



FROM VIDEO TO VALUE

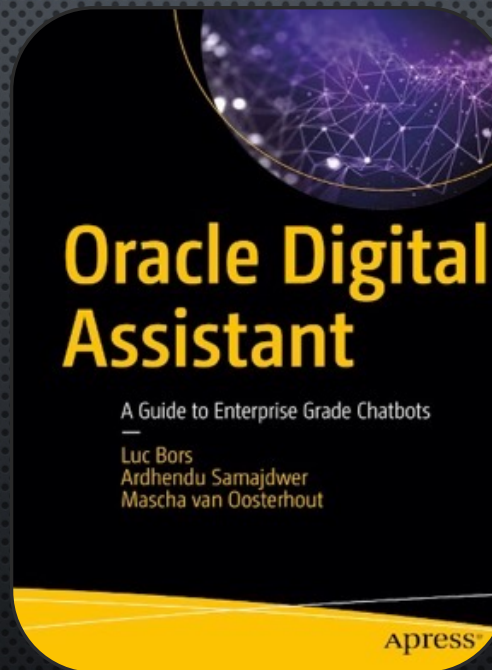
VIDEO ANALYTICS REDEFINED WITH OCI VISION AND ORACLE APEX

LUC BORS

APEX WORLD 2025

LUC BORS

NEW TECHNOLOGIES



TODAYS TOPICS



Image recognition
and object detection



Technical
components



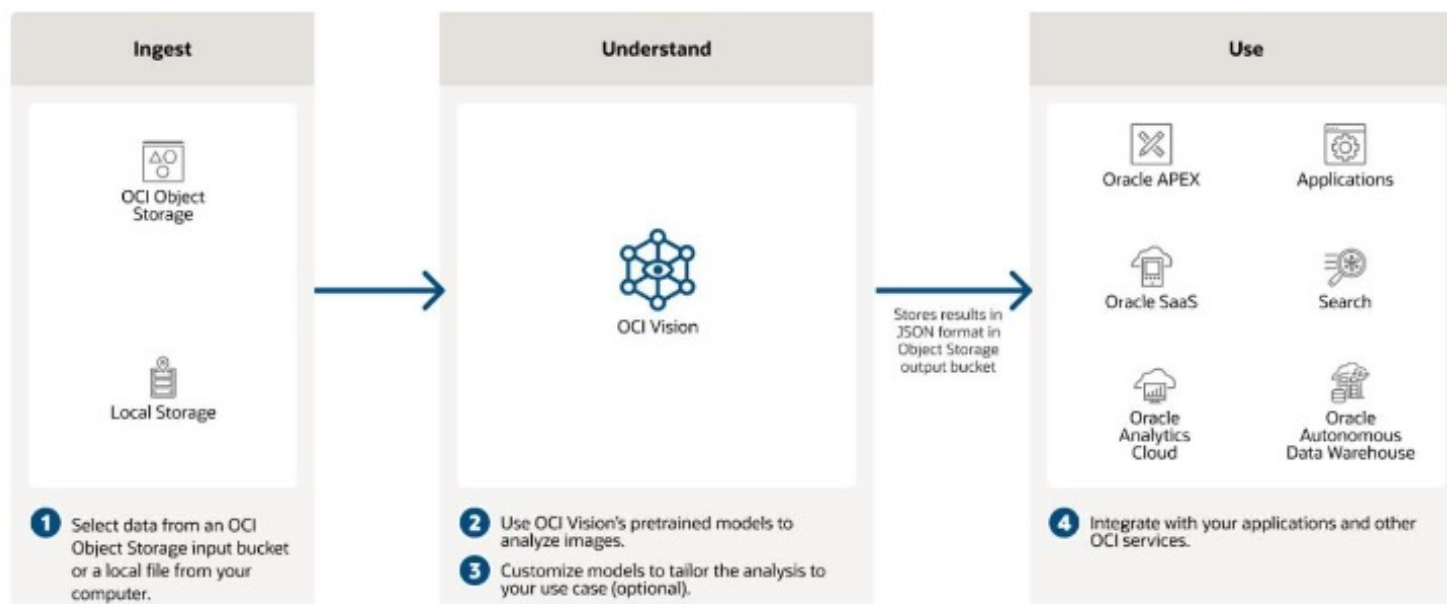
OCI Vision

OCI VISION: AI-POWERED VIDEO ANALYSIS

- **KEY FEATURES:** OCI Vision offers object detection, classification, and anomaly detection functionalities for comprehensive video analysis.
- **USE CASE APPLICATIONS:** Monitoring security footage, analyzing retail behavior, and tracking traffic exemplify OCI Vision's practical applications.
- **ARCHITECTURE OVERVIEW:**



ARCHITECTURE OVERVIEW



How AI Vision works



OCI VISION OOTB

WHAT CAN OCI VISION DO ?

OOTB WORKS FINE.....

.... BUT (HOW) CAN WE ENHANCE?



OCI VISION CUSTOM

WHAT CAN OCI VISION DO ?



NEXT LEVEL

PROCESSING VIDEOS

SETTING UP OCI VISION FOR ANALYSIS

- **SETUP OCI VISION INSTANCE:** INCLUDING API KEY RETRIEVAL AND IM SETUP.
- **PYTHON ANALYSIS SCRIPT:** A PYTHON CODE FOR VIDEO FRAME ANALYSIS, SHOWCASING PRACTICAL USAGE OF THE OCI VISION API.



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WHAT IS OPENCV?

- OPENCV (OPEN SOURCE
COMPUTER VISION LIBRARY)
- [HTTPS://OPENCV.ORG/ABOUT/](https://opencv.org/about/)





Video Frame Extraction: Extracting individual frames involves decoding video files and saving frames for subsequent analysis operations.



API Submission Process: Frames are formatted and transmitted through an API call to OCI Vision for efficient processing.



OpenCV Code Sample: A sample OpenCV script illustrates frame extraction and demonstrates a successful API integration with OCI Vision.

