

Symptom Severity Identification from Psychiatric Evaluation Notes

Track 2, i2b2 Rdoc Challenge 2016

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Problem Description

Task

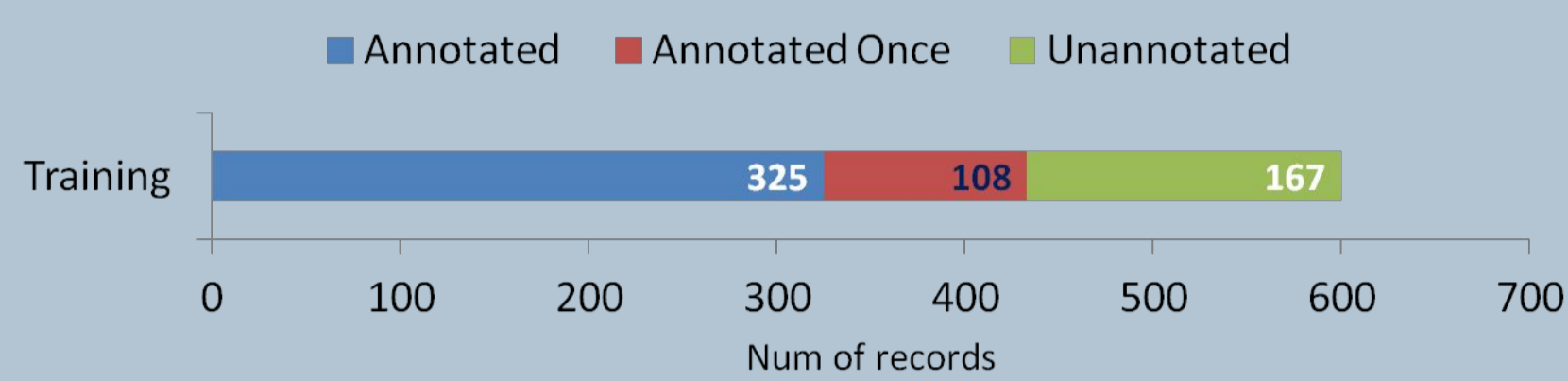
Problem: Understanding textual notes to identify severity of positive valence symptoms

Positive valence symptoms: Response to positive, motivational context. Examples:
• Reward seeking, consummatory behavior – drug abuse
• Reward/habit learning

• **Severity scale:** 0-3 (Absent, Mild, Moderate, Severe)

