NLP-Based Prediction of Medical Specialties at Hospital Admission Using Triage Notes

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Overcrowding in Emergency Departments

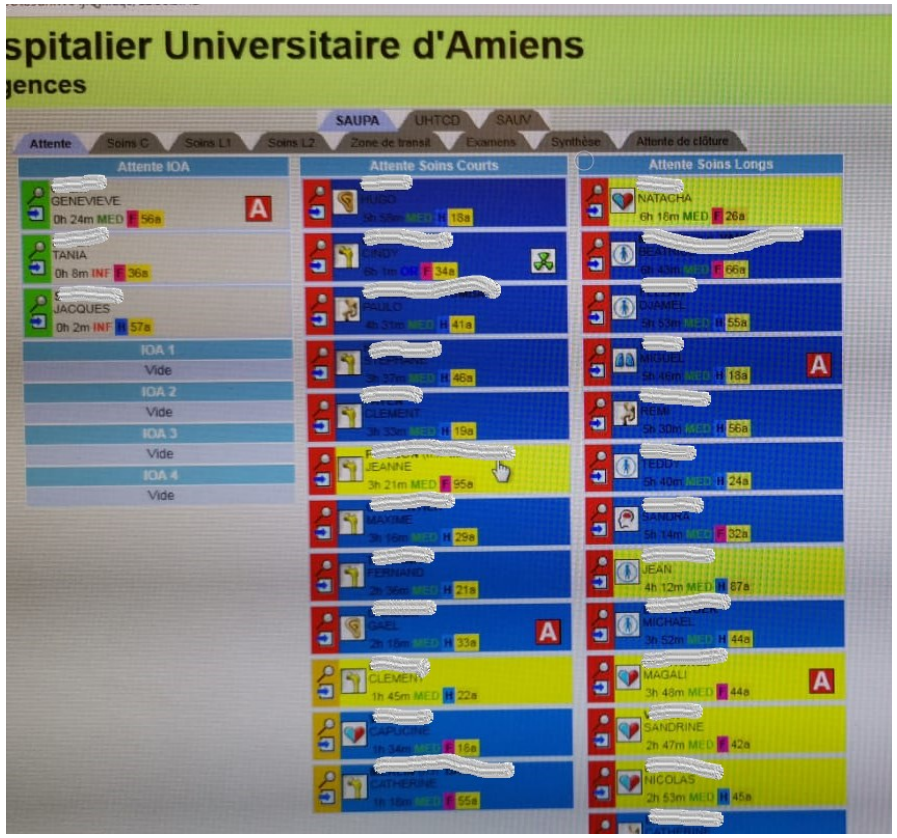


Photo Credits: Dr Émilien Arnaud, CHU, Amiens, France

The Role of Data Analytics

- Early prediction of hospitalization (our earlier work[1]).
- Prediction of medical specialties for patients hospitalized.

[1] Arnaud, E., Elbattah, M., Gignon, M., & Dequen, G. (2020). Deep learning to predict hospitalization at triage: Integration of structured data and unstructured text. *In Proceedings of the IEEE International Conference on Big Data*. IEEE.

Data Description

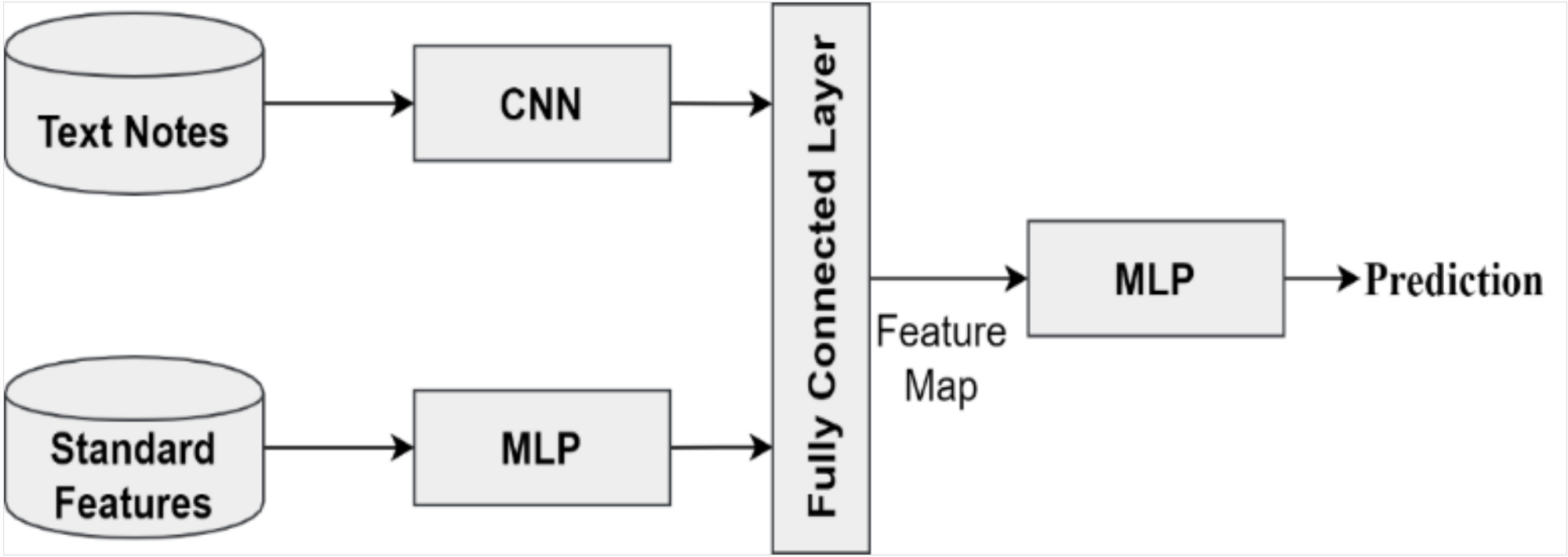
More than 260K ED records over the period of January 2015 to June 2019.

