ELK Task

Rana Hassan Hosny
GIZA SYSTEMS | RANA.HOSNY@GIZASYSTEMS.ONMICROSOFT.COM

Elasticsearch Endpoints Documentation

Quary list:

1. Search for a specific class:

   Purpose:

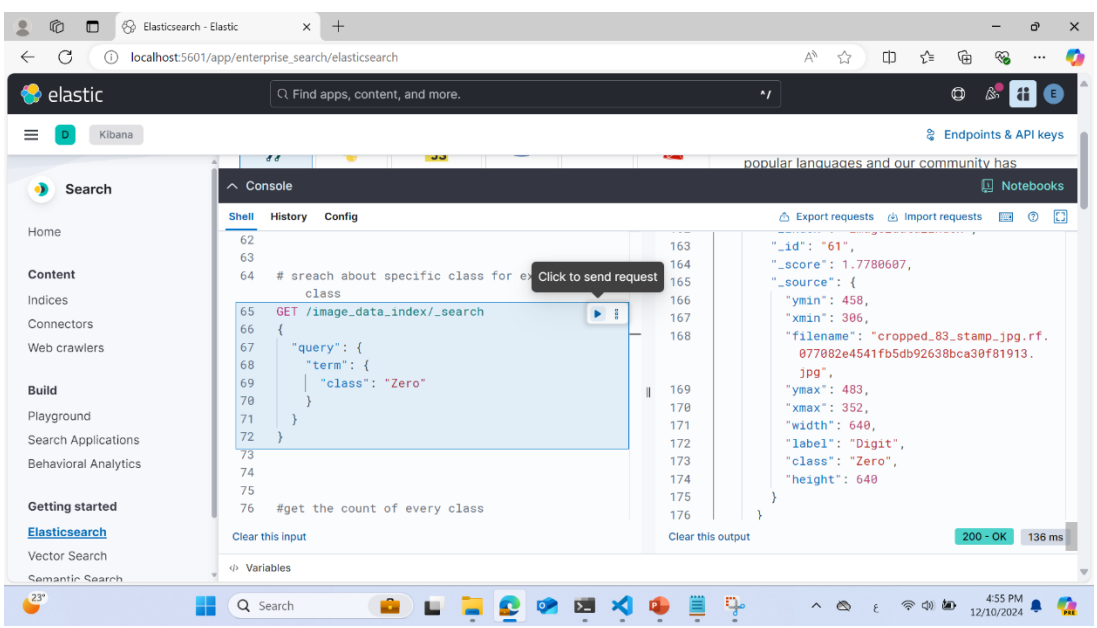
   - This query retrieves documents belonging to a specific class, such as "Zero". It is useful for filtering and analyzing data specific to one class.

```
GET /image_data_index/_search
{
  "query": {
    "term": {
      "class": "Zero"
    }
  }
}
```

   Usefulness:

   - Filters data by class.
   - Help to understand the distribution and details of specific classes.

   Example:



2. Get the count of every class:

Purpose:

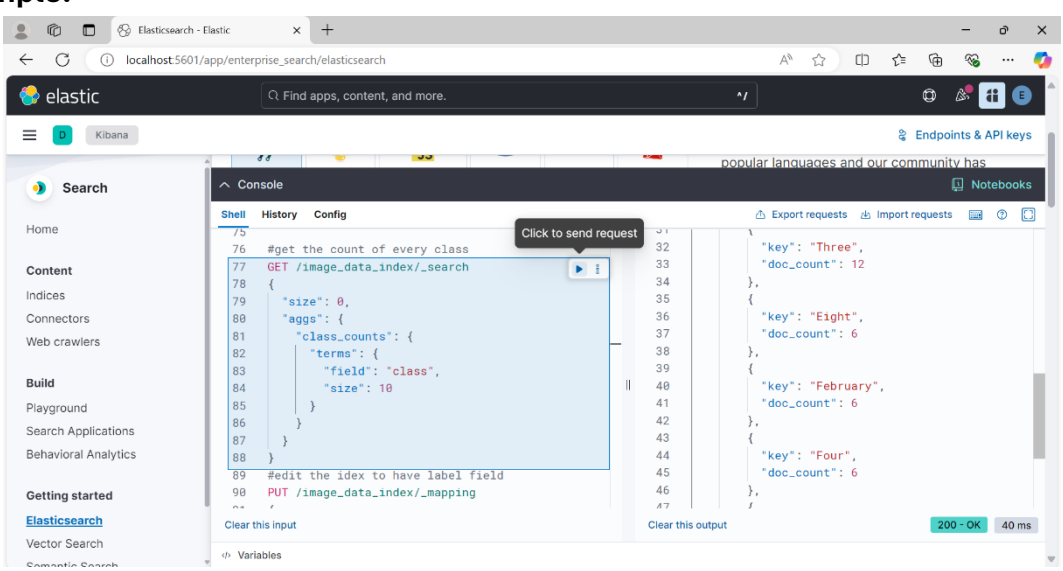
This query aggregates the number of documents for each class. It's helpful for visualizing the distribution of classes.

```
GET /image_data_index/_search
{
 "size": 0,
 "aggs": {
  "class_counts": {
   "terms": {
    "field": "class",
    "size": 10
   }
  }
 }
}
```

Usefulness:

- Provides insights into data distribution.
- Helps in debugging and balancing datasets.

