis can then be queried through the REST API.

#### Architecture Diagram:



For the image processing once we upload image in s3 bucket lambda function will invoke and image will be processed using amazon rekognition once it's done add image lambda function will store labels data from amazon recognition into dynamo DB.

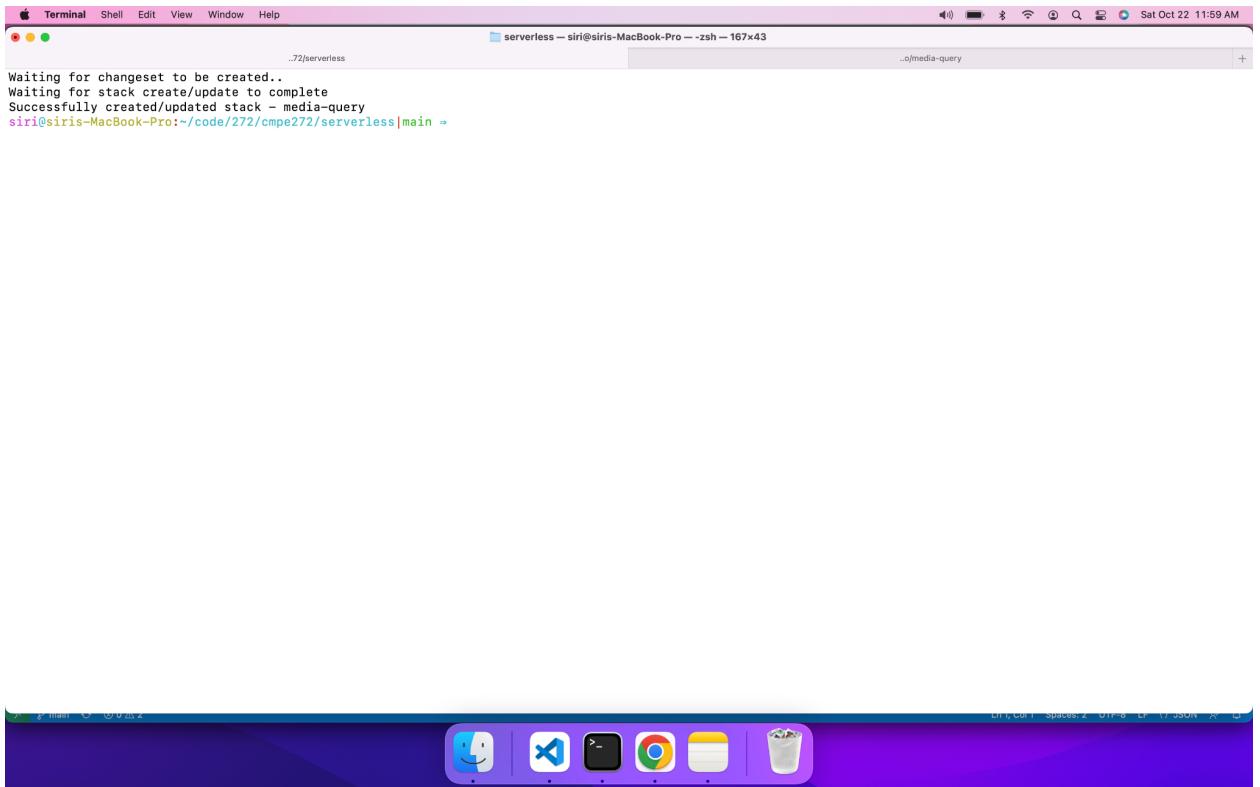
For the video processing once we upload a video file into s3 bucket lambda function will invoke and video will be processed using amazon rekognition then one message notification will be triggered in SNS. Once it's done, the video lambda function will store labels from amazon rekognition into dynamo DB .

App handler lambda function is invoked via api gateway which queries data stored in dynamo DB and responds to users with data about labels that are created from media processing.