#	Field Name	Type
1	Arrival (Week Day /Hour)	Categorical
2	Gender	Categorical
3	Origin	Categorical
4	Arrival Modlaity	Categorical
5	Accompaniers	Categorical
6	Family Status	Categorical
7	Waiting Modality	Categorical
8	Reason for Encounter	Categorical
9	Circumstances	Categorical
10	Age	Numeric
11	Oxygen Flow	Numeric
12	Heart Rate	Numeric
13	Respiration Rate	Numeric
14	Systolic Blood Pressure	Numeric
15	Diastolic Blood Pressure	Numeric
16	Pain Scale	Numeric
17	Temperature	Numeric
18	Oxygen Saturation	Numeric
19	Capillary Blood Glucose	Numeric
20	Capillary Blood Hemoglobin	Numeric
21	Bladder volume	Numeric
22	Capillary Blood Ketones	Numeric
23	Breath Test of Alcohol	Numeric
24	Nurse Triage Scale	Numeric
25	Nurse Notes	Text
26	Psychiatric History	Text
27	Surgical History	Text
28	Medical History	Text

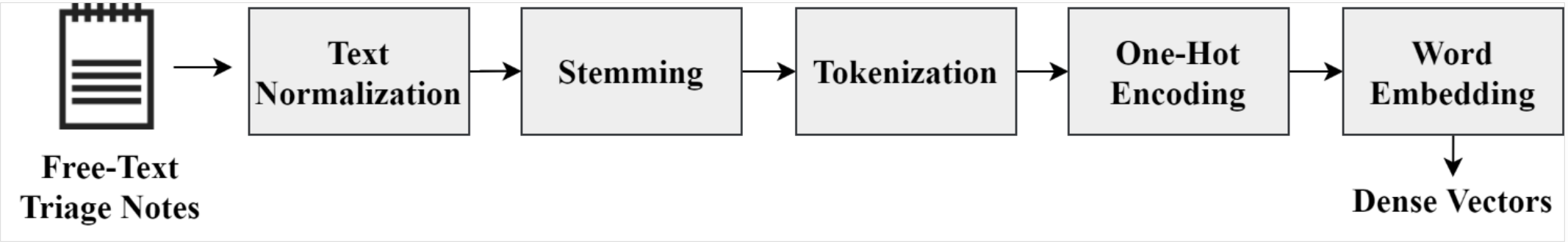
Data Description (cont'd)

Specialty / Label	Hospitalization %
Surgery / CHIR	19.7%
Short-Term Hospitalization Unit / UHCD	42.4%
Medical Specialty / MED	33%
Other	4.9%

