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GPS304

Building enterprise AI applications: No ML expertise required

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Introduction

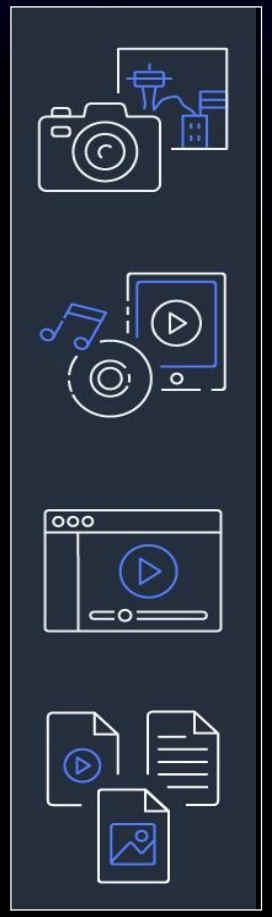
You are a developer in an organization that seeks to make a large archive of company assets discoverable; assets include **photos, video, audio, and documents** that lack detailed information regarding the content within

You are tasked with building an application that processes the company's assets at scale **and uses machine learning to extract granular metadata** from each asset

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Media2Cloud (M2C)

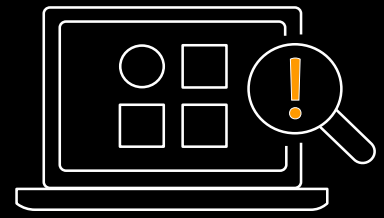
SAMPLE ENTERPRISE AI APPLICATION



Select machine learning services

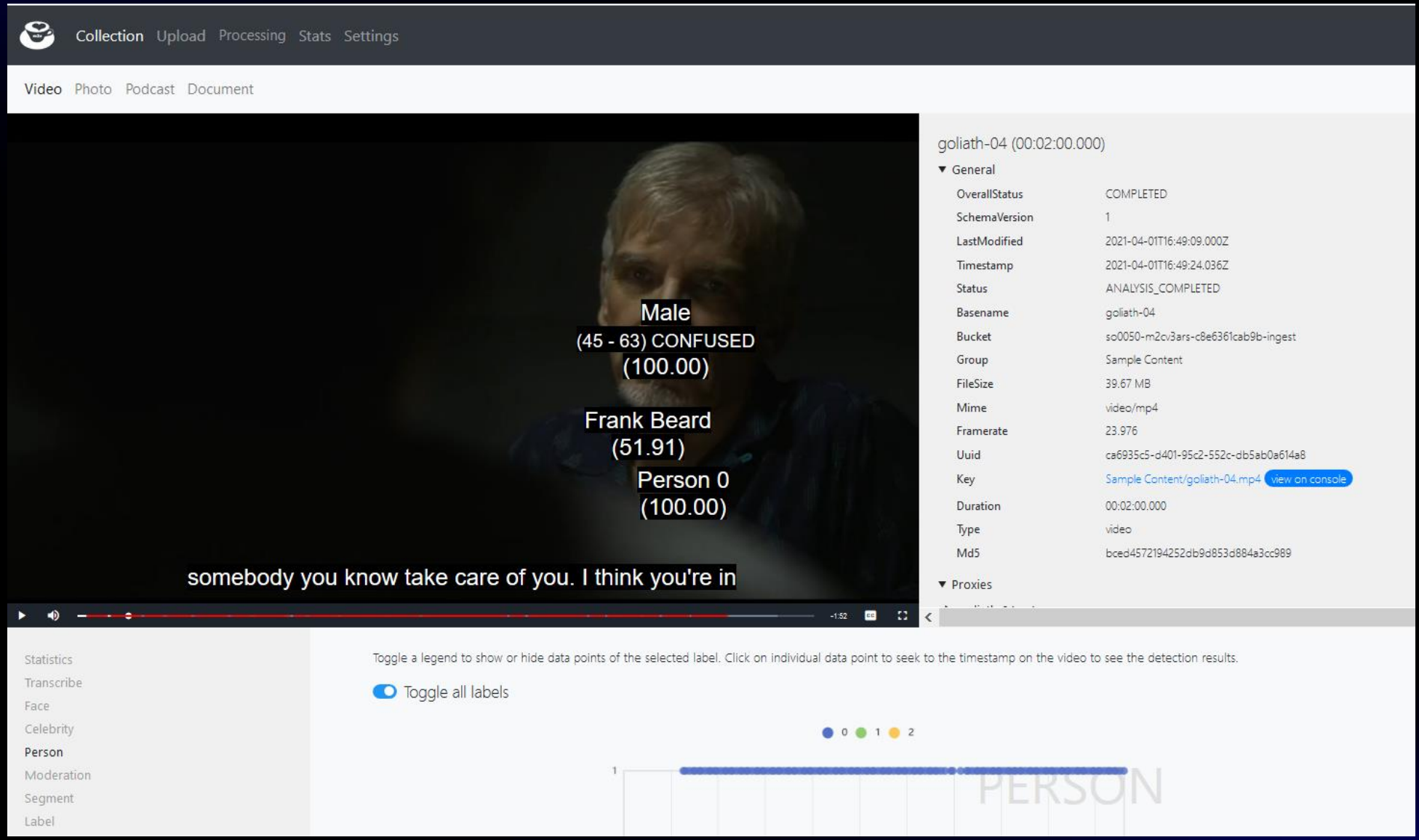
- Amazon Rekognition video
- Amazon Comprehend
- Amazon Textract
- Amazon Rekognition image
- Amazon Translate
- Amazon Transcribe

