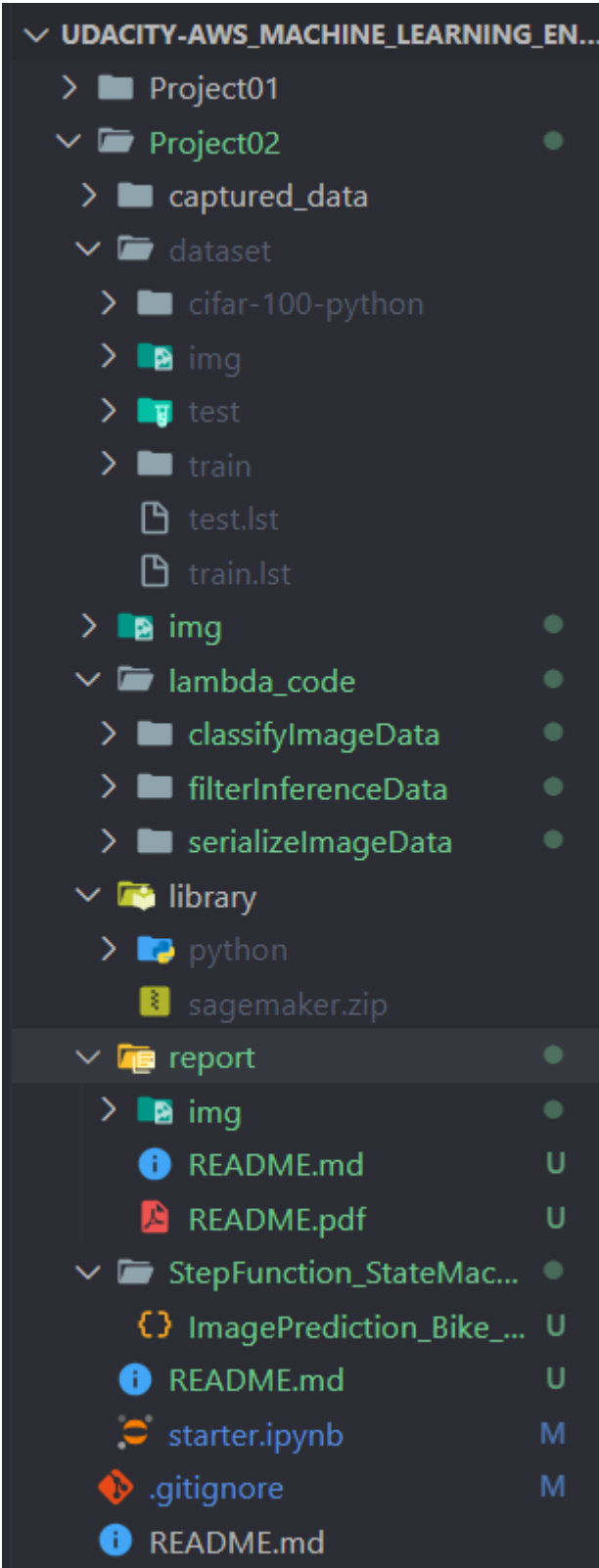


# Project Report

---

## Project Folder Structure

Working space:



## Service Set Up

After creating dataset, executing training job to create model, deploying endpoint and storing all output. We create 3 main **lambda functions**

- `serializeImageData`
- `classifyImageData`
- `filterInferenceData`

Functions (3)

Last fetched 20 seconds ago

Actions

Create function

Filter by tags and attributes or search by keyword

<

1

>

<input type="checkbox"/>	Function name	Description	Package type	Runtime	Last modified
<input type="checkbox"/>	<a href="#">classifyImageData</a>	-	Zip	Python 3.8	8 hours ago
<input type="checkbox"/>	<a href="#">filterInferenceData</a>	-	Zip	Python 3.8	9 hours ago
<input type="checkbox"/>	<a href="#">serializelmageData</a>	-	Zip	Python 3.8	18 days ago

