

Facebook Interaction as a Potential Marker of Cognitive Decline

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Introduction

While it has been established that social interaction is essential for physical health and well-being, it is also costly for the individual in terms of its heavy reliance on both mental and physical resources (Hess, 2014). According to a Selective Engagement of Cognitive hypothesis, individuals who experience early cognitive decline symptoms (MCI) might experience:

A limitation in their cognitive resources toward essential everyday functioning and away from other nonessential tasks (Kennedy and Adolphs, 2012).

The cognitive decline over a 4-year period in older adults that is associated with decreases in social interaction or social engagement (Hosking et al., 2017)

Language deterioration because Language deficits occur in early Alzheimer's disease (Taler & Phillips, 2008).

Therefore, measuring the social interaction of elderly people might be a key to the early detection of cognitive decline. With the widening of virtual social network platforms like Facebook, it would be possible to determine comprehensive and accurate measures of an individual's level of (digital) social interaction over several years (Eichstaedt et al., 2018).

Objectives



We aim to study changes in the:

Language use patterns

Social interaction patterns

Posting activity

Psychological changing patterns

Using textual Facebook history in a cohort of early diagnosed dementia patients, with the goal of developing a predictive model by machine learning.

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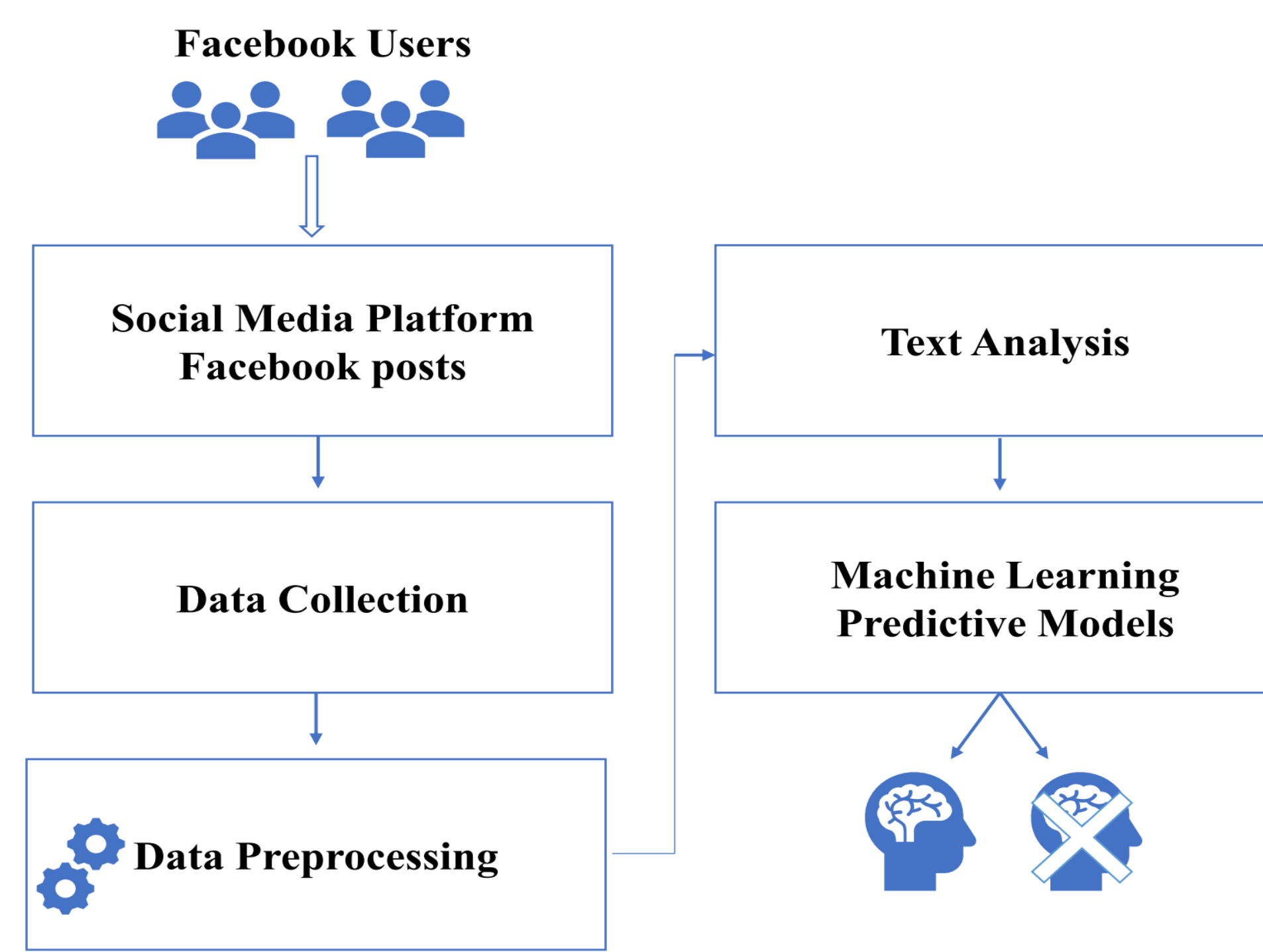
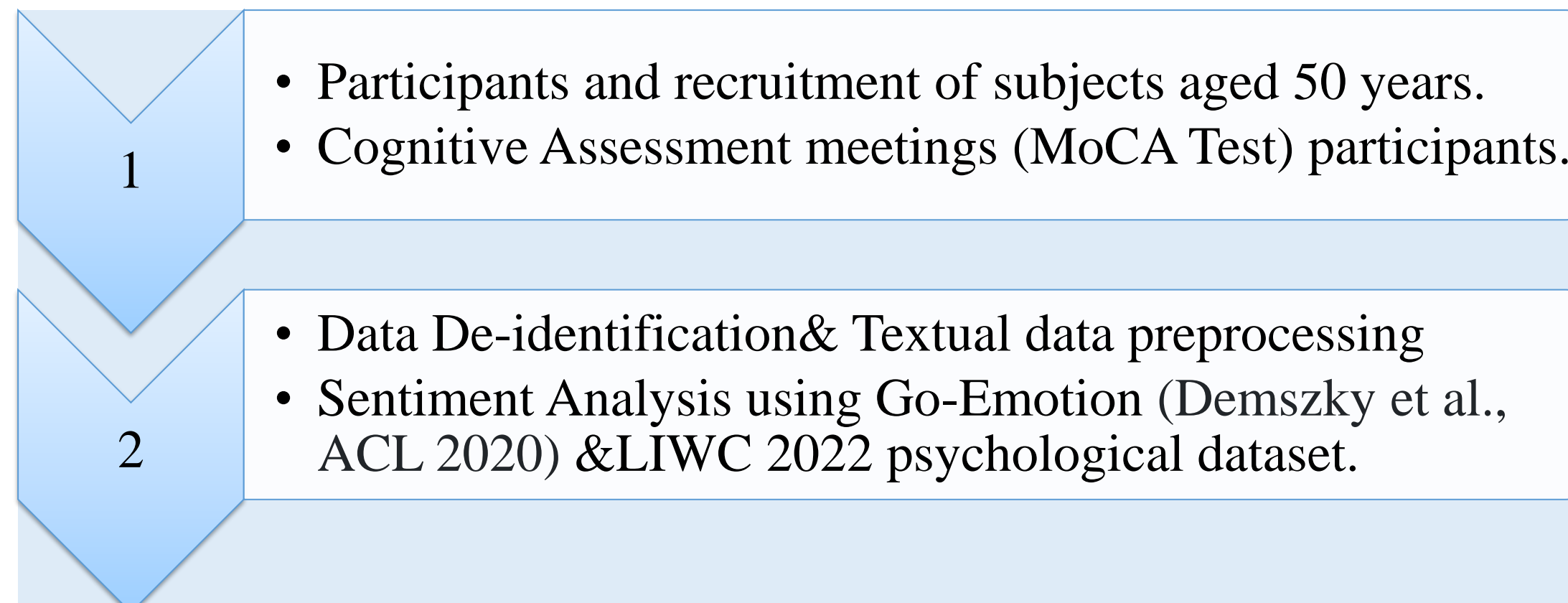
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Qansuwa's LinkedIn

Methodology



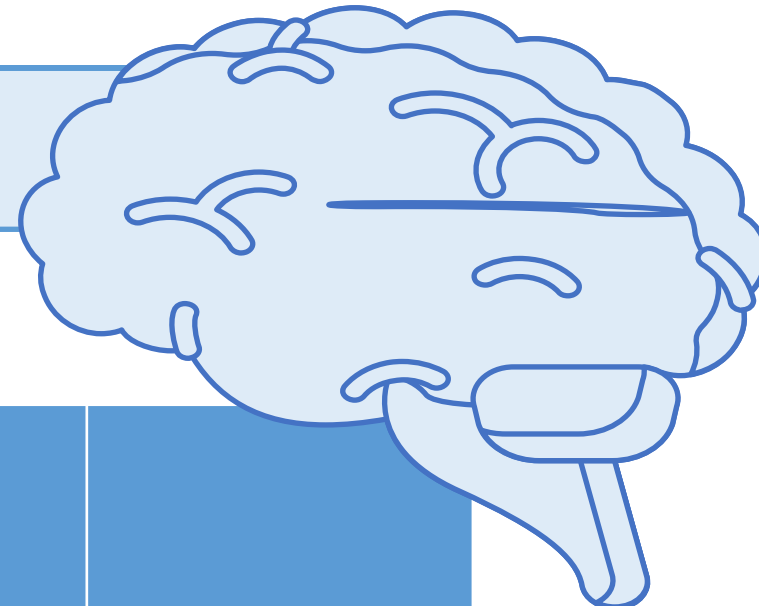
We are working with two datasets: the first one is the Go-emotion dataset, which has three categories (Demszky et al., ACL 2020):

Positive		Negative		Ambiguous
admiration 🙌	joy 😄	anger 😡	grief 😞	confusion 😕
amusement 😂	love ❤️	annoyance 😡	nervousness 😰	curiosity 🤔
approval 👍	optimism 🙌	disappointment 😞	remorse 😞	realization 💡
caring 🤝	pride 😏	disapproval 🗨️	sadness 😞	surprise 😲
desire 🤩	relief 😌	disgust 🤢	embarrassment 😳	
excitement 😄		fear 😨		
gratitude 🙏				

The second one is LIWC 2022 (linguistic inquiry and word count 2022), which is composed of some categories:

Linguistic Dimensions	• EX: Pronouns, Numbers, Conjunctions, Prepositions & negations.
Psychological Processes	• EX: Cognition, Memory, Anger, anxiety, Social behaviors & interpersonal conflict.
Expanded Dictionary	• EX: Cognition, Memory, Anger, Social behaviors, Motives & Mental health
Summary Variables	• EX: Word count, Analytical thinking & Emotional tone.

Initial Results



Scores			
Measures	F1	Recall	Precision
SVM (Go-emotion)	53.6%	66%	65%
SVM (LIWC 2022)	55.85%	61.5%	62%
SVM (LIWC+ Go-emotion)	55.7%	66.7%	67.7%
XGB (LIWC+ Go-emotion)	60.3%	67.3%	67.5%

Conclusion

Facebook data could allow us to investigate the relationship between objective daily activity patterns and objective psychological digital markers of cognitive decline.

We are working to identify the following:

- Which Facebook activity features for each subject can be correlated to cognitive changes?
- Match common diagnostic practices with knowledge acquired from Facebook.
- One of our final goals is to build decision support for a diagnostic framework for practitioners that can be used independently.

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Sponsors

This project is Funded by the Alzheimer Association & GBHI Pilot Award (MS)