Media asset management



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Media2Cloud results



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Formula 1 manages their asset library with Media2Cloud

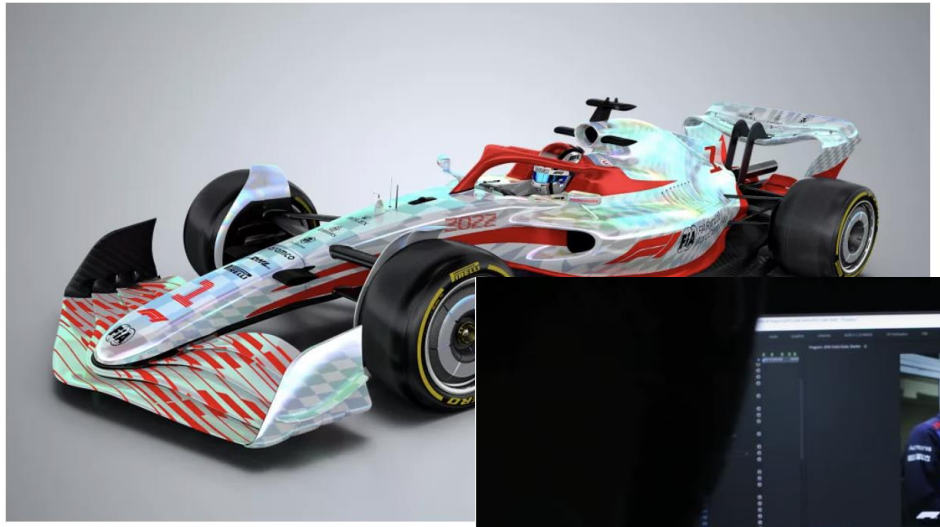
Media2Cloud enables more than 4PB of archived F1 footage (>150,000 hours of content)

F1 will identify racing legends and important moments in its archive library using M2C's AI framework

Exclusive: Amazon is helping Formula 1 preserve its history with colossal video archive

By Joel Khalili August 25, 2021

150,000 hours of F1 footage collected and sorted into a single searchable archive





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Access your environment

1. Go to: **https://dashboard.eventengine.run/login**
2. Enter this hash code: **b17a-12812bd4b4-0e**
3. Select Email One-Time Password (OTP)
4. Enter your email address to get a passcode
5. Go to your inbox, look for an email with “Your one-time passcode” subject
6. Copy the passcode, and paste it in the Passcode (9-digit) section
7. In the Team Dashboard, select the View Content Guide button

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Lab 1 – Call the AWS AI APIs



Amazon Rekognition

Image and video analysis



Amazon Transcribe

Automatic speech recognition



Amazon Comprehend

Natural language processing



Amazon Textract

Text and data extraction

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Exercise 1 – Amazon Rekognition APIs