Example:



3. Edit the index to add a `label` field:

Purpose:

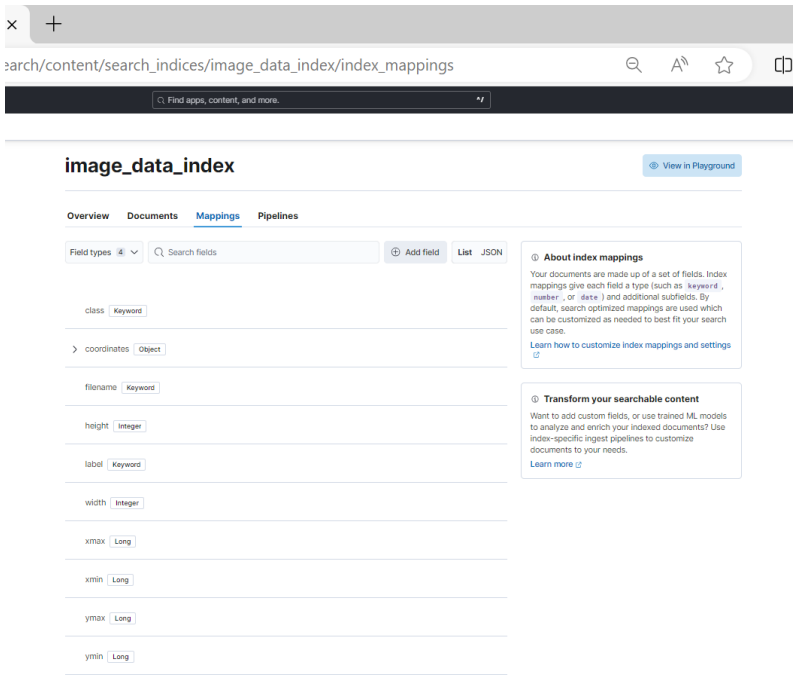
This updates the index mapping to include a new field label. It allows the addition of structured data for categorization.

```
PUT /image_data_index/_mapping
{
 "properties": {
  "label": {
   "type": "keyword"
  }
 }
}
```

Usefulness:

- Prepares the index for additional categorization.
- Supports flexible data enrichment.

Example:



4. Map class to label and add label field

Purpose:

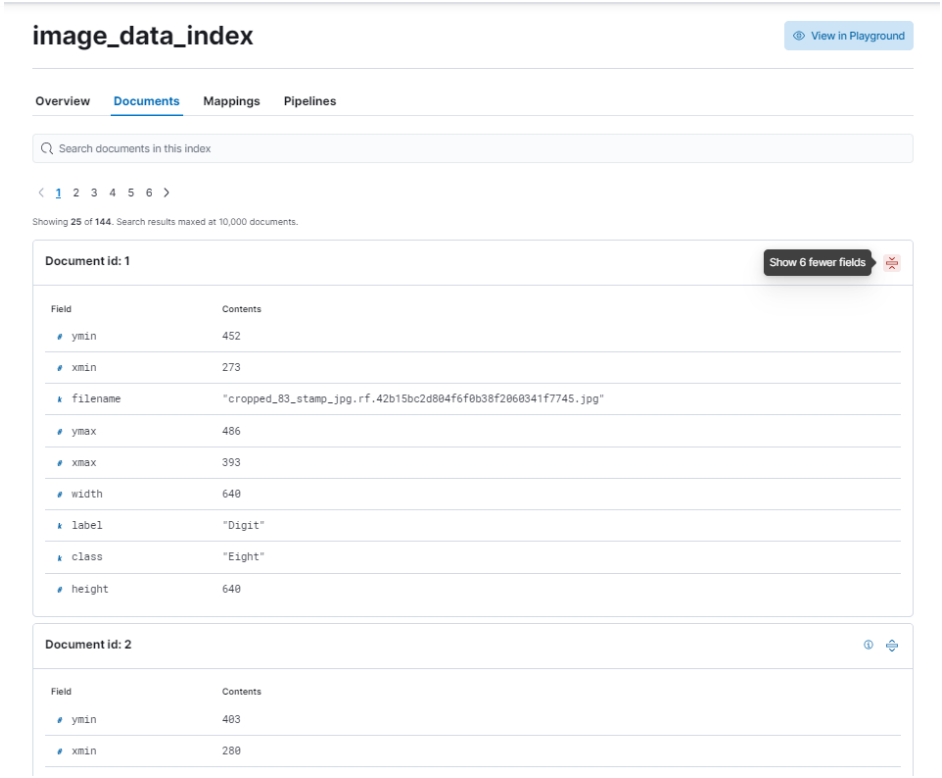
Adds a label field with values "Digit" or "Month" based on the class. It helps in grouping and querying data more efficiently.

```
POST /image_data_index/_update_by_query
{
  "script": {
    "source": """
      if (ctx._source.class == 'January' || ctx._source.class == 'February' ||
ctx._source.class == 'March' ||
        ctx._source.class == 'April' || ctx._source.class == 'May' ||
ctx._source.class == 'June' ||
        ctx._source.class == 'July' || ctx._source.class == 'August' ||
ctx._source.class == 'September' ||
        ctx._source.class == 'October' || ctx._source.class == 'November' ||
ctx._source.class == 'December') {
       ctx._source.label = 'Month';
     } else if (ctx._source.class == 'Zero' || ctx._source.class == 'One' ||
ctx._source.class == 'Two' ||
            ctx._source.class == 'Three' || ctx._source.class == 'Four' ||
ctx._source.class == 'Five' ||
            ctx._source.class == 'Six' || ctx._source.class == 'Seven' ||
ctx._source.class == 'Eight' ||
            ctx._source.class == 'Nine') {
       ctx._source.label = 'Digit';
     }
    """,
    "lang": "painless"
  }
}
```