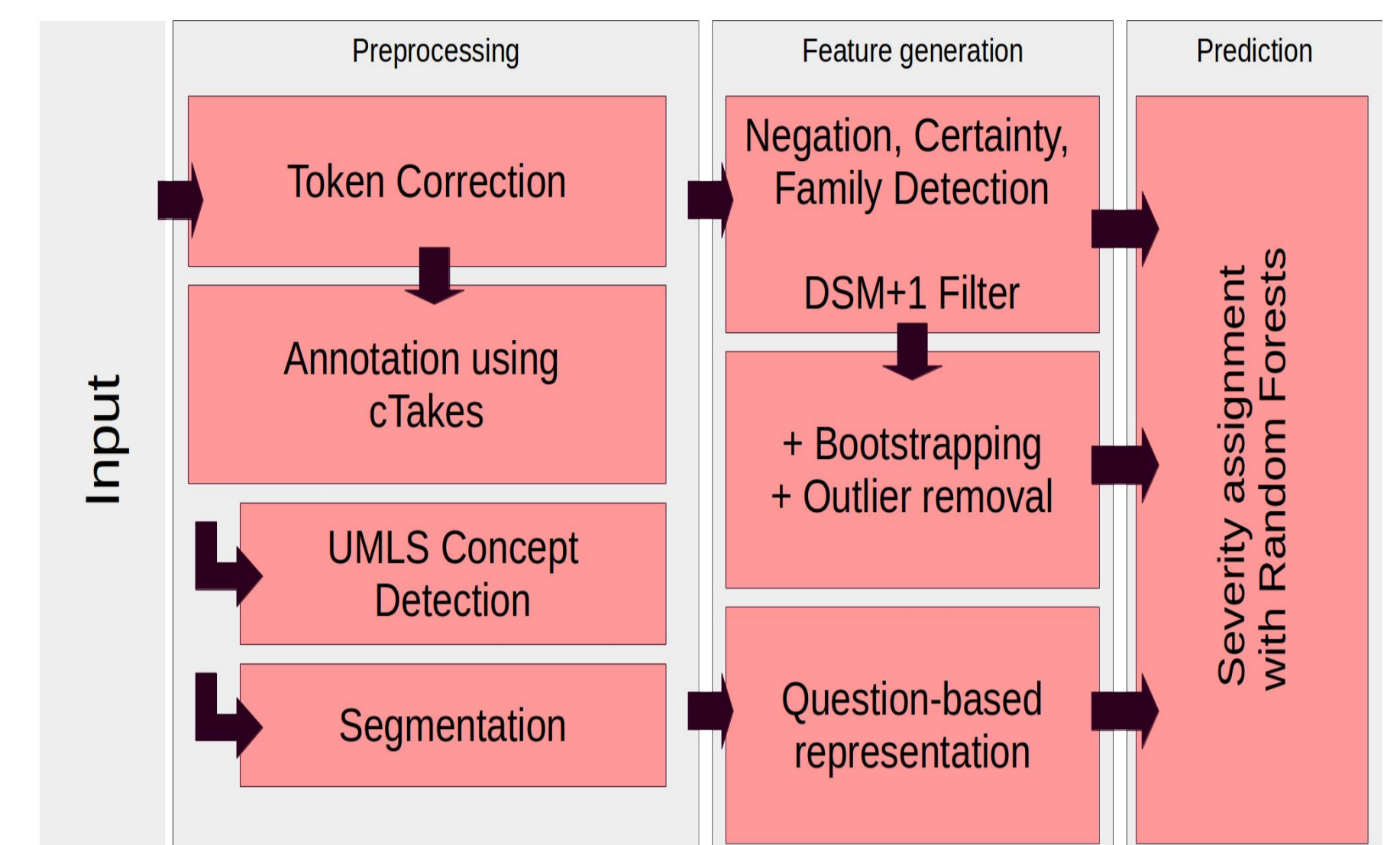
Dataset

• One psychiatric evaluation note per patient



• 216 test documents

Pipeline



Processing Techniques and Results

Sample Evaluation Note

Subject: Patient Initial Visit Note -Identifying Information Date of Service:

5/18/11CPT Code: 90792: With medical services

Sex: Male

Chief Complaint / HPI Chief Complaint (Patients own words)

I'm in pain. I need something for pain. History of Present Illness and Precipitating Events

Chronic pain in both knees since the 2080s. Received percocet at MEDIQUIK but stopped

going, because "they treat you like garbage. It was a nurse practitioner, she didn't do

nothing." Suicidal Behavior Hx of Suicidal Behavior: Yes

If Yes, comment on Timing, Lethality, Impulsivity, Comorbid Intoxication or Psychosis:

tried to slice his wrist "I was young and stupid", back in the 2060s, when my father died. Violent Behavior Hx of Violent Behavior: No

-Psychiatric History Hx of Inpatient Treatment: Yes

"2 or 4 years ago, Brunswick Hotel, a nervous breakdown because of a situation with the

court, charged with AB, which were eventually dropped. Hx of Outpatient Treatment: Yes has been treated for bipolar disorder but denies that he ever experienced a manic episode. Prior medication trials (including efficacy, reasons discontinued):

depakote 500 mg HS

seroquel 300 mg HS

trazodone 100 mg PO QHS

...

Appearance: Physically unkempt

Clothing: Disheveled

Facial Expression: WNL

...

Multi-Axial Diagnoses/Assessment Substance Related Disorders 303.90 Alcohol Dependence

Mood Disorders 311 Depressive Disorder NOS

Axis II (Personality Disorders): DEFERRED

Axis III:

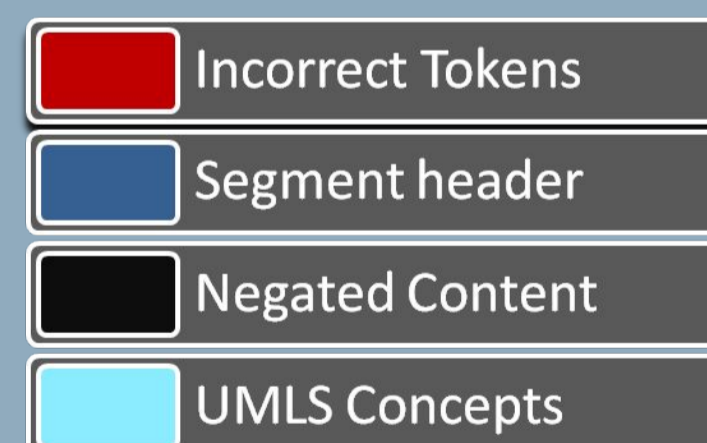
Chronic pain

Orthopedic concerns

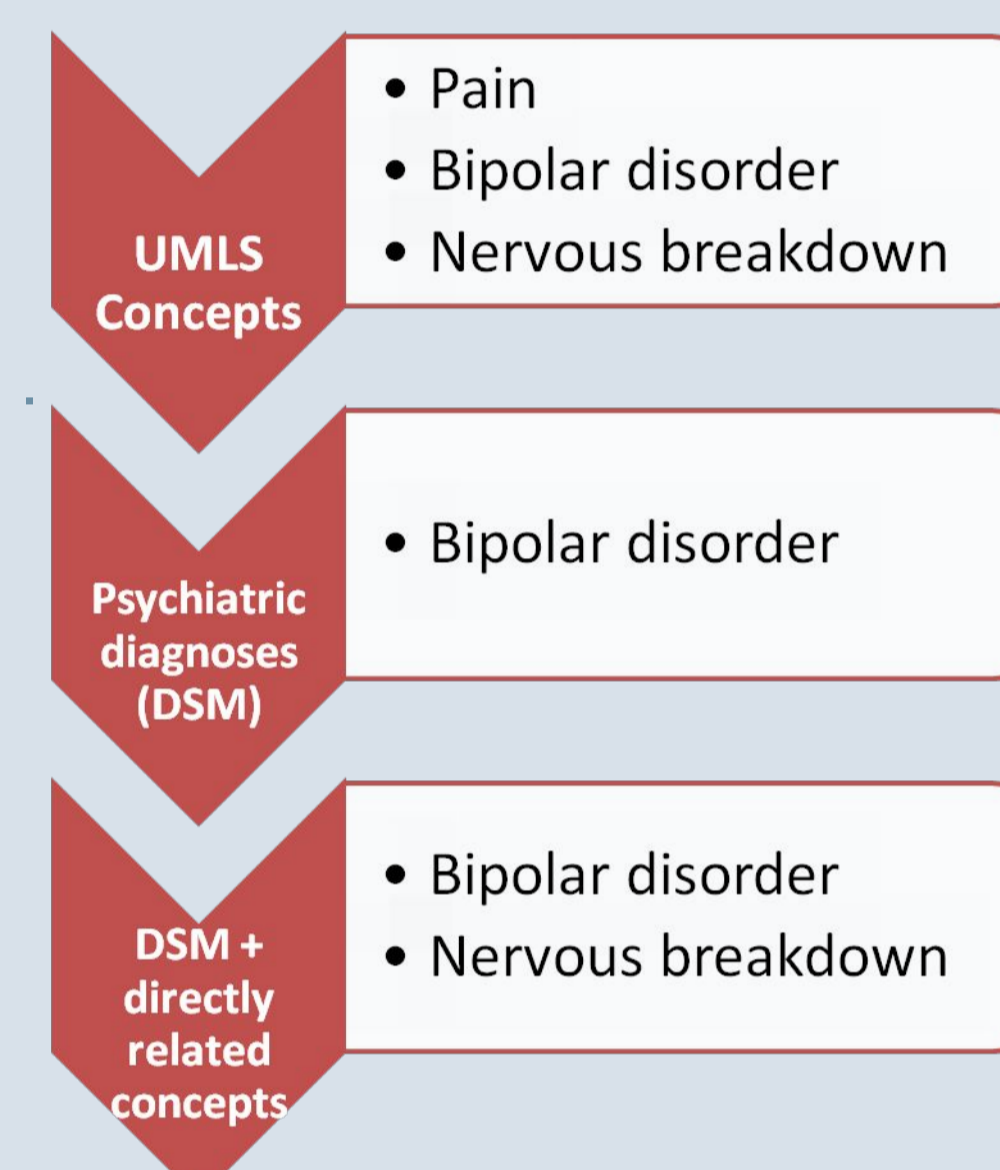
COPD Axis IV: Problems related to social environment;

Problems with primary support group

...



Processing



DSM+1 models:

- Negated sections removed
- Family history flagged
- If unannotated label predicted with confidence >60%: instance bootstrapped to train set
- Instances more representative of other classes than its own removed (5% per class)

QuestionSet models:

- Single token answers: categorical features
- Descriptive answers: DSM+1 concepts

- Random Forests classifiers
- Optimizing macro-averaged inverse Mean Absolute Error:

$$MAE^M = \frac{1}{|C|} \sum_{j=1}^{|C|} \frac{1}{|D_j|} \sum_{x_i \in D_j} |h(x_i) - y_i|$$

Results

Model	Inverse MAE (10 fold CV)	F-score (10 fold CV)	Inverse MAE (Test)	F-score (Test)
DSM+1	78.30% (SD 2.65%)	57.05% (SD 4.58%)	79.52%	61.15%
DSM+1, Bootstrapping, Outlier removal	78.77% (SD 3.61%)	56.70% (SD 6.66%)	80.64%	63.67%
QuestionSets	78.01% (SD 2.63%)	53.57% (SD 5.24%)	79.34%	60.46%

Total Participants:

24 teams, 65 submissions

Summary Statistics:

Min: 52.4597%
Mean: 77.1492%
Median: 77.588%
Max: 86.3019%
Standard deviation: 5.6080%

Conclusions and Discussion

- Similar performances of the three models
- Positive mentions of psychiatric diagnoses and related concepts: good indicator of symptom severity
- Identifying negated content, and family history: key to performance improvement
- Simple approaches work better - Limitation of data set size
- Bootstrapping unannotated data, outlier removal show a small improvement in system performance