Project Plan – First Deliverable

Project Title: AI for Reputation Monitoring on Social Media

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Objective

This project aims to develop an application that can perform analysis and monitoring on social media and other internet resource for the reputation of digital influencers.

Targeting at the Entertainment industry and the Advertising industry, the major user are the PR team of influencers or Key Opinion Leaders (KOL) and Advertising provider. By performing Natural Language Processing (NLP) on social media posts, comments, and news gathered from the internet to categorize their sentiments, related entities and contents. By further data analysis and visualization, our cross-platform application enables PR teams or the solo influencers to review the most recent public reaction in order to establishes the positioning for their future development. On another side, it also aids in advertising provider to choose the desired candidate and decide the compensation for the promotion job.

Problem Statement

The reputation of digital influencers is easily affected by any content across different platforms across the internet,[1] including discussions on online forum, news and posts, comments on social media. On Instagram, one of the most popular social media currently, the average number of comments is around 100 per day for profiles which owns number of followers between 100,000 to 500,000.[2] Therefore, the size of all data from multiple internet platform is enormous. There is a need to have an automatic application that can track and analyses the latest information for the influencers and advertising providers.

Basic background

Digital influencers, which defines as "encompasses multi-platform high-profile Internet microcelebrities who accumulate a following on social media and/or blogs through the textual and visual narration of their personal lives and lifestyles",[3] have captured the attention of people in the

age of social media. Starting their careers on social medias, most of them generate their earnings by sponsored content.[4] Such as posting pictures and stories of the advertising product on social media or making recommendations on their YouTube videos. Without any doubts, influencers who have a decent reputation is more preferred by brands.[1] Therefore, it is extremely critical for influencers to welly manage their own reputation which affect their credibility, trustworthiness.[1] To evaluate these keys of an influencer, engagement rate, reach and reputation are under consideration.[5]

It would be a problem for the PR team of Influencers or Solo influencers, advertising providers and brands to evaluate the mentioned factors across vast amount of data on the internet. The number of likes and shares, followers and endorsements of the influencers shows their frame and popularity on the internet,[5] so providing analysis on these numerical data are important. In addition, it is suggested that the reviews and comments are under concerned,[5] so sentiment and categorisation analysis on textual content can bring huge convenient by removing the time for manual reading.

Theoretical background

Natural Language Processing, "is an area of research and application that explores how computers can be used to understand and manipulate natural language text or speech to do useful things.",[6] is chosen to perform sentiment analysis on textual data in this application. After data analysis on numerical data is also finished, the result of them would be shown by data visualization which is "the representation of data through use of common graphics, such as charts, plots, infographics, and even animations."[7] This aid in users to extract meaning from the complex data and generate their insights in a simplified and clearer manner. Before performing the above-mentioned task, Application programming interface (API) is used to obtain data from various social media and news platform.[8] In order to spot the useful ones from different kinds of data, insights and opinions about influencer marketing and measurement of reputation are being referred.[9]

Related works

In the current market, there are some reputation monitoring products for large corporations which are not suitable for influencers.[10] Additionally, there are also a few products that is also focused on the entertainment industry for influencers. One of the similar one would be influencer management tools that is for the influencers to have collaboration with other

parties. Another similar one is influencer marketing platform, such as Upfluence, Traackr and Klear. [11-13] By providing information of their social media presence and sentiment analysis, their targeted user are mostly brands who are looking for influencers to do marketing promotions.

In contrast, one of the aims of our application is to aid in boosting the reputation of influencers. Therefore, we are providing a closer support and more direct and in-depth analysis to the influencer user side.

Deliverables

This cross-platform application will gather the most recent data from social medias, search engines, online new by API. Afterwards, sentiment analysis will be performed on textual data when data analysis will be performed on the numerical data.

Regarding the sentiment analysis, the NLP models is planned to perform three classification tasks. The first classification would be identifying which party or entity it is related to. The second would be grouping its content into different aspect. For example, the influencer's personal traits, professionalism and ethics, brand collaborations, controversies etc. At the end, it would be classifying the sentiment or the level of attitude. Such as Positive, Neutral and Negative Feedback.

Regarding the data analysis, it will be focus on data that reflect their popularity and reputation. Such as search rate, number of shares and exposure. Afterwards, Data Visualization will be performed on both the result of sentiment and data analysis in a form of interactive dashboard, so that it enables user to add filter, highlighting, sorting options according to the time, content categories, keywords. More functions, such as exporting the data in different formats, drilling up or down into the data will also be implemented. It is also planned that analysis will be done on past cases of event and incidents. After we capture the most recent activities of the influencers, suggestions and references will be given based on the past case analysis.

Sequence diagram of the primary function
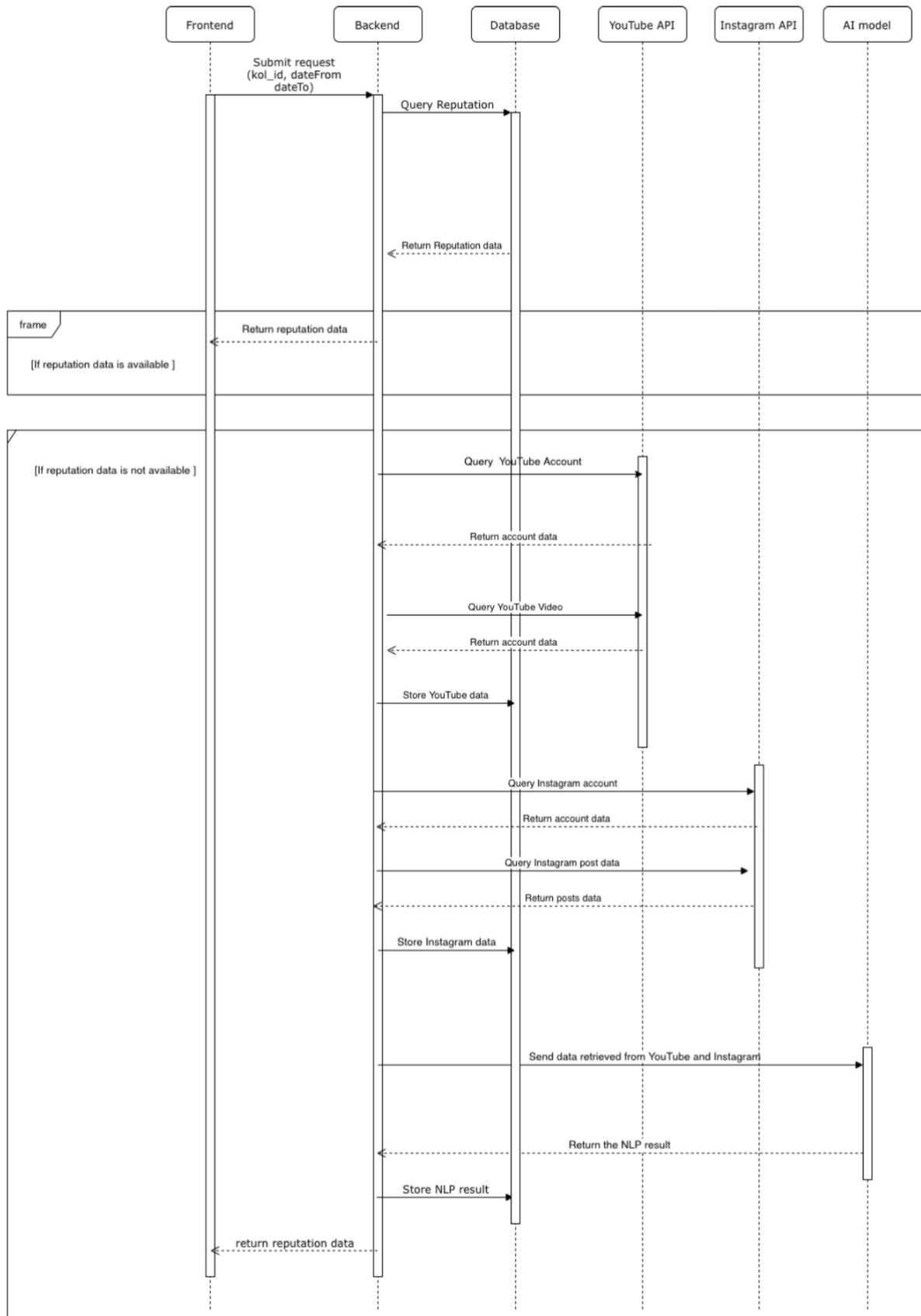
Project Methodology

NLP deep learning model

The deep learning NLP pre-trained model is chosen to be BERT, Bidirectional Encoder Representations from Transformers, which is developed by Google. After fine tuning the labelled dataset, it can understand the connections between textual features and the corresponding sentiment labels.[14] If there are difficulties in the process of implementation, alternative plan will be BERT's variant. One of it is ALBERT which is better for smaller model size training, another one is DistilBERT which is faster and memory efficient.

After receiving the demo data sets from API, data preparations work will start immediately. First step will be data cleaning to extract the useful textual content. Second is data labelling, to label its related entity, content category and sentiment level. Afterwards, other data preparation work will be performed, such as Tokenization, Segment Embedding and Attention Masks.

After the data sets are ready, model training will start. The included steps will be forward pass, hyperparameter tuning, fine-tuning etc. The whole process of model training will be performed on Python by Hugging Face Transformer Library which provides pretrained BERT models and fine-tunning support. TensorFlow will be the second choice in this case.

System architecture

The application is designed around the model-view-controller pattern, which provides a well-structured architecture. All the frontend serves as the view and mainly handles the the display logic. In the meantime, the backend is responsible for integrating with the AI model and the external API. This pattern effectively distributes the workload and assess the progress of the project. The upcoming sections provide the features that will be utilized.

Frontend

React Native has been chosen for frontend development. As mentioned above, the deliverable is a cross-platform application. React Native has a tool called 'Expo' that enables the frontend project to run on browsers, Android, and iPhones. Additionally, React Native offers robust UI development support, which can accelerate the development process. For basic UI elements, Material UI has been selected. This library provides well-built and customizable components, reducing the time spent on CSS. Moreover, the project requires efficient data visualization in tables and charts. The 'React Charts' library will be used for data visualization, which not only offers various chart types but also supports live data display.

To ensure the quality of the UI, it is planned to draft the prototype in the Figma before working on the frontend.

Backend

Java Spring Boot has been chosen for the backend development. Spring Data JPA, Swagger UI are included in the project. The Spring Data JPA, which is the Object-Relational Mapping tools (ORM), is included in the project. ORM create the mapping between the class in the spring boot and the table in Database. By utilizing ORM, the need for manual scripting of SQL queries is eliminated. This results in increasing code reusability and optimizing data retrieval, as the responsibility for writing SQL queries is handled by the ORM.

As for Swagger UI, it is an API testing tool that differs from Postman in its ability to automatically generate API documentation. The weakness of Swagger is that it clears the request parameter and payload with each update of the backend.

API (Social media platforms, News)

It is planned to utilize an API for the retrieval of data related to KOL. The application is targeted to integrate with YouTube and Instagram, as these platforms are frequently utilized by KOL in Hong Kong. If successful, there will be the potential to integrate with more platforms to improve the accuracy of the system.

YouTube provides Data API for developer. Data such as number of view, number of like and the comments associated with a particular video is able to retrieved. These data is valuable for analyzing the reputation of the KOL among their the audience. However, the usage has been limited. The API has a daily allotment of 10,000 units and consumes approximately 1 unit per search request.

Instagram already provides the "Instagram Graph API". The API allows retrieval of a variety of data, including followers, posts, comments, and more. The API is free, but the API is only available for business accounts.

It is also planned to implement more APIs, such as Facebook's, twitter's and

Database

Since the backend utilises the object-relational mapping tools, it is necessary to use the relational database. We choose PostgreSQL for the project. PostgreSQL has been chosen for the project, as it incorporates object-oriented functionalities such as inheritance in addition to offering features similar to MySQL. The current design of the database is shown in the below, the design will be modified continuously.
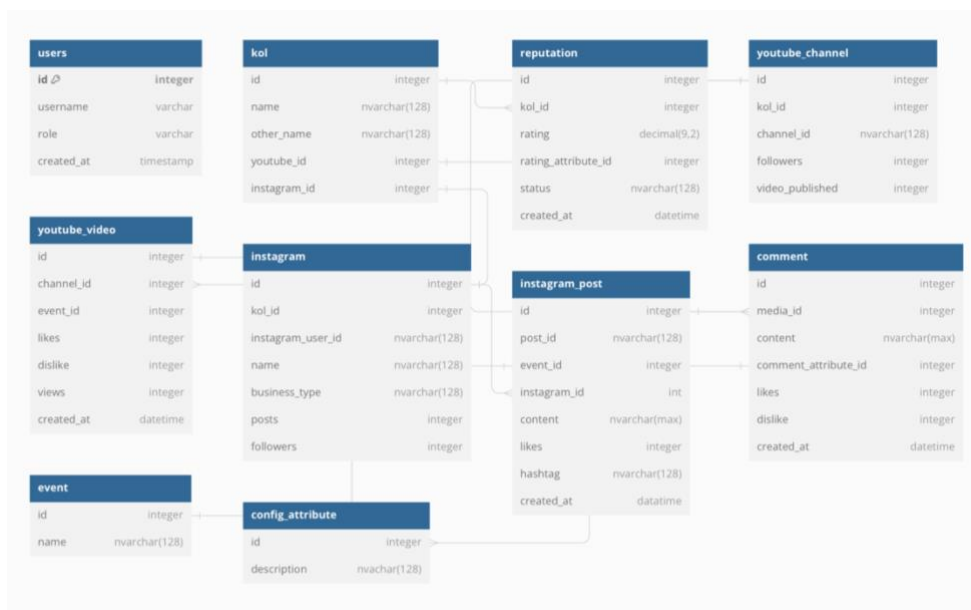
Current status

At the moment, the solution stack has been built. Specifically, the backend is able to query data from the database and a simple API has been established. As for the frontend, it is able to receive API responses and display the data in both browser and the mobile phone. Additionally, the GitHub repository has been created with link https://github.com/syamuelim/reputation-monitoring.git. All the update mentioned is visible in the repository and the example site is shown as follows.

Prerequisites

While the application has no dependency on hardware, it does require the installation of the following softwares. The development server must have PostgreSQL version 16 installed and the SQL server port configured to 5432. The backend also requires Java 17 and Python 3.9. As for the frontend, node.js is required to run Expo and React Native.

Project Exclusions

The following items are out of the project scope:

1. Fact-check whether influencer comments are true.
2. Adjust the scale according to the region of the influencer.

Result measurement

1. The AI model should have at least 70% accuracy, the test cases will be available in the end of Decembe.r
2. The frontend should apply responsive design, meaning that the element should be well displayed between 300px width to 1920px width.
3. Successfully visualize the data in a chart
4. Successfully connect the external API, and the successful rate should be over 90%.

5. The system should be bug-free.

Feasibility assessment

For training an NLP model, the most critical part would be the Data. Without a decent training dataset, the model will not be fair and accurate enough. To ensure this, the training data will be cleaned and labelled by manually or be collected from trustworthy resources.

For the performance of BERT model, it is believed that Hugging Face will provide useful support, customization and extensions in the process of training the model. BERT is also proven to be suitable for multiple language tasks which includes sentiment analysis.

Risks, Challenges & Mitigation

One of the challenges would be Data Bias. As the comments may mostly be written by their fans who majorly support the influencers or lack of diversity may also appear as some event may seldom happens. This may lead to inaccurate predictions for the model. To mitigate this situation, more data will be prepared to collect diverse and representative data. Balance sampling will also be adopted to reduce bias.

Another Challenge is that it is not possible for our application to cover all online platforms to gather the data. There are so many kinds of social media nowadays, so people may publish their comments or content in uncovered platforms. Missing this information may lead to unfair situation. However, we may further add other API of the most popular social media to the application to gather sufficient data and perform equitable analysis.

Project Management Info

Person In Charge	Coding Task	Other Task
Gavin Cheu	Backend Implementation, NLP Model training	Data preparation, Data analysis, Design of Dashboard
Samuel Yim	Front, backend Implementation	Data preparation

Project Schedule and Milestones

Sem1

Specific Date	Stage	Division of Labour & Estimated Hours
1 Oct, 2023	Deliverable 1: Project Plan	
31 Oct, 2023	Retrieve YouTube/ Instagram data from API	
	Test on the general data set	
30 Nov, 2023	Integrate with the sample NLP model	
	Test the ORM feature in backend	
	Draft Figma prototype	
28 Dev, 2023	Implement the primary function mentioned in backend	
	Implement the data chart in frontend	
28 Dec, 2023	Finish Preparation of First Presentation Preliminary implementation Interim report (Change from the report from CAES9542 Nov 30 handed in)	
31 Dec, 2023	Complete the first version of test cases on NLP model	
8-12 Jan 2024	First Presentation	
15-19 Apr 2024	Final Presentation	
23 Apr 2024	Deliverables of Phase 3 (Construction) • Finalized tested implementation • Final report	

21 Jan 2024	Deliverables of Phase 2 (Elaboration) • Preliminary implementation • Detailed interim report

15-19 Apr 2024	Final presentation
23 Apr 2024	Deliverables of Phase 3 (Construction) • Finalized tested implementation • Final report
26 Apr 2024	Project exhibition

Conclusion

Check list from CAES

Objectives (tangible & significant?)	
Problem statement/Benefits	
Basic background	
Theoretical background	
Literature review (or Related Works)	
Scope (what are/not included)	
Prerequisites (hardware, software, techniques, etc.)	
Deliverables (tangible enough?)	
Approach & Methodology (detailed enough?)	29/09
Feasibility assessment – getting the social media data	29/09
Feasibility assessment – API model	
Project management info (e.g. division of work, distinct work packages?)	29/09 (included in methodology)
Risks, challenges & Mitigation	
Schedule (detailed enough)	
Mini conclusion	
Appendices/References	

Reference

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[11] A. Bielfeldt, "How many likes & comments you need to perform among the best - instagram benchmarks," Fanpage Karma Blog, https://blog.fanpagekarma.com/2021/09/08/how-many-likes-comments-you-need-to-perform-among-the-best-instagram-benchmarks/ (accessed Oct. 1, 2023).

[12] Klear ,"Influencer marketing platform," Klear, https://klear.com/ (accessed Oct. 1, 2023).

[13] Traackr l, "Traackr I the #1 data-driven influencer marketing software," Traackr I The #1 Data-Driven Influencer Marketing Software, https://www.traackr.com/ (accessed Oct. 1, 2023).

[14] Huggingface.co ,"Bert 101 - state of the art NLP model explained," BERT 101 - State Of The Art NLP Model Explained, https://huggingface.co/blog/bert-101 (accessed Oct. 1, 2023).

References

https://react-charts.tanstack.com/

NLP based Application to Analyze the Sentiment of YouTube Comments

https://www.linkedin.com/pulse/nlp-based-application-analyze-sentiment-youtube-comments-sinha/

https://www.peerspot.com/products/monocl-professional-reviews

https://www.peerspot.com/categories/kol-management-software

What sector / industry we can target on?

Entertainment industry & Advertising industry

Who are the target user? What are their needs

1. KOL / popstar
   They can quickly review the public reaction, which establishing the positioning for their future development.
2. Advertising provider
   It can help advertising provider choose the desire candidate and decide the compensation for the promoting job.

What feature things it have

Sentiment analysis by NLP by data from (internet comments on social medias, news)

Score that shows reputation (Reputation index/ average sentiment score)

Generate Digital Reputation index

Shows the event that leads the reputation fall.

Number of searching on google, Facebook etc (for popularity)

The hit rates (likes, shares …) of post/ news

Basic data analysis of competitors

Analysis is done on past cases. After we capture the most recent activities of the KOL, give suggestions based on past cases

++ More different kind of data

What is the new/ innovation things

Seems! There are no similar reputation monitoring tools for PR team on KOL/ popstars

(reputation monitoring tools mostly for big company)

(KOL management tools mostly for collaboration with other parties

Notes on the zoom meeting:

1. KOL reputation for PR team
   - An special analysis for [Super fans], eg. Data from fans grp
   - ~ NPS score
   - Post Hit rate, Google search number

Screenshot