Usefulness:

- Simplifies querying based on high-level categories.
- Facilitate analytics by grouping similar data.

- **Example:**


image_data_index
View in Playground
Overview
Documents
Mappings
Pipelines
Search documents in this index
1 2 3 4 5 6
Showing 25 of 144. Search results maxed at 10,000 documents.
Document id: 1
Show 6 fewer fields
Field
Contents
ymin
452
xmin
273
filename
"cropped_83_stamp_jpg.rf.42b15bc2d804f6f0b38f2060341f7745.jpg"
ymax
486
xmax
393
width
640
label
"Digit"
class
"Eight"
height
640
Document id: 2
Field
Contents
ymin
403
xmin
280

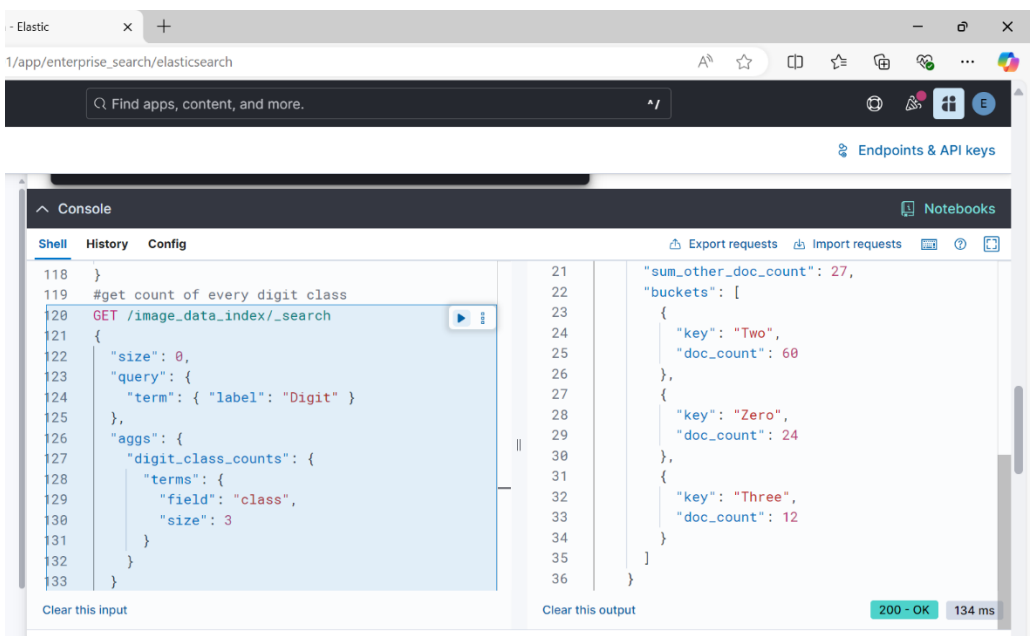
5. Get count of every digit class:

Purpose:

This query retrieves the counts of all classes labeled as "Digit".

```
GET /image_data_index/_search
{
 "size": 0,
 "query": {
  "term": { "label": "Digit" }
 },
 "aggs": {
  "digit_class_counts": {
   "terms": {
    "field": "class",
    "size": 3
   }   } }}
```

