

# Steps to setup project

## 1) DOWNLOAD CODE FROM GITHUB REPOSITORY

Open VSCode or any other Editor

- a) Download code from Git Repository
  - i) `gh repo clone nittysharma/metdata-enrichment`
  - ii) `cd metdata-enrichment`

## 2) INSTALL REQUIRED NODE PACKAGES

```
npm install aws-amplify
npm install -g @aws-amplify/cli
npm i --save @fontawesome/fontawesome-svg-core
npm i --save @fontawesome/free-solid-svg-icons
npm i --save @fontawesome/free-regular-svg-icons
npm i --save @fontawesome/react-fontawesome@latest
npm install aws-sdk
```

## 3) SET-UP AMPLIFY

- a) Run below commands in code editor to setup amplify

- i) **amplify configure**

Please refer to <https://docs.amplify.aws/cli/start/install/> to know how to initialize in detail if you are new to amplify  
It will also ask you to create a user, so create an IAM user with access to all the related services mentioned below.  
Download the credentials and save it.

### Update Configuration parameters

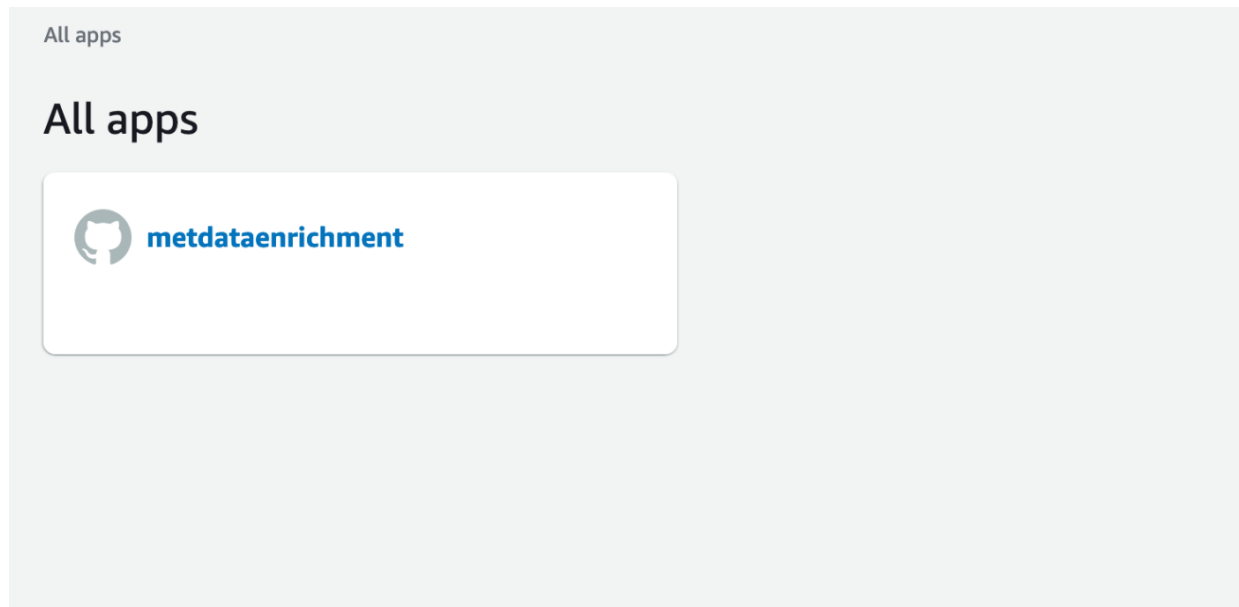
Navigate to `src/config.json` in your editor and update below properties

```
AWSRegion - Region where this application will be deployed
TableName - Name of the Dynamo DB table that will be created by CDK temp:
             e.g. assetMetadata is default table name set
```

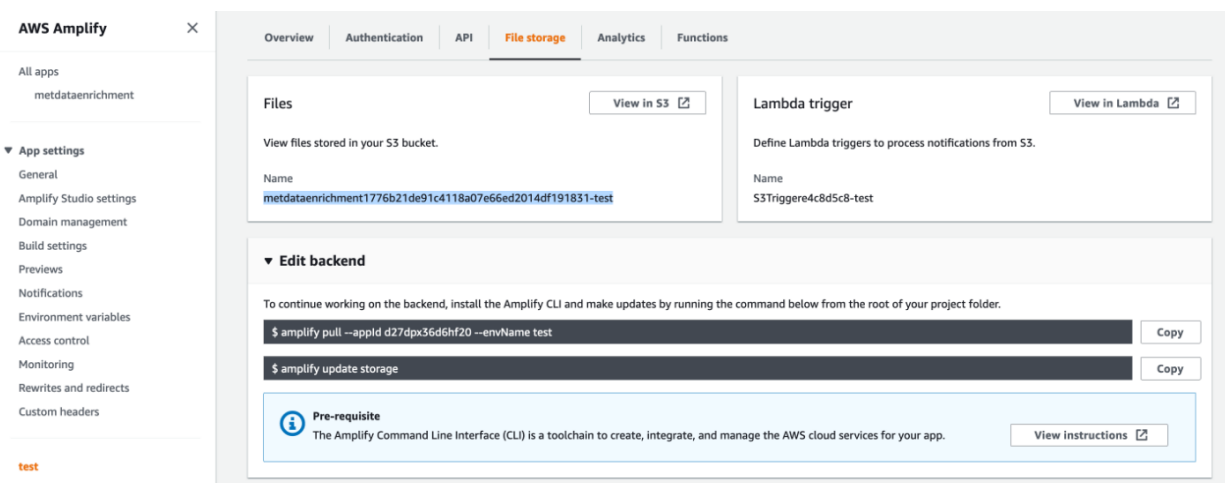
Leave `OpenSearchUrl` for now, we will update once we have deployed the entire workflow.