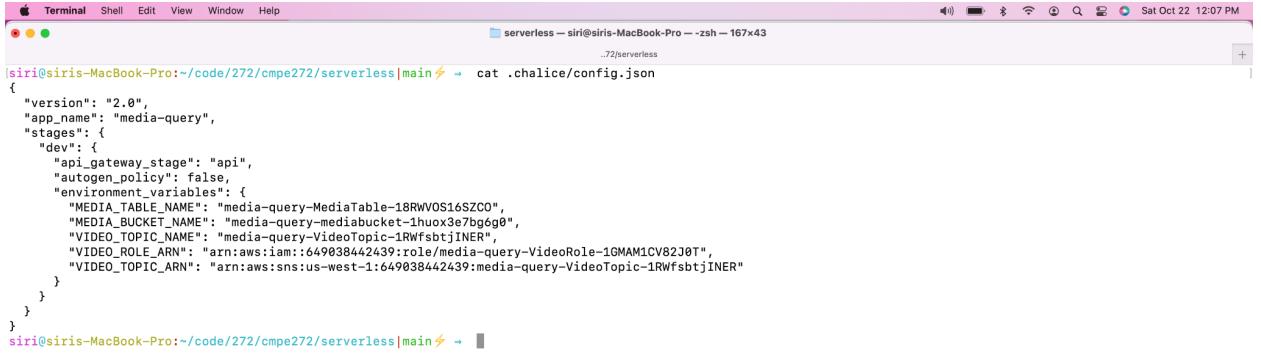
- First we need to clone the application I have developed.  
<https://github.com/sirishacyd/cmpe272>
- **Created & activated a virtual environment** for application. Installed dependencies and **chalice** libraries.

```
.72/serverless ..o/media-query +
[siri@siris-MacBook-Pro:~/code/272/cmpe272/serverless|main ~] python3 -m venv /tmp/venv05
[siri@siris-MacBook-Pro:~/code/272/cmpe272/serverless|main ~] . /tmp/venv05/bin/activate
[siri@siris-MacBook-Pro:~/code/272/cmpe272/serverless|main ~] which python
/tmp/venv05/bin/python
[siri@siris-MacBook-Pro:~/code/272/cmpe272/serverless|main ~] pip install -r requirements.txt
Collecting boto3<1.15.0
  Using cached boto3-1.14.63-py2.py3-none-any.whl (129 kB)
Collecting jmespath<1.0.0,>=0.7.1
  Using cached jmespath-0.10.0-py2.py3-none-any.whl (24 kB)
Collecting botocore<1.18.0,>=1.17.63
  Using cached botocore-1.17.63-py2.py3-none-any.whl (6.6 MB)
Collecting s3transfer<0.4.0,>=0.3.0
  Using cached s3transfer-0.3.7-py2.py3-none-any.whl (73 kB)
Collecting python-dateutil<3.0.0,>=2.1
  Using cached python_dateutil-2.8.2-py2.py3-none-any.whl (247 kB)
Collecting urllib3<1.26,>=1.20
  Using cached urllib3-1.25.11-py2.py3-none-any.whl (127 kB)
Collecting docutils<0.16,>=0.10
  Using cached docutils-0.15.2-py3-none-any.whl (547 kB)
Collecting six>=1.5
  Using cached six-1.16.0-py2.py3-none-any.whl (11 kB)
Installing collected packages: urllib3, six, jmespath, docutils, python-dateutil, botocore, s3transfer, boto3
Successfully installed boto3-1.14.63 botocore-1.17.63 docutils-0.15.2 jmespath-0.10.0 python-dateutil-2.8.2 s3transfer-0.3.7 six-1.16.0 urllib3-1.25.11
[notice] A new release of pip available: 22.2.1 => 22.3
[notice] To update, run: python3 -m pip install --upgrade pip
[siri@siris-MacBook-Pro:~/code/272/cmpe272/serverless|main ~] pip install chalice
Collecting chalice
  Using cached chalice-1.27.3-py3-none-any.whl (263 kB)
Requirement already satisfied: six<2.0.0,>=1.10.0 in /private/tmp/venv05/lib/python3.10/site-packages (from chalice) (1.16.0)
Collecting inquirer<3.0.0,>=2.7.0
  Using cached inquirer-2.10.0-py3-none-any.whl (17 kB)
Requirement already satisfied: pip<22.3,>=9 in /private/tmp/venv05/lib/python3.10/site-packages (from chalice) (22.2.1)
Requirement already satisfied: setuptools in /private/tmp/venv05/lib/python3.10/site-packages (from chalice) (63.2.0)
Collecting typing_extensions<5.0.0,>=4.0.0
  Using cached typing_extensions-4.4.0-py3-none-any.whl (26 kB)
Collecting attrs<21.5.0,>=19.3.0
  Using cached attrs-21.4.0-py2.py3-none-any.whl (60 kB)
Collecting wheel
  Using cached wheel-0.37.1-py2.py3-none-any.whl (35 kB)
Requirement already satisfied: jmespath<2.0.0,>=0.9.3 in /private/tmp/venv05/lib/python3.10/site-packages (from chalice) (0.10.0)
Requirement already satisfied: botocore<2.0.0,>=1.14.0 in /private/tmp/venv05/lib/python3.10/site-packages (from chalice) (1.17.63)
Collecting pyyaml<7.0.0,>=5.3.1
  Using cached PyYAML-6.0-cp310-cp310-macosx_11_0_arm64.whl (173 kB)
Collecting click<9.0,>=7
  Using cached click-8.1.3-py3-none-any.whl (96 kB)
Requirement already satisfied: docutils<0.16,>=0.10 in /private/tmp/venv05/lib/python3.10/site-packages (from botocore<2.0.0,>=1.14.0->chalice) (0.15.2)
Requirement already satisfied: python-dateutil<3.0.0,>=2.1 in /private/tmp/venv05/lib/python3.10/site-packages (from botocore<2.0.0,>=1.14.0->chalice) (2.8.2)
Requirement already satisfied: urllib3<1.26,>=1.20 in /private/tmp/venv05/lib/python3.10/site-packages (from botocore<2.0.0,>=1.14.0->chalice) (1.25.11)
Collecting readchar>=3.0.6
```