Face detection



Celebrity detection



Object detection



Content moderation



Text detection



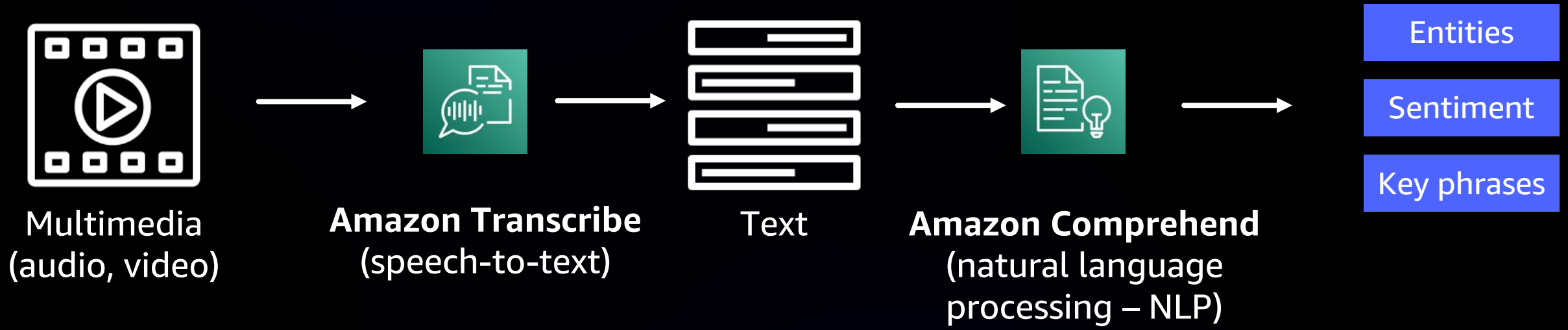
Amazon Rekognition



Multimedia (video, images)

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Exercise 2 – Amazon Transcribe and Comprehend APIs



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Exercise 3 – Amazon Textract API



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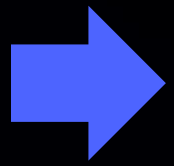
Media2Cloud deep dive

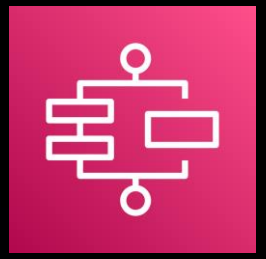
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Lab 2 – Enterprise AI application tenets

ORCHESTRATION

- **Use modular, reusable workflows** to enable complex workflows for AI analysis and other tasks
- Optimize application workflows with asynchronous orchestration





AWS Step Functions

Key features:

✓ Nested workflows

✓ Service integration

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Lab 2 – Enterprise AI application tenets

MEDIA TRANSCODING

- **Convert source files** to standardized formats that are supported by AI services for processing (e.g., Amazon Rekognition and Amazon Transcribe)
- Enable efficient playback and download
- Generate proxy files to **optimize downstream file processing** within the application





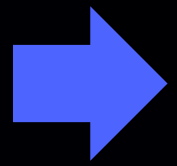
AWS Elemental MediaConvert

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Lab 2 – Enterprise AI application tenets

CUSTOM MODEL INTEGRATION

- Use custom model features from AI services to **support your business or domain-specific AI needs**
- Examples include detection of company logos, domain specific language, or business-specific entities like department names





Amazon Rekognition



Amazon Transcribe



Amazon Comprehend

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Lab 2 – Enterprise AI application tenets

SEARCH AND STORAGE

- Use purpose-built tools to persist data and enable search needs for your application
- Media2Cloud uses three services: Amazon S3, Amazon DynamboDb, and Amazon OpenSearch Service to enable different needs for an MAM application