- ii) **amplify init** - This will initialize the amplify settings, set-up the profile using access key and secret key
    - iii) **amplify status** - Verify the Amplify status
    - iv) **amplify publish** - Publish the application, after successful publish it will

- b) Go to AWS Amplify service in AWS console and you will see that application is published over here



Once Deployed go to File Storage menu and copy bucket name, you will be using it later



Go to Lambda trigger created as part of amplify and remove that manually from S3 Bucket as we will be creating the lambda trigger from CDK.

## 5) CDK TEMPLATE

The following

a) Following software installations are required. CLI needs to be configured to access your AWS account. Instructions can be found [here](#).

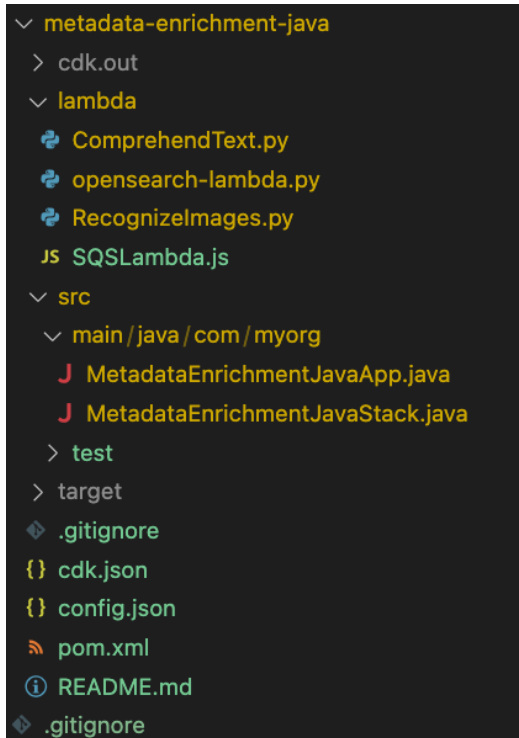
- Open JDK 11 or higher
- Maven 3.9 or higher

- CDK v2.7
- AWS CLI 2.11

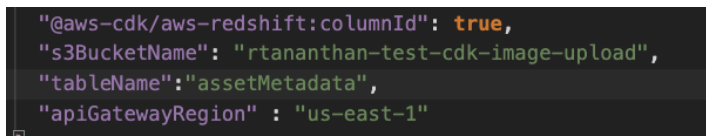
b) Check out the project source code from the Git repository.

gh repo clone deeptichugh28/metadata-enrichment-java-2

Structure looks like shown here.

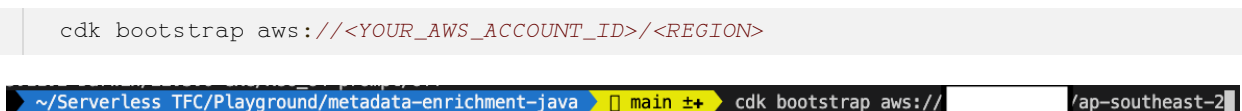


Open cdk.json file and update the s3BucketName key with the name of S3 bucket created as part of the Amplify. Also update tableName with the value assetMetaData. Update the apiGatewayRegion to the region you are running from.



c) In the terminal/command window of the operating system navigate to the root folder of the project( metadata-enrichment-java)

d) Bootstrap CDK environment with the command



e) To deploy the application execute the following command

```
cdk deploy --all
```