- AWS CLI to deploy a CloudFormation stack containing the S3 bucket,DynamoDB table, and SNS topic needed to run this application.



- Execute recordresource.py to create config.json file which can be used to deploy the lambda functions.



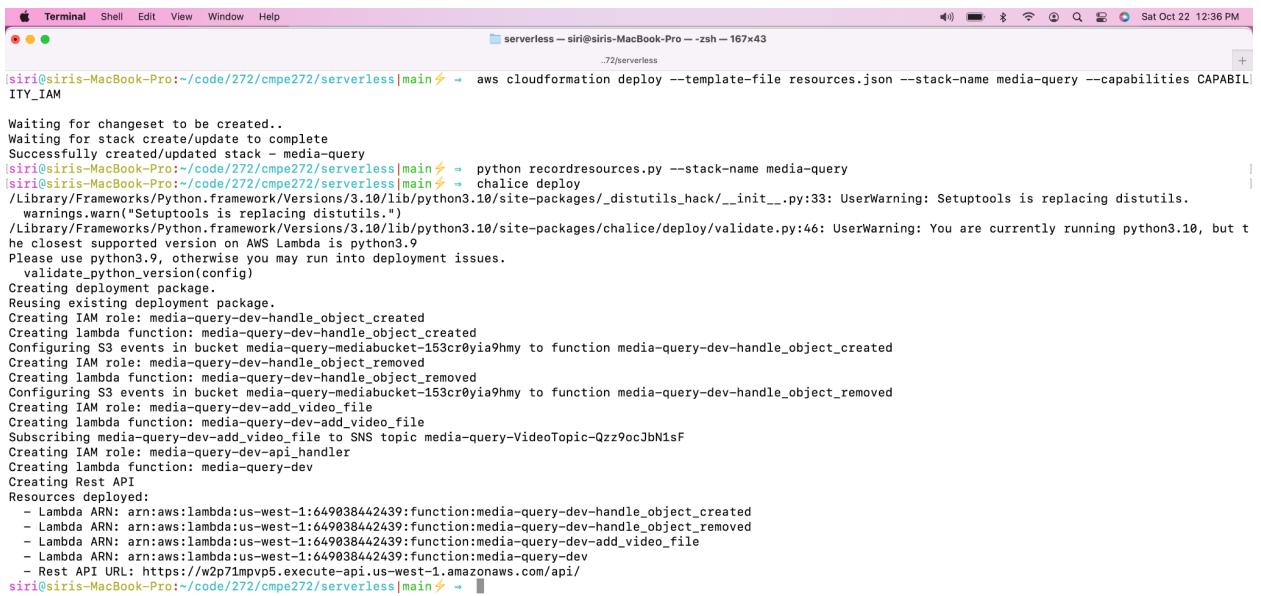
```

Terminal Shell Edit View Window Help
serverless -- siri@siris-MacBook-Pro ~ zsh - 167x48
.s2/serverless
[siri@siris-MacBook-Pro:~/code/272/cmpe272/serverless|main⚡ - cat .chalice/config.json
{
  "version": "2.0",
  "app_name": "media-query",
  "stages": {
    "dev": {
      "api_gateway_stage": "api",
      "autogen_policy": false,
      "environment_variables": {
        "MEDIA_TABLE_NAME": "media-query-MediaTable-18RWVOS16SZCO",
        "MEDIA_BUCKET_NAME": "media-query-mediabucket-1huox3e7bg6g0",
        "VIDEO_TOPIC_NAME": "media-query-VideoTopic-1RWfsbtjINER",
        "VIDEO_ROLE_ARN": "arn:aws:iam::649038442439:role/media-query-VideoRole-1GMAM1CV82J0T",
        "VIDEO_TOPIC_ARN": "arn:aws:sns:us-west-1:649038442439:media-query-VideoTopic-1RWfsbtjINER"
      }
    }
  }
}
siri@siris-MacBook-Pro:~/code/272/cmpe272/serverless|main⚡ -