Amazon S3
Persists all generated output from ingestion and AI analysis



Amazon DynamoDB
Stores index to all data in Amazon S3

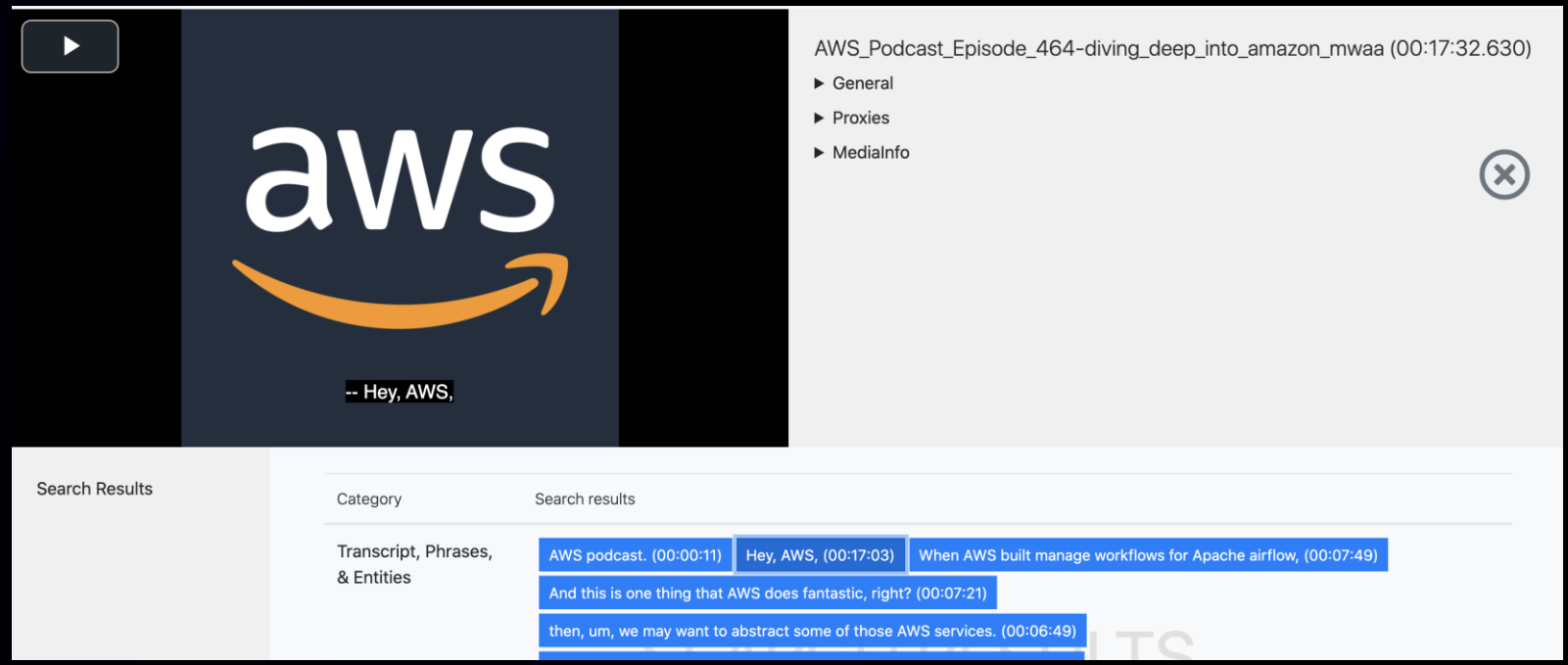


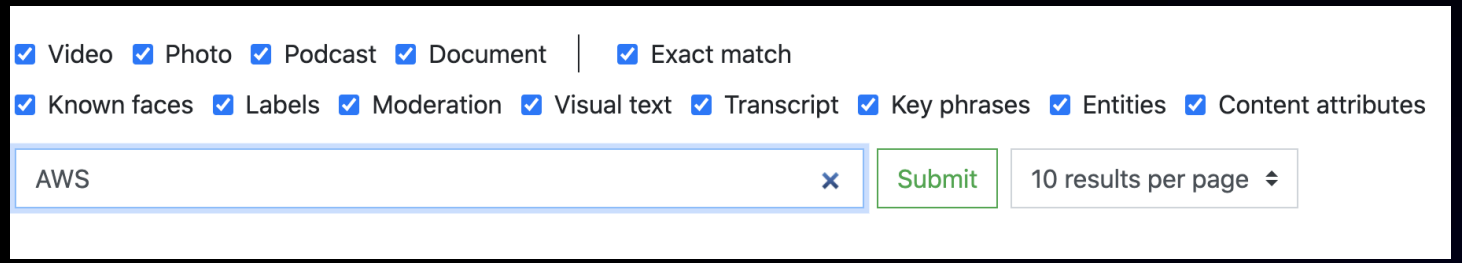
Amazon OpenSearch Service
Stores just enough data to enable optimal end user search

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Exercise 1 – Search and discovery

TEST M2C'S SEARCH FUNCTIONALITY



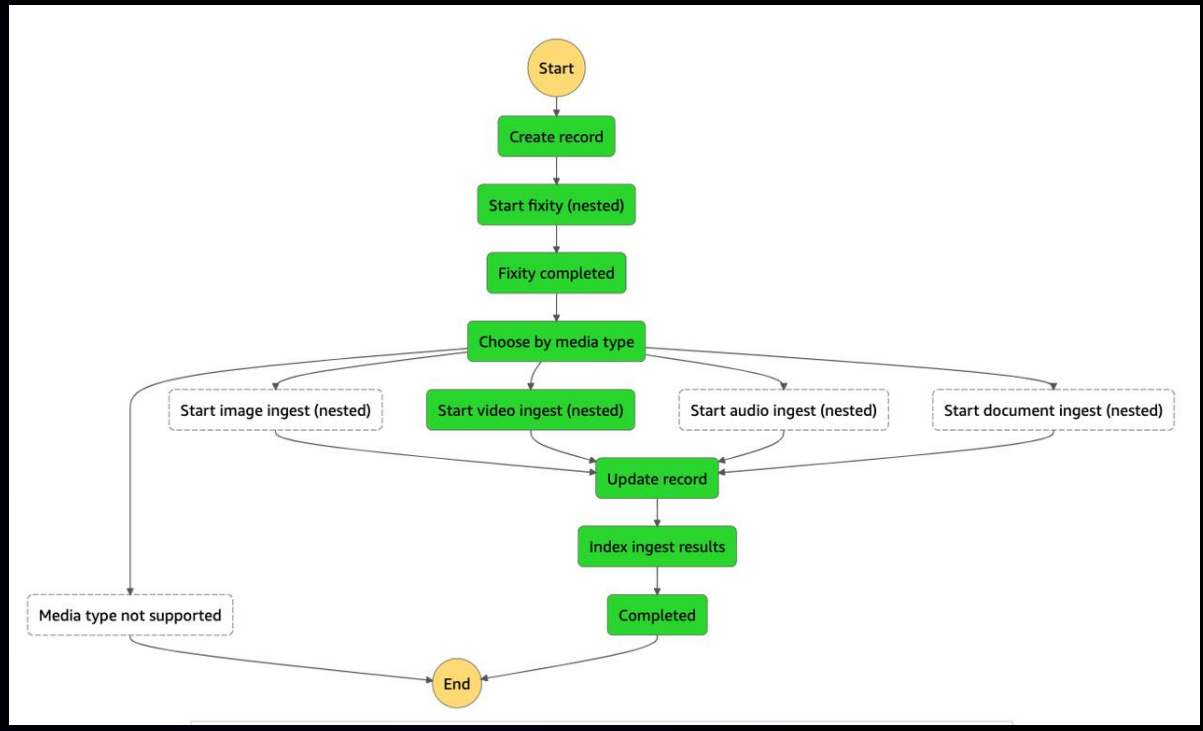


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Exercise 2 – Ingestion state machine

INGESTION WORKFLOW TASKS

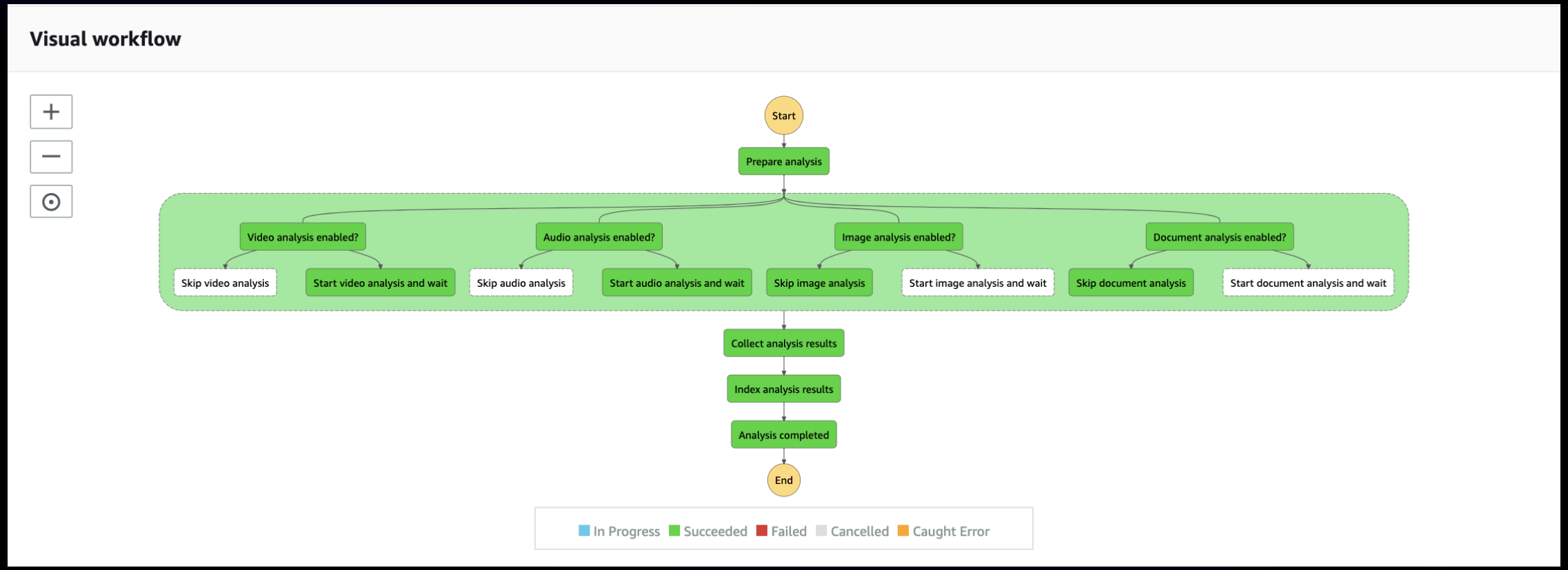
1. Create a record for the file being ingested
2. Extract technical metadata for the file
3. Run the specific ingest process defined for the media type of the file (creates a compressed proxy file for image and video)
4. Index ingestion results



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Exercise 3 – Analysis state machine