Output will look similar to the following

```
rtananth@3c06305455f6 ~/Serverless-TFC/Playground/metadata-enrichment-java [1 main] cdk deploy --all
+ Synthesis time: 5.34s
MetadataEnrichmentJavaStack: building assets...

[0%] start: Building f60fc703e4254c2c1a1968815e160ab0cfae3697b625cd24283b04ef9067023c:current_account-current_region
[0%] start: Building 077c6345cf6c0422945fee3671662d52d5e260374b0d2f1db81adc1fe4ffcc7:current_account-current_region
[50%] success: Built f60fc703e4254c2c1a1968815e160ab0cfae3697b625cd24283b04ef9067023c:current_account-current_region
[100%] success: Built 077c6345cf6c0422945fee3671662d52d5e260374b0d2f1db81adc1fe4ffcc7:current_account-current_region

MetadataEnrichmentJavaStack: assets built

This deployment will make potentially sensitive changes according to your current security approval level (--require-approval broadening).
Please confirm you intend to make the following modifications:

IAM Statement Changes
┌──────────┬──────────┬──────────┬──────────┬──────────┐
│ Resource │ Effect   │ Action    │ Principal │ Condition │
├──────────┼──────────┼──────────┼──────────┼──────────┤
│ + ${BucketNotificationsHandler050a0587b7544547bf325f094a3db834/Role.Arn} │ Allow    │ sts:AssumeRole │ Service:lambda.amazonaws.com │ │
│ + ${ComprehendText.Arn} │ Allow    │ lambda:InvokeFunction │ Service:states.amazonaws.com │ │
│ + ${ComprehendText.Arn} │ Allow    │ lambda:InvokeFunction │ AWS:${StateMachineID/Role} │ │
│ + ${ComprehendText/ServiceRole.Arn} │ Allow    │ sts:AssumeRole │ Service:lambda.amazonaws.com │ │
│ + ${MetadataQ.Arn} │ Allow    │ sqs:GetQueueAttributes  
sqs:GetQueueUrl  
sqs:SendMessage │ Service:s3.amazonaws.com │ "ArnLike": {  
  "aws:SourceArn": "arn:${AWS:Partition}:s3:::rtan  
anthan-test-cdk-image-upload"  
} │
│ + ${MetadataQ.Arn} │ Allow    │ sqs:ChangeMessageVisibility  
sqs:DeleteMessage  
sqs:GetQueueAttributes  
sqs:GetQueueUrl  
sqs:ReceiveMessage │ AWS:${SQSLambda/ServiceRole} │ │
│ + ${OpenSearch/ServiceRole.Arn} │ Allow    │ sts:AssumeRole │ Service:lambda.amazonaws.com │ │
│ + ${RecognizeImages.Arn} │ Allow    │ lambda:InvokeFunction │ Service:states.amazonaws.com │ │
└──────────┴──────────┴──────────┴──────────┴──────────┘

IAM Policy Changes
┌──────────┬──────────┬──────────┐
│ Resource │ Managed Policy ARN │
├──────────┼──────────┬──────────┤
│ + ${BucketNotificationsHandler050a0587b7544547bf325f094a3db834/Role} │ arn:${AWS::Partition}:iam:aws:policy/service-role/AWSLambdaBasicExecutionRole │
│ + ${ComprehendText/ServiceRole} │ arn:${AWS::Partition}:iam:aws:policy/service-role/AWSLambdaBasicExecutionRole │
│ + ${ComprehendText/ServiceRole} │ arn:${AWS::Partition}:iam:aws:policy/AmazonDynamoDBFullAccess │
│ + ${OpenSearch/ServiceRole} │ arn:${AWS::Partition}:iam:aws:policy/service-role/AWSLambdaBasicExecutionRole │
│ + ${RecognizeImages/ServiceRole} │ arn:${AWS::Partition}:iam:aws:policy/service-role/AWSLambdaBasicExecutionRole │
│ + ${RecognizeImages/ServiceRole} │ arn:${AWS::Partition}:iam:aws:policy/AmazonS3FullAccess │
│ + ${RecognizeImages/ServiceRole} │ arn:${AWS::Partition}:iam:aws:policy/AmazonRekognitionFullAccess │
│ + ${RecognizeImages/ServiceRole} │ arn:${AWS::Partition}:iam:aws:policy/AmazonDynamoDBFullAccess │
│ + ${RecognizeImages/ServiceRole} │ arn:${AWS::Partition}:iam:aws:policy/ComprehendFullAccess │
│ + ${SQSLambda/ServiceRole} │ arn:${AWS::Partition}:iam:aws:policy/service-role/AWSLambdaBasicExecutionRole │
└──────────┴──────────┴──────────┘

(NOTE: There may be security-related changes not in this list. See https://github.com/aws/aws-cdk/issues/1299)

Do you wish to deploy these changes (y/n)? y
MetadataEnrichmentJavaStack: deploying... [1/1]
[0%] start: Publishing f60fc703e4254c2c1a1968815e160ab0cfae3697b625cd24283b04ef9067023c:current_account-current_region
[0%] start: Publishing 077c6345cf6c0422945fee3671662d52d5e260374b0d2f1db81adc1fe4ffcc7:current_account-current_region
[50%] success: Published 077c6345cf6c0422945fee3671662d52d5e260374b0d2f1db81adc1fe4ffcc7:current_account-current_region
[100%] success: Published f60fc703e4254c2c1a1968815e160ab0cfae3697b625cd24283b04ef9067023c:current_account-current_region
MetadataEnrichmentJavaStack: creating CloudFormation changeset...

✔ MetadataEnrichmentJavaStack
+ Deployment time: 189.29s

Stack ARN:
arn:aws:cloudformation:ap-southeast-2:094595487946:stack/MetadataEnrichmentJavaStack/20885710-ced7-11ed-a641-0652b6293ed6

+ Total time: 194.63s
```

f) To remove the application and associated resources execute the following command.