```



- Chalice deploy to deploy a lambda function.



```

Terminal Shell Edit View Window Help
serverless -- siri@siris-MacBook-Pro ~ zsh - 167x48
.s2/serverless
[siri@siris-MacBook-Pro:~/code/272/cmpe272/serverless|main⚡ - aws cloudformation deploy --template-file resources.json --stack-name media-query --capabilities CAPABILITY_IAM
Waiting for changeset to be created..
Waiting for stack create/update to complete
Successfully created/updated stack - media-query
[siri@siris-MacBook-Pro:~/code/272/cmpe272/serverless|main⚡ - python recordresources.py --stack-name media-query
[siri@siris-MacBook-Pro:~/code/272/cmpe272/serverless|main⚡ - chalice deploy
/Library/Frameworks/Python.framework/Versions/3.10/lib/python3.10/site-packages/_distutils_hack/_init__.py:33: UserWarning: Setuptools is replacing distutils.
  warnings.warn("Setuptools is replacing distutils.")
/Library/Frameworks/Python.framework/Versions/3.10/lib/python3.10/site-packages/chalice/deploy/validate.py:46: UserWarning: You are currently running python3.10, but t
he closest supported version on AWS Lambda is python3.9
Please use python3.9, otherwise you may run into deployment issues.
  validate_python_version(config)
Creating deployment package.
Reusing existing deployment package.
Creating IAM role: media-query-dev-handle_object_created
Creating lambda function: media-query-dev-handle_object_created
Configuring S3 events in bucket media-query-mediabucket-153cr0yia9hmy to function media-query-dev-handle_object_created
Creating IAM role: media-query-dev-handle_object_removed
Creating lambda function: media-query-dev-handle_object_removed
Configuring S3 events in bucket media-query-mediabucket-153cr0yia9hmy to function media-query-dev-handle_object_removed
Creating IAM role: media-query-dev-add_video_file
Creating lambda function: media-query-dev-add_video_file
Subscribing media-query-dev-add_video_file to SNS topic media-query-VideoTopic-Qzz9ocJbNisF
Creating IAM role: media-query-dev-api_handler
Creating lambda function: media-query-dev
Creating Rest API
Resources deployed:
- Lambda ARN: arn:aws:lambda:us-west-1:649038442439:function:media-query-dev-handle_object_created
- Lambda ARN: arn:aws:lambda:us-west-1:649038442439:function:media-query-dev-handle_object_removed
- Lambda ARN: arn:aws:lambda:us-west-1:649038442439:function:media-query-dev-add_video_file
- Lambda ARN: arn:aws:lambda:us-west-1:649038442439:function:media-query-dev
- Rest API URL: https://w2p71mpv5.execute-api.us-west-1.amazonaws.com/api/
siri@siris-MacBook-Pro:~/code/272/cmpe272/serverless|main⚡ -

```



- S3 buckets lambda function ,SNS, API gateway details in the console.

