Sentiment Analysis for Product Reviews

with AWS Services

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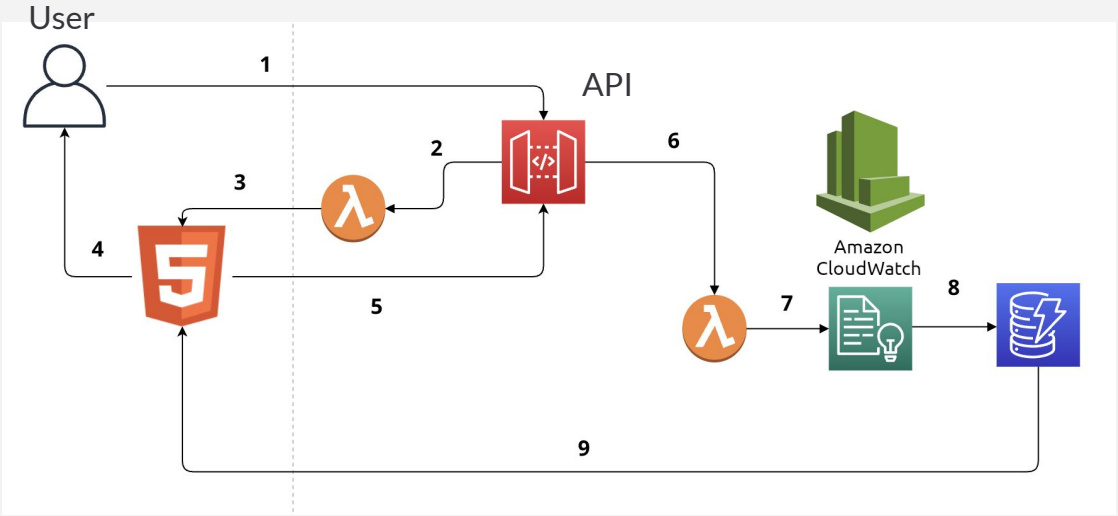
(launch deployment)

Architecture Diagram



1. User calls the API gateway endpoint
2. Website Lambda is triggered
3. Website Lambda sends the HTML to the User
4. User sees the website
5. User submits review through the website
6. API Gateway receives a post request which triggers the review processor Lambda
7. The Lambda runs the review through AWS Comprehend
8. The review is passed through comprehend and output information is stored in DynamoDB
9. If successfully stored, the website lamda sends a get request through the API gateway to query DynamoDB
10. Website is updated with review and sentiment scores.

Security

Our app's main point of contact is at the API gateway level, and the HTML that is given from the website Lambda:

- Website Level Security
  - We adhere to CORS (Cross Origin Resource Sharing) so the review processor endpoint can only be accessed through the form, or the same domain. This counters cross-site scripting.
  - We have input sanitization so our form won't accept raw input preventing things like SQL injection.

- API Gateway Security
  - Allows in-depth monitoring of the API endpoints
  - Can rate limit the endpoints depending on the traffic and activity
  - Can detect DDoS attacks by IP address or other parameters

- Lambda had a IAM policy that only allows it to do specific tasks
  - Lambda: InvokeFunction
  - DynamoDB: PutItem, GetItem, Scan
  - Comprehend: DetectSentiment
  - Logs: CreateLogGroup, CreateLogStream, PutLogEvents

Scalability & Availability

- API gateway has load balancing and auto scaling that can scale to millions of users
- Lambdas can also infinitely scale depending on how many requests there are since they can spin up as many EC2 instances as they want
- DynamoDB can also auto scale in the case when there are many reads and writes happening to the database.

- Did not have time to add Route 53
    - This would have made a custom domain that we could use for our api gateway
    - This would provide availability since if the api gateway failed, it would spin up another api gateway and the user could use the same domain for that apigateway.

Demo

1. Go to https://github.com/YueKnowWho/Sentiment_Analysis, and clone the repository:

```
anlu@ALMBP-2 Desktop % git clone https://github.com/YueKnowWho/Sentiment_Analysis.git && cd Sentiment_Analysis


Cloning into 'Sentiment_Analysis'...
remote: Enumerating objects: 46, done.
remote: Counting objects: 100% (46/46), done.
remote: Compressing objects: 100% (34/34), done.
remote: Total 46 (delta 15), reused 34 (delta 10), pack-reused 0 (from 0)
Unpacking objects: 100% (46/46), done.
anlu@ALMBP-2 Sentiment_Analysis %
```

Demo

1. cd into Sentiment_Analysis, run the CloudFormation command using AWS CLI:
   aws cloudformation deploy --template-file template.yaml --stack-name Sentiment-Analysis --capabilities CAPABILITY_NAMED_IAM

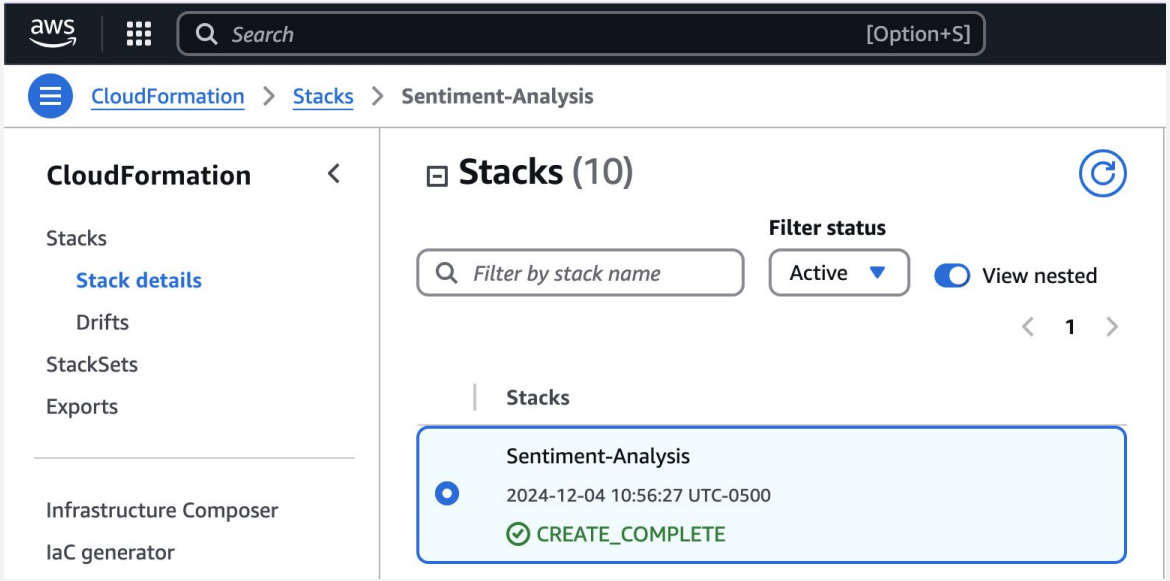
2. Wait for creation completion

```
anlu@ALMBP-2 Sentiment_Analysis % aws cloudformation deploy --template-file template.yaml --stack-name Sentiment-Analysis --ca
pabilities CAPABILITY_NAMED_IAM



Waiting for changeset to be created..
Waiting for stack create/update to complete
Successfully created/updated stack - Sentiment-Analysis
anlu@ALMBP-2 Sentiment_Analysis %
```

Demo

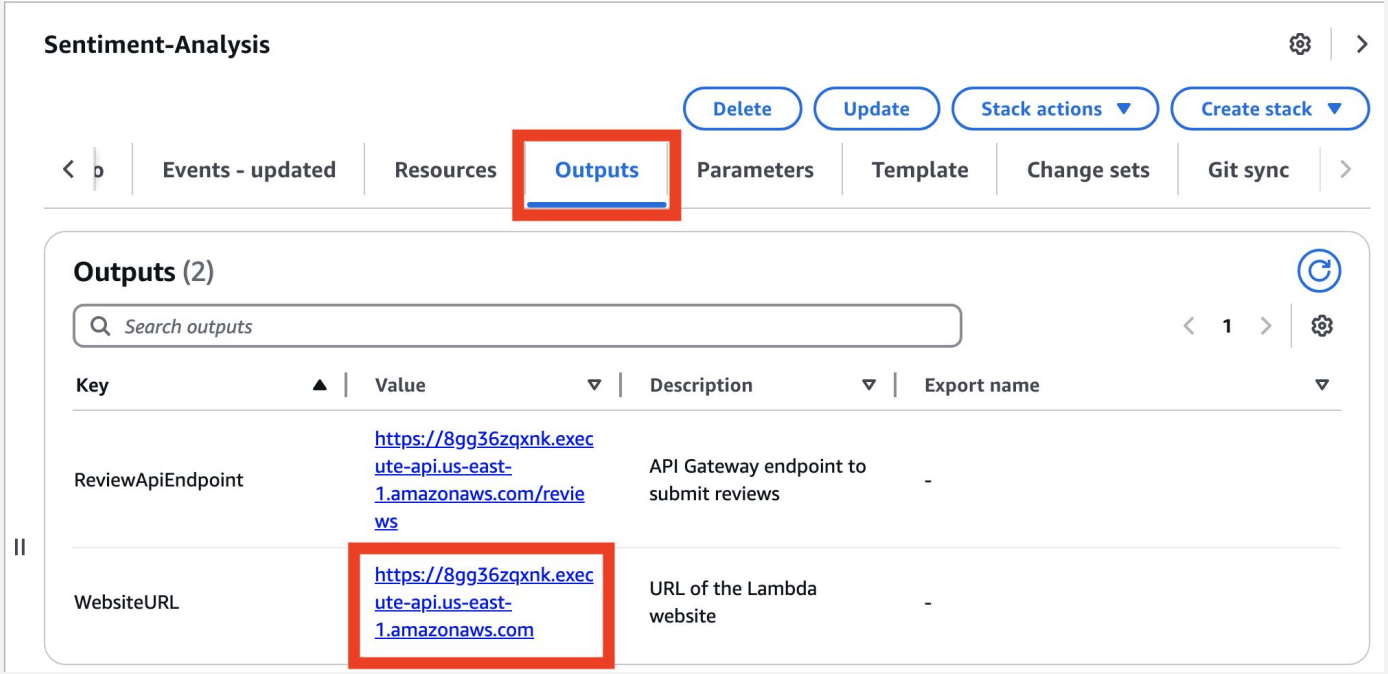
1. In the AWS console, go to CloudFormation: https://console.aws.amazon.com/cloudformation/home

2. search for the “Sentiment-Analysis” stack



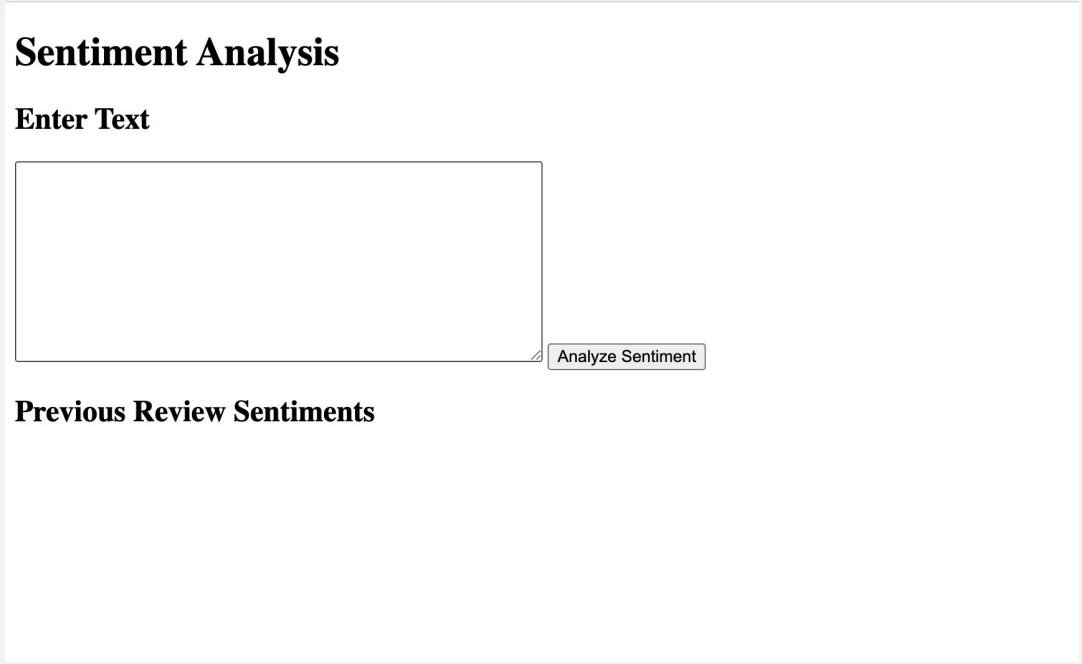
Demo

1. Click on "Outputs" tab
2. Click on the "WebsiteURL" link. This should take you to the HTML website.



Demo

1. Here, this the Sentiment Analysis website
2. Enter the desired text in the textbox, and click “Analyze Sentiment”

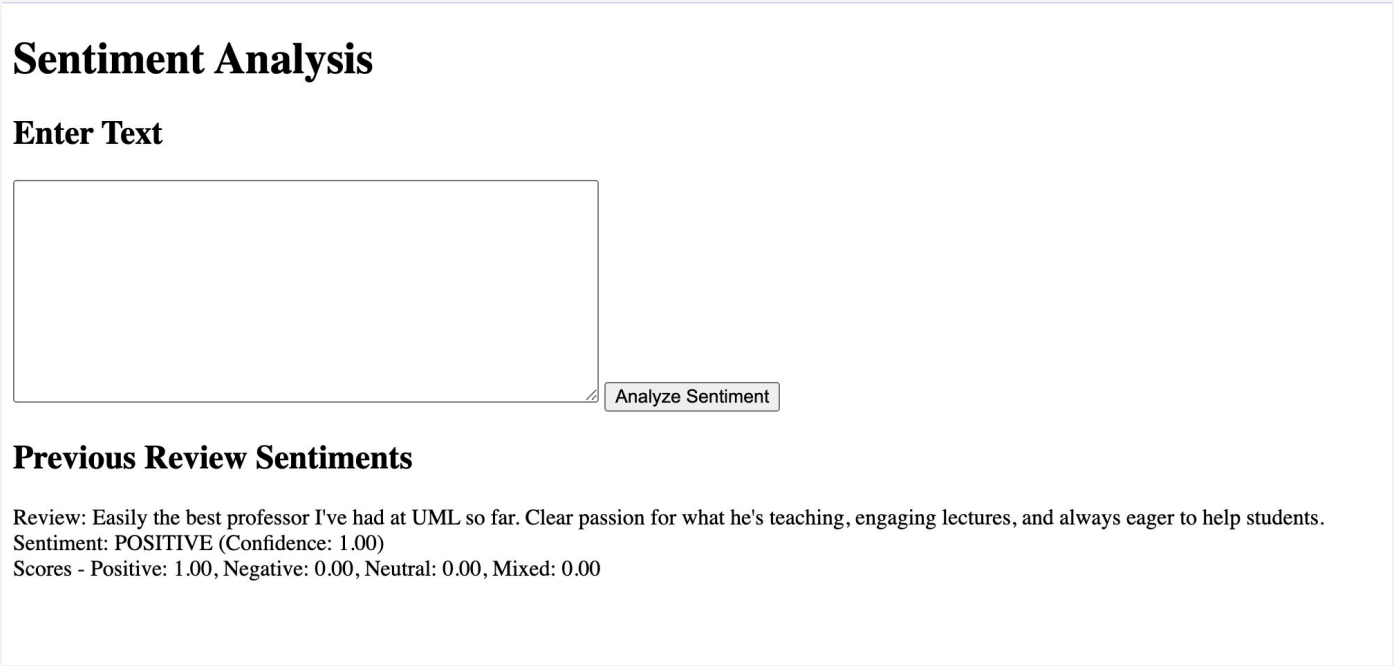


Example Reviews

Review	Expected Sentiments
Easily the best professor I've had at UML so far. Clear passion for what he's teaching, engaging lectures, and always eager to help students.	Positive
The current time is 10:19pm.	Neutral
The phone has a stunning screen, but the battery life is awful. Performance is underwhelming, though the camera is decent.	Mixed
bad quality. The rackets broke within the first 15 mins of usage.	Negative

Demo

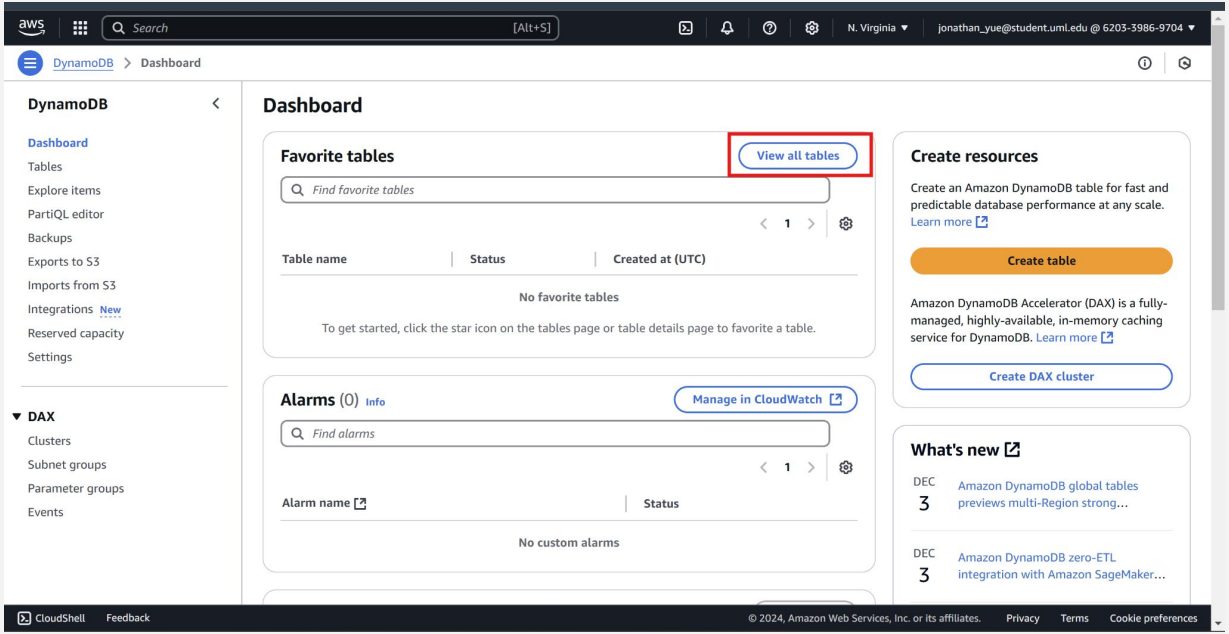
1. When done, you will notice a return statement, consisting of the submitted text, the Sentiment analysis, the Sentiment confidence score, and the 4 Sentiment sub-category scores:



Demo

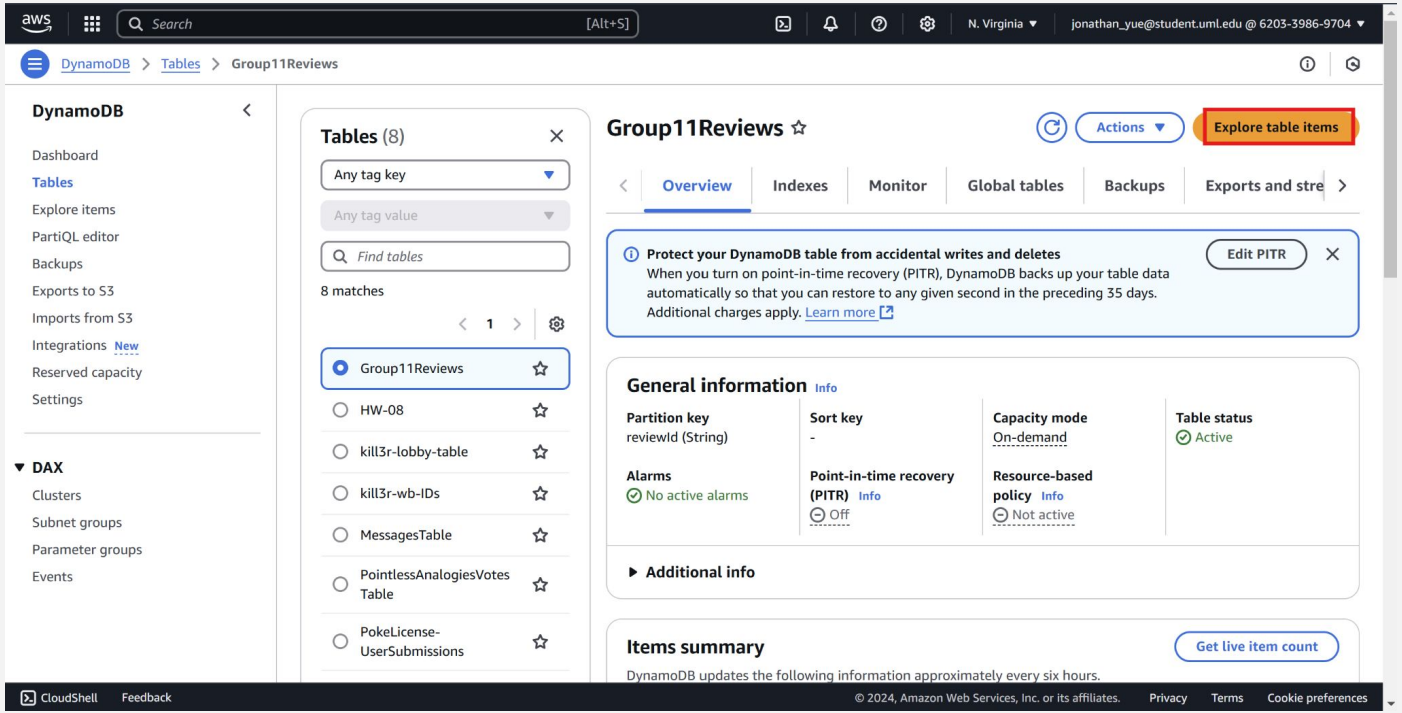
To see the input being stored in DynamoDB:

1. Go to DynamoDB: https://console.aws.amazon.com/dynamodbv2/home
2. Click and click on “view all tables”



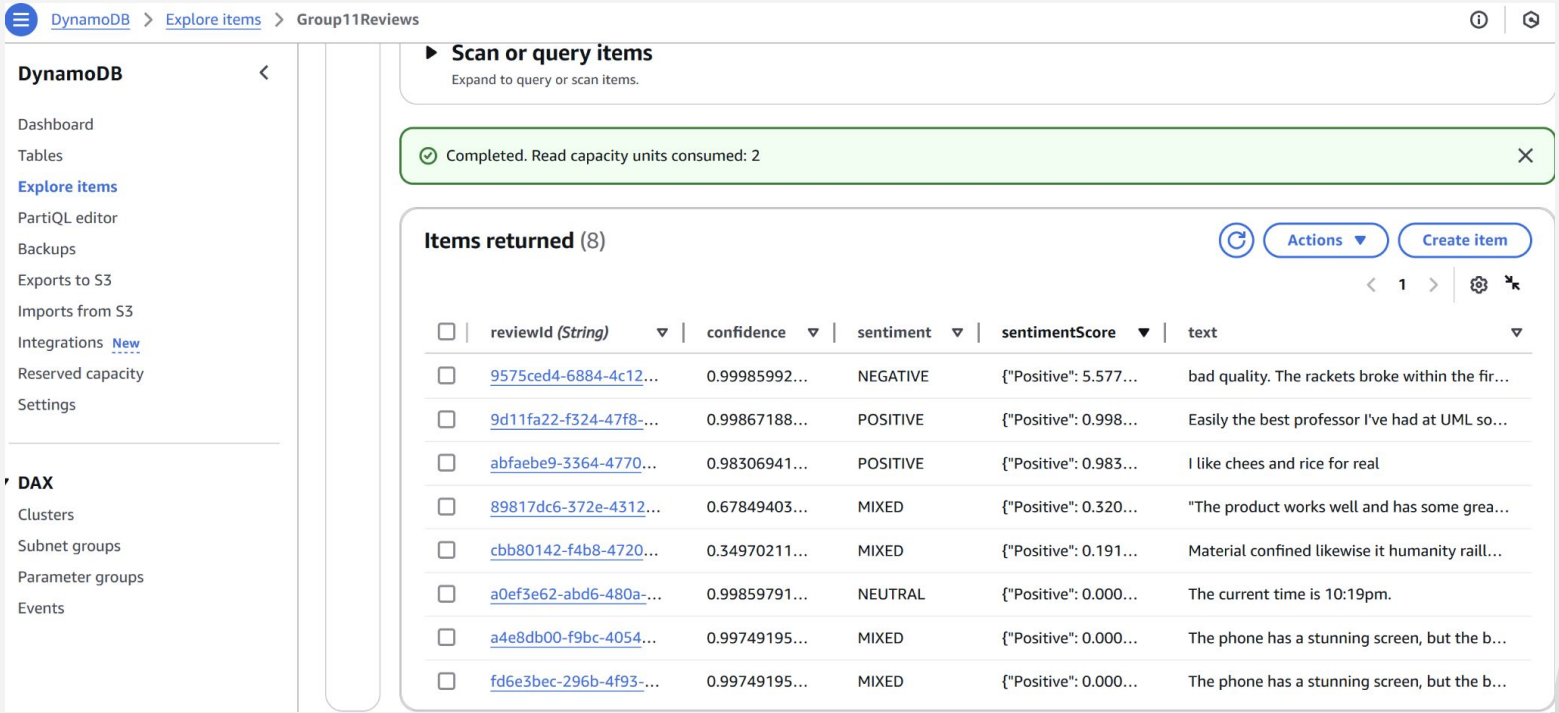
Demo

1. Select the DynamoDB named “Group11Reviews”
2. Click on “explore table items”



Demo

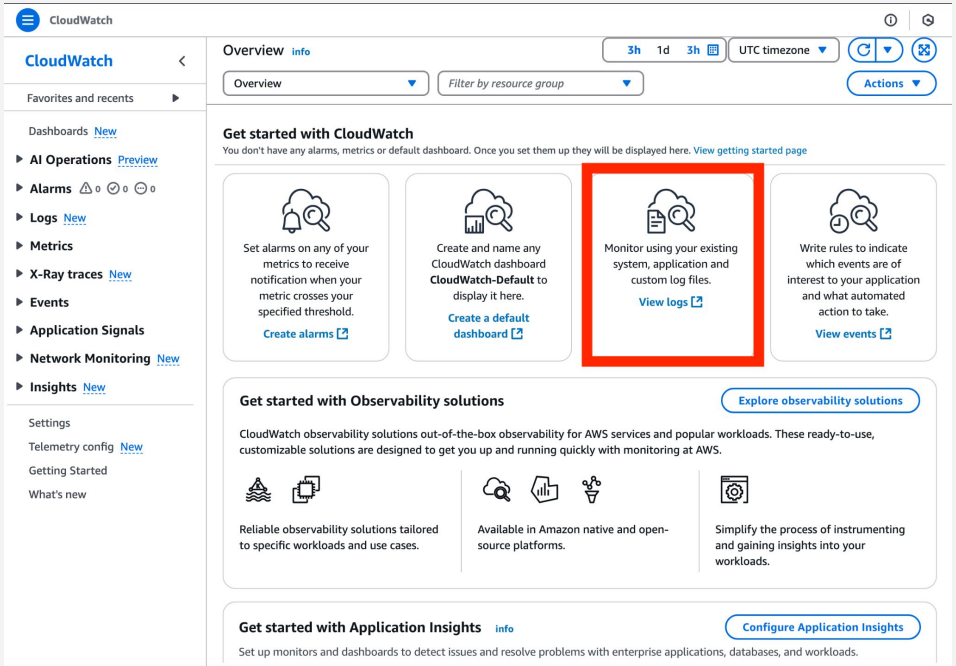
1. Scroll down to “Items returned”, and see the table items



Demo

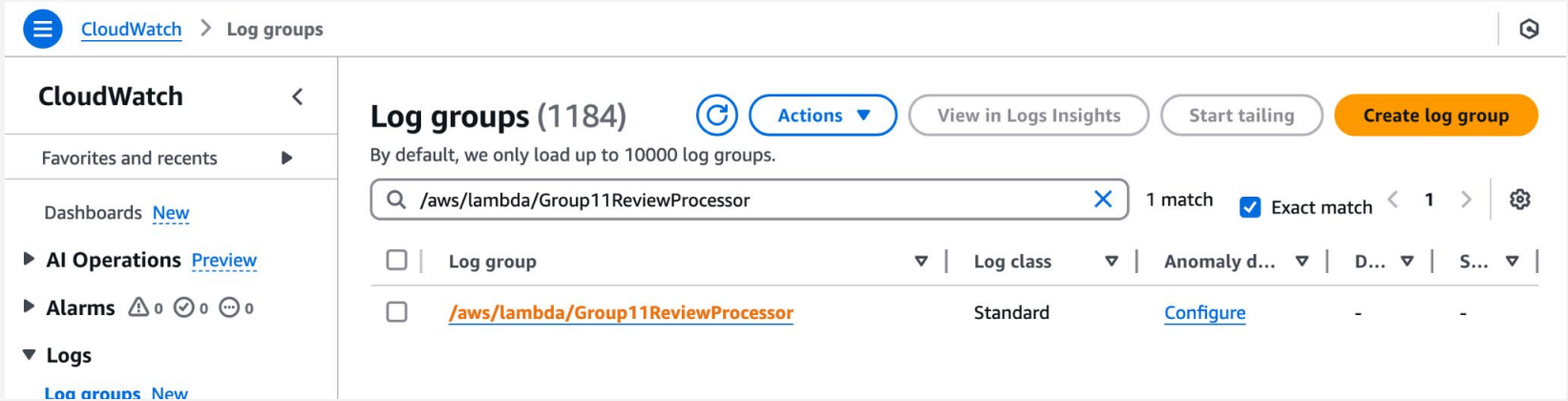
1. To view CloudWatch logs, head to the following link: https://console.aws.amazon.com/cloudwatch/home

2. Click on “View logs”



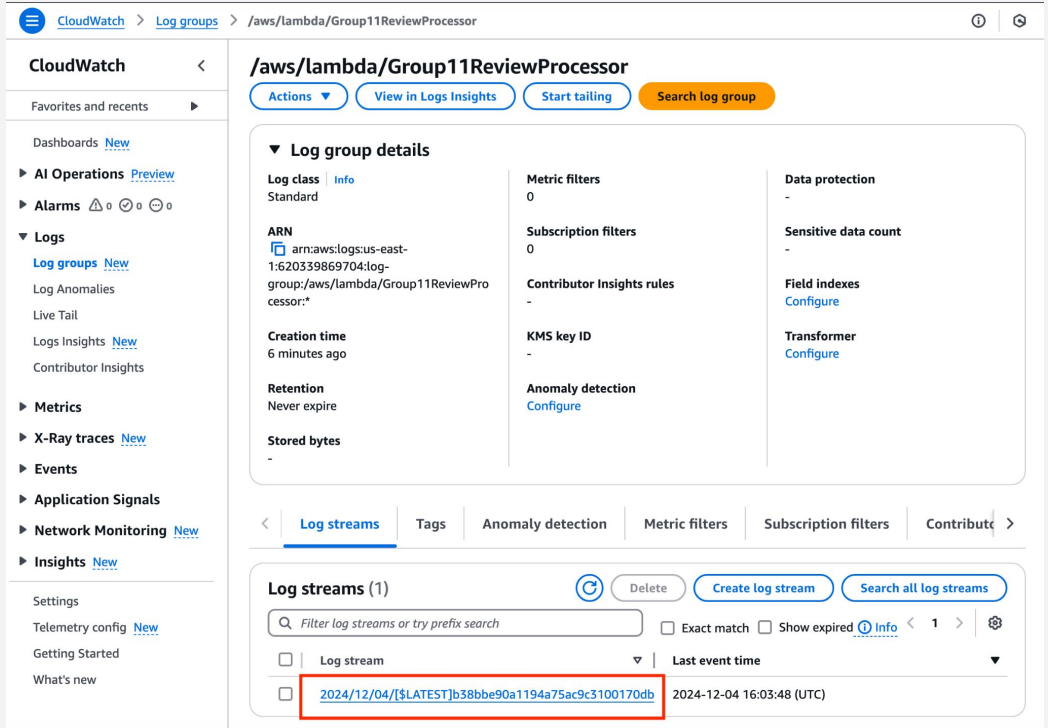
Demo

1. search for "/aws/lambda/Group11ReviewProcessor"



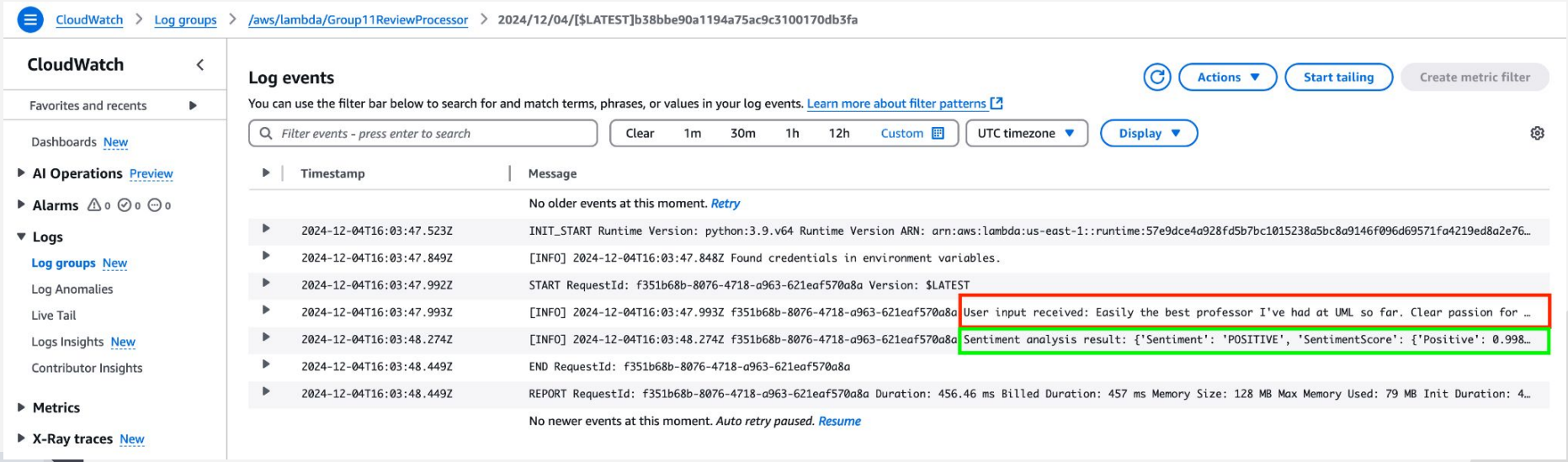
Demo

1. Open this Log group
2. Open the most recent Log stream

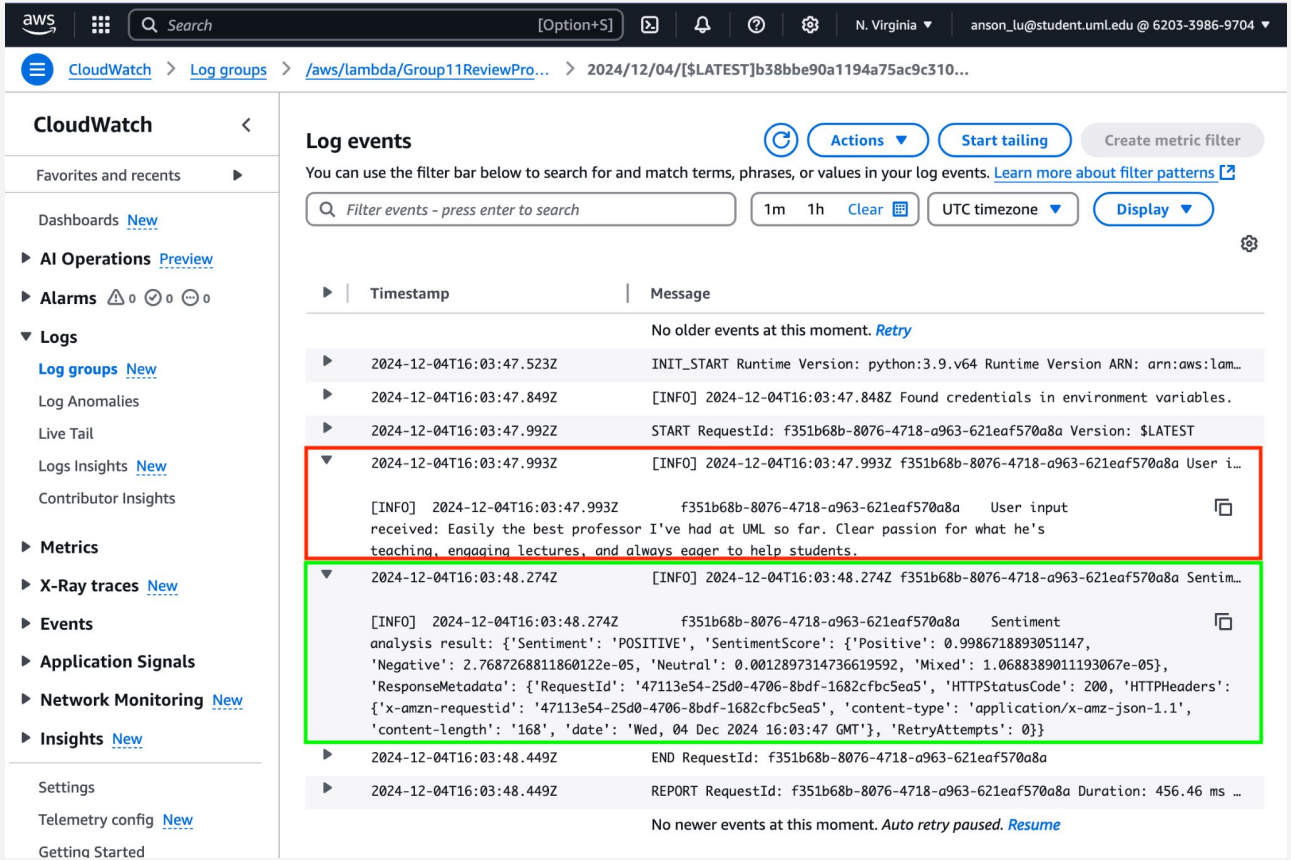


Demo

1. Find the “User input received” input text recorded
2. Find the “Sentiment analysis result” return response recorded



Demo


aws
Search
[Option+S]
N. Virginia
anson_lu@student.uml.edu @ 6203-3986-9704
CloudWatch
Log groups
/aws/lambda/Group11ReviewPro...
2024/12/04/[$LATEST]b38bbe90a1194a75ac9c310...
CloudWatch
Favorites and recents
Dashboards New
AI Operations Preview
Alarms
Logs
Log groups New
Log Anomalies
Live Tail
Logs Insights New
Contributor Insights
Metrics
X-Ray traces New
Events
Application Signals
Network Monitoring New
Insights New
Settings
Telemetry config New
Getting Started
Log events
Actions
Start tailing
Create metric filter
You can use the filter bar below to search for and match terms, phrases, or values in your log events. Learn more about filter patterns
Filter events - press enter to search
1m
1h
Clear
UTC timezone
Display
Timestamp
Message
No older events at this moment. Retry
2024-12-04T16:03:47.523Z INIT_START Runtime Version: python:3.9.v64 Runtime Version ARN: arn:aws:lam…
2024-12-04T16:03:47.849Z [INFO] 2024-12-04T16:03:47.848Z Found credentials in environment variables.
2024-12-04T16:03:47.992Z START RequestId: f351b68b-8076-4718-a963-621eaf570a8a Version: $LATEST
2024-12-04T16:03:47.993Z [INFO] 2024-12-04T16:03:47.993Z f351b68b-8076-4718-a963-621eaf570a8a User i…
[INFO] 2024-12-04T16:03:47.993Z f351b68b-8076-4718-a963-621eaf570a8a User input received: Easily the best professor I've had at UML so far. Clear passion for what he's teaching, engaging lectures, and always eager to help students.
2024-12-04T16:03:48.274Z [INFO] 2024-12-04T16:03:48.274Z f351b68b-8076-4718-a963-621eaf570a8a Sentim…
[INFO] 2024-12-04T16:03:48.274Z f351b68b-8076-4718-a963-621eaf570a8a Sentiment analysis result: {'Sentiment': 'POSITIVE', 'SentimentScore': {'Positive': 0.9986718893051147, 'Negative': 2.7687268811860122e-05, 'Neutral': 0.0012897314736619592, 'Mixed': 1.0688389011193067e-05}, 'ResponseMetadata': {'RequestId': '47113e54-25d0-4706-8bdf-1682cfbc5ea5', 'HTTPStatusCode': 200, 'HTTPHeaders': {'x-amzn-requestid': '47113e54-25d0-4706-8bdf-1682cfbc5ea5', 'content-type': 'application/x-amz-json-1.1', 'content-length': '168', 'date': 'Wed, 04 Dec 2024 16:03:47 GMT'}, 'RetryAttempts': 0}}
2024-12-04T16:03:48.449Z END RequestId: f351b68b-8076-4718-a963-621eaf570a8a
2024-12-04T16:03:48.449Z REPORT RequestId: f351b68b-8076-4718-a963-621eaf570a8a Duration: 456.46 ms …
No newer events at this moment. Auto retry paused. Resume

Demo

1. To delete all AWS resources created, run the following command:
   aws cloudformation delete-stack --stack-name Sentiment-Analysis

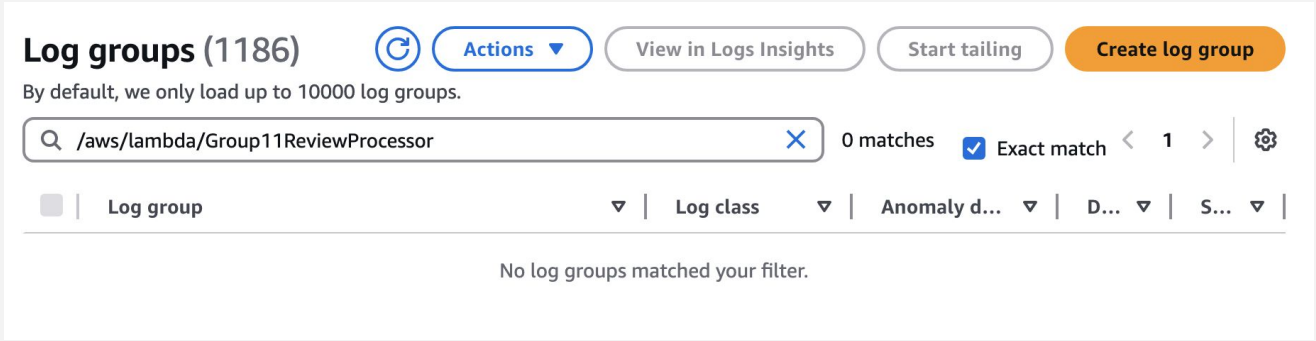
```
anlu@ALMBP-2 Sentiment_Analysis % aws cloudformation delete-stack --stack-name Sentiment-Analysis
anlu@ALMBP-2 Sentiment_Analysis %
```

Demo

1. To delete the CloudWatch logs:
   aws logs delete-log-group --log-group-name "/aws/lambda/Group11ReviewProcessor"

   aws logs delete-log-group --log-group-name "/aws/lambda/Group11WebsiteLambdaFunction"

```
anlu@ALMBP-2 Sentiment_Analysis % aws logs delete-log-group --log-group-name "/aws/lambda/Group11ReviewProcessor"

anlu@ALMBP-2 Sentiment_Analysis % aws logs delete-log-group --log-group-name "/aws/lambda/Group11WebsiteLambdaFunction"
anlu@ALMBP-2 Sentiment_Analysis %
```



Applications

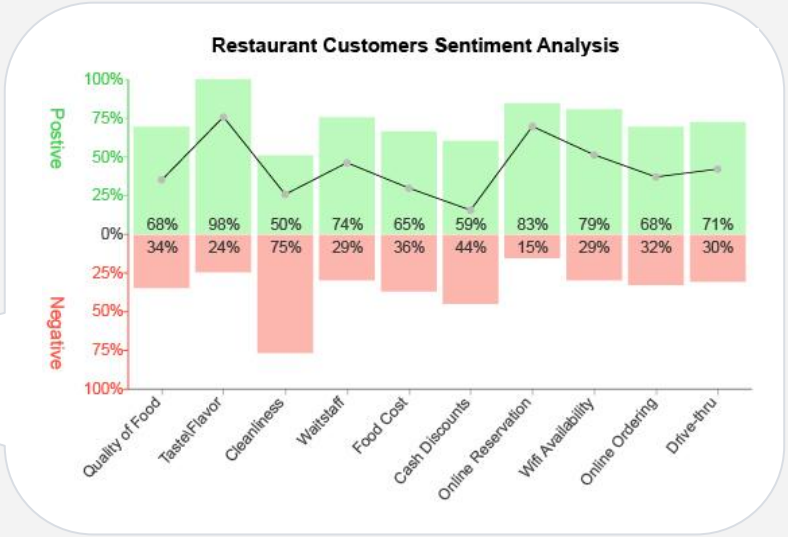
Customer Feedback Analysis
- Service
- Product
- Game patch notes

Social Media Monitoring
- Content

Personal Feedback
- Performance reviews
- Hospitality

Education Feedback
- Universities/Schools
- Teaching methods/material

Market Research
- Startup/Kickstarters




Employee performace review

Dear Ms. Owens,

I hope this email finds you well. As we approach the end of the [quarter/year], it's time to take stock of your performance over the past [period]. First and foremost, I want to express my appreciation for your hard work and dedication to [company/project/team].

Here is brief feedback from your manager:

Employee rating: Often exceeds expectations

Strengths: Alice excelled in team collaboration by helping team members brainstorm solutions in order to meet deadlines and onboarding new hires remotely.

Opportunity: I believe Alice could improve her hard skills to become an even more seasoned specialist. She can learn new skills by attending workshops and industry events.

RATE MY PROFESSORS

End