Approach Overview



Text Preprocessing Pipeline



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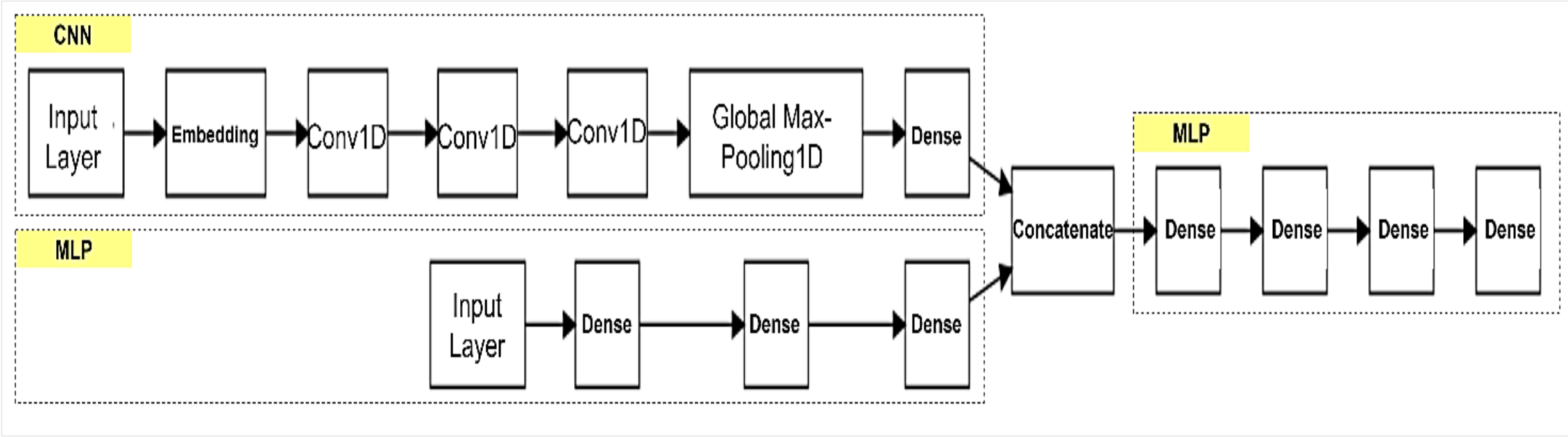
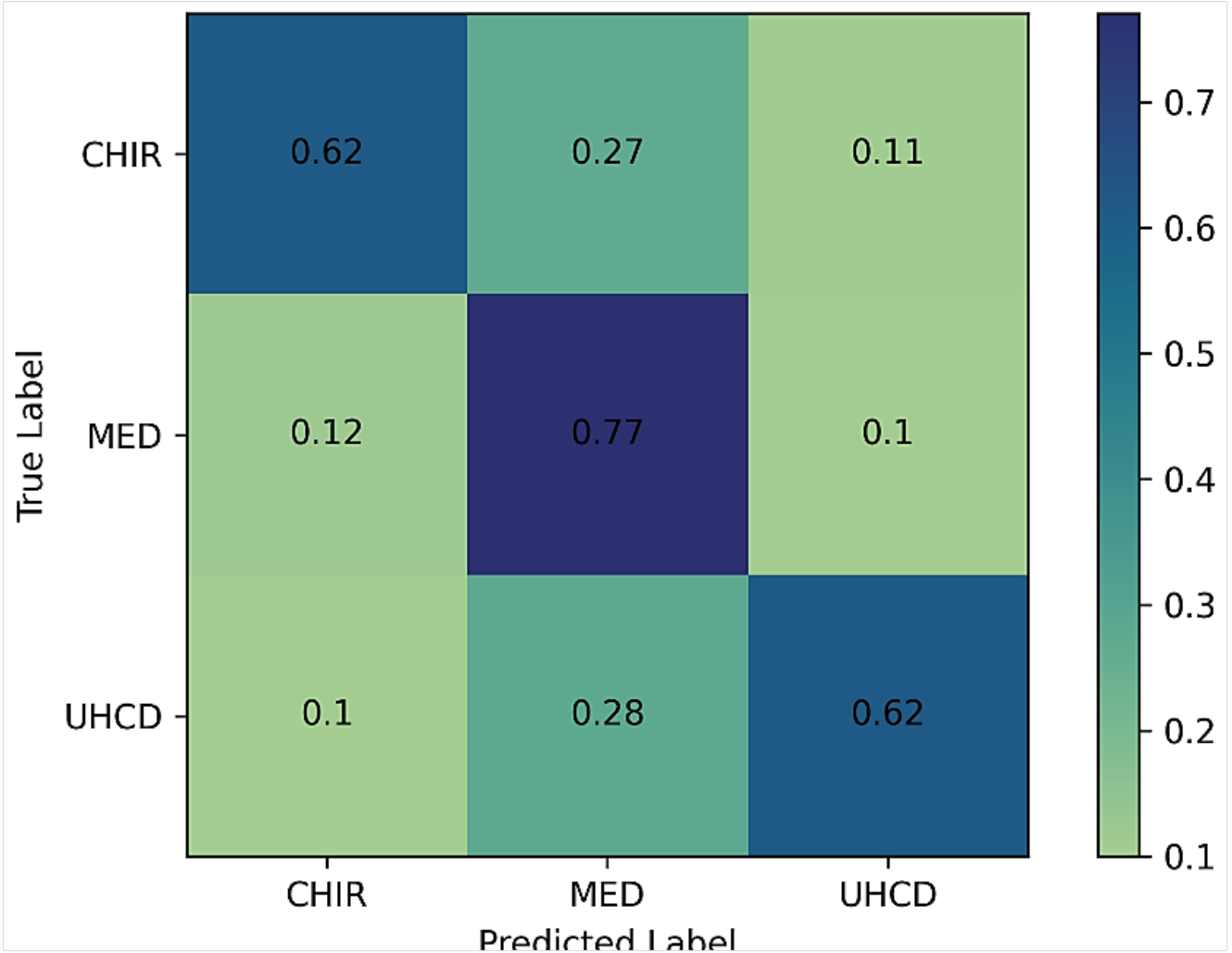
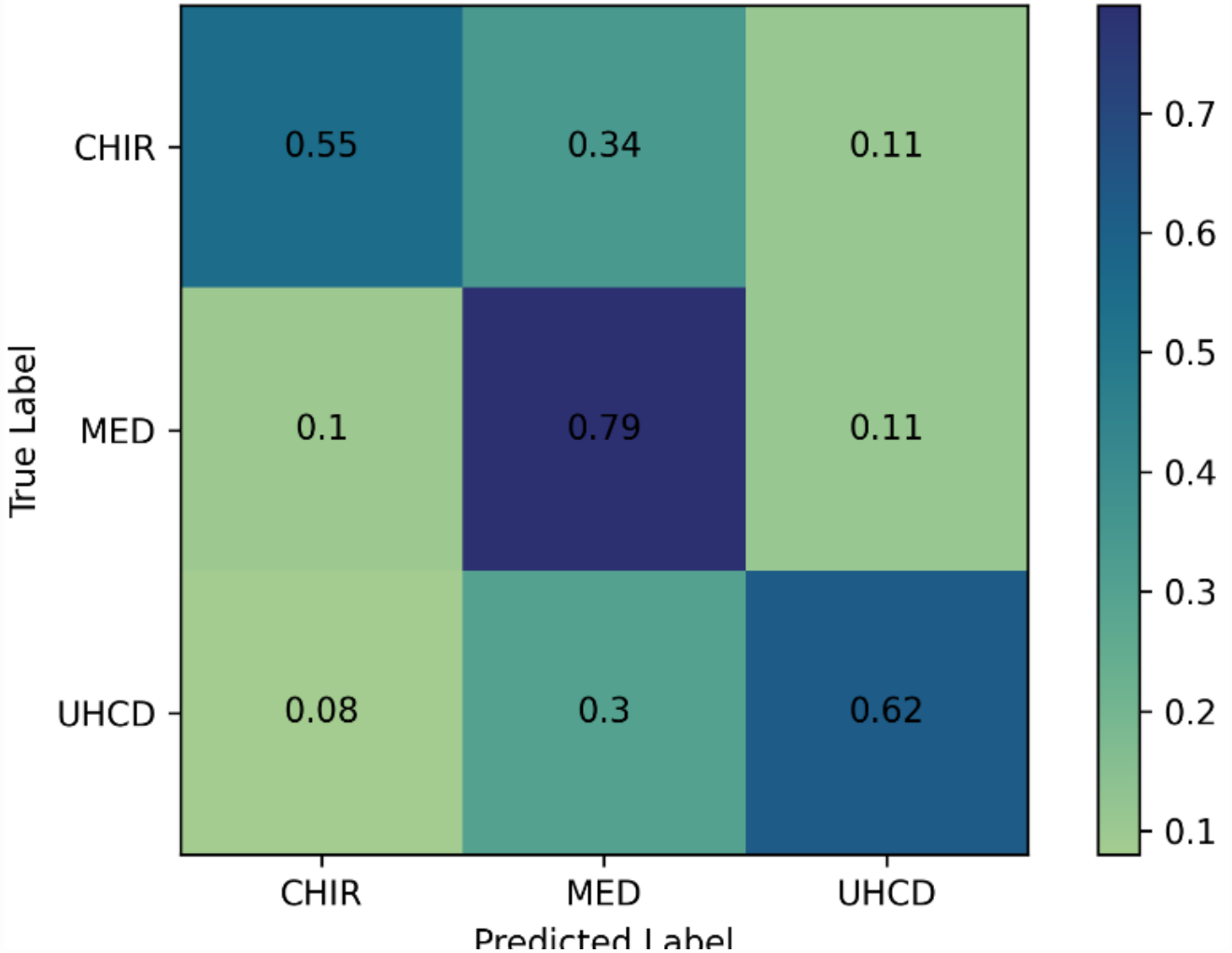
Model Architecture



Results (3-Fold CV)



Results (Model performance without text notes)



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Conclusions

- ML-based approaches could be utilized to help provide an early prediction of medical specialties.
- The significance of our approach is the effective integration of standard data with free-text triage notes.
- Our empirical results robustly confirmed the positive impact of using such textual notes on the model performance.

Thank You!