For `classifyImageData`, the predicting process is supposed to last longer. We set the timeout to **1 minute** (Default is 3 seconds)

General configuration

Info

Edit

Description	Memory	Ephemeral storage
-	128 MB	512 MB
Timeout	SnapStart	
1 min 0 sec	None <div>Info</div>	

We also create layer that is already installed with "sagemaker" module and attached to function `classifyImageData`. This allows to run Python3.8 Runtime with custom libraries.

sagemakerSDK

Delete












Download

Create version

Version details

Version	Version ARN	Description
4	<div><div></div>arn:aws:lambda:us-east-1:673115746990:layer:sagemakerSDK:4</div>	-
Created	License	Compatible runtimes
<div>20 hours ago</div>	-	python3.8
Compatible architectures		
x86_64		

All functions we use the same role `Project02-khangtictoc` with necessary policy for easy deployment task.

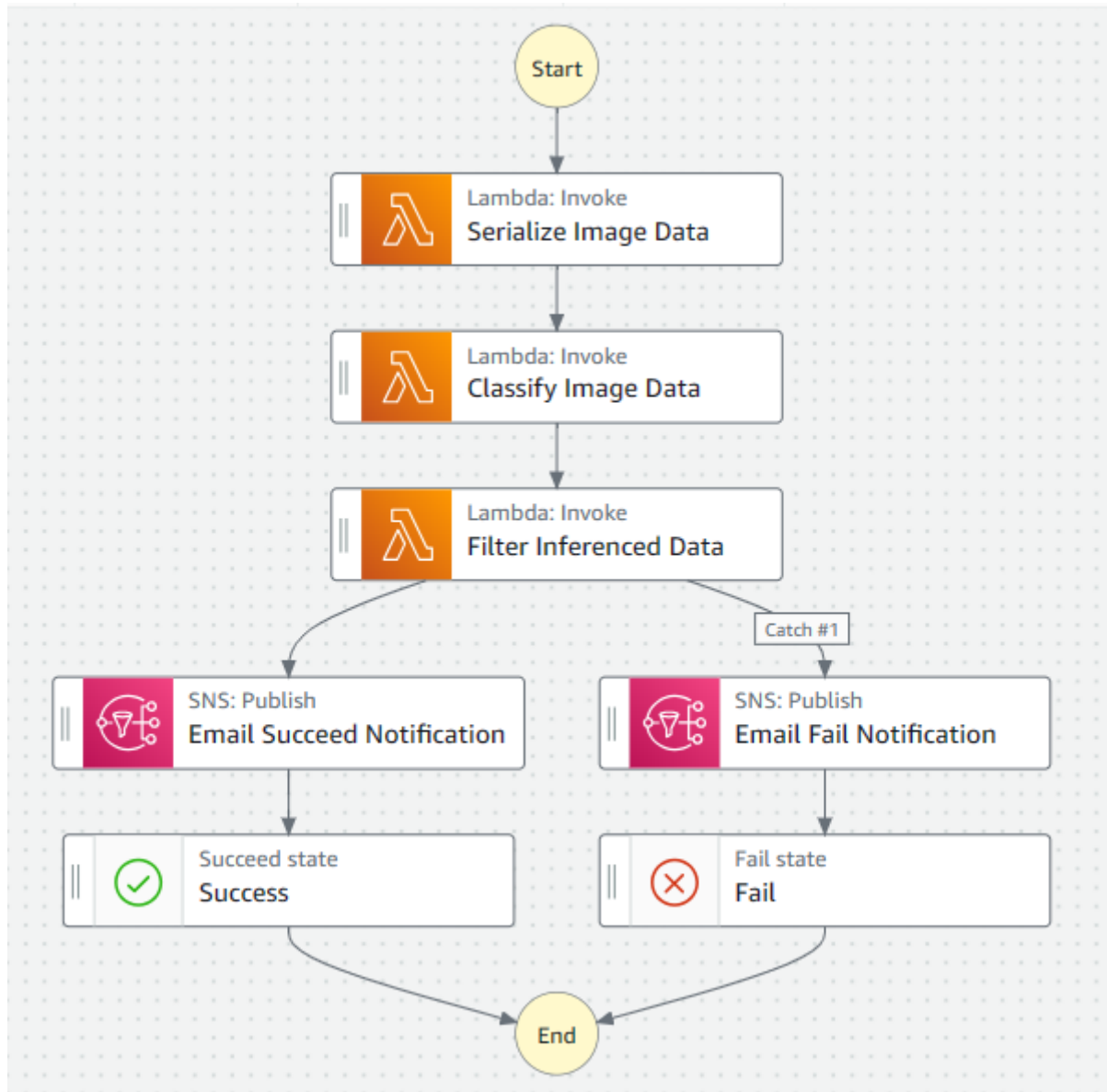
<input type="checkbox"/>	Policy name <a href="#">↗</a>	Type	Attached entities
<input type="checkbox"/>	  <a href="#">AmazonS3FullAccess</a>	AWS managed	<u>4</u>
<input type="checkbox"/>	  <a href="#">AmazonSageMakerFullAccess</a>	AWS managed	<u>5</u>
<input type="checkbox"/>	  <a href="#">AWSLambda_FullAccess</a>	AWS managed	<u>2</u>
<input type="checkbox"/>	  <a href="#">AWSStepFunctionsFullAccess</a>	AWS managed	<u>3</u>
<input type="checkbox"/>	  <a href="#">CloudWatchFullAccess</a>	AWS managed	<u>2</u>
<input type="checkbox"/>	  <a href="#">CloudWatchFullAccessV2</a>	AWS managed	<u>2</u>

