LIG102

Automating Fitness Video Analysis

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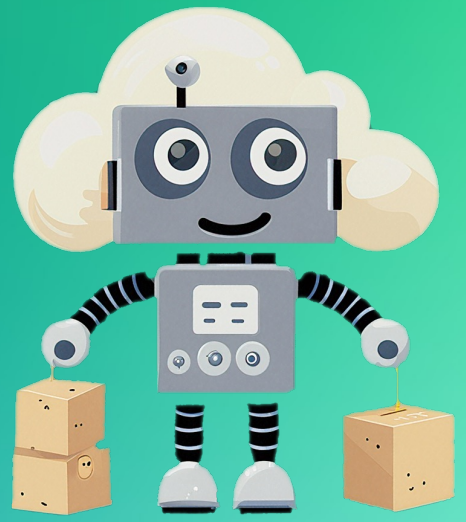
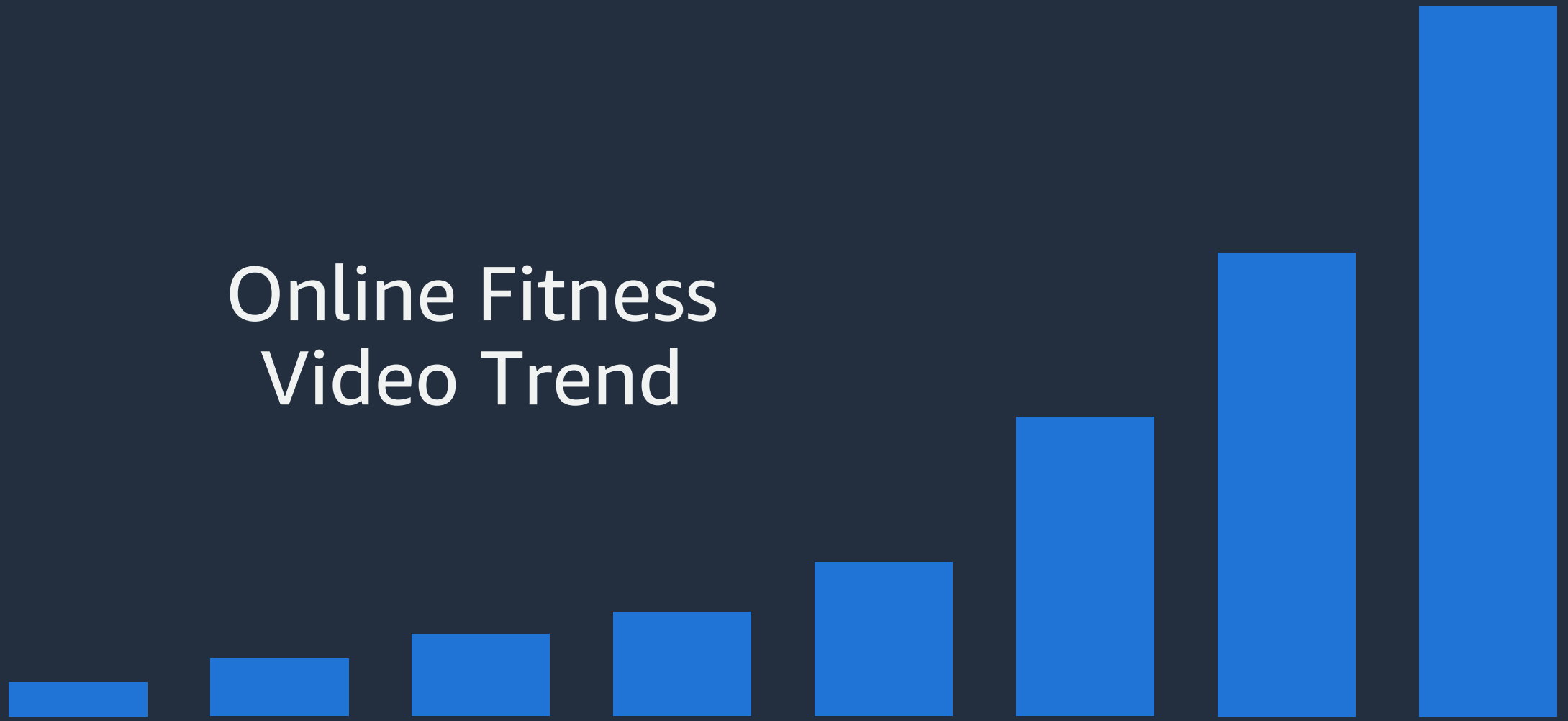


With Generative AI, we can understand videos on a whole new level and automate the process of searching and augmenting videos

Why Does That Matter?