EXTRACTING VIDEO FRAMES & SENDING TO OCI VISION

CALLING OIC VISION

```
# Video reader
filename = 'video.mp4'
cap = cv2.VideoCapture(filename)

# Video writer
out = cv2.VideoWriter('soccer_out.avi', cv2.VideoWriter_fourcc('M', 'J', 'P', 'G'), 10, (1920, 1080))

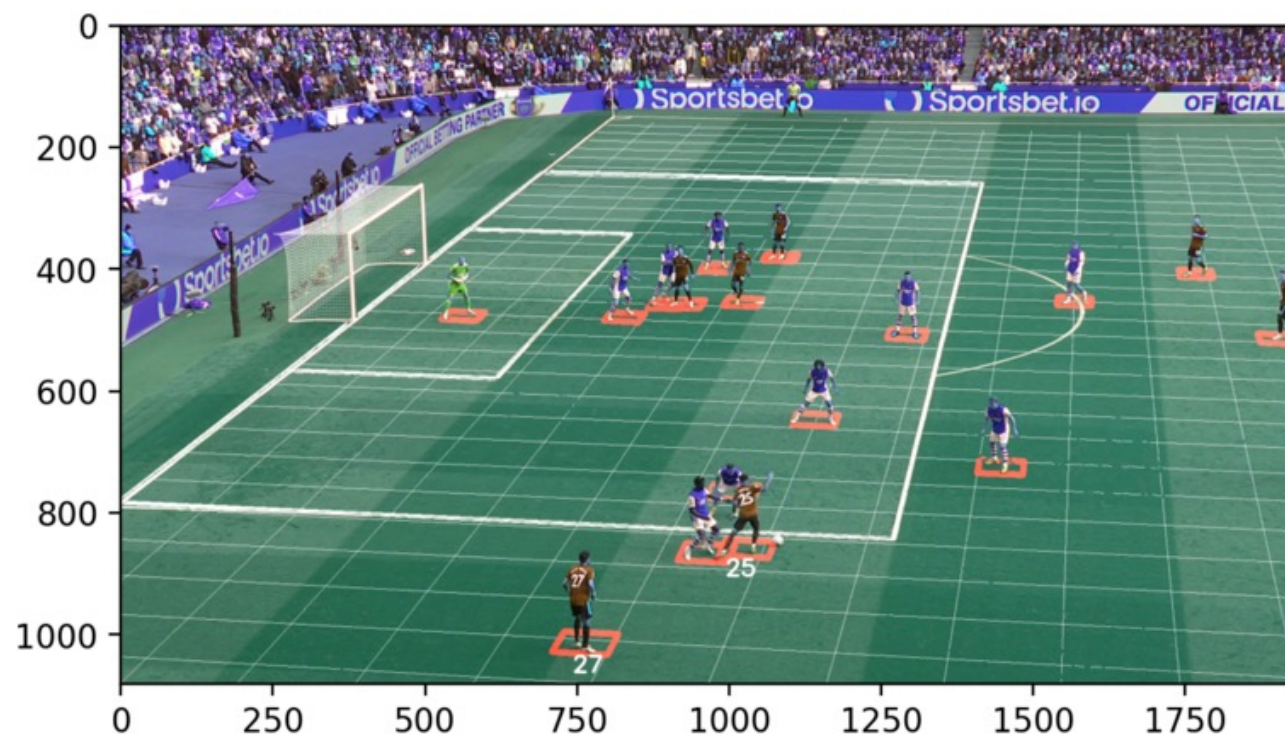
# Remove the first few frames (because it has a video overlay on top of the field)
for i in range(1, 15):
    ret, image_np = cap.read()

tracked_players = [] # Empty list

frame_number = 6
while (frame_number <= 80):
    # Read three frames from the video (we are skipping 2 frames, then processing the third)
    ret, image_np = cap.read()
    ret, image_np = cap.read()
    ret, image_np = cap.read()
    _, im_arr = cv2.imencode('.jpg', image_np) # im_arr: image in Numpy one-dim array format.

    # Call the AI Vision service to do object recognition and text recognition
    im_bytes = im_arr.tobytes()
    im_b64 = base64.b64encode(im_bytes)
    inline_image_details.data = im_b64.decode('utf-8')
    analyze_image_details.image = inline_image_details
    analyze_image_details.features = features
    res = ai_service_vision_client.analyze_image(analyze_image_details=analyze_image_details)
    res_json = json.loads(repr(res.data))
```


Writing to video, frame 45
Found shirt number 27
Found shirt number 25



STORING THE RESULT IN A TABLE

```
def store_tracking_information(image_objects, frame_number, connection, cur):
    # Stores the tracking information that was derived from the image in the database
    for index, image_object in enumerate(image_objects):
        world_coordinate = image_object["world_coordinates"]
        if "display" in image_object:
            sql = ""
            if image_object["name"] == "Person":
                shirt_number = "null"
                if "shirt_number" in image_object:
                    shirt_number = image_object["shirt_number"]
                sql = "insert into tracking(framenumber, object, shirt_number, position_x, position_y) values (" + str(frame_number) + ", 'Player', " + str(world_coordinate) + ", " + str(image_object["position_x"]) + ", " + str(image_object["position_y"]) + ")"
            if image_object["name"] == "Football":
                sql = "insert into tracking(framenumber, object, position_x, position_y) values (" + str(frame_number) + ", 'Ball\\', " + str(image_object["position_x"]) + ", " + str(image_object["position_y"]) + ")"
            cur.execute(sql)
    connection.commit()
```




Creating RESTful Web Service:

Developing a RESTful Web Service in APEX enables seamless integration with the OCI Vision API.



API Interaction Diagram: A visual representation shows the interaction between APEX, OCI Vision API, JSON parsing, and UI display.



APEX REST API Example: Sample code demonstrates how to call the OCI Vision service within an APEX application efficiently.

INTEGRATING OCI VISION API WITH ORACLE APEX

APEX WEB CREDENTIALS

Resources

- My groups
- Integrated applications
- API keys**
- Auth tokens
- Customer secret keys
- My access tokens
- My requests
- My consents
- My oauth 2.0 client credentials
- SMTP credentials
- Database passwords
- Keep me signed-in sessions

- > User preferences
- > Work information
- > Other information

API keys

Add API key
Delete

<input type="checkbox"/>	Fingerprint
<input type="checkbox"/>	45:e6:41:23:9a:84:27:7f:e

0 selected

Add API key Help

Note: An API key is an RSA key pair in PEM format used for signing API requests. You can generate the key pair here and download the private key. If you already have a key pair, you can choose to upload or paste your public key file instead. [Learn more](#)

☒ Generate API key pair
 ☐ Choose public key file
 ☐ Paste a public key


Public key

i

Download the private key. It will not be shown again. After you download it, [change the file permissions](#) so only you can view it

↓ Download private key
 ↓ [Download public key](#)

Add
Cancel



> User preferences

> Workspaces

> Other

Resources

My groups

Integrated applications

API keys

Auth tokens

Customer secret keys

My access tokens

My requests

My consents

My oauth 2.0 client credentials

SMTP credentials

Database passwords

API keys

Add API key

☐

Fin

☐

45

☐

c2

0 selected

Configuration file preview

[Help](#)

Note: This configuration file snippet includes the basic authentication information you'll need to use the SDK, CLI, or other OCI developer tool. Paste the contents of the text box into your ~/.oci/config file and update the key_file parameter with the file path to your private key. [Learn more](#)

Select API key fingerprint

c2:a0:9b:99:13:b8:54:4f:62:db:c6:a7:0f:00:6a:55

Configuration file preview *Read-only*

[DEFAULT]

```
user=oid1-user-01-passwd=5paw4jvnskiC5r4GsdhucGostQmuy4mshbucQidhucFhbs
[REDACTED]
```

Copy

Paste the contents of the text box into your ~/.oci/config file.

Close

3:49:12 UTC


5:10:03 UTC

Showing 2 API keys < Page 1 >



APEX SETUP

- WEBCREDENTIALS
- REST DATA SOURCE


APEX

App Builder

SQL Workshop











Team Development

Gallery


Search


Workspace Utilities

Workspace Utilities

 REST Enabled SQL Services Manage references to external REST Enabled SQL services.	 Generative AI Configure Generative AI Services.
 Remote Servers Manage Remote Server objects used for REST Data Sources and Authentications.	 Application Groups Organize applications into logical groups.
 Web Credentials Manage secure credentials to connect to REST Enabled SQL or other REST services.	 Workspace Themes Manage workspace themes that can be utilized by any application within the workspace.
 Export ... Export workspace components.	 Oracle APEX Views Query the various views against Oracle APEX metadata.
 Manage Backups View and manage backups across applications in this workspace	 REST Source Catalogs Manage catalogs of REST Sources for integration into applications

WEBCREDENTIALS (SEE CONFIG FILE)


APEX
App Builder
SQL Workshop
Team Development
Gallery




Workspace Utilities
Web Credentials
Create/Edit

Web Credentials


Cancel
Create

Attributes

Name




Static ID




Authentication Type


Basic Authentication




Use Database Credential

☐



Client ID or Username




Client Secret or Password



Verify Client Secret or Password



Valid for URLs



Note that changing this value requires re-entering the client secret.

USE REST DATA SOURCE

Application Logic <ul style="list-style-type: none"> Application Definition Application Items Application Processes 1 Application Computations Application Settings Build Options 4 	Security <ul style="list-style-type: none"> Security Attributes Authentication Schemes 1 Authorization Schemes 1 Application Access Control Session State Protection 	Other Components <ul style="list-style-type: none"> Lists of Values Plug-ins 1 Component Settings Shortcuts Component Groups Data Load Definitions
Navigation and Search <ul style="list-style-type: none"> Lists 3 Navigation Menu Breadcrumbs 1 Navigation Bar List Search Configurations 	User Interface <ul style="list-style-type: none"> User Interface Attributes Progressive Web App Themes 1 Templates 69 Email Templates Map Backgrounds 	Files and Reports <ul style="list-style-type: none"> Static Application Files 3 Static Workspace Files Report Layouts Report Queries
Data Sources <ul style="list-style-type: none"> REST Data Sources Duality Views JSON Sources 	Workflows and Automations <ul style="list-style-type: none"> Task Definitions Automations 1 Workflows 	Globalization <ul style="list-style-type: none"> Globalization Attributes Text Messages Application Translations

APEX

App Builder

SQL Workshop

Team Development

Gallery

Search

Application 100

Shared Components

REST Data Sources

VISION_DS

REST Data Source

Delete

Apply Changes

Show All

REST Data Source

Settings

Authentication

Data Profile

Operations

Parameters

Subscription

Advanced

REST Data Source

Name

VISION_DS

REST Data Source Type

Oracle Cloud Infrastructure (OCI)

Remote Server

vision-aiservice-eu-amsterdam-1-oci-oraclecloud-com-20220125-actions

Base URL

https://vision.aiservice.eu-amsterdam-1.oci.oraclecloud.com/20220125/actions

URL Path Prefix

/analyzeImage

Settings

Authentication

Credentials

AI_VISION

Authentication Server

- Select -

CONFIGURE PARAMETERS!

REST Source Operation

Cancel

Delete

Apply Changes

Show All

Operation

Operation Parameters

Caching

Advanced

Operation

Name

REST Source Base URL

https://vision.aiservice.eu-amsterdam-1.oc1.oraclecloud.com/20220125/actions/analyzeImage

URL Pattern

.

HTTP Method

POST

Database Operation

- Not mapped -

Request Body Template

```
{
  "compartmentId": "#COMPARTMENT_ID#",
  "image": {
    "source": "INLINE",
    "data": "#FILE_DATA#"
  },
  "features": [
    {
      "featureType": "#FEATURE_TYPE#",
      "maxResults": 5
    }
  ]
}
```

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BUILDING A FULL-STACK VIDEO ANALYTICS APP



Full-Stack Architecture Overview: ...



Data Storage in OCI:
Utilize OCI Object Storage for secure video storage, ensuring scalability and durability for large datasets.



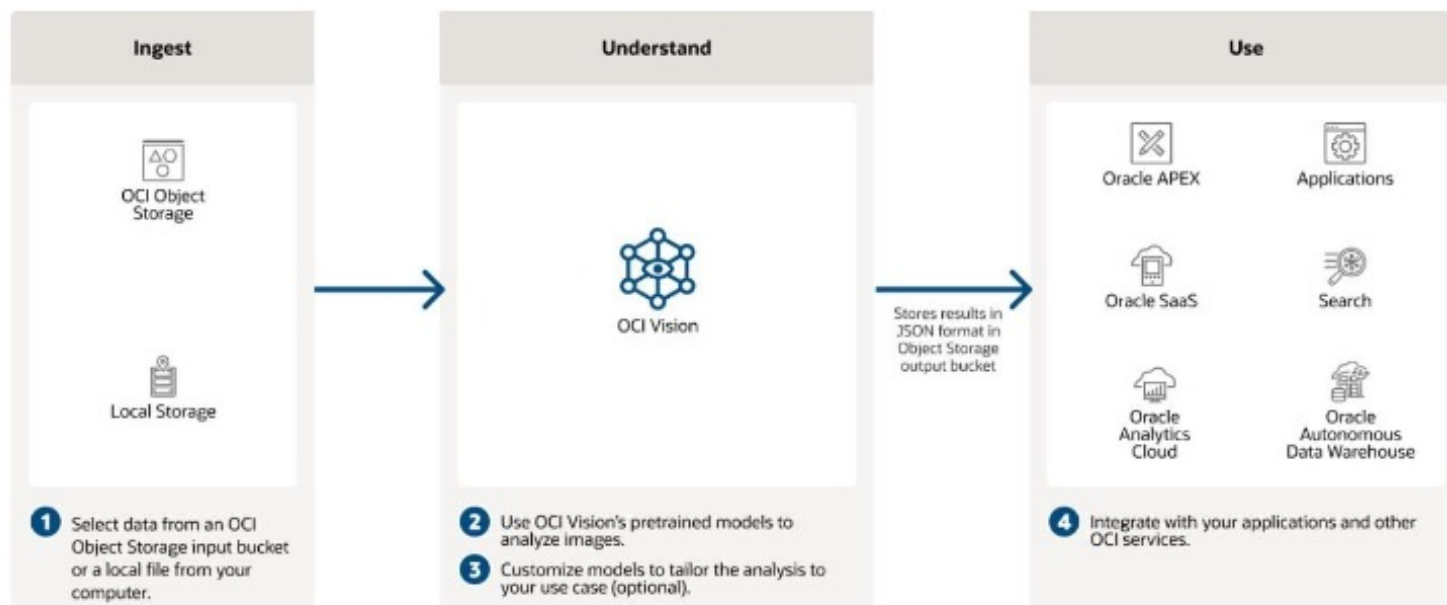
Processing & UI Display:
Leverage backend functions for frame processing, delivering results to user-friendly APEX dashboards for visualization.



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THE FLOW

- **VIDEO (OR IMAGE) UPLOAD** → OCI OBJECT STORAGE
- **FRAME PROCESSING** → SENT TO OCI VISION API
- **AI PROCESSING** → JSON RESPONSE STORED IN ORACLE DB
- **VISUALIZATION** → APEX APPLICATION



How AI Vision works

CALL OCI VISION FROM APEX

```

DECLARE
    l_blob      BLOB;
    l_clob      CLOB;
    l_response  CLOB;
BEGIN
    -- Retrieve the selected image BLOB
    SELECT file_data
    INTO l_blob
    FROM images
    WHERE id = :P_SELECTED_ID;

    -- Convert BLOB to Base64 if API requires it
    l_clob := APEX_WEB_SERVICE.BLOB2CLOBBASE64(l_blob);

    -- Call REST Data Source
    l_response := APEX_EXEC.EXECUTE_REMOTE(
        p_connection => 'VISION_DS', -- Your REST Data Source
        p_operation  => 'POST',
        p_request_body => JSON_OBJECT(--> see below <-->
    );

    -- Show response message
    APEX_UTIL.SET_SESSION_STATE('P_MESSAGE', 'Upload Successful! Response: ' || l_response);
END;

{
    "compartmentId": "#COMPARTMENT_ID#",
    "image": {
        "source": "INLINE",
        "data": l_clob
    },
    "features": [
        {
            "featureType": "OBJECT_DETECTION",
            "maxResults": 15
        }
    ]
}

```


SUMMARY

- ORACLE OCI VISION:
 - OBJECT DETECTION WORKS OOTB
 - CUSTOM MODELS CAN ENHANCE DETECTIONS
 - INTEGRATION VIA API
 - ADVANCED VIDEO ANALYSES STILL NEEDS PROCESSING AND CUSTOM CODE
- ANALYSES CAN BE TRIGGERED FROM APEX APPLICATIONS
- ANALYTICS DATA STORED IN DB CAN BE EXPOSED IN APEX APPLICATIONS

Q&A & NEXT STEPS



Key Takeaways:

Integration of OCI Vision and Oracle APEX fosters efficient development of sophisticated video analytics applications.



Additional Resources:

Explore comprehensive resources available online for deeper understanding of video analytics, OCI, and APEX.



GA of AI Vision Stored Video Analyses:

Currently only available in, Ashburn. Phoenix and London



 www.bohort.nl

 @lucb_

 @bohort_nl

 @official.bohort_nl

 <https://www.linkedin.com/company/bohort>