**Note:** `CloudWatchFullAccess` and `CloudWatchFullAccessV2` are for debugging lambda functions

Trust Entities:

```
{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Effect": "Allow",
      "Principal": {
        "Service": [
          "lambda.amazonaws.com",
          "states.amazonaws.com"
        ]
      },
      "Action": "sts:AssumeRole"
    }
  ]
}
```

Our **Step Function** 's diagram:



The workflow performs following tasks:

- Serialize data of input image file by *base64 encoding*
- Deserialize data and transfer all raw image data into deployed endpoint for inferences
- Filter and evaluate the result if they are matched defined conditions:
  - **Yes** => Send email notification with **Successful** status
  - **No** => **Exception Handling**, catching the error "States.Taskfailed " => Send email notification with **Failed** status => Stop the workflow

For the first state, we pass JSON payload as input as project mentioned. The next 2 states, we pass the input from the output from previous states.

For "Email Notification", we use **SNS service** to publish email message to my personal email account. Create a simple **Standard Topic**:

PersonalTopic

Edit

Delete

Publish message

Details

Name	PersonalTopic	Display name	-
ARN	arn:aws:sns:us-east-1:673115746990:PersonalTopic	Topic owner	673115746990
Type	Standard		

Create "Subscription" associated with above topic:

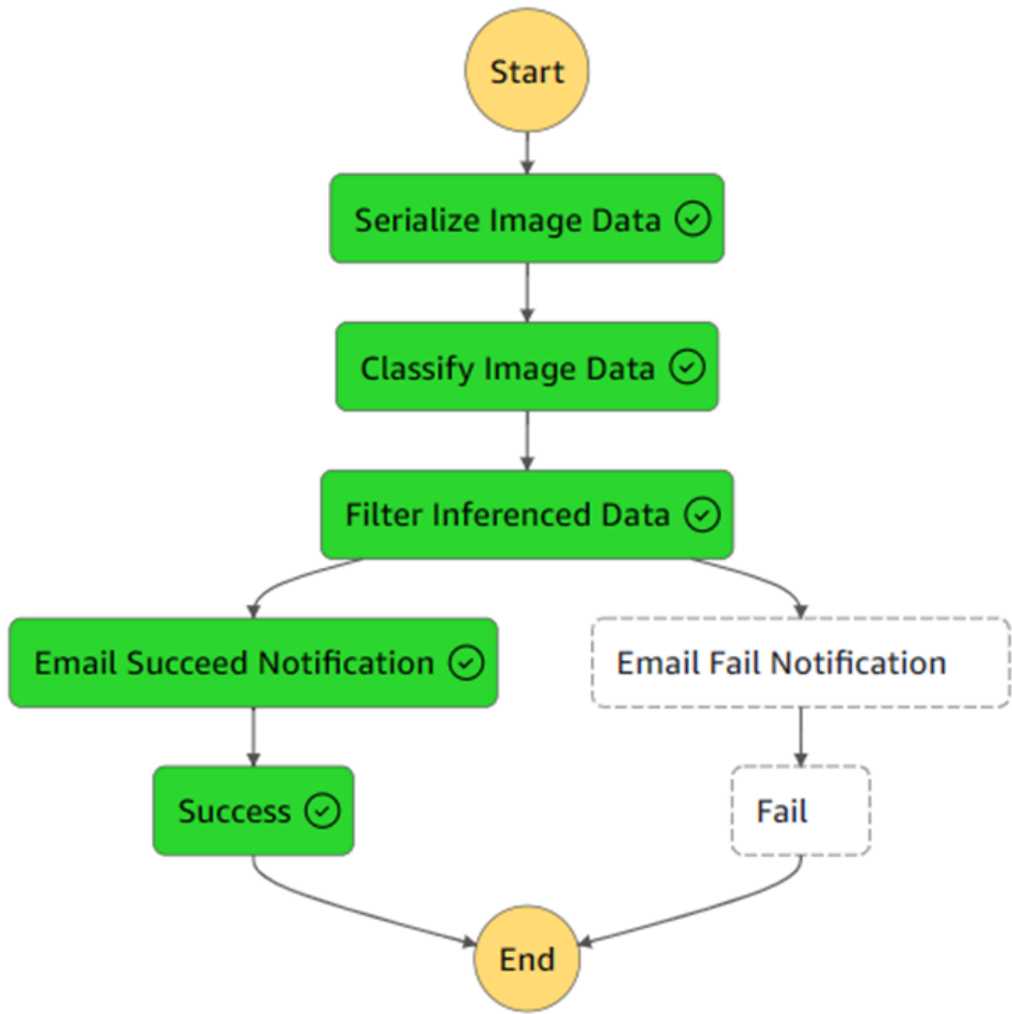
Subscription: 7fdc7d7e-7816-4dc9-8fc4-b1cad911dab2

Details

ARN	arn:aws:sns:us-east-1:673115746990:PersonalTopic:7fdc7d7e-7816-4dc9-8fc4-b1cad911dab2	Status	<div>✔ Confirmed</div>
Endpoint	tranhoangkhang09112001@gmail.com	Protocol	EMAIL
Topic	PersonalTopic		
Subscription Principal	arn:aws:iam::673115746990:role/voclabs		