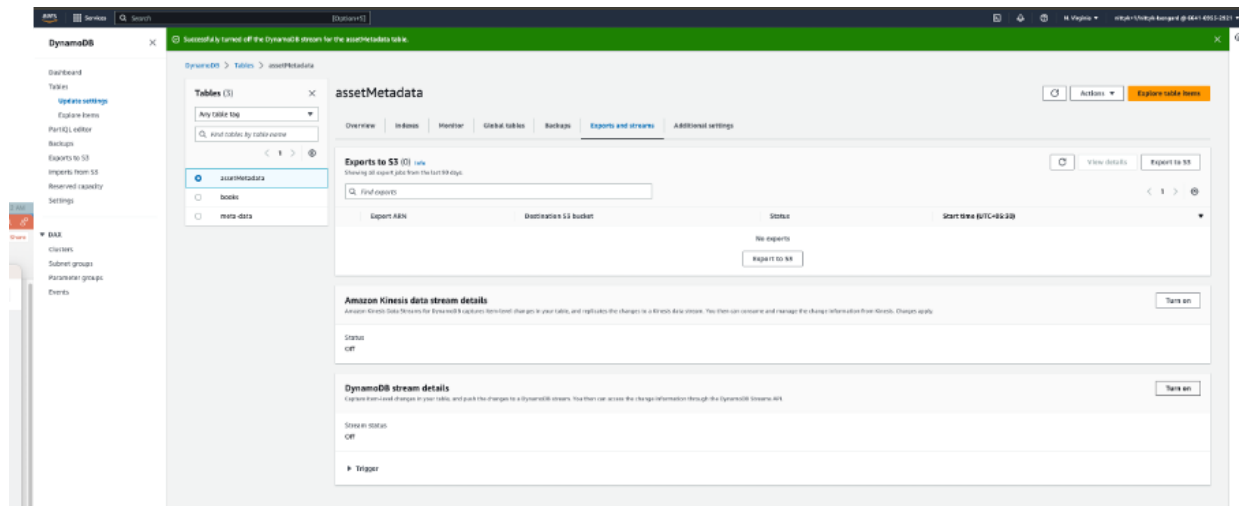
```
cdk destroy --all
```

```
rtananth@3c06305455f6 ~/Serverless-TFC/Playground/metadata-enrichment-java [1 main] cdk destroy --all
Are you sure you want to delete: MetadataEnrichmentJavaStack (y/n)? y
MetadataEnrichmentJavaStack: destroying... [1/1]

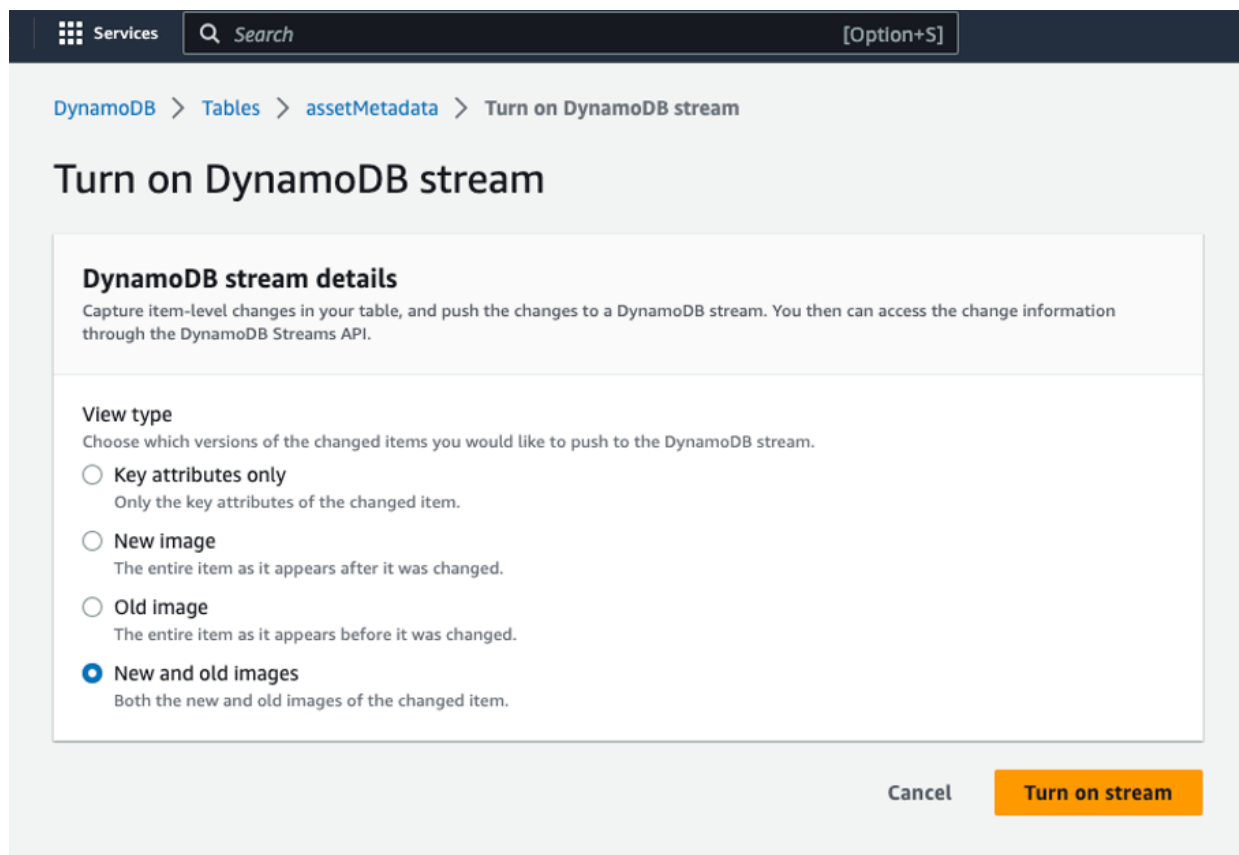
✔ MetadataEnrichmentJavaStack: destroyed
```

## 6) OPEN SEARCH

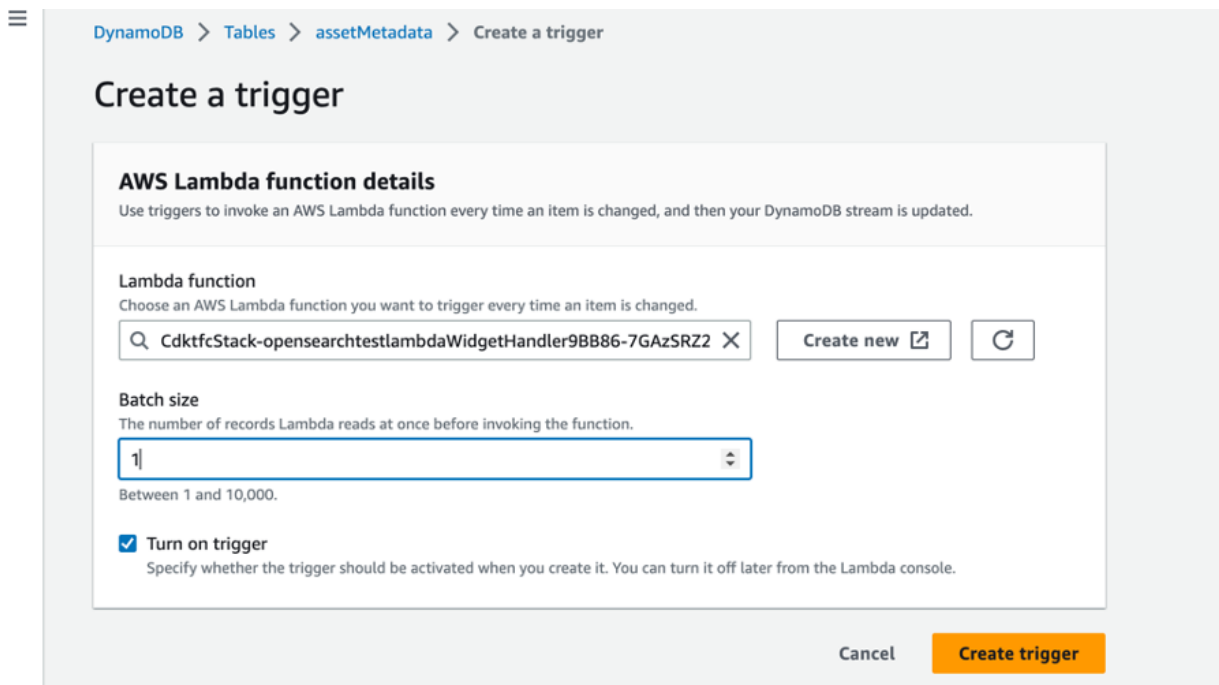
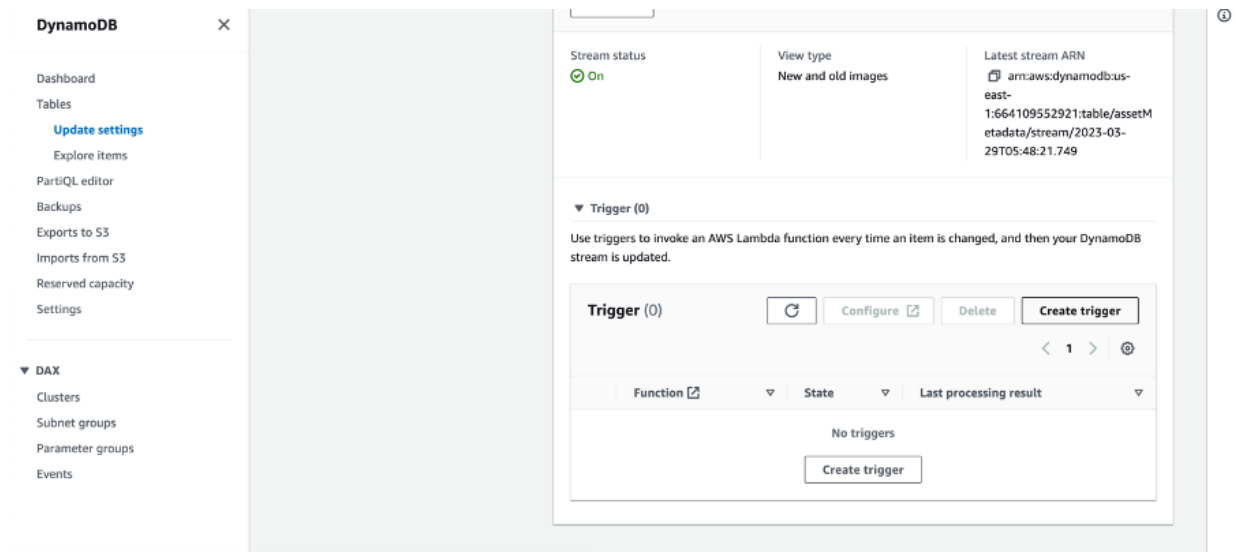
Step1: Please make sure Dynamo DB Stream is enabled for table "assetMetaData" you have created. Go to DynamoDB→Tables→click assetMetaData→Export and Streams→scroll down by default DynamoDb Stream and if it is disabled click on "Turn On" button on right