AI ANALYSIS WORKFLOW TASKS

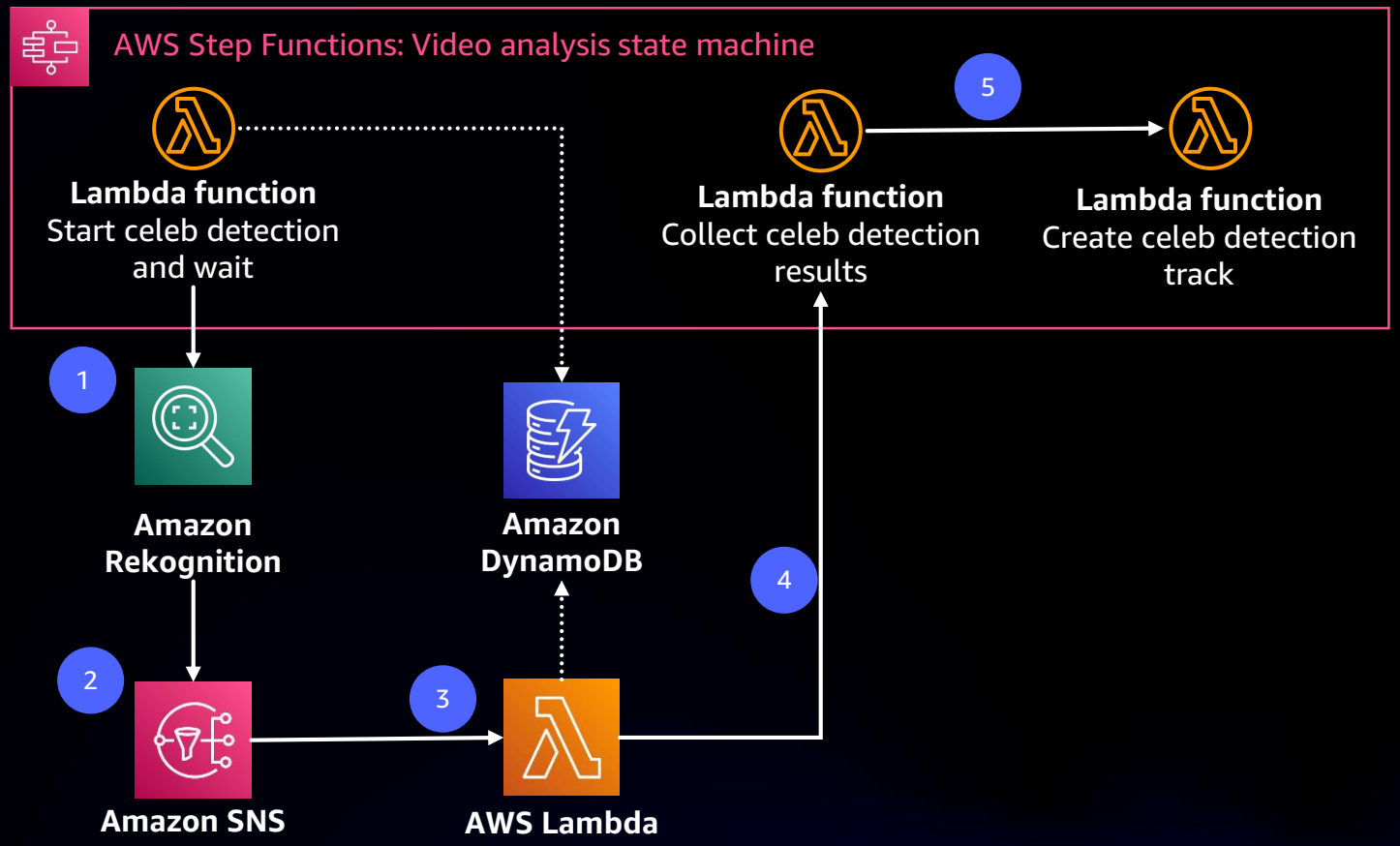


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Exercise 3 – Analysis state machine