AWS Lambda > Functions

Last fetched 10 seconds ago

| Function name                         | Description | Package type | Runtime    | Last modified |
|---------------------------------------|-------------|--------------|------------|---------------|
| media-query-dev                       | -           | Zip          | Python 3.9 | 7 hours ago   |
| media-query-dev-add_video_file        | -           | Zip          | Python 3.9 | 7 hours ago   |
| media-query-dev-handle_object_created | -           | Zip          | Python 3.9 | 7 hours ago   |
| media-query-dev-handle_object_removed | -           | Zip          | Python 3.9 | 7 hours ago   |

CloudFormation > Stacks

Stacks (1)

| Stack name  | Status          | Created time                 | Description |
|-------------|-----------------|------------------------------|-------------|
| media-query | CREATE_COMPLETE | 2022-10-22 12:33:43 UTC-0700 | -           |

Topics (2)

| Name                                 | Type  | ARN  |
|--------------------------------------|---|--|
| media-query-VideoTopic-Qzz9ocJbN1sF  | Standard  | arn:aws:sns:us-west-1:649038442439:media-query-VideoTopic-Qzz9ocJbN1sF |
| f9ab903a-d603-45ae-bbdf-b0ed374afcdc | arn:aws:lambda:us-west-1:649038442439:function:media-query-dev-add_video_file | Confirmed LAMBDA media-query-VideoTopic-1RWfsbtjNER                    |
| f0b052b7-902f-430a-95ab-939b4e0f7437 | arn:aws:lambda:us-west-1:649038442439:function:media-query-dev-add_video_file | Confirmed LAMBDA media-query-VideoTopic-Qzz9ocJbN1sF                   |

The screenshot shows the AWS API Gateway console. On the left, there's a sidebar with options like 'APIs', 'Custom domain names', and 'VPC links'. The main area is titled 'APIs (5)' and contains a table with the following data:

| Name        | Description | ID         | Protocol | Endpoint type | Created    |
|-------------|-------------|------------|----------|---------------|------------|
| media-query |             | 3xvmrbwqo7 | REST     | Edge          | 2022-10-22 |
| media-query |             | 6nshnnpch4 | REST     | Edge          | 2022-10-22 |
| media-query |             | w2p71mpvp5 | REST     | Edge          | 2022-10-22 |
| news-update |             | jw0lwk1avi | REST     | Edge          | 2022-10-02 |
| news-update |             | u5soewmta3 | REST     | Edge          | 2022-10-12 |

- Use the below command to see the bucket name.

```
siri@siris-MacBook-Pro:~/code/272/cmpe272/serverless|main⚡ = aws cloudformation describe-stacks --stack-name media-query \
--query "Stacks[0].Outputs[?OutputKey=='MediaBucketName'].OutputValue" \
--output text
```

A screenshot of a macOS terminal window. The title bar says 'Terminal'. The command entered is:

```
serverless -- aws cloudformation describe-stacks --stack-name media-query --query --output -- less - aws cloudformation describe-stacks --stack-name media-query --query Stacks[0].Outputs[?OutputKey=='MediaBucketName'].OutputValue --ou...
```

The output shows:

```
media-query-mediabucket-153cr0yia9hmy
(END)
```



- Upload sample files to do the media processing.



A screenshot of a Mac OS X desktop. At the top, there's a menu bar with "Terminal", "Shell", "Edit", "View", "Window", and "Help". Below the menu bar is a window titled "serverless" with the command-line interface (CLI) for AWS Lambda. The CLI shows two commands being run:

```
siri@siris-MacBook-Pro:~/code/272/cmpe272/serverless|main⚡ - aws s3 cp ~/Desktop/sample.jpg s3://media-query-mediacbucket-153cr0yia9hmy/sample.jpg
upload: ../../../../Desktop/sample.jpg to s3://media-query-mediacbucket-153cr0yia9hmy/sample.jpg
[siri@siris-MacBook-Pro:~/code/272/cmpe272/serverless|main⚡ - aws s3 cp ~/Desktop/sample.mp4 s3://media-query-mediacbucket-153cr0yia9hmy/sample.mp4
upload: ../../../../../../Desktop/sample.mp4 to s3://media-query-mediacbucket-153cr0yia9hmy/sample.mp4
[siri@siris-MacBook-Pro:~/code/272/cmpe272/serverless|main⚡ - ]
```

The desktop background is dark blue/black, and the Dock at the bottom contains icons for Mail, Finder, App Store, Google Chrome, Notes, and iWork.

- Open the lambda function using https URL.
- <https://w2p71mpvp5.execute-api.us-west-1.amazonaws.com/api?media-type=image>
- <https://w2p71mpvp5.execute-api.us-west-1.amazonaws.com/api?media-type=video>
- <https://w2p71mpvp5.execute-api.us-west-1.amazonaws.com/api?startswith=sam>
- <https://w2p71mpvp5.execute-api.us-west-1.amazonaws.com/api?label=Person>

```
1 // 20221022125459
2 // https://w2p71mpvp5.execute-api.us-west-1.amazonaws.com/api?startswith=sample.m
3
4 [
5 {
6   "name": "sample.mp4",
7   "labels": [
8     "Yard",
9     "Puppy",
10    "Skirt",
11    "Chihuahua",
12    "Hound",
13    "Female",
14    "Wildlife",
15    "Labrador Retriever",
16    "Grass",
17    "Animal",
18    "Fence",
19    "Nature",
20    "Portrait",
21    "Photo",
22    "Human",
23    "Girl",
24    "Strap",
25    "Person",
26    "Pants",
27    "Photography",
28    "Jacket",
29    "Coyote",
30    "Clothing",
31    "Sheep",
32    "Tire",
33    "Husky",
34    "Mammal"
35  ]
36}
```

- Delete chalice, s3 bucket and cloud formation stack.

The screenshot shows a macOS Terminal window with two tabs open. The left tab, titled '.72/serverless', contains Python code for a media query Lambda function. The right tab, titled '.272/bookhouse', shows the command-line output of the deletion process.

```

    "Tire",
    "Husky",
    "Mammal",
    "Canine",
    "Bear",
    "Apparel",
    "Dog",
    "Shoe",
    "Den",
    "Coat",
    "Outdoors",
    "Police Dog",
    "Footwear",
    "Wolf",
    "Red Wolf",
    "Goat",
    "Plant",
    "Face",
    "Pet",
    "Zoo"
  ],
  "name": "sample.mp4",
  "type": "video"
}
]

siri@iris-MacBook-Pro:~/code/272/cmpc272/serverless/main ✘ ~ chalice delete
/Library/Frameworks/Python.framework/Versions/3.10/lib/python3.10/site-packages/chalice/deploy/validate.py:46: UserWarning: You are currently running python3.10, but
the closest supported version on AWS Lambda is python3.9
Please use python3.9, otherwise you may run into deployment issues.
validate_python_version(config)
Deleting Rest API: W2p1mpvp5
Deleting Function: arn:aws:lambda:us-west-1:649038442439:function:media-query-dev
Deleting IAM role: media-query-dev-api_handler
Deleting IAM role: media-query-dev-add_video_file
Deleting IAM role: media-query-dev-handle_object_removed
Deleting IAM role: media-query-dev-handle_object_created
Deleting IAM role: media-query-dev-handle_object_created
siri@iris-MacBook-Pro:~/code/272/cmpc272/serverless/main ✘ ~ aws cloudformation delete-stack --stack-name media-query
siri@iris-MacBook-Pro:~/code/272/cmpc272/serverless/main ✘ ~

```