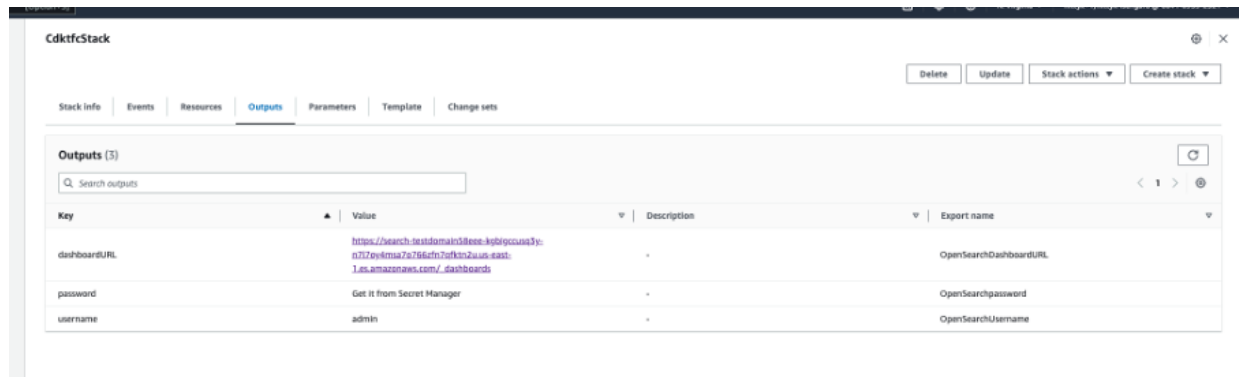
On Next screen Select both "New and Old Images" and click "Turn on Stream"



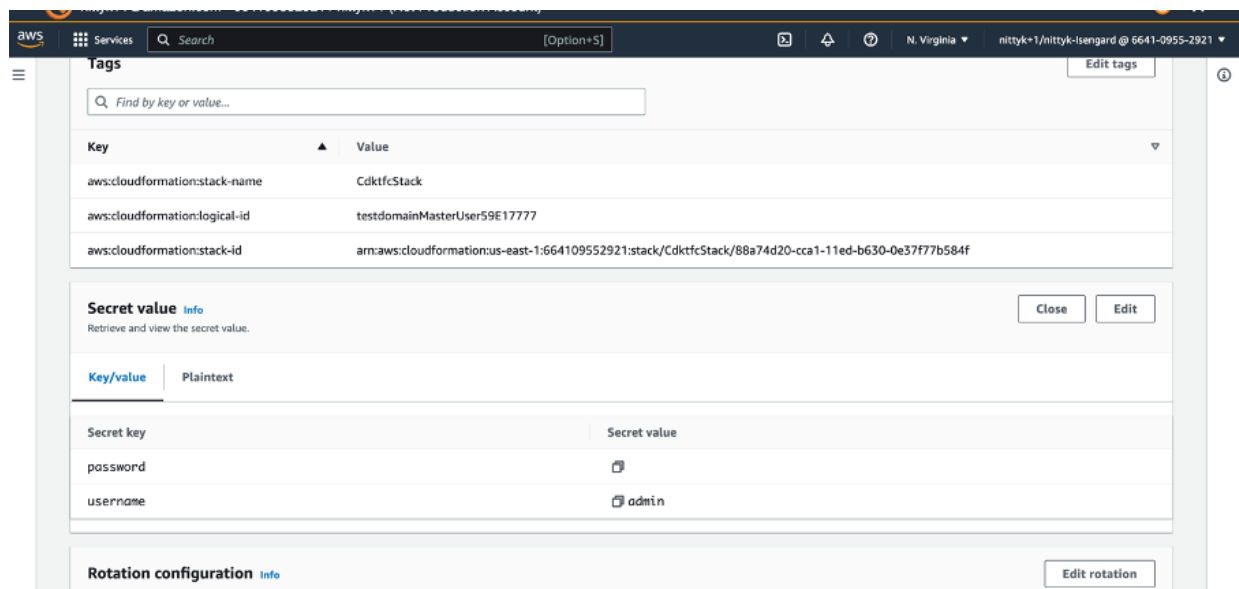
Add lambda trigger which we have just created.



Step2: Configure Open Search Go to Cloud-formation template Click on "" go to output session, You will see OpenSearchDashboard URL. Copy this URL and Open it on another browser tab. Enter username as "admin"



For password go to AWS Secret manager





Use this password to login in Open Search Dashboard.



Please login to OpenSearch Dashboards

If you have forgotten your username or password, please ask your system administrator

 admin

 .....

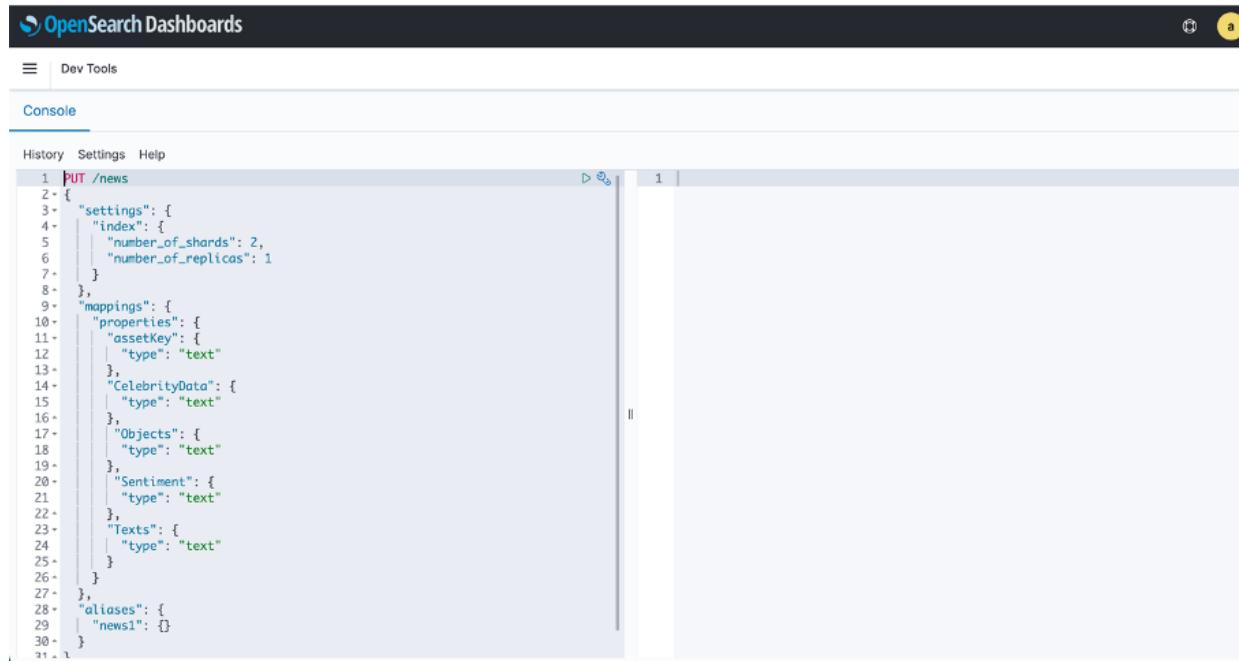
Log In

After Login skip add sample option, On left side menu go to Dev Tools, Execute below Script

```
PUT /news
{
  "settings": {
    "index": {
      "number_of_shards": 2,
      "number_of_replicas": 1
    }
  },
  "mappings": {
    "properties": {
      "assetKey": {
        "type": "text"
      },
      "CelebrityData": {
        "type": "text"
      },
      "Objects": {
        "type": "text"
      },
      "Sentiment": {
        "type": "text"
      },
      "Texts": {
        "type": "text"
      }
    }
  }
}
```

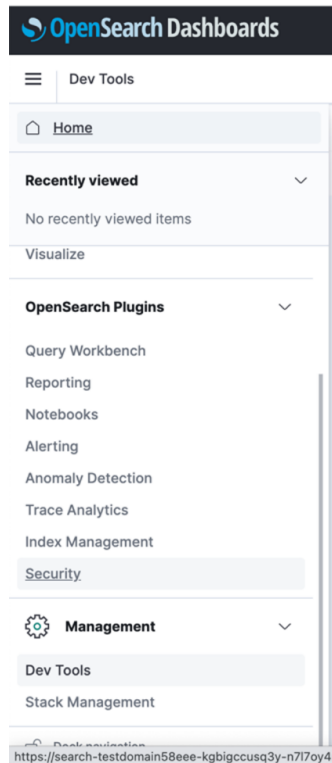


```
}  
},  
"aliases": {  
  "news1": {}  
}  
}
```

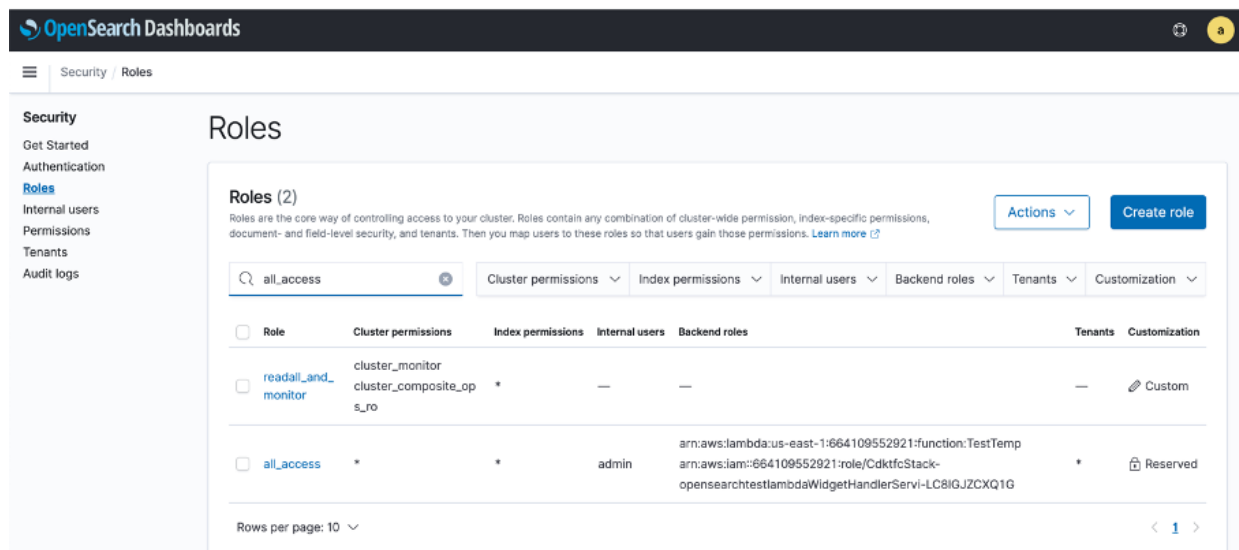


This will create index with name of "news".

Now we need to add backend role of lambda to openSearch. Go to left side menu--->Security



Click on Roles→search for  
"all\_access" from search bar.  
Click on all\_access



On Next screen click on Mapped User Tab: Here we need to add Role of our current lambda which is in between Click on Manage Mapping

OpenSearch Dashboards

Security / Roles / all\_access

## all\_access

Duplicate role

Permissions Mapped users

**Mapped users (3)**

You can map two types of users: users and backend roles. A user can have its own backend role and host for an external authentication and authorization. A backend role directly maps to roles through an external authentication system. [Learn more](#)

Delete mapping Manage mapping

| <input type="checkbox"/> User type    | User                                                                                          |
|---------------------------------------|-----------------------------------------------------------------------------------------------|
| <input type="checkbox"/> User         | admin                                                                                         |
| <input type="checkbox"/> Backend role | arn:aws:lambda:us-east-1:664109552921:function:TestTemp                                       |
| <input type="checkbox"/> Backend role | arn:aws:iam::664109552921:role/CdktfStack-opensearchtestlambdaWidgetHandlerServi-LC8IGJZCXQ1G |

Rows per page: 10 < 1 >

We have two sections User and backend role. We need to add new backend role.

**Users**

You can create an internal user in internal user database of the security plugin. An internal user can have its own backend role and host for an external authentication and authorization. External users from your identity provider are also supported. [Learn more](#)

**Users**

admin x Create new internal user

Look up by user name. You can also create new internal user or enter external user.

**Backend roles**

Use a backend role to directly map to roles through an external authentication system. [Learn more](#)

**Backend roles**

arn:aws:lambda:us-east-1:664109552921:function:TestTe Remove

arn:aws:iam::664109552921:role/CdktfStack-opensearchcl Remove

Type in backend role Remove

Add another backend role

Cancel Map

Go To aws console again to get Lambda role ARN,



Security / Roles / all\_access / Map user

## Map user

Map users to this role to inherit role permissions. Two types of users are supported: user, and backend role. [Learn more](#)

### Users

You can create an internal user in internal user database of the security plugin. An internal user can have its own backend role and host for an external authentication and authorization. External users from your identity provider are also supported. [Learn more](#)

Users

admin x [icon] v [Create new internal user]

Look up by user name. You can also create new internal user or enter external user.

### Backend roles

Use a backend role to directly map to roles through an external authentication system. [Learn more](#)

Backend roles

|                                                       |        |
|-------------------------------------------------------|--------|
| arn:aws:lambda:us-east-1:664109552921:function:TestTe | Remove |
| arn:aws:lambda:us-east-1:664109552921:function:TestTe | Remove |

For every add/update/delete in dynamodb table we will get DynamoDb Stream that will trigger lambda and lambda will feed open search. we can check same by running.

Dev Tools

Console

History Settings Help

200 - success 543 ms

```

1 GET /news/_search
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22

```

```

1 {
2   "took": 24,
3   "timed_out": false,
4   "_shards": {
5     "total": 2,
6     "successful": 2,
7     "skipped": 0,
8     "failed": 0
9   },
10  "hits": {
11    "total": {
12      "value": 1,
13      "relation": "eq"
14    },
15    "max_score": 1.0,
16    "hits": [
17      {
18        "_index": "news",
19        "_type": "_doc",
20        "_id": "public/Football.jpg",
21        "_score": 1.0,
22        "source": {

```

## 7) EXPOSING AS API GATEWAY

After we have successfully setup the Opensearch service, we will expose this via API gateway. There is already one Lambda function “opensearch-lambda” created by CDK template. This function will query OpenSearch Service and return results.

### CREATE AND CONFIGURE THE API

#### TO CREATE YOUR API USING THE API GATEWAY CONSOLE

1. Navigate to the API Gateway console at <https://console.aws.amazon.com/apigateway/home>

- On the left navigation pane, choose **APIs**.
- Click on **Create API**
- Locate **REST API** (not private) and choose **Build**.
- On the following page, locate the **Create new API** section and make sure **New API** is selected.