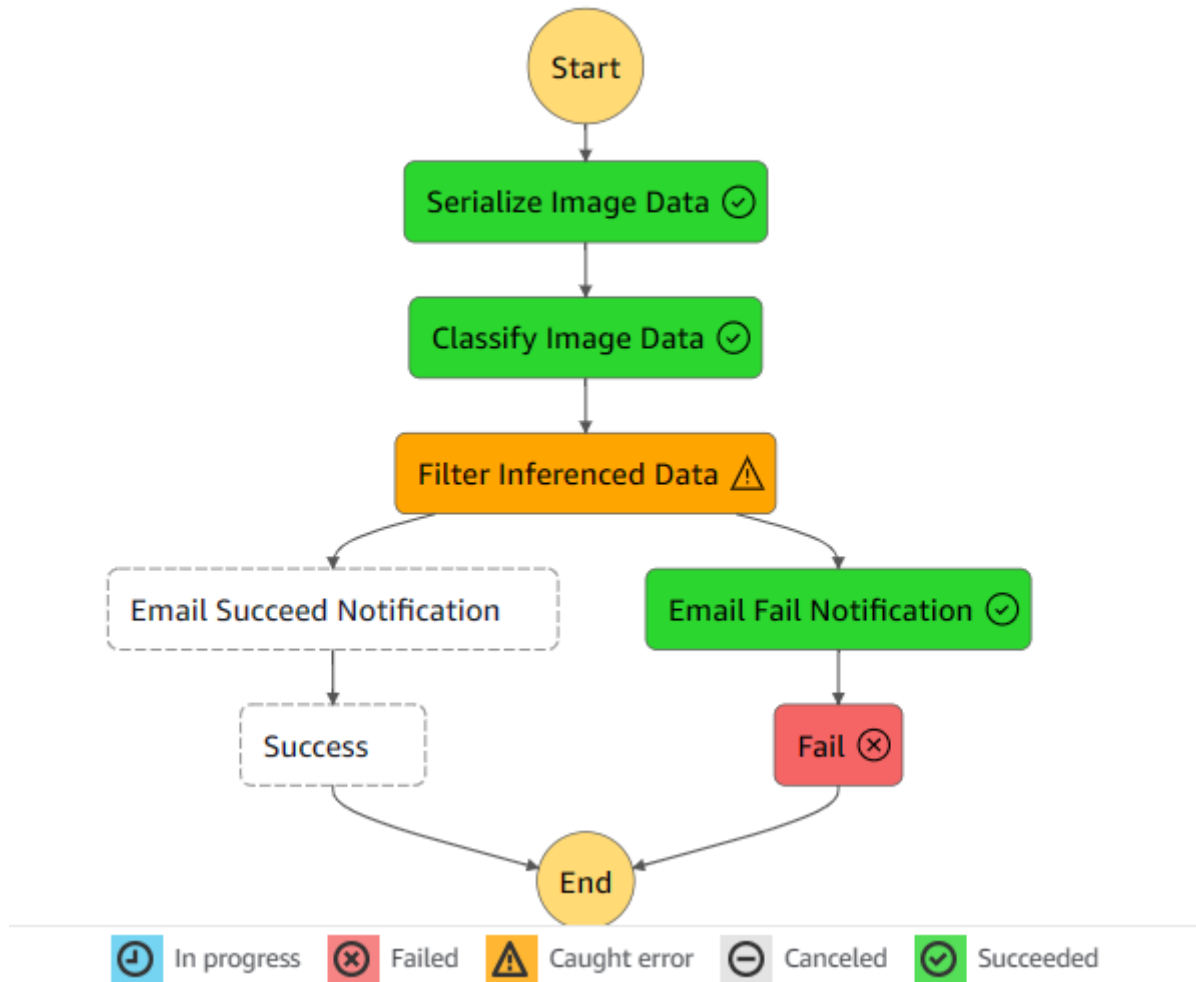
Result & Evaluation

Try a sample that producing inferences that meets THRESHOLD



 In progress  Failed  Caught error  Canceled  Succeeded

Try a sample that producing inferences that **DOES NOT** meets THRESHOLD



Inputs & Output of a successful execution:

Similar to each other, i.e, for state **Classify Image Data**

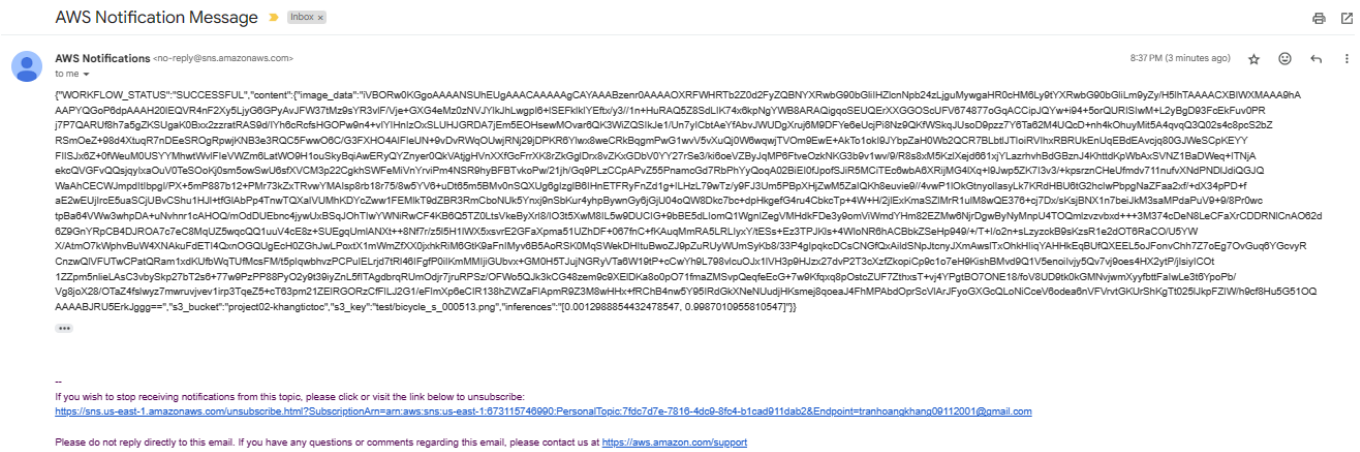
```
{
  "statusCode": 200,
  "body": {
    "image_data":
      "iVBORw0KGgoAAAANSUHuEgAAACAAAGCAYAAABzenr0AAAAOXRfWHRtb2Z0d2FyZQBNYXRwbG90bG1lIHZlcnNpb242LzIuYm9kaHR0cHM6Ly9tYXRwbG90bG1lLn9yZy/H51hTAAACXBIXMAAAhAAPYQGoP6pAAAH201EQVR4nF2Xy5LjyG6PyAvJFw37tmZ9sYR3v1F/Vje+GXG4eH20NVJY1KJhLwgpI6+1SEfklkIYEftx/y3//1n+HuRAQ5Z85dLlK74x6kNgYWB8ARAQigqoSEUQErXXGG0ScUFV674877oGqACCipJQYw+194+5orQURISiW+L2yBgD93FCEkFuv0PRJ7P7QARUf8h7a5gZKSUGaK0Bxx2zzratRAS9d/IYh6cRcfsHG0Pw9n4+vIYHnIz0xSLUHJGRDA7jEm5EOHsewM0var6QK3WiZQSIkJe1/Un7yICbtAeyfAbvJWUDgXruj6M9DFYe6eUcJPi8Nz9QKfW5kqJUs0D9pzz7Y6Ta62M4UQcD+nh4kOhuyMit5A4qvqQ3Q02s4c8pc52bZRSm0eZ+98d4XtuqR7nDeESR0gRpwjKXNB3e3RQC5FwW06C/G3FXH04A1FIEU+9vDvRwq0UwJRNj29jDPKR6V1wx8wecRkBgmpPwG1wvV5vXuQJ0W6wqWjTV0m9EwE+AkTo1okI9JYbpZaH0Wb2QCR7BLt1JTI0iRVIhxrBRUKEnUqEBdEavcjq80GJWeScpKEYYFIISJx6Z+0fW0U0SYMMhwrtw1FIEVWZm6Latw09H1ouSukyBqIawEryQVZnyer0QkVATjgHVnXXfGcFrrXK8nZkGg1Drx8vZKxGDbV0YV27rSe3/ki6oeVZByJqMP6FtveOzkNKG3b9v1wv/9/R8s8xM5Kz1XeJd661xjYLaZrhvhBdGBznJ4KhttdKpIbAxSVNZ1BaDwEq+ITNjAekcQVGFvQQsJqyIxa0uV0TeS0okJ0sm5ow5wU6sFVXCM3p22CgkhSwFeMiVnrvriPm4NSR9hyBFBTVkoPw/21jh/Gq9PLzCCpAPvZ55PnamcGd7RbPhYyQoqA02BIEI0fJpofS3IR5MCiTEc6wbA6XRijM641Xq+19Jwp5ZK7I3v3/+kpsrzncHeUfmdv711nufvXNdPND1JdiQG3QWAhCECwJmpdItIbpgI/PX+5mP887b12+PMr73kZxTRvWMAIsp8rb18r75/8w5YV6+uDt65m5BMv0n5SXUg6Gizg1B6IHnETFRyFnZd1g+ILHzL79wTz/y9fJ3Ums5PBpXhJZwM5ZaIQk8uev1e9//4wvP110kGtnyo11asyLk7KRdHBu6tG2hcIwPbpgNaZFa2xf/+dx34pPD+faE2wEUjIrcESuaSCJUBvCShu1HJ1+tfG1AbPp4TnwTQXa1VUMhKDYcZwW1FEM1kt9dZBR3RmCboNUK5Ynxj9n5bKur4yhpBywnGy6jGjU040QW8Dkc7bc+dpHkgefG4ru4CbkcTp+4w+H/2j1ExKmaSZ1Mr1u1M8wQE376+cj7Dx/sKsJBXN1n7be1JkM3saMPdaPuV9+9/8Pr0wctPba64Vw3whpDA+u1vhnrr1caHOQ/m0dDUEbnc4jywUx85q30hTiWwMiRwCF4KB6Q5TZ0LtsVkeByXr18/I03t5XwM8IL5w9DUCIG+9bBE5dLIomQ1WgnIZegVMHdkFde3y9omViWmdYHm82EZMw6NjrdGwByNymnpU4TOQm1zvzvbxd+++3M374cDeN8LeCfaXrCDDRNlCnA062d629GnYRpbCB4DJROA7c7c8MqUz5wqcQQ1uuV4cE8z+SUEgqUm1ANXt++8NF7r/z515H1lWk5xsvrE2GfAXpma51UZhDF+067fnC+fKAuqMmRA5LRLIyxY/tESs+Ez3TPJK1s+4wIoNR6hACBbkZSehp949/+T+I/o2n+sLZyckB8sKzsR1e2d0T6ARaCO/USYwK/Atm07klphvBuH4XNAXuFdETI4Qxn0GQUgEcH0ZGhJwLpoxTxlmmZfXX08jxhkRiM6GtK9aFnIMyv6B5AoRSK0Mq5WekDHItuBwoZJ9pZuRyUWmSyKb8/33P4gIpqkcDCsCNGfQxAlldSnPjtcnyJXmAw1TxOhkHiiQYAHhKEqBUfQXEEL5oJFonvChh7Z70Eg70vGuG6YgcvyRCnZvQ1VFUTwCPatQRam1xdKufBwqTUFMcSFm/t5pIqwbhvzPCPUIELrjd7tR146IFgP01KmmWIIjGUbvx+GM0HSTJuJNGRyVta6W19tP+cWYh9L798v1cu0Jx1lVH3p9HJzx27dvP2T3cXzfKzopIcp9c1o7eH9KishBMvd9Q1V5enoIvJy5Qv7v9oes4HX2ytP/jlsiyICot1ZZpm5n1ieLAsC3by5Skp27bT2s6+77w9PzPP88Py02y9t39IyZnLSfITAgdbrqRUmOdjrn7jrRUSz/OFWo5QJk3kC648zem9c9XE1DKa80ep071fmaZMSvPQeqfEcG+7w9Kfqqx8p0stcZUF7ZthxsT+v4YVgtB070NE18/f0v8UD9tk0kGMNvJwmXyyfbbtFaiWle3t6Yp0Pb/Vg8jox28/OTaZ4fslwy7mwrUvJvev1irp3TqeZ5+cT63pm21ZE1RG0RzCFF1LJ2G1/eFlmXp6eCIR138hZWZaFlApmR9Z3M8wHx+fRCh4nw5Y951RdGkXNeUudjHKSmeJ8qoea34FhMPAbdOprScV1ArJFyoGXGcLoNlCceV6odea6nVFrvtGKUrShKgTt0251JkpfZIW/h9cf8Hu5G510QAAAABJRU5ErkJggg==",
    "s3_bucket": "project02-khangticot",
    "s3_key": "test/bicycle_s_000513.png",
    "inferences": "[0.0012988854432478547, 0.9987010955810547]"
  }
}
```

