SENTIMENT ANALYSIS MODULE

FERMI
FAKE NEWS RISK MITIGATOR

DATA & INFORMATION: The module is trained on publicly available social media datasets using the RoBERTa model to predict sentiment labels such as positive, negative, or neutral. The output includes sentiment scores, providing insights through various visualisations that range from overall sentiment scores displayed in graphs of the collected social media posts to sentiment scores over time and even sentiment scores for individual nodes in a data graph with the collected social media posts.

ADDED VALUE

The FERMI Sentiment Analysis module uses advanced Bidirectional Encoder Representations to analyse social media data, including data graphs of posts with influential nodes spreading disinformation. Although not flawless, it aids LEAs and researchers by enhancing human judgment in combating disinformation, offering insights for crime investigation, prevention, public perception analysis, and temporal sentiment shifts. These capabilities provide an additional intelligence layer, complementing human expertise in fighting crime and improving public safety. In high level, it can be used for:

• **Early Warning Systems based on public opinion analysis**: By analysing social media sentiment, early warning systems can identify negative sentiment patterns enabling authorities to proactively intervene and prevent potential crime trends or threats. This analysis also aids in evaluating public response, managing community relations, and adjusting investigative strategies for more effective law enforcement.

• **Suspect Analysis**: Sentiment analysis module's output may assist researcher in analysing the sentiments expressed. It can help identify potential behavioural patterns, attitudes, or intentions that may be relevant to the investigation. By analysing the sentiments expressed at social media, LEAs can gain insights into their mindset, potential motives, and plans.

• **Social Media Monitoring**: Relevant stakeholders could use sentiment analysis output to monitor social media and identified social media threads (a series of connected posts) related to crimes or potential threats by extracting expressed negative or harmful intentions that may allow LEAs to take proactive measures. On the other hand, social scientists and researchers can gain deep insights into public sentiment regarding various topics and understand how disinformation affects public opinion and emotional responses over time. This can inform studies on the societal impact of disinformation and help in developing strategies to mitigate its effects.

USE

The module reveals sentiments in social media posts through a 4-step process, in details: (1) **Text Preprocessing**: Cleans posts by removing noise and retaining essential content;

(2) **BERT Encoding & Fine-Tuning**: Converts words into multi-dimensional vectors using a pre-trained BERT model, capturing word context for sentiment understanding. Fine-tunes the model for crime investigation sentiment classification;

(3) **Sentiment Classification**: Uses encoded text representations to classify sentiment, applying classification layers on BERT to predict sentiment labels or scores;

and (4) **Sentiment Analysis Output**: Outputs the input data graph (without post text), adding fields for prediction probability (model confidence) and prediction class and label (numeric and textual sentiment representation: 0 for negative, 1 for neutral, 2 for positive).

PRIVACY & ETHICS

FERMI's Sentiment Analysis module ensures data privacy, combats algorithmic bias, enhances the contextual understanding, and ensures relative data utilisation through several measures. These include rigorous privacy policies, transparent data practices, robust security measures, bias evaluations, and strict adherence to FERMI's ethical and legal frameworks. Regular audits and oversight mechanisms are also implemented to ensure compliance with these standards.

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