- Configure the following fields:
- API name: **opensearch-api**
- Description: **API for searching assets using Metadata using an Amazon OpenSearch Service**
- Endpoint Type: **Regional**
- Choose **Create API**.
- Choose **Actions** and **Create Method**.
- Select **GET** in the dropdown and click the checkmark to confirm.
- Configure the following settings, then choose **Save**:
  - Integration type - Lambda Function
  - Use Lambda proxy integration - Yes
  - Lambda Region - <REGION>
  - Lambda Function - opensearch-lambda
  - Use Default Timeout - Yes

## CONFIGURE THE METHOD REQUEST

### CHOOSE METHOD REQUEST AND CONFIGURE THE FOLLOWING SETTINGS:

|   | Setting           | Value                                        |
|---|-------------------|----------------------------------------------|
| 1 | Authorization     | NONE                                         |
| 2 | Request Validator | Validate query string parameters and headers |
| 3 | API Key Required  | FALSE                                        |

Under **URL Query String Parameters**, choose **Add query string** and configure the following parameter:

|   | Setting  | Value |
|---|----------|-------|
| 1 | Name     | q     |
| 2 | Required | Yes   |

## DEPLOY THE API AND CONFIGURE A STAGE

THE API GATEWAY CONSOLE LETS YOU DEPLOY AN API BY CREATING A DEPLOYMENT AND ASSOCIATING IT WITH A NEW OR EXISTING STAGE.

1. Choose **Actions** and **Deploy API**.
2. For **Deployment stage** choose **New Stage** and name the stage `opensearch-api-test`.
3. Choose **Deploy**.
4. Configure the following settings in the stage editor, then choose **Save Changes**:

|   | Setting           | Value |
|---|-------------------|-------|
| 1 | Enable throttling | Yes   |
| 2 | Rate              | 1000  |
| 3 | Burst             | 500   |

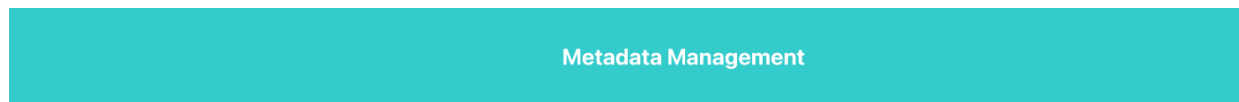
These settings configure an API that has only one method: a `GET` request to the endpoint root (`https://some-id.execute-api.<Region>.amazonaws.com/search-es-api-test`). The request requires a single parameter (`q`), the query string to search for. When called, the method passes the request to Lambda, which runs the `opensearch-lambdafunction`

Also, Enable CORS to access it from your frontend. You can enable CORS by following the steps mentioned here <https://docs.aws.amazon.com/apigateway/latest/developerguide/how-to-cors-console.html>

You can copy the created API gateway endpoint to search the metadata after you have uploaded images through UI/S3 bucket.

## 8) RUN APPLICATION AND UPLOAD THE IMAGES

You can upload the images and test this.



Upload Image to Gallery  ImageWithSpanish.jpg



Now you can successfully search the metadata through the URL copied in step 7 and it will show you the output in JSON. This can be integrated with the UI as well.

| JSON            | Raw Data                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Headers                           |
|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|
| Save            | Copy                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Collapse AllExpand AllFilter JSON |
| timed_out:      | false                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                   |
| ▼ _shards:      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                   |
| total:          | 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                   |
| successful:     | 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                   |
| skipped:        | 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                   |
| failed:         | 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                   |
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| total:          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                   |
| value:          | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                   |
| relation:       | "eq"                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                   |
| max_score:      | 0.28907335                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                   |
| ▼ hits:         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                   |
| 0:              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                   |
| _index:         | "news"                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                   |
| _type:          | "_doc"                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                   |
| _id:            | "public/GettyImages.jpg"                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                   |
| _score:         | 0.28907335                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                   |
| _source:        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                   |
| PII:            | "[[{"Score": 0.9999596476554871, "Type": "NAME", "BeginOffset": 134, "EndOffset": 149}]]"                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                   |
| CelebrityData:  | "[[{"CelebrityName": "Priyanka Chopra", "Confidence": 98.61427307128906}]]"                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                   |
| SyntaxElements: | "[[{"TokenId": 1, "Text": "public", "BeginOffset": 0, "EndOffset": 6, "PartOfSpeech": {"Tag": "ADJ", "Score": 0.81189219789505}}, {"TokenId": 2, "Text": "\\", "BeginOffset": 6, "EndOffset": 7, "PartOfSpeech": {"Tag": "SYM", "Score": 0.8961832629813862}}, {"TokenId": 3, "Text": "GettyImages.jpg", "BeginOffset": 7, "EndOffset": 22, "PartOfSpeech": {"Tag": "PROPN", "Score": 0.741998816834259}}, {"TokenId": 4, "Text": "\\", "BeginOffset": 22, "EndOffset": 23, "PartOfSpeech": {"Tag": "PUNCT", "Score": 0.985617892742157}}, {"TokenId": 5, "Text": "\\\\", "BeginOffset": 23, "EndOffset": 24, "PartOfSpeech": {"Tag": "PUNCT", "Score": 0.999986469745636}}, {"TokenId": 6, "Text": "Face", "BeginOffset": 24, "EndOffset": 28, "PartOfSpeech": {"Tag": "PROPN", "Score": 0.49619147181518925}}, {"TokenId": 7, "Text": "\\\\", "BeginOffset": 28, "EndOffset": 29, "PartOfSpeech": {"Tag": "PUNCT", "Score": 0.9998219813214111}}, {"TokenId": 8, "Text": "\\", "BeginOffset": 29, "EndOffset": 30, "PartOfSpeech": {"Tag": "PUNCT", "Score": 0.9999996423721313}}, {"TokenId": 9, "Text": "\\\\", "BeginOffset": 31, "EndOffset": 32, "PartOfSpeech": {"Tag": "PUNCT", "Score": 0.9999942779541816}}, {"TokenId": 10, "Text": "Head", "BeginOffset": 32, "EndOffset": 36, "PartOfSpeech": {"Tag": "PROPN", "Score": 0.7851257928265198}}, {"TokenId": 11, "Text": "\\\\", "BeginOffset": 36, "EndOffset": 37, "PartOfSpeech": {"Tag": "PUNCT", "Score": 0.9999999999999999}}]]" |                                   |