Inputs & Output of a failed execution:

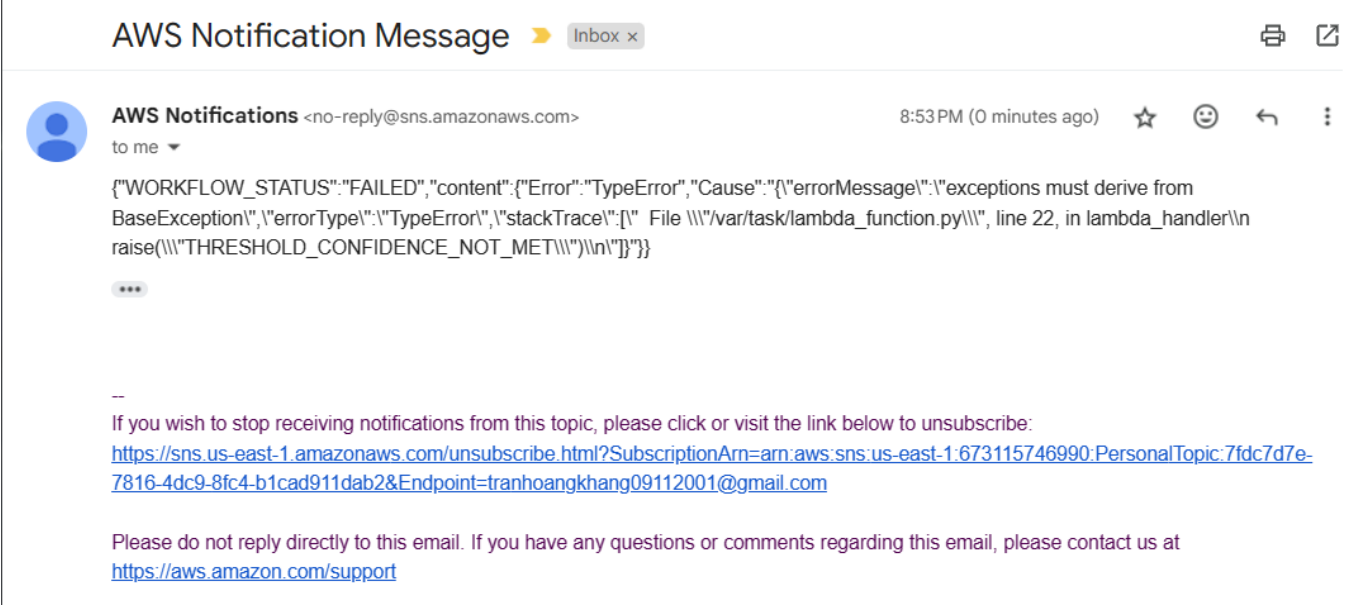
Same as successful one, the prominent difference lies in "Error Handling"

```
1 {
2   "Error": "TypeError",
3   "Cause": "{\n  \"errorMessage\": \"exceptions must derive from
BaseException\", \"errorType\": \"TypeError\", \"stackTrace\": [\n  File
\\\"/var/task/lambda_function.py\\\"\", line 22, in lambda_handler\n
raise(\\\"THRESHOLD_CONFIDENCE_NOT_MET\\\")\\n\\n\"]}"
4 }
```

Email of successful execution:



Email of failed execution:



Confidence point:



