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UE19CS344
DATABASE TECHNOLOGIES (DBT)

Project Report

Twitter Streaming Analysis

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Table of Contents

Introduction:

This Database Technologies project deals with handling a stream of tweets, finding out the most popular hashtags in a particular batch/window and displaying them. The data is further also stored in a database for persistent storage, should there be any future requirements for the data.
The data is streamed through Kafka, both batch and stream processing are performed and the outputs are delivered. The data is then pulled by Spark (Structured Streaming is used) from Kafka and here the structured data is then finally stored in a MySQL database. This gives us an insight into how a pipeline can be created to pass data through for processing purposes.

GITHUB LINK: https://github.com/tarunkumarrrr/UE19CS344---DBT---Twitter-Streaming-Analysis.git

Installation of Software:

- Spark v3.1.2
- Kafka v3.1.0
- Confluent for Kafka

External python libraries required:

- confluent-kafka
- pandas
- numpy
- kafka-python
- pyspark
- mysql-connector

Input Data:

a) Source: The input dataset is called Sentiment140 which can be found here: Sentiment140 dataset with 1.6 million tweets | Kaggle.

b) Description: This dataset contains 1.6 million tweets. The schema is of the form:
(Sentiment, Tweet).

Streaming Mode experiment:

Description

We conducted this experiment using Kafka. The input data is streamed into a topic using a kafka producer, which streams the data from a .csv file on the local machine, into the topic. We then set up a kafka consumer, which we used to subscribe to that particular topic. This data streams into this consumer, where a tumbling window calculates which hashtag is trending at that point. We performed this experiment using the following softwares:

1) kafka module (kafka.admin to publish)
2) confluent_kafka module (confluent_kafka.Consumer to subscribe)

Windows

We have used a window size of 15 minutes. Therefore, every 15 minutes, a tumbling window operation takes place on the data so we can get trending hashtags.

Results

We get the top trending hashtags every 15 minutes in case the tweets streamed during that time had hashtags, else we get an empty list for that window.

Batch Mode experiment:

Description

We conducted this experiment using Kafka. The input data is streamed into a topic using a kafka producer, which streams the data from a .csv file on the local machine, into the topic. We then set up a kafka consumer, which we used to subscribe to that particular topic. This data from the topic gets sent in batches to the consumer. Then, trending hashtags are then extracted from that data and displayed.

Batch Size

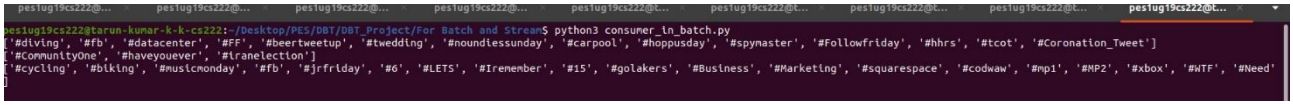
We have implemented this experiment in such a way, that all the data is steamed in batches every 15 minutes. Therefore, the batch size depends on how much data has been sent to the topic in the past 15 minutes.

Results

The top trending hashtags are received for each batch of tweets that is sent for processing at 15-minute intervals.

Comparison of Streaming & Batch mode

Batch mode:



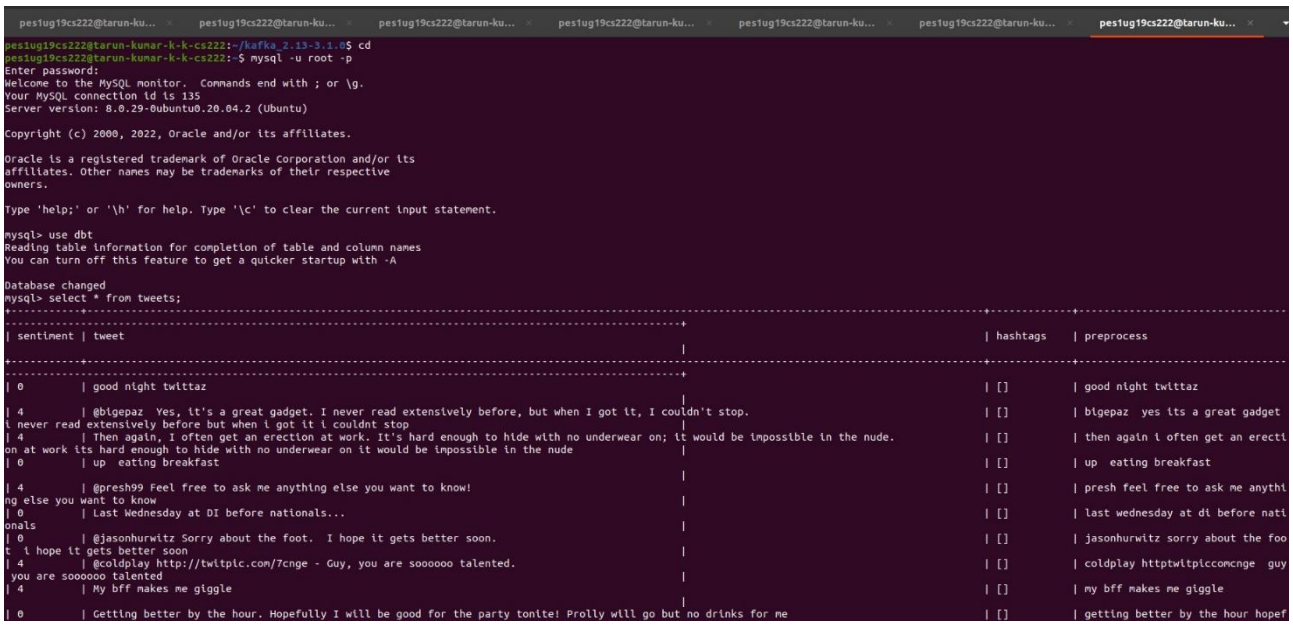
(Output after 15 minutes)

Stream mode:

(a similar result for streaming mode after 15 minutes)

Conclusion

We learnt about the following technologies: Kafka, Spark and MySQL and how they can be used in a pipeline to process data and perform further analysis with the data received. In our case we used tweets for our analysis but this can be extended to other domains where the data can be published to a Kafka topic and that topic can then be subscribed to by other technologies to receive whatever data is needed for processing/analysis.



This is how the data is stored in MySQL for persistent storage. The raw sentiment and tweet are stored, the hashtags are extracted and stored and the pre-processed data is also stored should there be any need to perform sentiment analysis on this data.

References

- How to Install and Configure MySQL in Ubuntu 20.04 LTS – VITUX
- Apache Kafka Tutorial Edureka
- Structured Streaming Programming Guide - Spark 3.2.1 Documentation (apache.org)
- Sentiment140 dataset with 1.6 million tweets | Kaggle