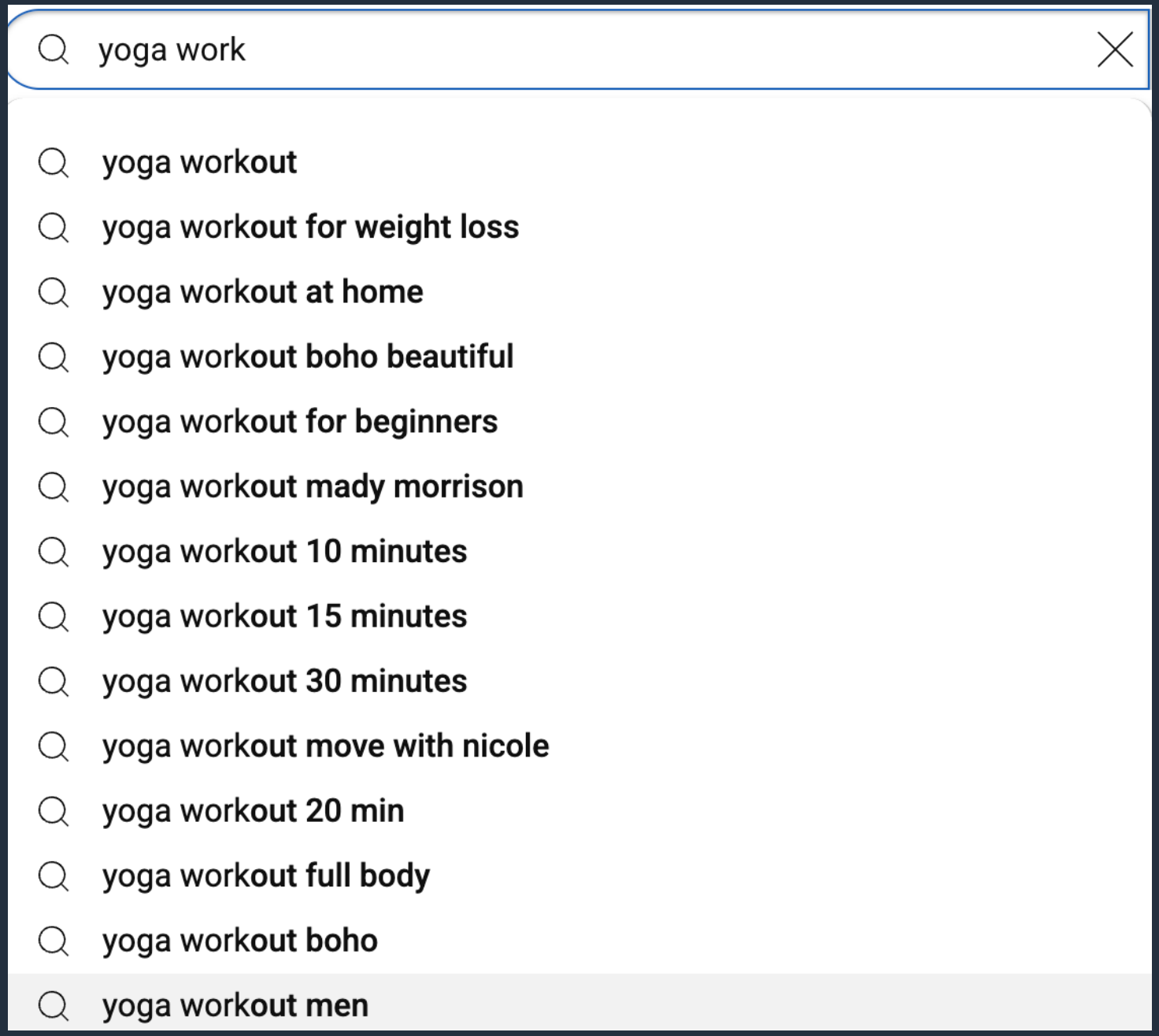
Online Fitness Video Trend



Use Case 1: Search

How can you find and select the right workout?

How can we go from here...?



...to meaningful selection criteria?

- I did X yesterday, which one today?
- Could I skip a section to save time?
- Can I follow this without a screen?
- Can I do this with my injury?
- What is the vibe of the class/ instructor?

Generative AI Opportunities

New meta data to **characterize the workout**

Information on **class structure, intensity and focus**

Class highlights

Use Case 2: Guidance

What does it take a to motivate and guide someone behind the screen who is by themselves?

How does equipment know when to adjust resistance?

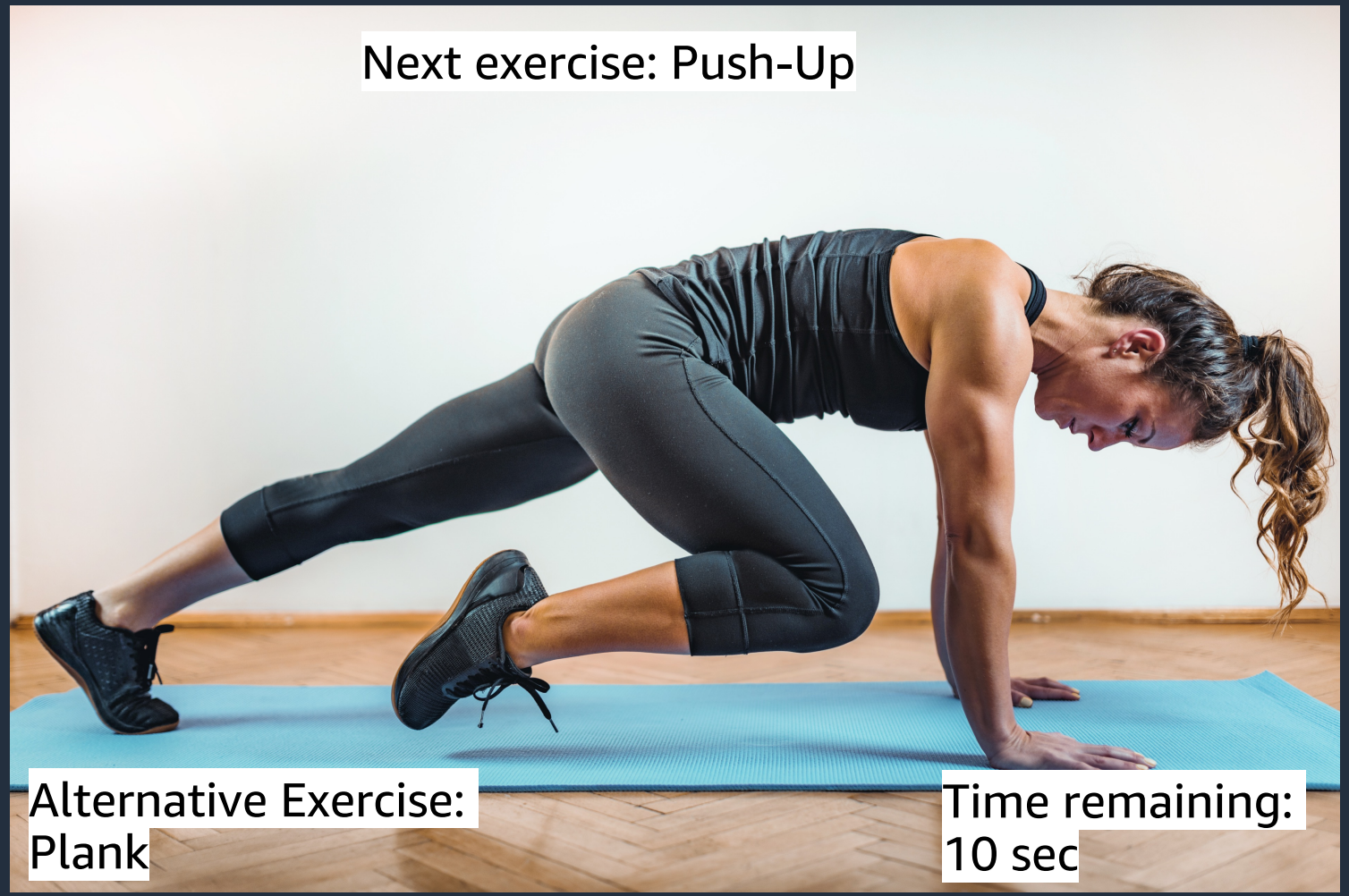
Without Moderation…

Voice and Video Analysis Opportunities:

Display guiding **parameters and transitions**

Reference elements of **class structure**

With Moderation…



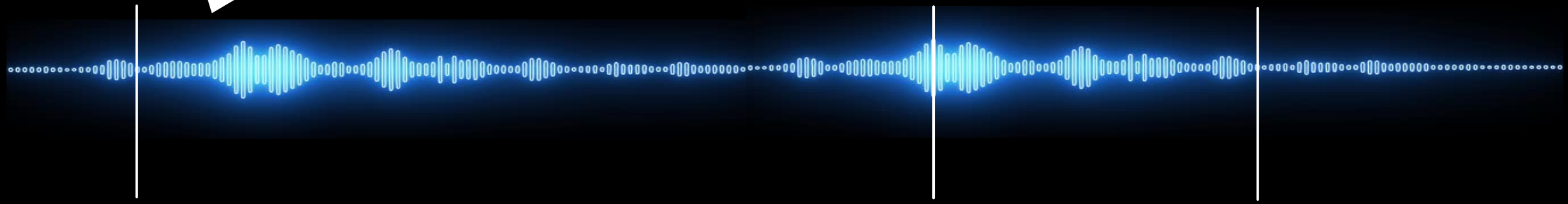
What is Intensity Tracking?

How does your bike know when to transition to another resistance?

Good morning everyone and welcome to today's 30-minute power ride! I'm Coach Emma and I'll be guiding you through an amazing workout today.

Let's start with a quick warm-up. Keep your resistance at level 3

and maintain a comfortable cadence around 70 RPM.



[00:00:05]

[00:00:18]

[00:00:21]

Intensity Tracking: How Did We Build It?

High-Level Architecture

Video

High-Level Architecture

Video

Amazon Transcribe

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Timestamped transcript

High-Level Architecture

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Timestamped transcript

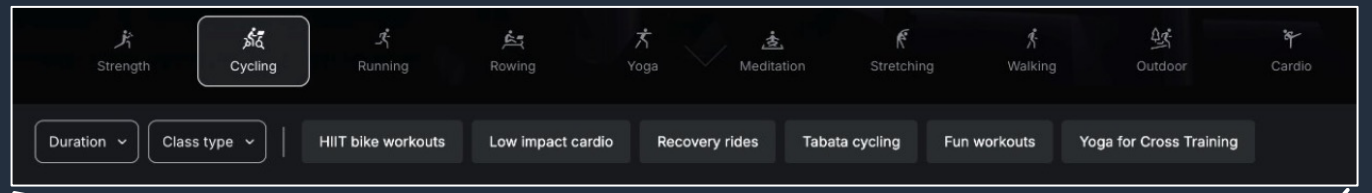
Amazon Bedrock

spinning

Workout Type

Images

High-Level Architecture



Meta-Data for Search and Selection

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Workout Type

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```
{
   "time": "00:05:18",
   "metric": "resistance",
   "actionType": "relative",
   "value": "+1",
},
{
   "time": "00:06:30",
   "metric": "resistance",
   "actionType": "absolute",
   "value": "6",
}
```


Generated JSON

The Hard Parts

Challenge #1: Adapting to Different Coaches

Clear command

“Alright team, we're hitting our first hill climb! Turn that resistance knob to the right until you reach level 7”

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“Go all in!”

Convert to numbers

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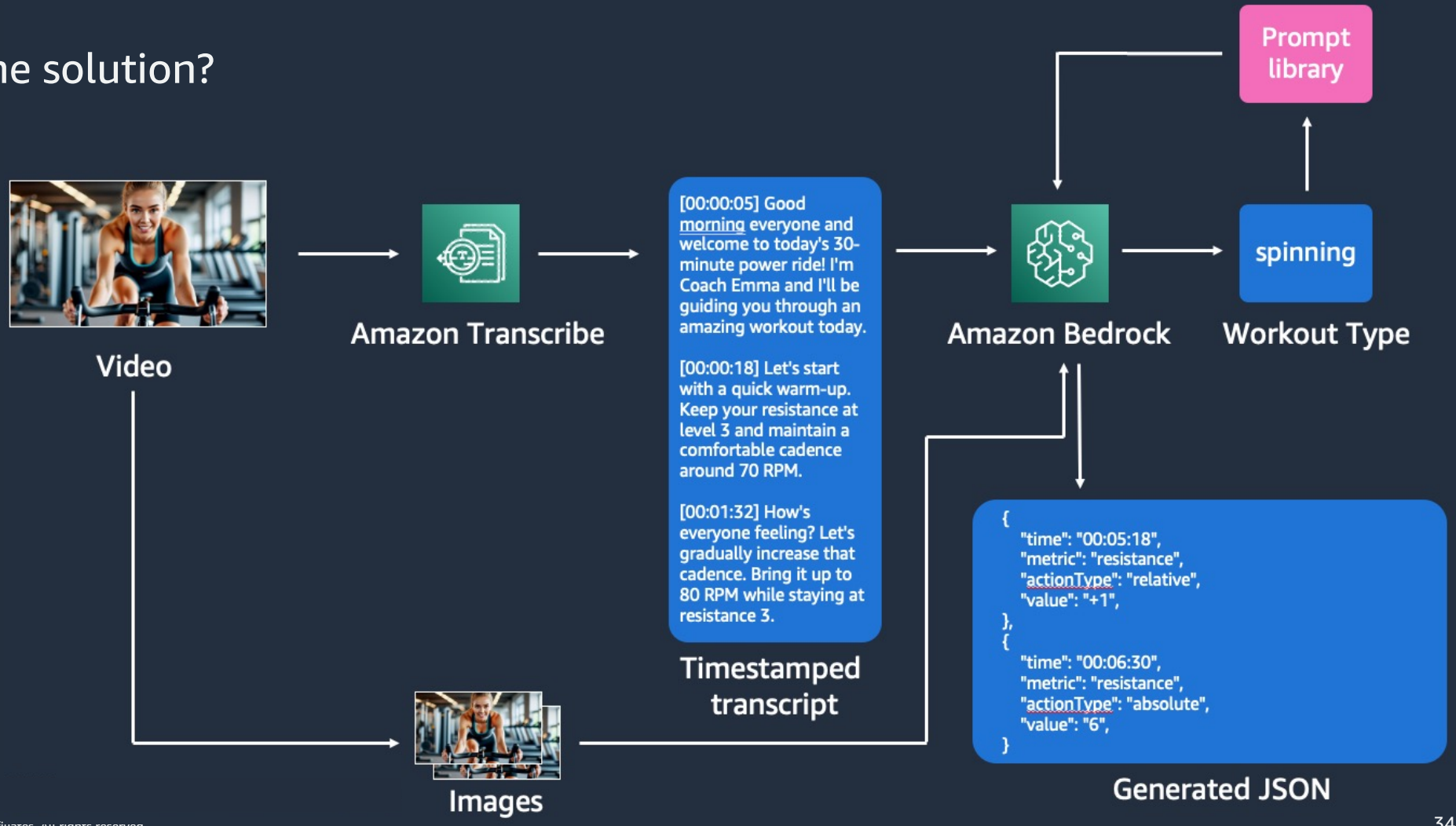
Library of examples

=> Dynamically load examples from the same modality, workout type, and coach

Challenge #2: Evaluation

How to evaluate the solution?



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Transcription accuracy

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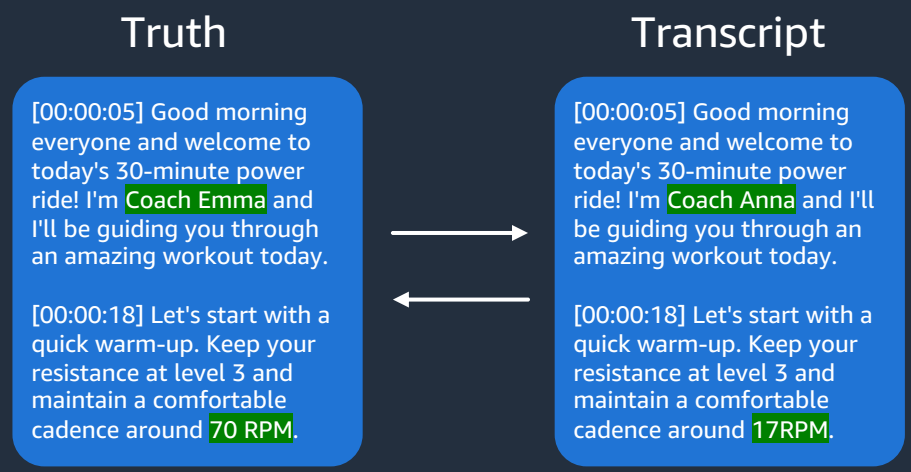

Comparing true and extracted transcripts