BASELINE AI API CALL FLOW

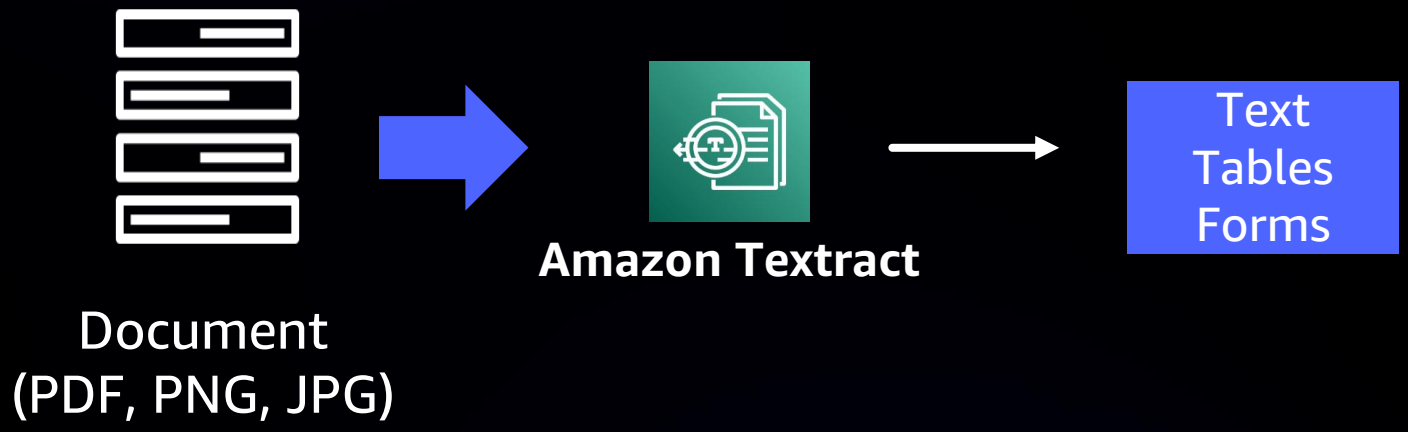
1. Lambda function starts a detection job (Amazon Rekognition celeb detection API)
2. AI API sends a notification about the job status (Amazon SNS in the case of Amazon Rekognition)
3. Event notification for job status (complete or fail) triggers a status updater
4. Analysis state machine indexes AI metadata output
5. State machine resumes to the next step



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Exercise 4 (optional) – Documents processing

TEXT, FORMS AND TABLES DETECTION INSIDE DOCUMENTS



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Lab 3 – Customizing with Amazon Rekognition

INTEGRATE YOUR APPLICATION WITH CUSTOM ML MODELS



Multimedia
(audio, video)



Amazon Rekognition
+
Custom labels



Custom and
improved detection

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Exercise 1 – Create a face collection

FACE RECOGNITION WITH A HUMAN IN THE LOOP



Input images

Amazon Rekognition

[[0,1,0,2,3,4,5,6,7…]

[1,0,1,0,0,0,6,4,3…]]

Feature vectors

IndexFaces

CreateCollection

CreateCollection

StartFaceSearch

Key operations

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Exercise 2 – Amazon Rekognition custom labels

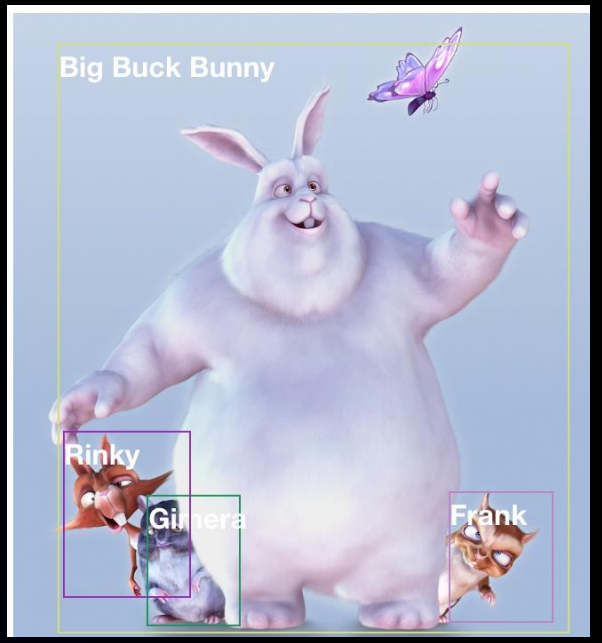
PROBLEMS YOU CAN SOLVE WITH CUSTOM LABELS



Classification



Exemplar-based detection



Localization

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Exercise 2 – Amazon Rekognition custom labels

