Generalizable Natural Language Processing Framework for Migraine Reporting from Social Media

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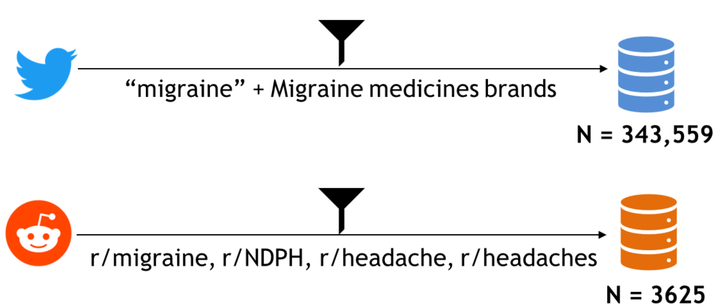
Abstract

- Our objectives:
  - ➢ Verify existence of self-reported migraine chatter on social media
  - ➢ Develop supervised text classifier for detecting self-reported migraine post
  - ➢ Assess the utility of social media for studying cohort-specific challenges.
- Expert-annotated **5750** Tweets & **302** Reddit posts
- Best system F_1 score **0.90** (Twitter), **0.93** (Reddit)
- Analysis show sentiment trends associated with migraine medications

Background

- **Patient-generated social media data** captures daily **habits/interests**[1]
- Social media with NLP improve patient-centered outcomes in cohort studies
- Example: breast cancer, substance use[2,3]
- Studies[4] investigated migraine using social media.
- Unclear if such methods are portable to other social media platforms

Dataset



Methodology

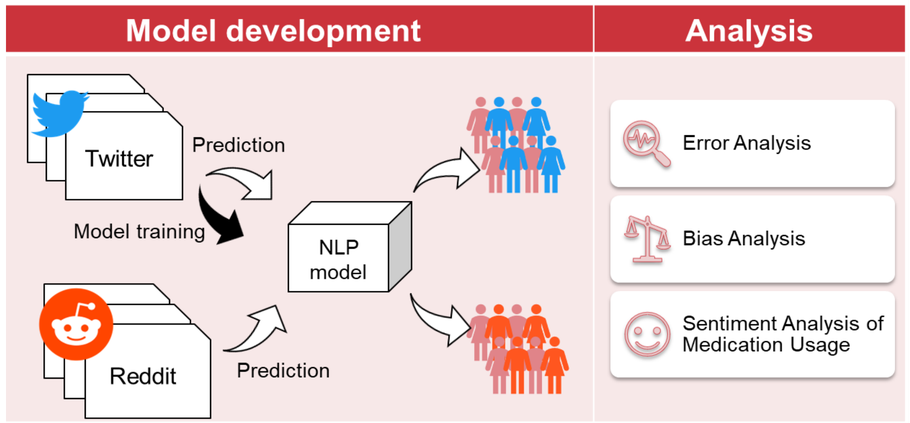


Figure 1: The development framework of system.

Classification Results

Table 1: Classification results of different transformer-based models

Model	Precision	Recall	F_1-score (95% CI)
Twitter Data			
RoBERTa	0.84	**0.95**	0.89 (0.87-0.91)
SciBERT	0.87	0.89	0.88 (0.85-0.90)
BioBERT	**0.88**	0.89	0.88 (0.86-0.91)
BioClinicalBERT	0.85	0.91	0.88 (0.86-0.91)
BERTweet	**0.88**	0.91	**0.90** (0.87-0.92)
Clinical_KB_BERT	0.86	0.91	0.88 (0.85-0.90)
External: Reddit data			
RoBERTa	0.91	**0.95**	**0.93** (0.91-0.95)
BERTweet	0.89	0.90	0.90 (0.87-0.93)

- **Error analysis** show lack of context, ambiguous reference to word "migraine" as primary false positives
- Hard to spot such errors, **even for human annotator**
- Manual **Bias analysis** on 5% of all tweets in test set
- Changes in gender words didn't alter classification results

Medication Sentiments

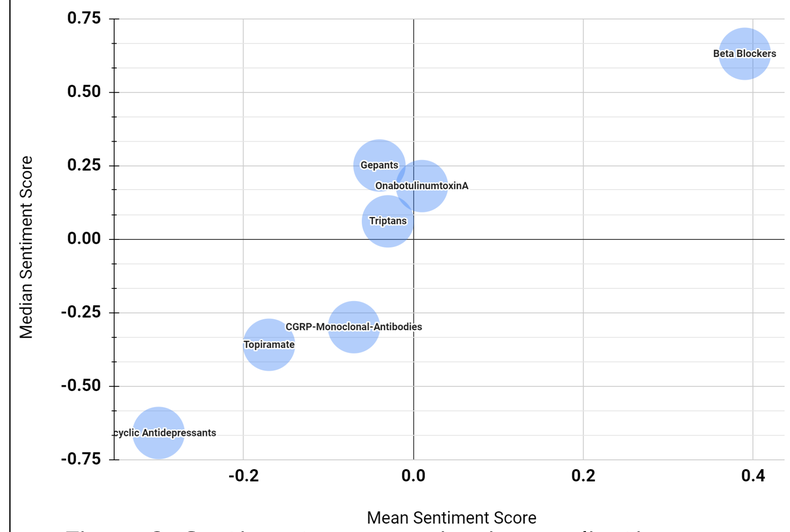


Figure 2: Sentiments across migraine medication groups

Conclusion

Social media can enhance EHRs by providing ongoing data on migraine management.

Developed NLP framework effectively analyzes social media for migraine insights.

References

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