Example:



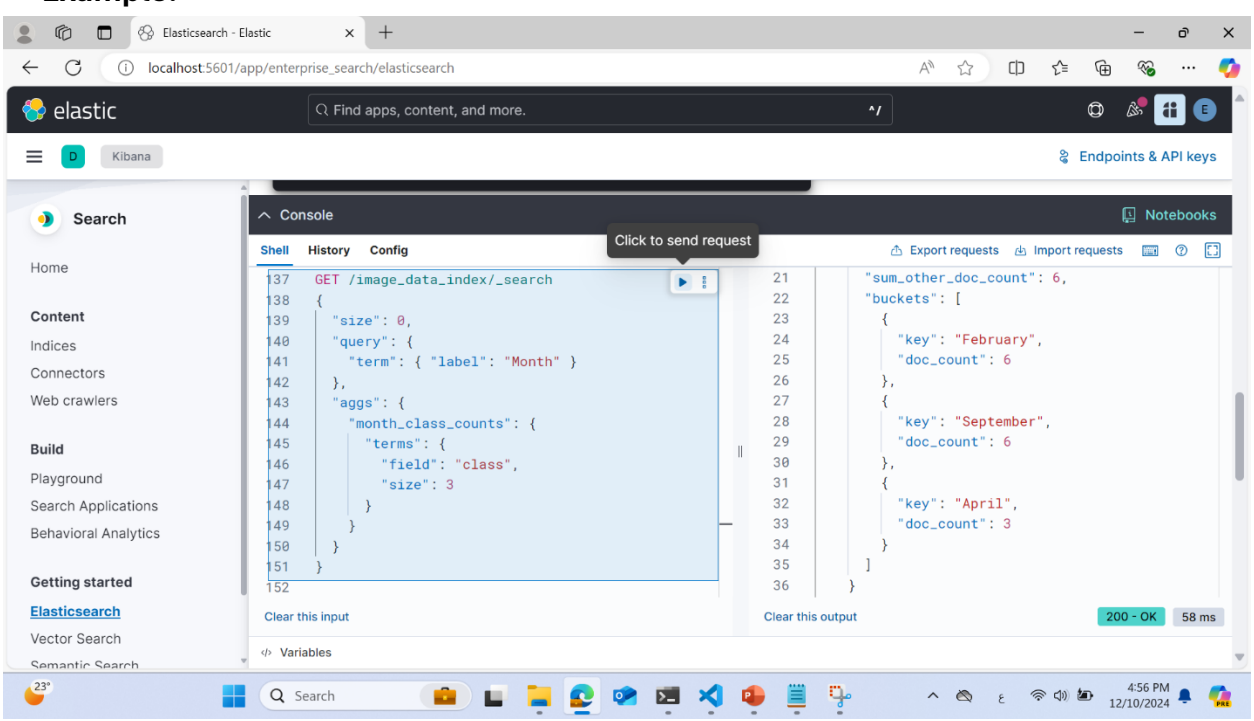
6. Get count of every month class:

Purpose:

This query retrieves the counts of all classes labeled as "Month".

```
GET /image_data_index/_search
{
 "size": 0,
 "query": {
  "term": { "label": "Month" }
 },
 "aggs": {
  "month_class_counts": {
   "terms": {
    "field": "class",
    "size": 3
   } }}}
```

Example:



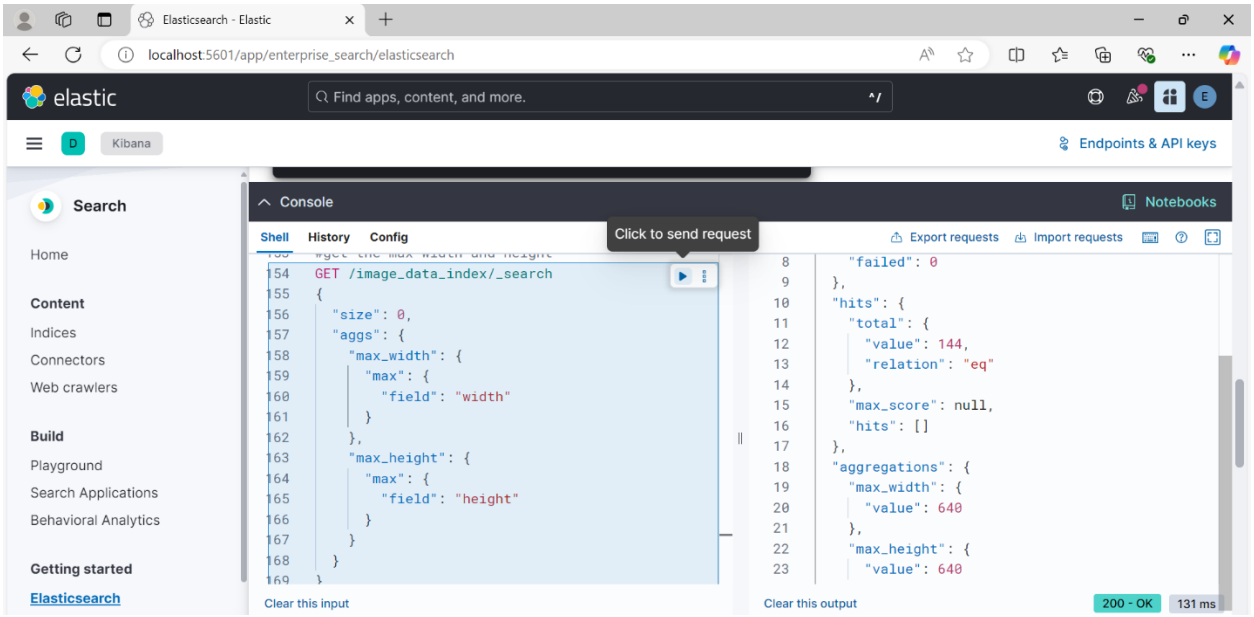
7. Get the max width and height:

Purpose:

Finds the maximum width and height values in the dataset. Useful for understanding image dimensions.

```
GET /image_data_index/_search
{
 "size": 0,
 "aggs": {
  "max_width": {
   "max": {
    "field": "width"
   }
  },
  "max_height": {
   "max": {
    "field": "height"
  } } }}
```

Example:



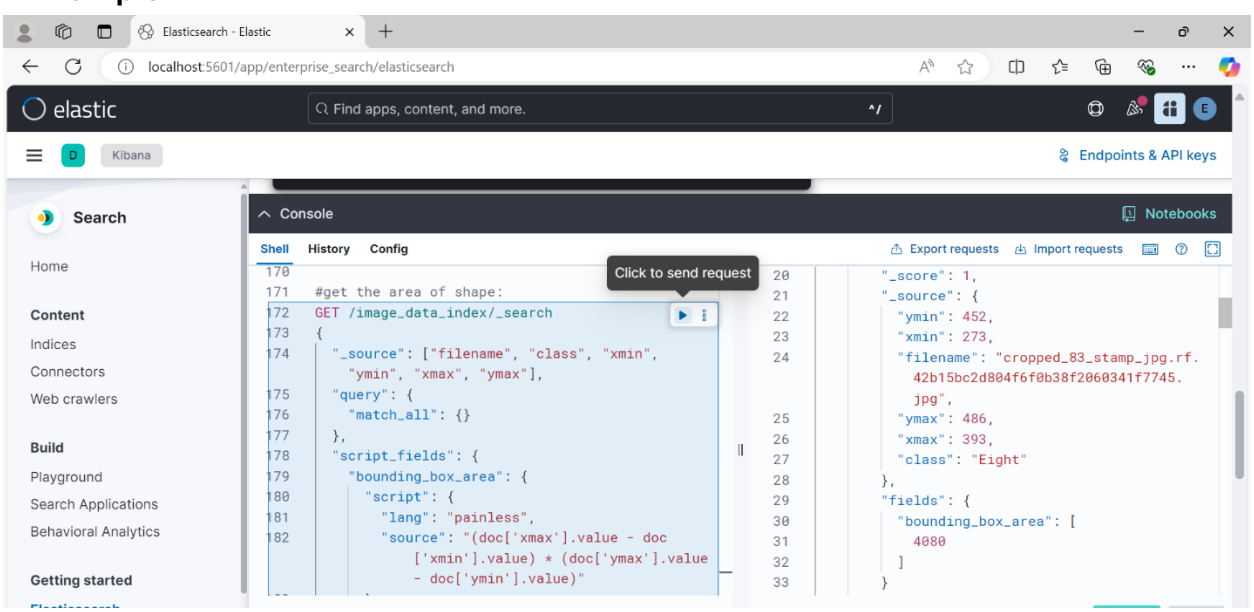
8. Calculate the area of shapes

Purpose:

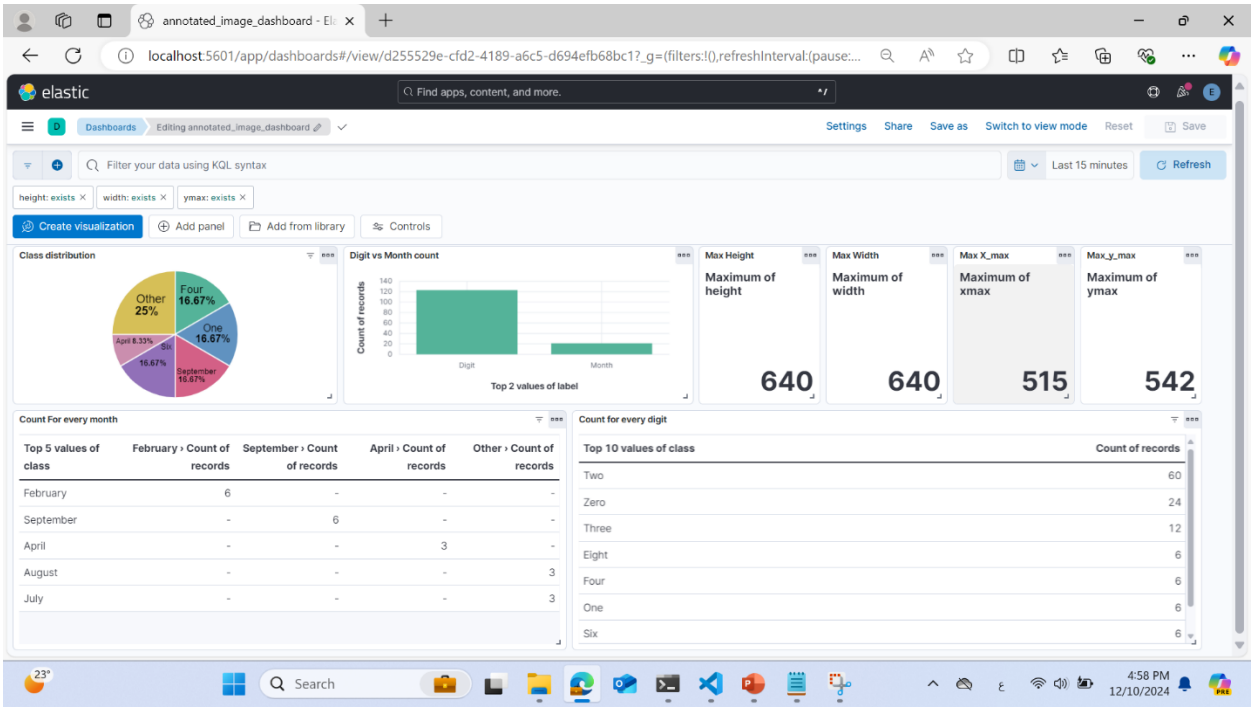
Calculates the area of bounding boxes using the formula (xmax - xmin) * (ymax - ymin).

```
GET /image_data_index/_search
{
 "_source": ["filename", "class", "xmin", "ymin",
"xmax", "ymax"],
 "query": {
  "match_all": {}
 },
 "script_fields": {
  "bounding_box_area": {
   "script": {
    "lang": "painless",
    "source": "(doc['xmax'].value -
doc['xmin'].value) * (doc['ymax'].value -
doc['ymin'].value)"
   } }}}
```

Example:



Kibana Dashboards:



Bonus:

In the bar tables I did filter by label one by label =” Month ”and other by label =”Digit ”

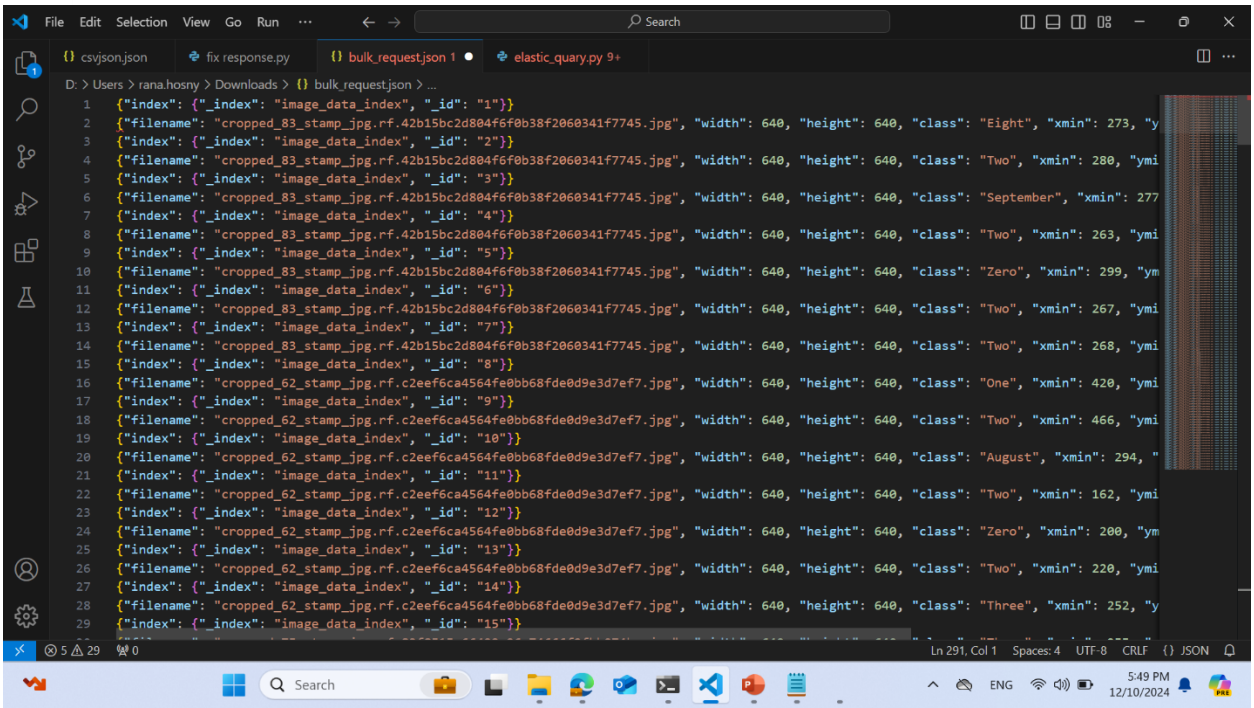
Implementation Documentation:

Data Ingestion:

- First I have downloaded the annotated images data as TensorFlow csv format and transform this to Json (as I wanted flatted Json not nested one)
- I want to use Bulk API, so I use this code to transform the Json to the format which Bulk API gets:

```
# Prepare the bulk request body with an incrementing index

bulk_data = []
for i, doc in enumerate(documents, start=1):  # Starting index at 1
    bulk_data.append({ "index": { "_index": "image_data_index",
"_id": str(i) } })  # Add index action with incremental _id
    bulk_data.append(doc)  # Add the document itself

# Convert the bulk data to JSON format and join it with newline
characters
bulk_request = '\n'.join(json.dumps(item) for item in bulk_data)

# Specify the file path
file_path = r"D:\Users\rana.hosny\Downloads\bulk_request.json"

# Save to the file
with open(file_path, 'w') as f:
    f.write(bulk_request)

print(f"Bulk request saved to {file_path}")
```

Sample of the bulk request file:



- Then insert the data like this example:(I have inserted it in chunks as the command has limited size input)

```
curl -X PUT https://172.18.0.2:9200/_bulk -k -u "elastic:MT2t34+MmwG6rouktA0E" -H
"Content-Type: application/json" -d '
{"index": {"_index": "image_data_index", "_id": "139"}}
{"filename": "cropped_69_stamp_jpg.rf.16bcae47cb7897f4754c41ebfe358519.jpg",
"width": 640, "height": 640, "class": "Eight", "xmin": 439, "ymin": 247, "xmax":
473, "ymax": 346}
{"index": {"_index": "image_data_index", "_id": "140"}}
{"filename": "cropped_69_stamp_jpg.rf.16bcae47cb7897f4754c41ebfe358519.jpg",
"width": 640, "height": 640, "class": "September", "xmin": 264, "ymin": 259, "xmax":
371, "ymax": 350}
```

```
{"index": {"_index": "image_data_index", "_id": "141"}}
{"filename": "cropped_69_stamp_jpg.rf.16bcae47cb7897f4754c41ebfe358519.jpg",
"width": 640, "height": 640, "class": "Two", "xmin": 226, "ymin": 266, "xmax":
245, "ymax": 363}
{"index": {"_index": "image_data_index", "_id": "142"}}
{"filename": "cropped_69_stamp_jpg.rf.16bcae47cb7897f4754c41ebfe358519.jpg",
"width": 640, "height": 640, "class": "Two", "xmin": 144, "ymin": 269, "xmax":
175, "ymax": 370}
{"index": {"_index": "image_data_index", "_id": "143"}}
{"filename": "cropped_69_stamp_jpg.rf.16bcae47cb7897f4754c41ebfe358519.jpg",
"width": 640, "height": 640, "class": "Zero", "xmin": 171, "ymin": 291,
"xmax": 197, "ymax": 341}
{"index": {"_index": "image_data_index", "_id": "144"}}
{"filename": "cropped_69_stamp_jpg.rf.16bcae47cb7897f4754c41ebfe358519.jpg",
"width": 640, "height": 640, "class": "Two", "xmin": 195, "ymin": 263, "xmax":
223, "ymax": 367}
'
```

```
ranahossny@rana-hosny: ~
, "xmin": 466, "ymin": 290, "xmax": 506, "ymax": 420}
{"index": {"_index": "image_data_index", "_id": "10"}}
{"filename": "cropped_62_stamp_jpg.rf.c2eef6ca4564fe0bb68fde0d9e3d7ef7.jpg", "width": 640, "height": 640, "class": "Augu
st", "xmin": 294, "ymin": 299, "xmax": 408, "ymax": 432}
{"index": {"_index": "image_data_index", "_id": "11"}}
{"filename": "cropped_62_stamp_jpg.rf.c2eef6ca4564fe0bb68fde0d9e3d7ef7.jpg", "width": 640, "height": 640, "class": "Two"
, "xmin": 162, "ymin": 315, "xmax": 200, "ymax": 438}
{"index": {"_index": "image_data_index", "_id": "12"}}
{"filename": "cropped_62_stamp_jpg.rf.c2eef6ca4564fe0bb68fde0d9e3d7ef7.jpg", "width": 640, "height": 640, "class": "Zero
", "xmin": 200, "ymin": 355, "xmax": 221, "ymax": 400}
{"index": {"_index": "image_data_index", "_id": "13"}}
{"filename": "cropped_62_stamp_jpg.rf.c2eef6ca4564fe0bb68fde0d9e3d7ef7.jpg", "width": 640, "height": 640, "class": "Two"
, "xmin": 220, "ymin": 310, "xmax": 247, "ymax": 427}
