Detecting Signs of Mental Disorders on Social Networks: a Systematic Literature Review

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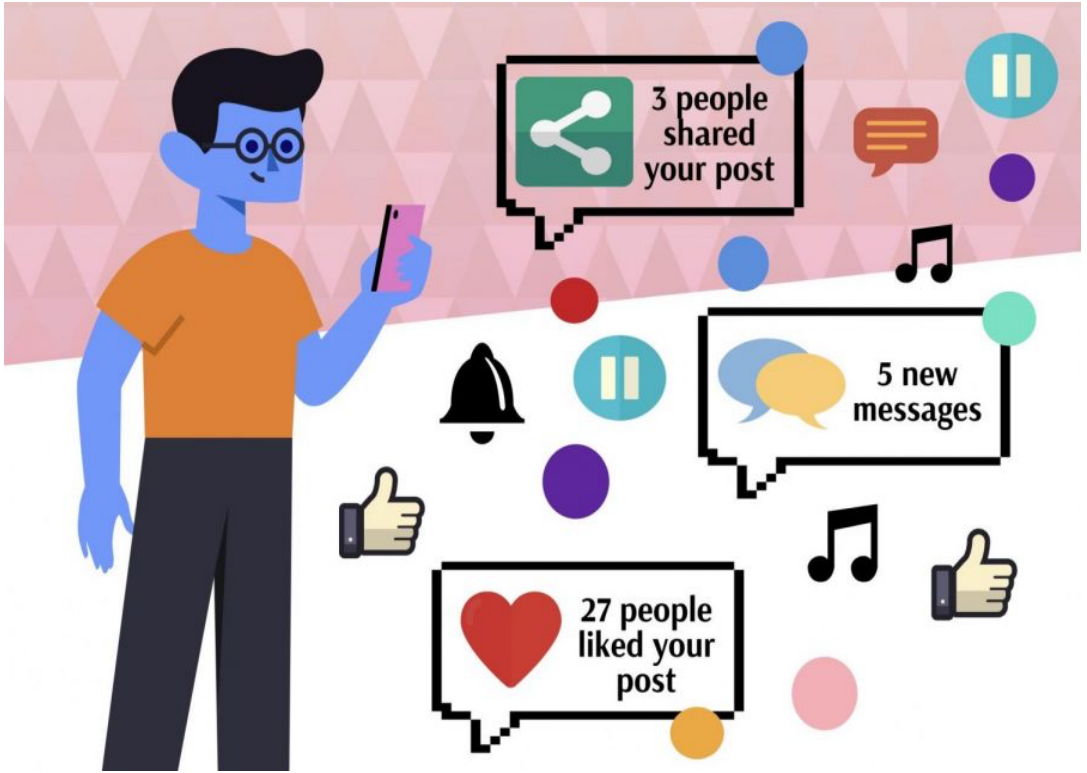
Presenter: Damires Souza, Federal Institute of Paraiba (IFPB), Brazil

About the presenter

Damires Souza is currently a Titular Professor at the Federal Institute of Paraiba (IFPB), Brazil. Damires Souza is the coordinator of some research projects at IFPB. Her main research interests are concerned with the areas of data science, databases, machine learning and semantic web.

Introduction

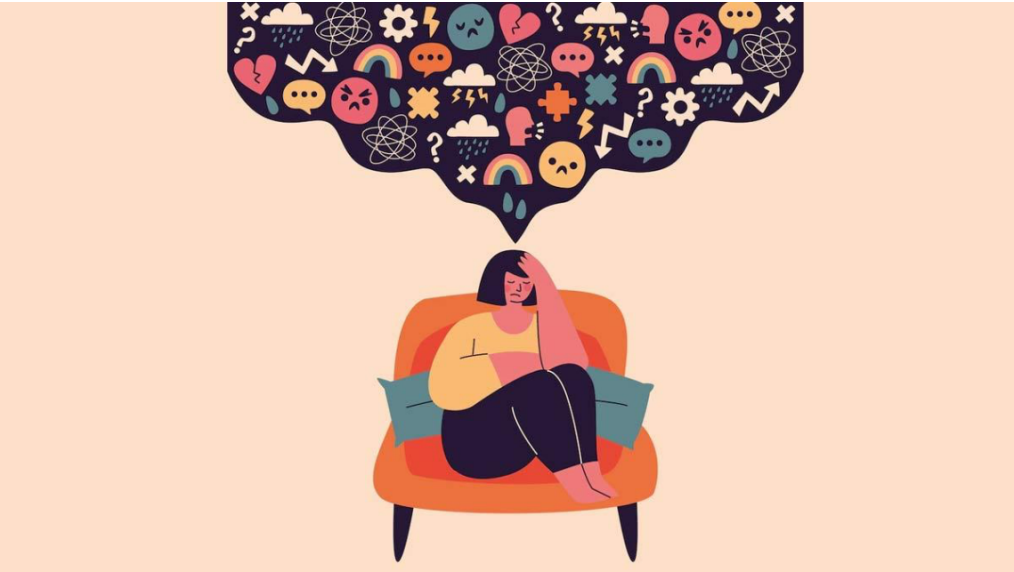
- The use of **social networks** has increasingly gained more and more popularity.
- **Feelings** or **opinions** are continuosly published on these platforms by users
  - Texts, photos, emoticons, vídeos



Font: https://coppellstudentmedia.com/99492/uncategorized/pro-social-media-provides-sense-of-community-open-mindedness/

Introduction

- Some posts may sometimes indicate a propensity to **mental disorders**
  - E.g., **depression**
- Users with mental disorders tend to present **different online behaviors** from other ones



Font: https://www.onlymyhealth.com/social-media-and-its-effect-on-mental-health-1654604837

Research problem

In what ways could a data driven computational solution help to identify feelings or opinions on social network users likely to indicate depression or other kind of mental disease?

RQ: What is the **state of the art** on identifying signs of mental disorders on social networks profiles?

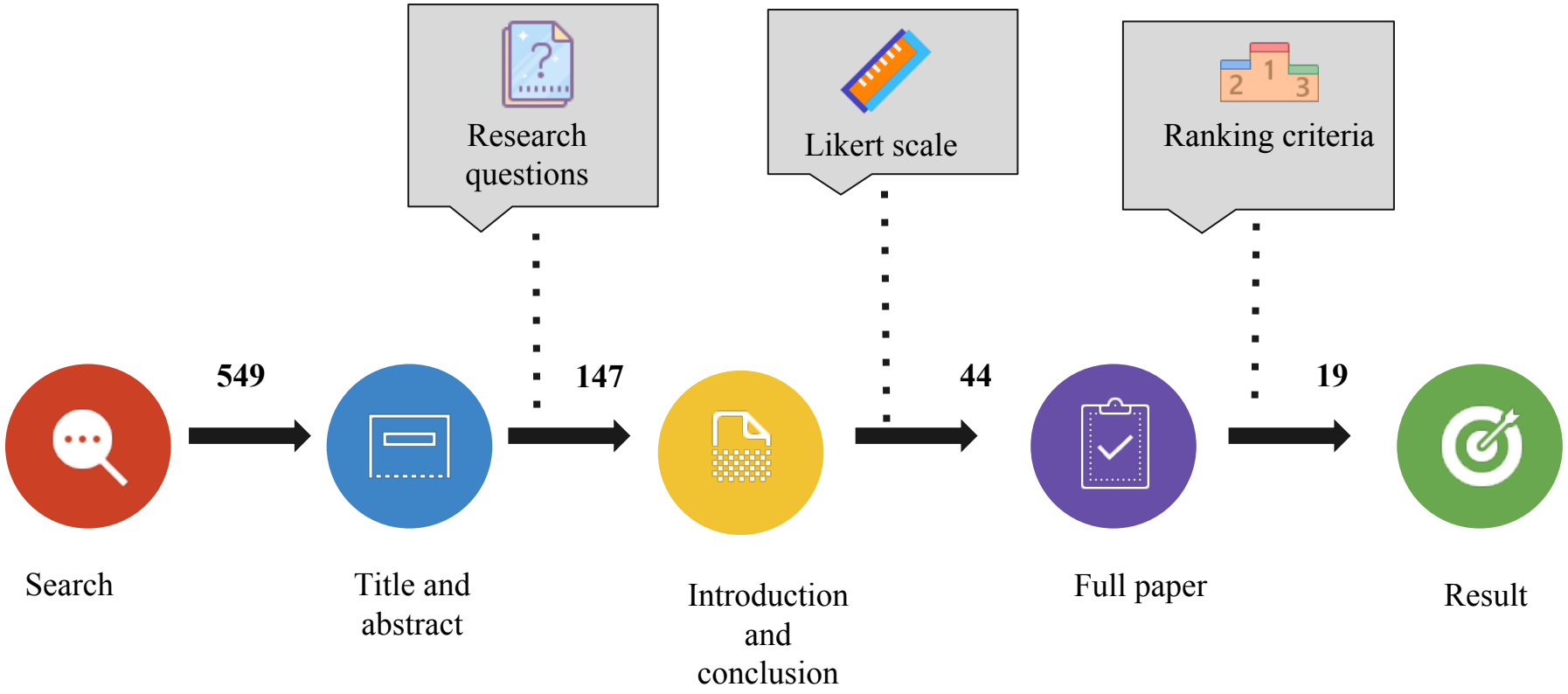
Main contributions

- A **Systematic Literature Review** (**SLR**)
  - Different **types of mental disorders** on social networks
  - Issues and aspects related to **data preprocessing methods** and **labeling strategies** used to build corpora.
  - **Features** important to deal with
  - Research **challenges**

Agenda

- Research methodology
- Results and discussion
- Related works
- Conclusions and further work

Research Methodology



Research Questions

RQ1: What sentiment analysis strategies have been proposed/applied to detect signs of mental disorders on social media posts?

RQ2: Which behavioral characteristics or features have been used most in discovering predecessors of mental disorders?

RQ3: Which languages are most commonly used to build corpora?

RQ4: What data preprocessing strategies have been proposed/employed?

RQ5: What kind of techniques have been proposed/used for post training data labeling? What types of labels have commonly been used?

RQ6: What evaluation metrics have been used to assess the quality of results?

RQ7: What challenges and gaps have been found?

Search definition

(”sentiment analysis” OR ”text mining” OR ”emotion”) AND (”social networks” OR ” social media” OR ”social posts”) AND (”depression” OR ”depressive disorder” OR ”mental disorder”)

- ACM Digital Library
- IEEE Xplore Digital Library
- Science Direct
- Brazilian Journal of Information Systems (iSys)
- Journal of Information and Data Management (JIDM)
- Brazilian Database Symposium (SBBD)
- Brazilian Conference on Intelligent Systems (Bracis)
- Symposium on Knowledge Discovery, Mining and Learning (KDmile)
- Brazilian Symposium on Multimedia and Web Systems (WebMedia)
- Brazilian Workshop on Social NetWork Analysis and Mining (Brasnam)

Inclusion and Exclusion criteria

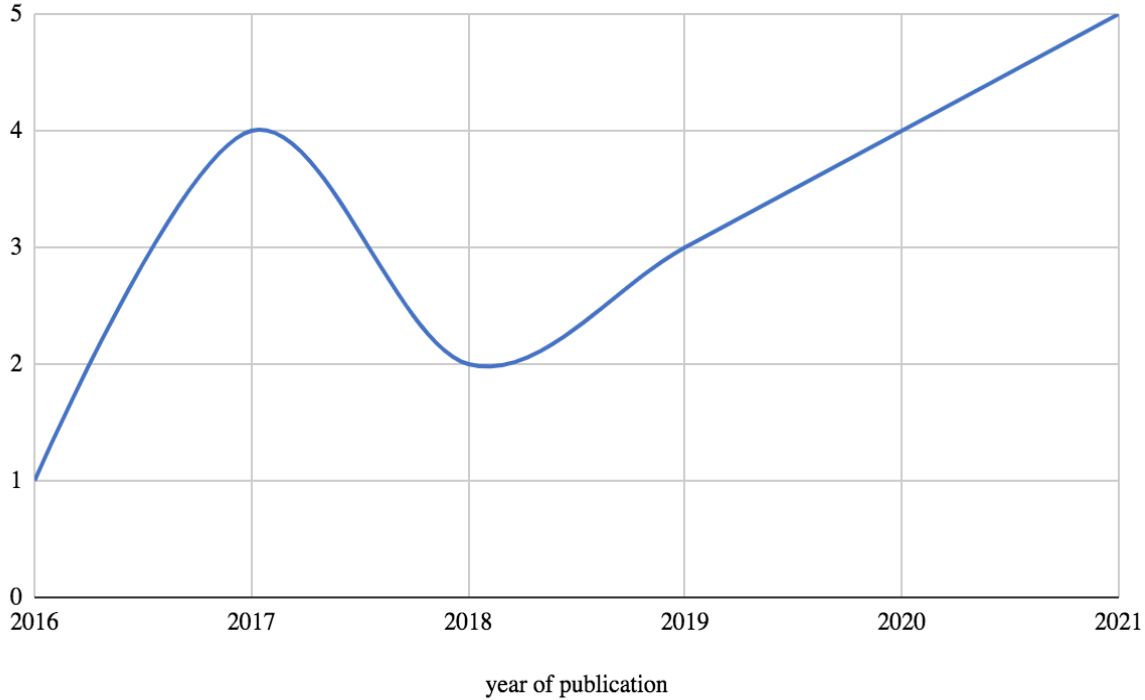
(I1) Works that answer at least one of the research questions
(I2) Primary studies

(E1) Studies without scientific relevance
(E2) Secondary or tertiary works
(E3) Articles published before 2016

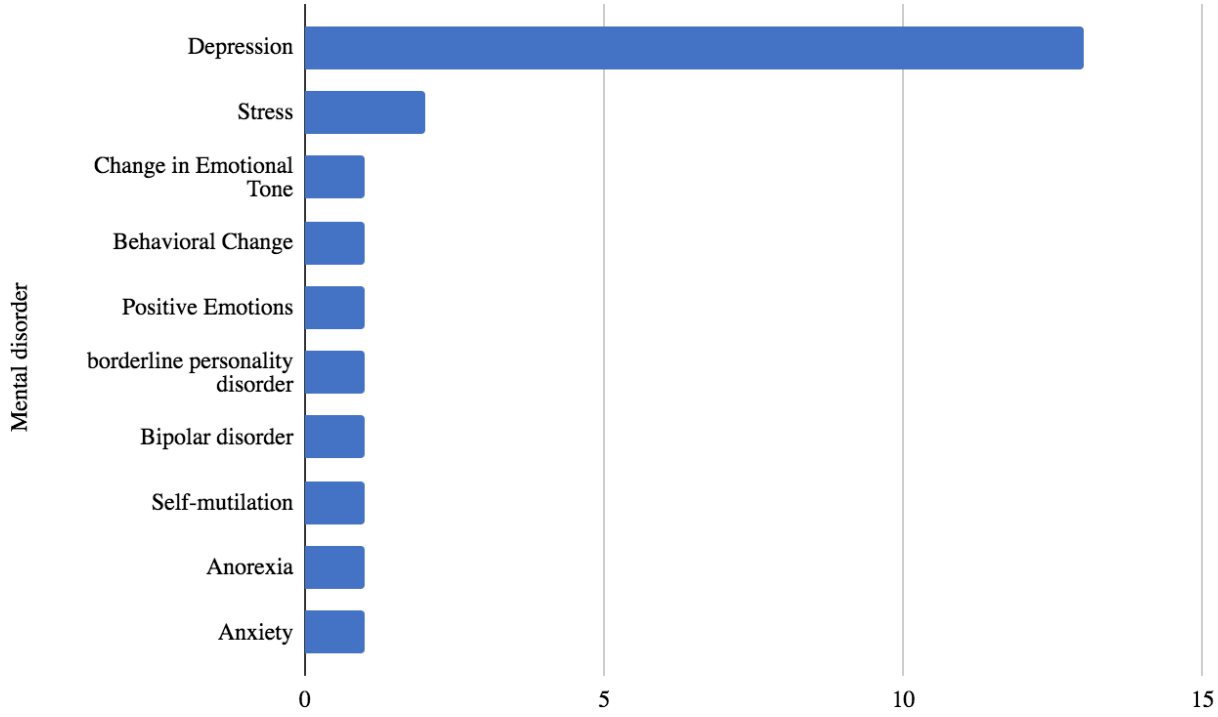
Results: Number of Selected studies

Digital library	Phase 1	Phase 2	Phase 3	Final result
ACM Digital Library	477	100	24	8
IEEE Xplore	34	19	9	6
Science Direct	11	9	2	1
iSys	4	0	0	0
JIDM	7	1	0	0
Bracis	3	2	1	0
Brasnam	7	7	3	2
KDMile	2	2	1	1
SBBD	1	2	1	1
Webmedia	3	2	0	0
Total	**549**	**147**	**44**	**19**

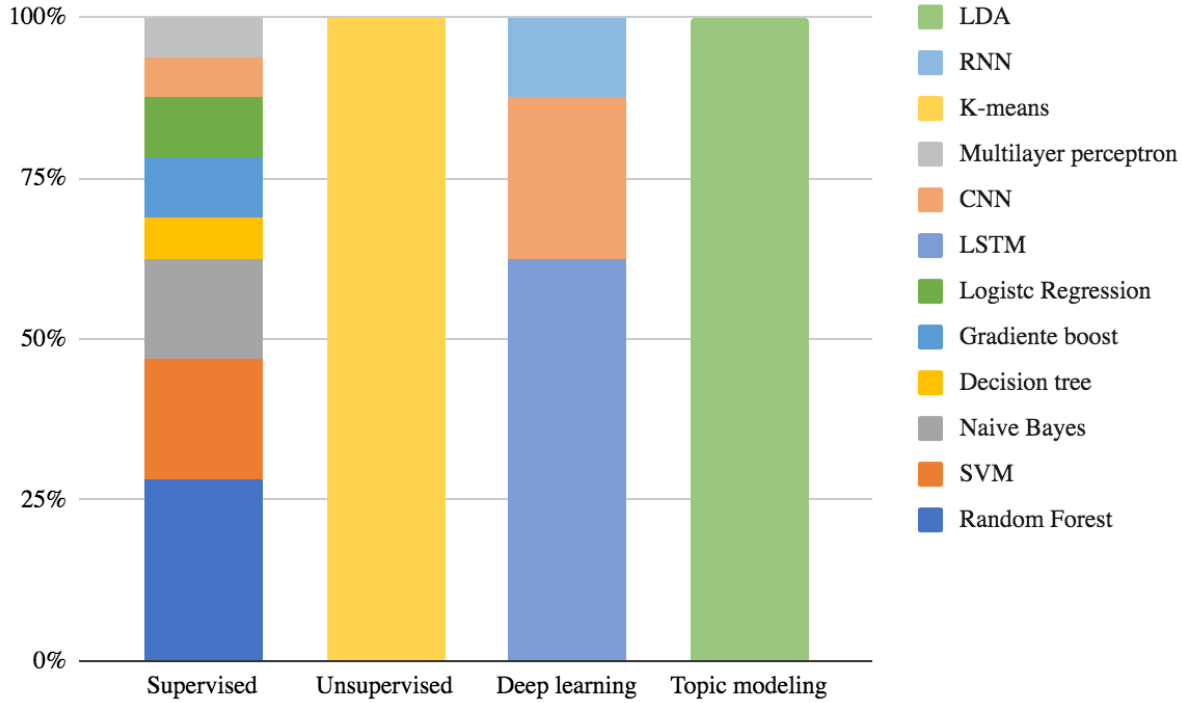
Results: Timeline of gathered publications



Results – Mental disorders



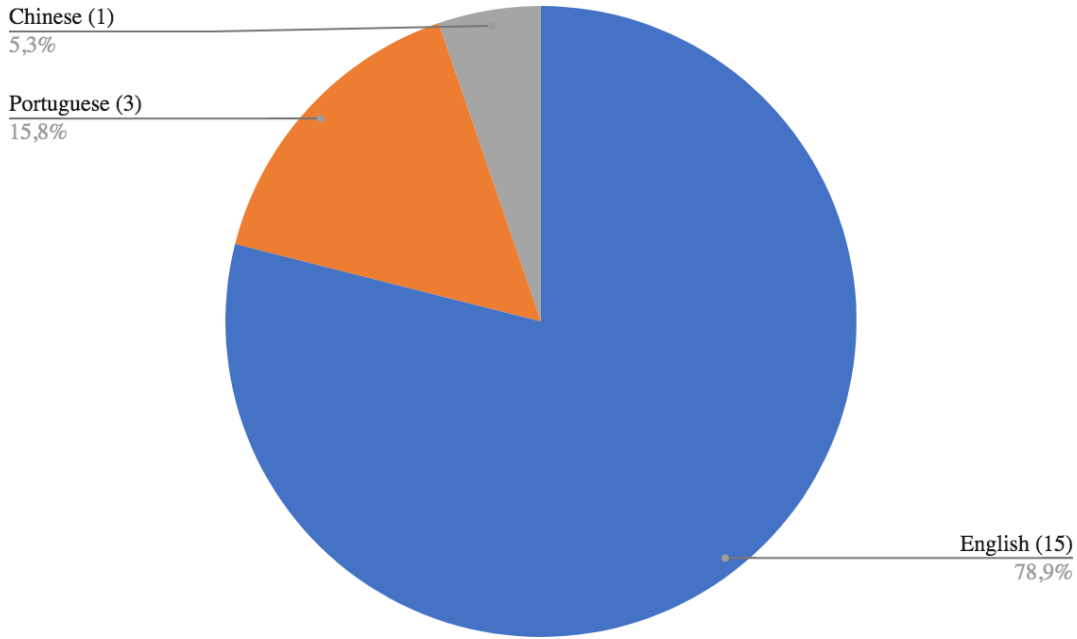
Results - RQ1: Sentiment analysis strategies



Results - RQ2:Behavioral characteristics or features

Category	Feature
Behavioral	Time of posts, engagement, interval between posts, frequency on the networks, insomnia index, number of publications;
Linguistics	Antidepressant drug names, depressive terms, first person pronouns, syntactic features (verb, adverb);
Social network	Number of followers, number of reposts, comment tree, interaction with friends.

Results - RQ3: Languages



Results - RQ4: Data preprocessing strategies

- Removal of stopwords
- Tokenization
- Lemming
- Stemming
- Emojis and emoticons removed or turned into text;
- Anonymization
- TF-IDF

Results - RQ5. Data labeling techniques

- Self-reports
- Manual labeling by experts
- Automated labeling using Textblob

Results - RQ6: Evaluation metrics

- Precision
- Recall
- Accuracy
- F-measure
- AUC

Results - RQ7: Challenges

- Lexicon Dictionaries for the portuguese language
  - Focus on mental disorders
- Training data labeling is still very dependent on reports or on manual notes
- Lack of studies specifically focused on emotions, linguistic and behavioral associated with the timeline of user posts
- Need of more studies using resources such as images, emoticons and emojis to detect signs of mental disorders.

Related Works

Work	Description
Giuntini et al., 2020	- Feelings and emotions to identify depressive mood disorders - Social networks, techniques, emotions and feelings were most used in the discovery of predecessors of depression.
Casani et al, 2020	- Insights into sentiment analysis, ML techniques and labeling techniques with focus on depressive tendencies on social networks.
Skaik and Inkpen, 2020	- Works that used social media texts for mental health surveillance - Attention to depression and suicide - Data collection techniques, features used in training ML models.
Rissola et al., 2021	- Depressive, eating and post-traumatic stress disorders - Feature extraction using topic models and lexical approaches
This work	- **Signs of mental disorders on social networks** - **Methods, data preprocessing** - **Features** - **Data training labeling** - **Challenges**

Conclusions

- SRL presenting insights on works concerned with posts on social media which may indicate propensity for mental disorders.
- Some important points are:
  - The most studied mental disorder is depression;
  - English is the most used language and there are few studies using portuguese;
  - Features such as emoticons, emojis, behavioral characteristics and interaction between users can be further explored;
  - Training data labeling strategies are usually carried out manually.

Further Work

- Development of strategies that can enable more automated labeling of training data
- Construction of a lexical dictionary in portuguese language focused on depression disorder.

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