Modeling self-harm behavior using psychiatric CDM

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INTRO:

- This study aims to develop the prediction model of self-harm behaviors using psychiatric CDM.
- The psychiatric CDM is not well established yet. Thus, we started with psychological evaluation reports as a preliminary analysis.

METHODS

- We identified self-harm or suicidal cases by utilizing admission notes in the Emergency Department at Ajou University Medical Center from 2012-2017.
- Then linked psychological evaluation reports, if they existed.
- Converted them into OMOP CDM V.6.0; quantitative scores to **Observation and Measurement table**, narrative textual data to **Note and Note_NLP table**.
- Identified univariate or latent factors associated with the development of self-harm behaviors, and developed the predictive model.
- With quantitative scores, applied;
  - Principal component analysis
  - Hierarchical clustering analysis
  - LASSO logistic regression model
  - Gradient boosting machine model
  - Random Forest
- With narrative textual data, applied;
  - Natural Language Processing
  - Vanilla RNN (recurrent neural network)
  - LSTM (long-short term memory) RNN

RESULTS

- A total of 663 subjects were identified, 256 psychological reports were linked, and 133 had at least one self-harming event.
- Only 20.3% of concept ID was found from standard vocabularies.
- Analysis with textual data (LSTM: accuracy **76%**) performed better than with quantitative scores (Random forest: accuracy **62%**) for predicting self-harm behaviors.

Converted psychological evaluation reports into OMOP CDM 6.0. as a stepping stone of psychiatric CDM expansion, which worked fine to assess and predict self-harm behaviors. But still a long way to go..

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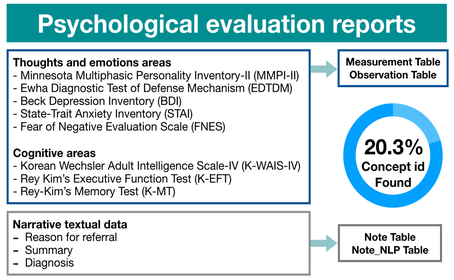

Figure 1. Conversion of psychological evaluation reports to OMOP CDM V.6.0

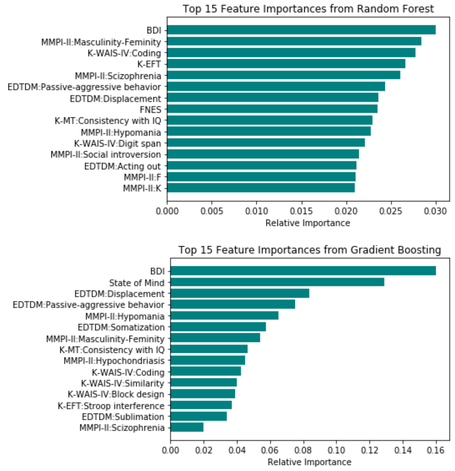

Figure 2. Top 15 feature importances from Gradient boosting machine and random forest. Abbreviation: BDI = Beck Depression Inventory; MMPI-II = Minnesota Multiphasic Personality Inventory-II, K-WAIS-IV = Korean Wechsler Adult Intelligence Scale-IV, K-EFT = Rey Kim's Executive Function Test, EDTDM = Ewha Diagnostic Test of Defense Mechanism, FNES = Fear of Negative Evaluation Scale, K-MT = Rey-Kim's Memory Test, STAI = State-Trait Anxiety Inventory.

(A) Reason for referrals

(B) Summary

Figure 3. Wordcloud for (A) reason for referrals written in Korean and (B) summary of psychological assessment reports

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