{"index": {"_index": "image_data_index", "_id": "14"}}
{"filename": "cropped_62_stamp_jpg.rf.c2eef6ca4564fe0bb68fde0d9e3d7ef7.jpg", "width": 640, "height": 640, "class": "Thre
e", "xmin": 252, "ymin": 319, "xmax": 276, "ymax": 427}
'
{"errors":false,"took":0,"items":[{"index":{"_index":"image_data_index","_id":"7","_version":1,"result":"created","_shar
ds":{"total":2,"successful":1,"failed":0},"_seq_no":10,"_primary_term":1,"status":201}},{"index":{"_index":"image_data_i
ndex","_id":"8","_version":1,"result":"created","_shards":{"total":2,"successful":1,"failed":0},"_seq_no":11,"_primary_t
erm":1,"status":201}},{"index":{"_index":"image_data_index","_id":"9","_version":1,"result":"created","_shards":{"total"
:2,"successful":1,"failed":0},"_seq_no":12,"_primary_term":1,"status":201}},{"index":{"_index":"image_data_index","_id":
"10","_version":1,"result":"created","_shards":{"total":2,"successful":1,"failed":0},"_seq_no":13,"_primary_term":1,"sta
tus":201}},{"index":{"_index":"image_data_index","_id":"11","_version":1,"result":"created","_shards":{"total":2,"succes
sful":1,"failed":0},"_seq_no":14,"_primary_term":1,"status":201}},{"index":{"_index":"image_data_index","_id":"12","_ver
sion":1,"result":"created","_shards":{"total":2,"successful":1,"failed":0},"_seq_no":15,"_primary_term":1,"status":201}}
,{"index":{"_index":"image_data_index","_id":"13","_version":1,"result":"created","_shards":{"total":2,"successful":1,"f
ailed":0},"_seq_no":16,"_primary_term":1,"status":201}},{"index":{"_index":"image_data_index","_id":"14","_version":1,"r
esult":"created","_shards":{"total":2,"successful":1,"failed":0},"_seq_no":17,"_primary_term":1,"status":201}}]}ranahoss
ny@rana-hosny:~$
```

Mapping Decisions:

When creating the index image_data_index and defining its mapping, the choice of field types was driven by the structure and usage of the data.

```
PUT /image_data_index
{
 "mappings": {
  "properties": {
   "filename": {
    "type": "keyword"
   },
   "width": {
    "type": "integer"
   },
   "height": {
    "type": "integer"
   },
   "class": {
    "type": "keyword"
   },
   "coordinates": {
    "properties": {
     "xmin": {
      "type": "integer"
     },
     "ymin": {
      "type": "integer"},
     "xmax": {
      "type": "integer"},
     "ymax": {
      "type": "integer"
     }} } } }}
```

- filename (keyword): For exact searches by unique file names.
- width and height (integer): Store image dimensions for filtering or aggregation.
- class (keyword): Categorical data for grouping and counting classes.
- coordinates (nested integers): Bounding box dimensions for area
- calculations.

Adding the label Field:

```
PUT /image_data_index/_mapping
{
  "properties": {
    "label": {
      "type": "keyword"
    }
  }
'
```

`label` **(keyword)**: Represents static high-level categories like "Digit" or "Month" for efficient filtering and grouping.

Query Design:

- **Search Specific Class**: Retrieves documents matching a specific class for precise filtering.
- **Count Classes**: Aggregates the distribution of class occurrences to understand data composition.
- **Count by Label**: Filters and counts classes within specific high-level labels for insights.
- **Find Max Dimensions**: Identifies the largest image dimensions for analysis.
- **Calculate Bounding Box Area**: Computes areas to evaluate object sizes within images.

Visualization Choices:

- Pie plot: to show the total percentage of distribution of every class
- 4 Kpis to show the max values of X_min,X_max,Y_min and Y_max
- The table shows the count of instances in every digit class
- The table shows the count of instances in every month class

Video Demo: