

Covid Data Analysis in AWS



OBJECTIVE

- To perform data analysis and visualization on Covid-19 data using ETL tools.
- To perform data analysis on Covid_19 data and extract the meaningful information from the dataset which will help in taking quick and informed decision.



TECHNOLOGIES USED

- AWS Glue
- SparkSQL
- Redshift
- AWS S3
- SparkSQL
- Crawler
- AWS Lambda
- PySpark



SCHEMA REPRESENTATION

Covid_19_India
Sno
Date
Time
State/UnionTerritory
ConfirmedIndianNational
ConfirmedForeignNational
Cured
Deaths
Confirmed

IndividualDetails
Id
government_id
age
gender
detected_city
detected_district
detected_state
nationality
current_status
status_change_date
notes



Problem Statements

1. Clean and transform data for processing

The screenshot shows the AWS Glue console interface. At the top, there's a navigation bar with the AWS logo, 'Services', a search bar, and user information. Below this, the job 'covid19' is selected, with tabs for 'Visual', 'Script', 'Job details', 'Runs', and 'Schedules'. The 'Visual' tab is active, showing a workflow diagram with three steps: 'Elasticmapreduce job', 'Transform SQL Code', and 'Data target is Amazon S3'. To the right of the diagram, there are tabs for 'Node properties', 'Transform', 'Output schema', and 'Data preview'. The 'Transform' tab is selected, displaying instructions to associate an alias with each input source, a table with 'Input sources' and 'Spark SQL aliases', and a 'Code block' for SQL code. The code block contains two lines of SQL: '1 select * from covid_19 where Area = "US"' and '2'.

Services Search for services, features, marketplace products, and docs [All +5] Username@kpipartners.com @ 5545-5433-8883 Oregon Support

covid19 Last Saved at 10/14/2021, 3:24:56 PM Save Delete Run

Visual Script Job details Runs Schedules

Source Transform Target Undo Redo Remove

Elasticmapreduce job SQL code

Transform SQL Code Spark SQL

Data target is Amazon S3

Node properties Transform Output schema Data preview

Associate an alias with each input source. [Info](#)
Enter valid SQL table names to associate with DynamicFrames

Input sources	Spark SQL aliases
S3 bucket	covid_19


Code block
Enter SQL code to add to your job.

```
1 select * from covid_19 where Area = "US"
2
```





Edit with WPS Office

1.Clean and transform data for processing Cont...


Services ▾

[Alt+S]




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Global ▾

Query results

[Download results](#)

Query results are not available after you choose Close or navigate away. Choose Download results to download a copy of the following query results.

Status

 Successfully returned 802 records in 646 ms

Bytes returned: 34096 B

Raw

Formatted

```

Year,Date,Time,State/Territory,ConfirmedTotal,ConfirmedTotal,ConfirmedTotal,ConfirmedTotal,ConfirmedTotal,ConfirmedTotal
1, 01/01/20, 8:00 PM, Kerala, 1, 0, 0, 0, 1
2, 01/01/20, 8:00 PM, Kerala, 1, 0, 0, 0, 1
1, 01/01/20, 8:00 PM, Kerala, 2, 0, 0, 0, 2
4, 02/01/20, 8:00 PM, Kerala, 1, 0, 0, 0, 1
5, 03/01/20, 8:00 PM, Kerala, 1, 0, 0, 0, 1
6, 04/01/20, 8:00 PM, Kerala, 1, 0, 0, 0, 1

```

2. ETL operations on dataset

covid1

Last Saved at 10/14/2021, 3:24:56 PM Save Delete Run

Visual | Script | Job details | Runs | Schedules

Source | Transform | Target | Undo | Redo | Remove

Node properties | **Transform** | Output schema | Data preview

DropFields

	Field	Data type
<input type="checkbox"/>	Sno	long
<input type="checkbox"/>	Date	string
<input checked="" type="checkbox"/>	Time	string
<input type="checkbox"/>	State/UnionTerritory	string
<input type="checkbox"/>	ConfirmedIndianNational	long

The screenshot displays the KPI PARTNERS ETL tool interface. At the top, the job is named 'covid1' and shows a 'Last Saved' timestamp of 10/14/2021, 3:24:56 PM, along with 'Save', 'Delete', and 'Run' buttons. Below this is a navigation bar with tabs for 'Visual', 'Script', 'Job details', 'Runs', and 'Schedules'. A secondary toolbar contains icons for 'Source', 'Transform', 'Target', 'Undo', 'Redo', and 'Remove'. The main workspace shows a vertical flow of three nodes: a 'Database' source node, a 'DropFields' transform node (highlighted in blue), and a 'Data target' node. The 'DropFields' node's configuration panel is open on the right, showing a table of fields to be dropped. The 'Time' field is selected for dropping, while 'Sno', 'Date', 'State/UnionTerritory', and 'ConfirmedIndianNational' are not. The 'Data type' column shows 'long' for 'Sno' and 'ConfirmedIndianNational', and 'string' for 'Date', 'Time', and 'State/UnionTerritory'.

2. ETL operations on dataset Cont...

Status

✓ Successfully returned 807 records in 386 ms

Bytes returned: 27696 B

Raw

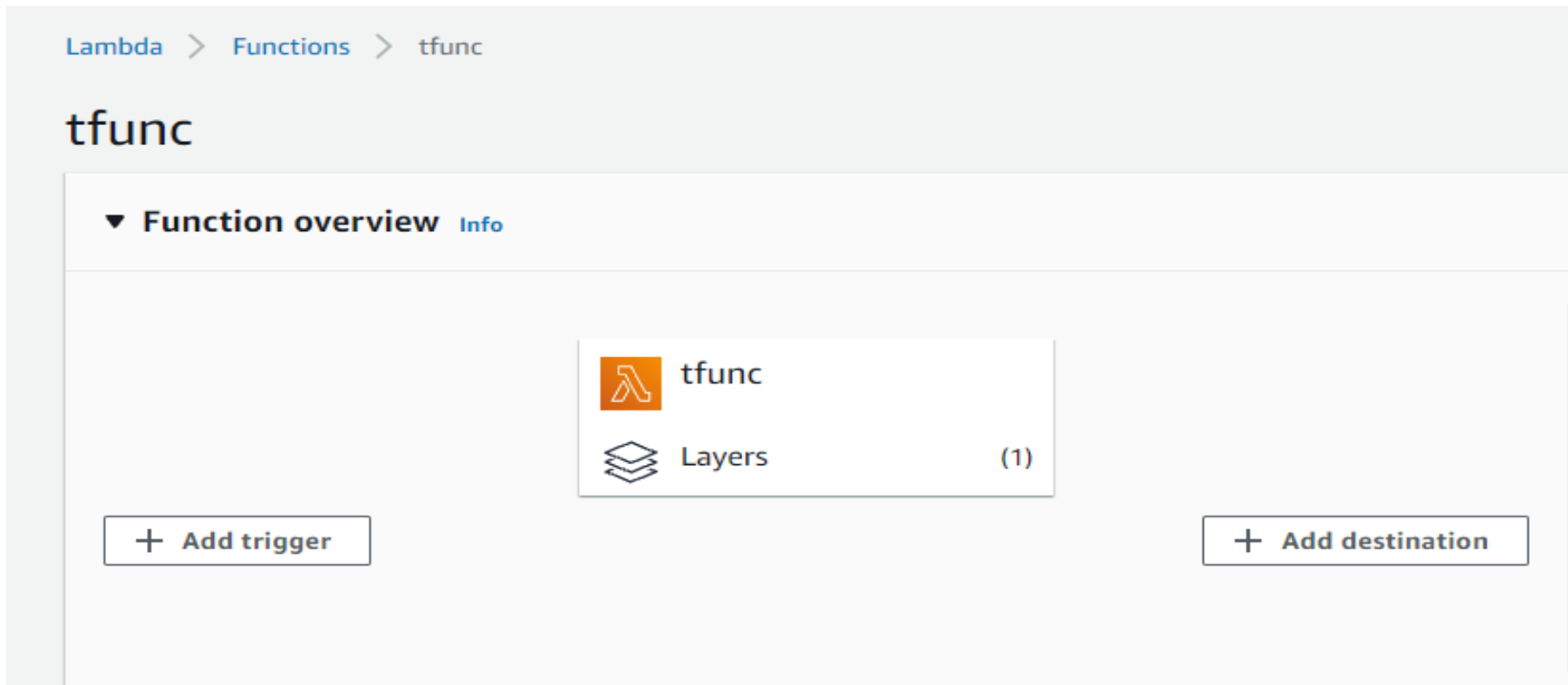
Formatted

```
Sno,Date,State/UnionTerritory,ConfirmedIndianNational,ConfirmedForeignNational,Cured,Deaths,Confirmed
1,30/01/20,Kerala,1,0,0,0,1
2,31/01/20,Kerala,1,0,0,0,1
3,01/02/20,Kerala,2,0,0,0,2
4,02/02/20,Kerala,3,0,0,0,3
5,03/02/20,Kerala,3,0,0,0,3
6,04/02/20,Kerala,3,0,0,0,3
7,05/02/20,Kerala,3,0,0,0,3
8,06/02/20,Kerala,3,0,0,0,3
9,07/02/20,Kerala,3,0,0,0,3
10,08/02/20,Kerala,3,0,0,0,3
11,09/02/20,Kerala,3,0,0,0,3
```



Edit with WPS Office

3. Storing the modified data in AWS



3. Storing the modified data in AWS Cont...



```
1 import json
2 import awswrangler as wr
3 import pandas as pd
4 from datetime import datetime
5
6 def lambda_handler(event, context):
7
8     df = wr.s3.read_csv("s3://training-labtarget1/TrainingLab/Thasneema/in/input/", dataset=True)
9
10    df = df.rename(columns={'Sno': 'Sno', 'Date': 'Dates', 'Time': 'Times', 'State/UnionTerritory': 'StateUnionTerritory',
11                           'ConfirmedIndianNational': 'ConfirmedIndianNational', 'ConfirmedForeignNational': 'ConfirmedForeignNational',
12                           'Cured': 'Cured', 'Deaths': 'Deaths', 'Confirmed': 'Confirmed'})
13
14    df['Dates'] = pd.to_datetime(df['Dates'])
15
16    df.dropna(inplace=True)
17
18    wr.s3.to_csv(df, "s3://training-labtarget1/TrainingLab/Thasneema/out/q3/tmp/tmptsub/tm.csv", index=False)
19
20    return {
21        'statusCode': 200,
22        'body': json.dumps('Successful')
23    }
24
25
```

3. Storing the modified data in AWS Cont...

Query results are not available after you choose **Close** or navigate away. Choose **Download results** to download a copy of the following query results.

 **Download results**

Status

✔ Successfully returned 802 records in 1586 ms

Bytes returned: 42107 B

Raw

Formatted

```
Sno,Dates,Times,StateUnionTerritory,ConfirmedIndianNational,ConfirmedForeignNational,Cured,Deaths,Confirmed
1.0,2020-01-30,6:00 PM,Kerala,1,0,0.0,0.0,1.0
2.0,2020-01-31,6:00 PM,Kerala,1,0,0.0,0.0,1.0
3.0,2020-01-02,6:00 PM,Kerala,2,0,0.0,0.0,2.0
4.0,2020-02-02,6:00 PM,Kerala,3,0,0.0,0.0,3.0
5.0,2020-03-02,6:00 PM,Kerala,3,0,0.0,0.0,3.0
6.0,2020-04-02,6:00 PM,Kerala,3,0,0.0,0.0,3.0
7.0,2020-05-02,6:00 PM,Kerala,3,0,0.0,0.0,3.0
8.0,2020-06-02,6:00 PM,Kerala,3,0,0.0,0.0,3.0
9.0,2020-07-02,6:00 PM,Kerala,3,0,0.0,0.0,3.0
10.0,2020-08-02,6:00 PM,Kerala,3,0,0.0,0.0,3.0
```



Edit with WPS Office

4.Display total cases ,new cases , recovered cases and deaths.

Using Crawler to create table and Data Catalogue as input source-

Search for services, features, marketplace products, and docs
[AIR]
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Oregon
Support

Crawlers > covidindia-crawler

Run crawler
Edit

Name	covidindia-crawler
Description	Create a single schema for each S3 path
Table level	false
Security configuration	
Tags	
State	Ready
Schedule	
Last updated	Sun Oct 17 09:54:54 GMT+0530 2021
Date created	Sun Oct 17 09:54:54 GMT+0530 2021
Database	covidindia
Service role	TrainingLab: MasterGlue: Role
Selected classifiers	
Data store	S3
Include path	s3://training-labtarget1/TrainingLab/Rajesh/Project/Covid/covid_india_dataset/
Connection	
Exclude patterns	

4.Display total cases ,new cases , recovered cases and deaths Cont...

AWS Glue

Search for services, features, marketplace products, and docs [All+5]

Services

AWS Glue

Data catalog

Databases

Tables

Connections

Crawlers

Classifiers

Schema registries

Schemas

Settings

ETL

AWS Glue Studio

New

Blueprints

Workflows

Jobs

ML Transforms

Triggers

Crawlers

A crawler connects to a data store, progresses through a prioritized list of classifiers to determine the schema for your data, and then creates metadata tables in your data catalog.

User preferences

Add crawler Run crawler Action

Filter by tags and attributes

Showing 1 9 < > Refresh Help

	Name	Schedule	Status	Logs	Last runtime	Median runtime	Tables updated	Tables added
	Consumer_Complaint_Analysis		Ready	Logs	1 min	1 min	0	0
	agrttest		Ready	Logs	42 secs	42 secs	0	1
	covid		Ready	Logs	35 secs	35 secs	0	1
	covid19_K		Ready	Logs	52 secs	52 secs	0	6
<input checked="" type="checkbox"/>	covidIndia-crawler		Ready	Logs	55 secs	55 secs	0	1
	crawlncovid		Ready	Logs	45 secs	45 secs	0	1
	covidcrawler		Ready	Logs	1 min	1 min	0	1
	training1		Ready	Logs	1 min	1 min	0	1
	training2		Ready	Logs	2 mins	2 mins	0	1

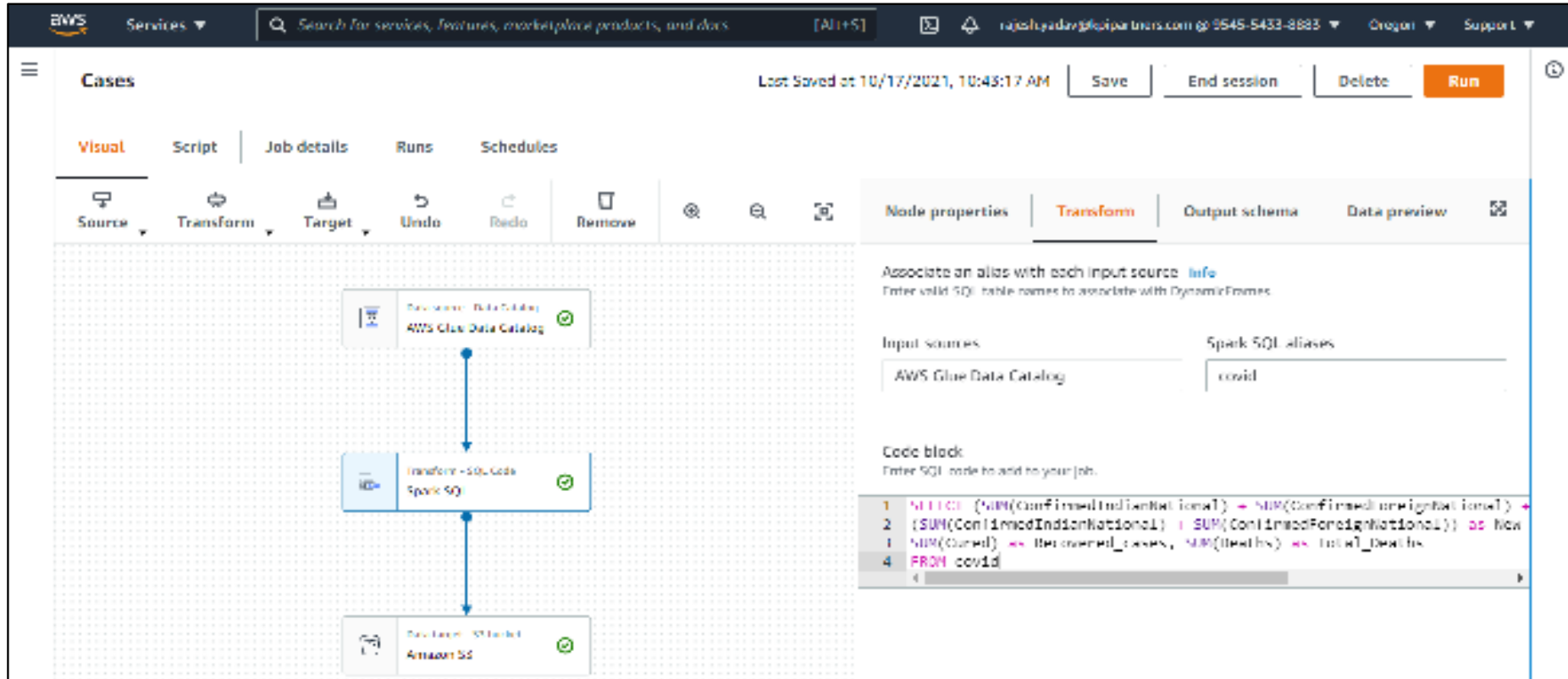
Edit with WPS Office

4.Display total cases, new cases, recovered cases and deaths Cont...

Changing the data type of date-

Change	Column name	Data type	Key	Change	Column name	Data type	Key
Changed	sno	bigint		Changed	sno	int	
Changed	date	string		Changed	date	date	
	time	string			time	string	
	state/unionterri...	string			state/unionterri...	string	
Changed	confirmedindia...	bigint		Changed	confirmedindia...	string	
Changed	confirmedforei...	bigint		Changed	confirmedforei...	string	
Changed	cured	bigint		Changed	cured	int	
Changed	deaths	bigint		Changed	deaths	int	
Changed	confirmed	bigint		Changed	confirmed	int	

4.Display total cases, new cases, recovered cases and deaths Cont...



The screenshot shows the AWS Glue console interface. The top navigation bar includes the AWS logo, a search bar, and user information. The main content area is titled "Cases" and shows a workflow with three nodes: "Source - Data Catalog", "Transform - SQL Code", and "Target - Amazon S3". The "Transform" node is selected, and its properties are displayed on the right. The "Transform" tab shows the SQL code used in the transform.

Node properties

Associate an alias with each input source. [Info](#)
Enter valid SQL table names to associate with DynamicFrames.

Input sources: AWS Glue Data Catalog

Spark SQL aliases: covid

Code block:
Enter SQL code to add to your job.

```
1 SELECT (SUM(ConfirmedIndianNational) + SUM(ConfirmedForeignNational)) AS New
2 (SUM(ConfirmedIndianNational) + SUM(ConfirmedForeignNational)) AS New
3 SUM(Covid) AS Recovered_Cases, SUM(Deaths) AS Total_Deaths
4 FROM covid
```

4.Display total cases, new cases, recovered cases and deaths Cont...

Query results

Query results are not available after you choose Close or navigate away. Choose Download results to download a copy of the following query results.

Status

✔ Successfully returned 2 records in 730 ms

Bytes returned: 80 B

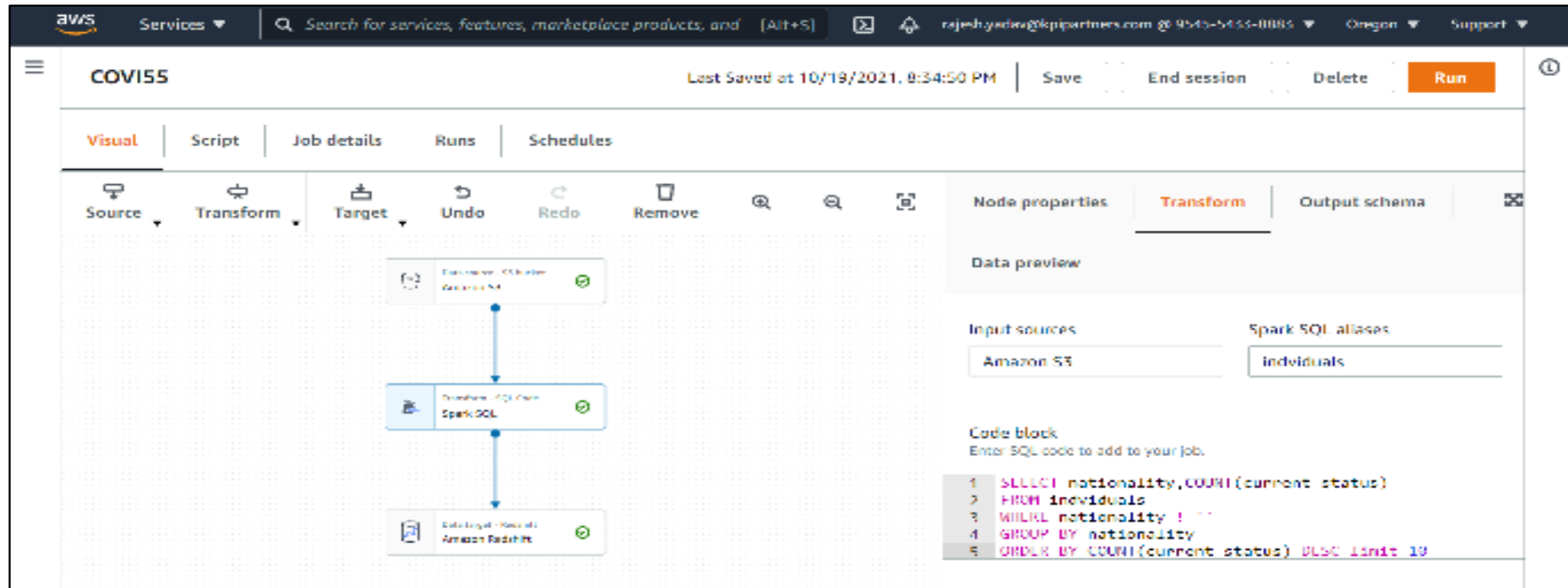
Raw | **Formatted**

Total cases	New Cases	Recovered cases	Total Deaths
10492.0	6103.0	3320.0	1060.0



5. Which country in Distinct WHO region highest cases in till date.

Select nationality, count(current_status) from individuals where nationality !=
" group by nationality order by count(current_status) desc limit 10



The screenshot shows the AWS Glue console interface for a job named "COVI55". The job is in the "Visual" tab, showing a workflow with three nodes: "Extract -> Amazon S3", "Transform -> Spark SQL", and "Load -> Amazon Redshift". The "Transform" node is selected, showing its properties and the SQL code to be executed.

Node properties: Transform

Data preview

Input sources: Amazon S3

Spark SQL aliases: individuals

Code block

```
1 SELECT nationality, COUNT(current_status)
2 FROM individuals
3 WHERE nationality != ""
4 GROUP BY nationality
5 ORDER BY COUNT(current_status) DESC limit 10
```

5. Which country in Distinct WHO region highest cases in till date Cont...

Amazon Redshift Visual Query Editor interface for a job named **COVI55**. The interface shows a workflow diagram and configuration panels.


Workflow Diagram:

- Source:** Database - Athena - Amazon S3
- Transform:** Transform - SQL Cook - Spark SQL
- Target:** Data target - Redshift - Amazon Redshift

Configuration Panels:

- Node properties:** Data target properties - Redshift
- Data preview:**
 - Database: covid
 - Table: covid5
 - Temporary directory - optional: `s3://training-lab-target-1/Trainin`
 - IAM role associated with the Redshift cluster - optional: Traininglab_MasterRedshift_Role

5. Which country in Distinct WHO region highest cases in till date Cont...

Query results		Table details	
Query 22061		Execution	Data
 Completed, started on October 19, 2021 at 20:31:47 Elapsed Time: 00 m 02 s		Visualize	
Rows returned (11)		Export	
<input type="text" value="Search rows"/>		< 1 >	
nationality		totalcases	
nationality			
India		1051	
Italy		18	
Indonesia		15	
"United Kingdom"		7	
Thailand		2	



6. Total no of confirmed cases over between a certain date.

Select sum(Confirmed) from temp where Dates between "01/01/2020" and "31/04/2020"

Tjob6 Last Saved at 10/19/2021, 10:47:24 AM Save Delete Run

Visual | Script | Job details | Runs | Schedules

Source | Transform | Target | Undo | Redo | Remove | 🔍 | 🔄 | 📄

Node properties | **Transform** | Output schema | Data preview

Associate an alias with each input source. [Info](#)
Enter valid SQL table names to associate with DynamicFrames

Input sources: S3 bucket | Spark SQL aliases: temp

Code block
Enter SQL code to add to your job.

```

1 select sum(Confirmed)
2 from temp
3 where Dates between "01/01/2020"
4 and "31/04/2020"

```

Diagram showing a workflow: Data source - S3 bucket → Transform - SQL Code (Spark SQL) → Data target - Reducible Amazon S3

6. Total no of confirmed cases over between a certain date Cont...

Query results

Query results are not available after you choose **Close** or navigate away. Choose **Download results** to download a copy of the following query results.

 **Download results**

Status

✔ Successfully returned 2 records in 372 ms

Bytes returned: 39 B

Raw


Formatted

```
sum(CAST(Confirmed AS DOUBLE))  
43083.0
```




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8.Date of first confirmed case in a particular region.


Services

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[Alt+5]



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Oregon

Support

first

Job has not been saved

Save

Delete

Run

Script
Job details
Runs
Schedules

Script
Info

```

10         ],
11         "recursive": true,
12     },
13     transformation_ctx: "s3bucket_name",
14 }
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8.Date of first confirmed case in a particular region Cont...

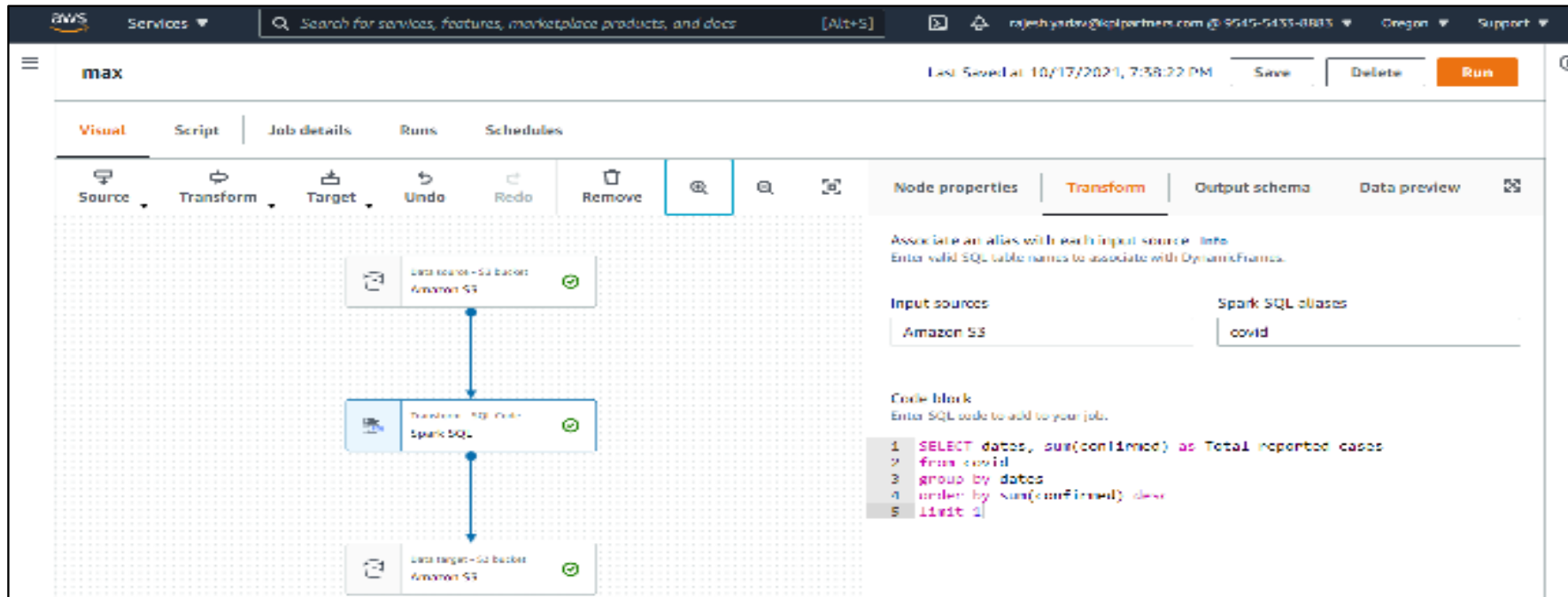
Status
✔ Successfully returned 53 records in 439 ms
Bytes returned: 728 B

Raw	Formatted
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dates	StateOrUnionTerritory
2020-01-02	Kerala
2020-01-04	Himachal Pradesh
2020-01-04	Haryana
2020-01-04	Ladakh
2020-01-04	Jharkhand



9.Date on which max no. cases were reported in a country.

Select Dates, sum(Confirmed) as Total_reported_cases from covid group by Dates order by sum(Confirmed) desc limit 1



The screenshot shows the AWS Glue console interface for a job named 'max'. The job is configured with the following details:

- Visual** tab is selected.
- Node properties** tab is selected.
- Transform** tab is selected.
- Input sources** are listed as Amazon S3.
- Spark SQL aliases** are listed as covid.
- Code block** contains the following SQL query:


```
1 SELECT dates, sum(confirmed) as Total reported cases
2 from covid
3 group by dates
4 order by sum(confirmed) desc
5 limit 1
```


9.Date on which max no. cases were reported in a country Cont...

Query results

Download results

Query results are not available after you choose Close or navigate away. Choose Download results to download a copy of the following query results.

Status

✔ Successfully returned 2 records in 710 ms

Bytes returned: 45 B

Raw

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dates	Total reported cases
2020-09-04	5865.0



Visualization in Redshift-

aws Services Search for services, features, marketplace products, and docs [Alt+5] m.jedryadwy@kpipartners.com @ 954-5433-8583 Oregon Support

covid8 Last saved at 10/21/2021, 12:05:12 AM Save Delete Run

Visual Script Job details Runs Schedules

Source Transform Target Undo Redo Remove

Node properties Transform Output schema Data preview

Associate an alias with each input source. Info
Enter valid SQL table names to associate with DynamicFragments.

Input sources Spark SQL aliases

Amazon S3 covid

Code block
Enter SQL code to add to your job.

```

1 SP_FCT_ConfirmedIndianH1N1, ConfirmedForeignH1N1,
2 Confirmed_Deaths_H1N1 covid

```

Flow diagram showing data flow from Amazon S3 to Spark SQL to Amazon Redshift.



Visualization in Redshift Cont...

Amazon Redshift console interface showing a workflow for data visualization in Redshift.

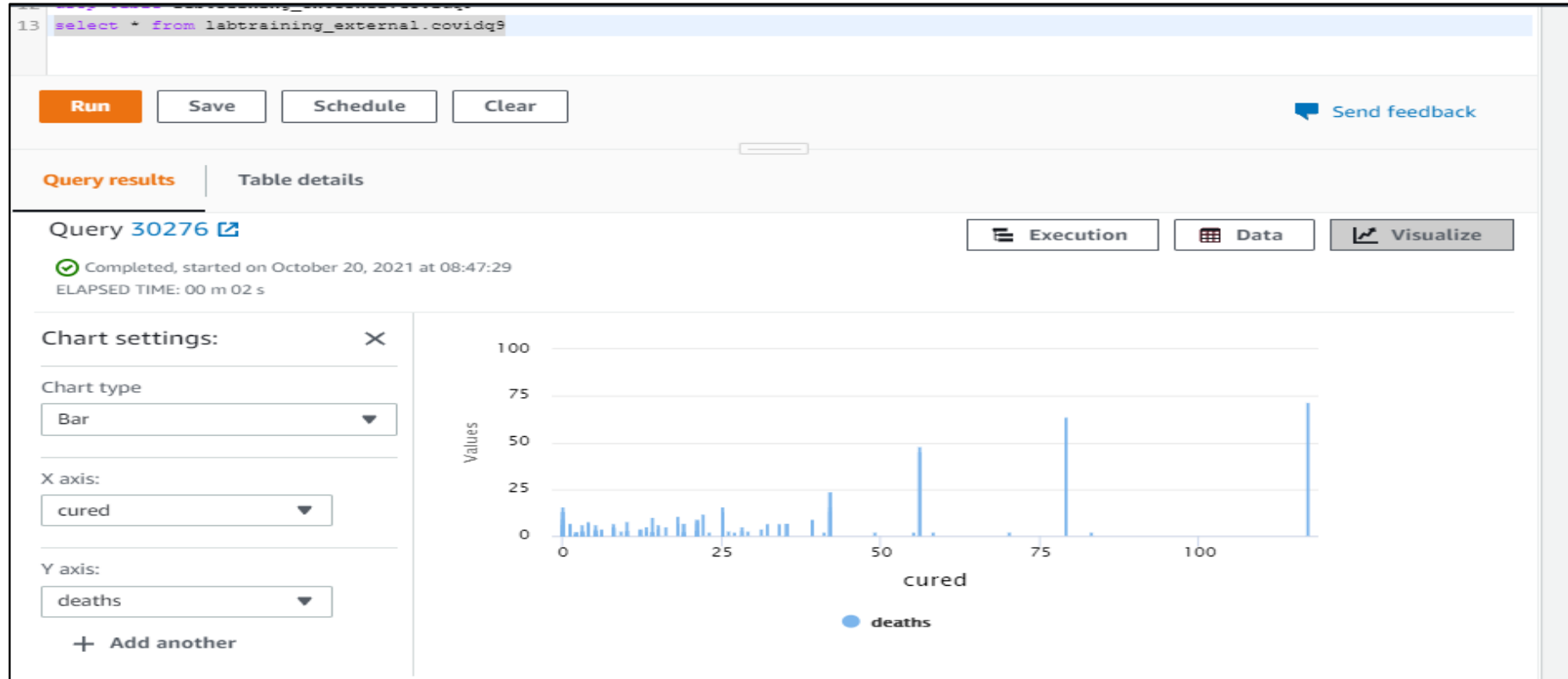
Workflow Diagram:

- Data source - S3 bucket:** Amazon S3 (Green checkmark)
- Transform - SQL Code:** Spark SQL (Green checkmark)
- Data target - Redshift:** Amazon Redshift (Green checkmark)

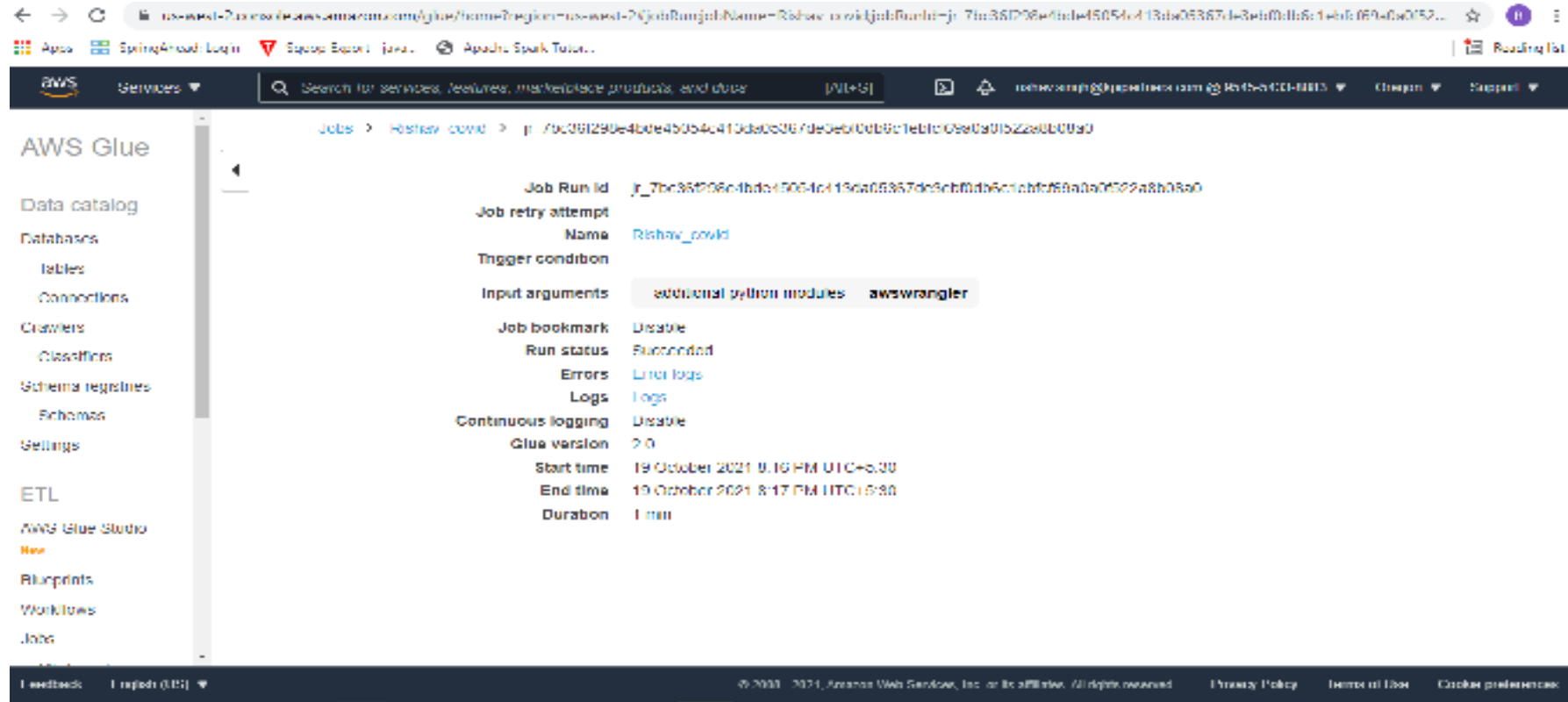
Node properties (Data target properties - Redshift):

- Database: dev
- Table: covid19
- Temporary directory - optional: s3://bucket/prefix/object
- IAM role associated with the Redshift cluster - optional: TrainingJob_MediaWorkshop_Role

Visualization in Redshift Cont...



Creating Glue Job and Executing Transformation using PySpark



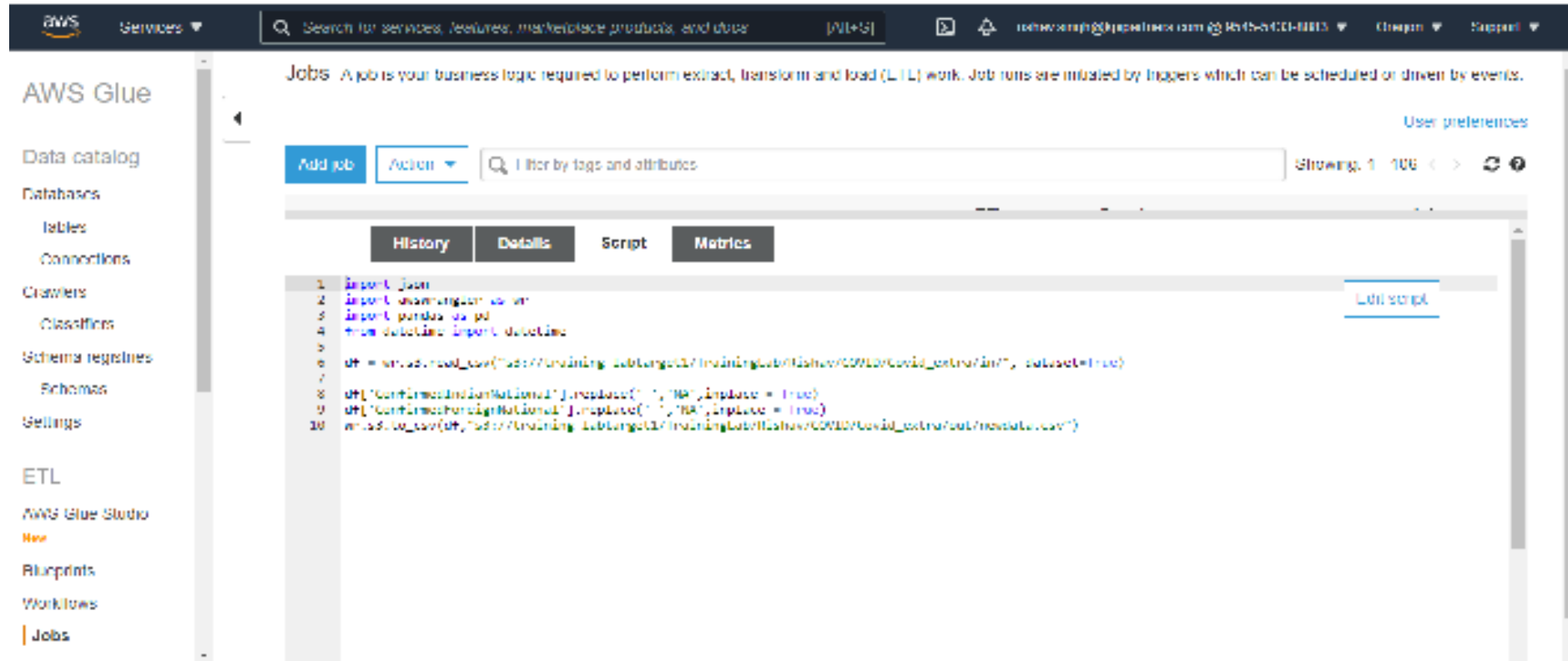
The screenshot displays the AWS Glue console interface. On the left, a navigation menu includes links for Data catalog, Databases, Tables, Connections, Crawlers, Classifiers, Schema registries, Richness, Settings, ETL, AWS Glue Studio, Blueprints, Workflows, and Jobs. The main content area shows the details for a specific Glue job named 'Rishav_covid'.

Job Details:

- Job Run Id:** jr_7bc35f206e4bdc45054c413da05357dc9ebf0db6c1eb1c05a0a01522a0b0090
- Job retry attempt:** 0
- Name:** Rishav_covid
- Trigger condition:** OnDemand
- Input arguments:** additional python modules: awswrangler
- Job bookmark:** Disable
- Run status:** Succeeded
- Errors:** [View logs](#)
- Logs:** [Logs](#)
- Continuous logging:** Disable
- Glue version:** 2.0
- Start time:** 19 October 2021 9:16 PM UTC+5:30
- End time:** 19 October 2021 8:17 PM UTC+5:30
- Duration:** 1 min



Creating Glue Job and Executing Transformation using PySpark Cont...



The screenshot displays the AWS Glue console interface. On the left, a navigation sidebar lists various services including Data catalog, Databases, Tables, Connections, Crawlers, Classifiers, Schema registries, ETL, and Jobs. The main content area is titled 'Jobs' and includes a description: 'A job is your business logic required to perform extract, transform and load (ETL) work. Job runs are initiated by triggers which can be scheduled or driven by events.' Below this, there are buttons for 'Add job' and 'Action', along with a search bar 'Filter by tags and attributes'. A tabbed interface shows 'History', 'Details', 'Script', and 'Metrics', with the 'Script' tab currently selected. The script is a PySpark code snippet that reads data from an Amazon S3 location, filters for records where 'Confirmed' is 'Yes', and writes the results to another S3 location. The script is as follows:

```
1 import json
2 import os
3 import pandas as pd
4 from datetime import datetime
5
6 df = spark.read_csv('s3://training-subtarget1/trainingdata/fisher/Covid_extra/in/', delimiter=',', header=True)
7
8 df['ConfirmedIndianNational'].replace(' ', 'NA', inplace = True)
9 df['ConfirmedForeignNational'].replace(' ', 'NA', inplace = True)
10 df.write_csv('s3://training-subtarget1/trainingdata/fisher/Covid_extra/out/metadata.csv')
```

Creating Glue Job and Executing Transformation using PySpark Cont...

```

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448,449.0,20/03/20,7:30 PM,Sihan,NA,NA,0.0,1.0,11.0
449,450.0,20/03/20,7:30 PM,Chondigarh,NA,NA,0.0,0.0,3.0
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471,472.0,20/03/20,7:30 PM,Uttar Pradesh,NA,NA,11.0,0.0,65.0
472,473.0,20/03/20,7:30 PM,West Bengal,NA,NA,0.0,1.0,13.0

```

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THANK YOU