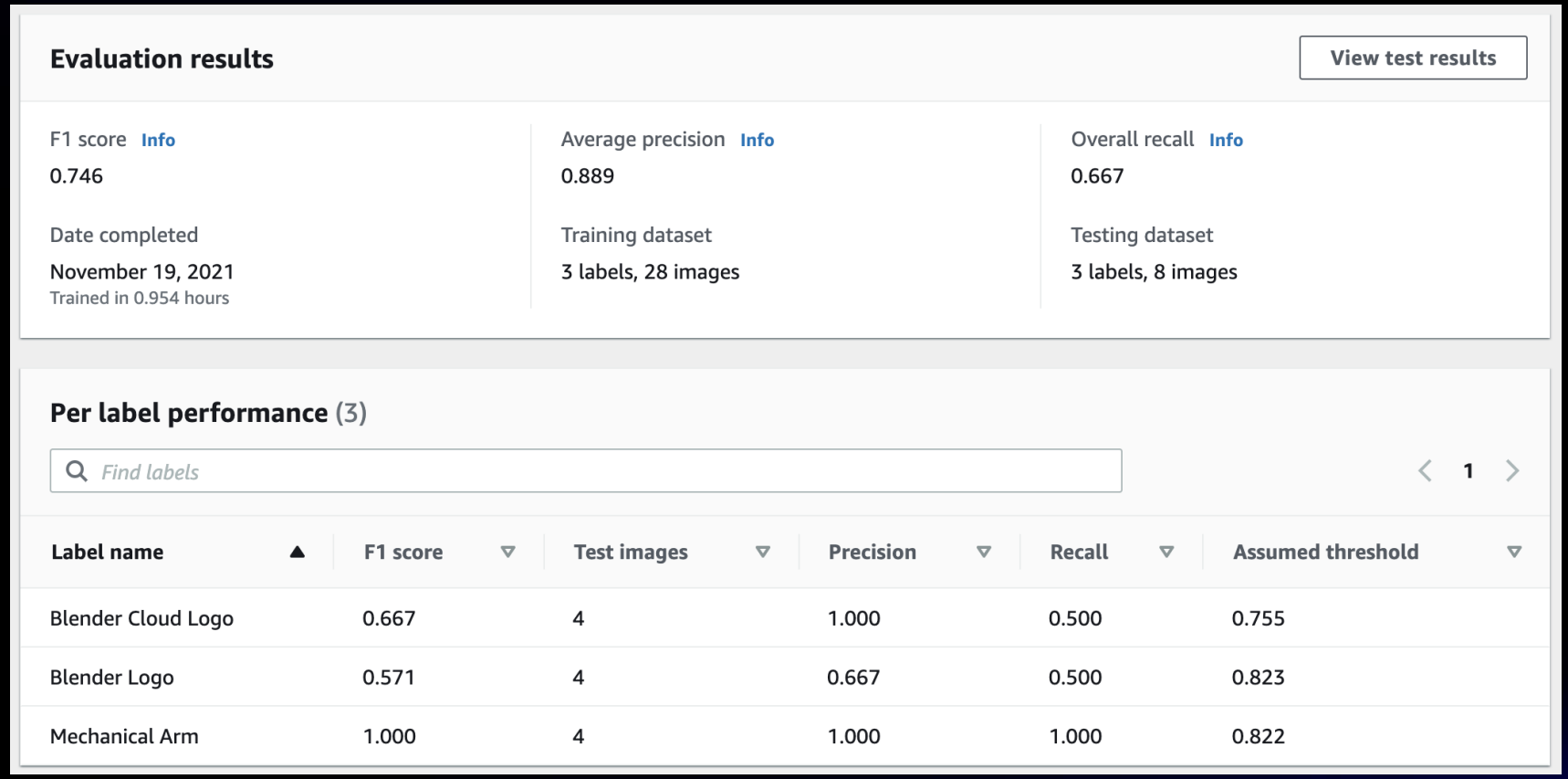
WHAT YOU DON'T HAVE TO WORRY ABOUT

- Choosing a training algorithm
- Optimizing hyperparameters
- Managing infrastructure
- Developing specialized computer vision knowledge

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Exercise 2 – Amazon Rekognition custom labels

EVALUATION RESULTS



Evaluation results View test results

F1 score Info
0.746

Average precision Info
0.889

Overall recall Info
0.667

Date completed
November 19, 2021
Trained in 0.954 hours

Training dataset
3 labels, 28 images

Testing dataset
3 labels, 8 images

Per label performance (3)

Find labels

1

Label name	F1 score	Test images	Precision	Recall	Assumed threshold
Blender Cloud Logo	0.667	4	1.000	0.500	0.755
Blender Logo	0.571	4	0.667	0.500	0.823
Mechanical Arm	1.000	4	1.000	1.000	0.822

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Exercise 3 – Using a custom vocabulary (optional)

TRANSCRIBE WITH PROPER NOUNS AND JARGON



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Do more . . .

github.com/aws-solutions/media2cloud/tree/v3preview

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For further study . . .

- M2C implementation guide (https://docs.aws.amazon.com/solutions/latest/media2cloud/welcome.html)
- Amazon Rekognition face collections (https://docs.aws.amazon.com/rekognition/latest/dg/collections.html)
- Amazon Rekognition custom labels
  Intro: https://docs.aws.amazon.com/rekognition/latest/customlabels-dg/what-is.html
  Tutorial: https://docs.aws.amazon.com/rekognition/latest/customlabels-dg/tutorial-introduction.html
- Amazon Transcribe custom vocabulary (https://docs.aws.amazon.com/transcribe/latest/dg/custom-vocabulary.html) and custom language model (https://docs.aws.amazon.com/transcribe/latest/dg/custom-language-models.html)
- Document Understanding Solution (DUS) (https://aws.amazon.com/solutions/implementations/document-understanding-solution/)

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Thank you!

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