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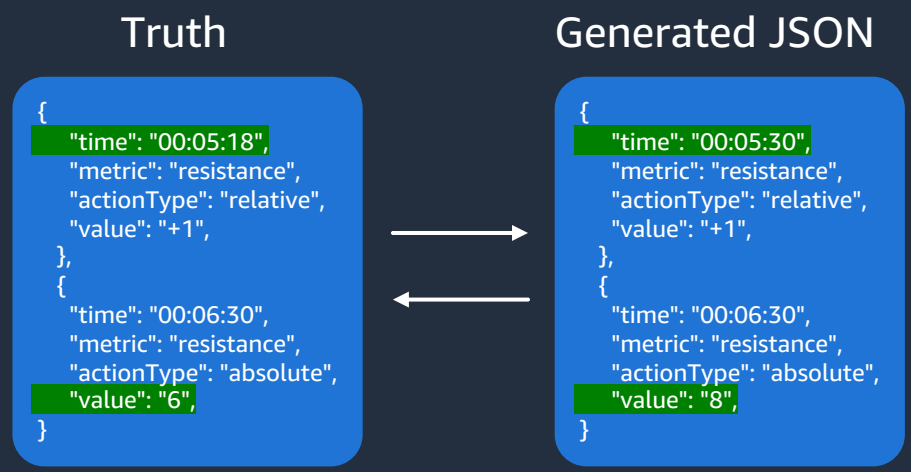
- Metric identification (e.g., resistance vs speed)
- Time of action (e.g., time between the real and identified action)
- Adjustment value (e.g., difference between the actual and true value)



Comparing true and generated JSONs

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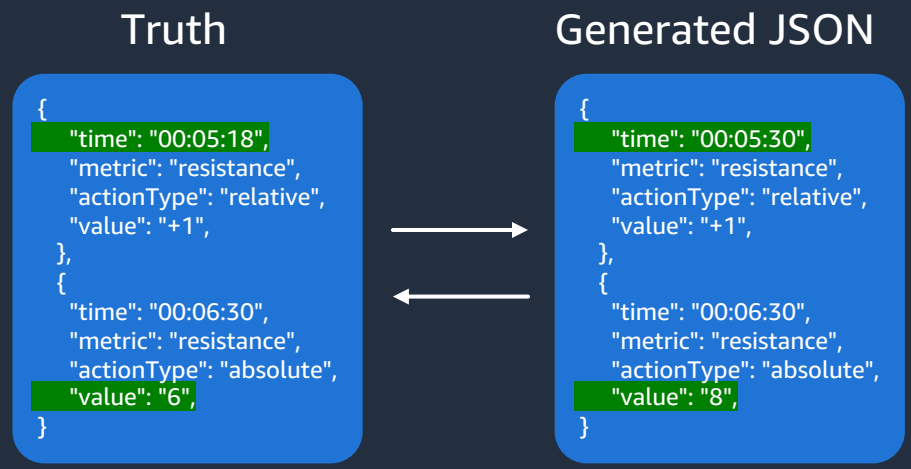

Comparing true and generated JSONs

Requires manual human annotation of fitness videos

Challenge #3: Processing in Near Real-Time

- Full transcript is not available in real-time
- Hence, solution should work with batches

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[00:02:45] Perfect work! Now we're going to add a little more challenge. I want you to increase your resistance to level 5. Keep that same cadence at 80 RPM.

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- How much context to add?
  - Include the full session before
  - Use a sliding window approach

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Outlook

Outlook

Instructor Monitoring

- Movement Classification
- Understanding targeted muscle groups

Athlete Monitoring

- Pose Estimation and Biomechanics Analysis
- Repetition & Set Detection
- Real-Time Feedback Generation

Custom Classes and Recommendations

Thank you!

Julia Wagner
juliwag@amazon.de

Nikita Kozodoi
kozodoi@amazon.de

Please complete the session survey.

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