Assessing the Severity of Health States based on Social Media Posts

Shweta Yadav[‡], Joy Prakash Sain[‡], Amit Sheth[§], Asif Ekbal[*], Sriparna Saha[*], Pushpak Bhattacharyya[*],
[‡] Wright State University, OH, USA [*]Indian Institute of Technology Patna, India
[§]University of South Carolina, SC, USA

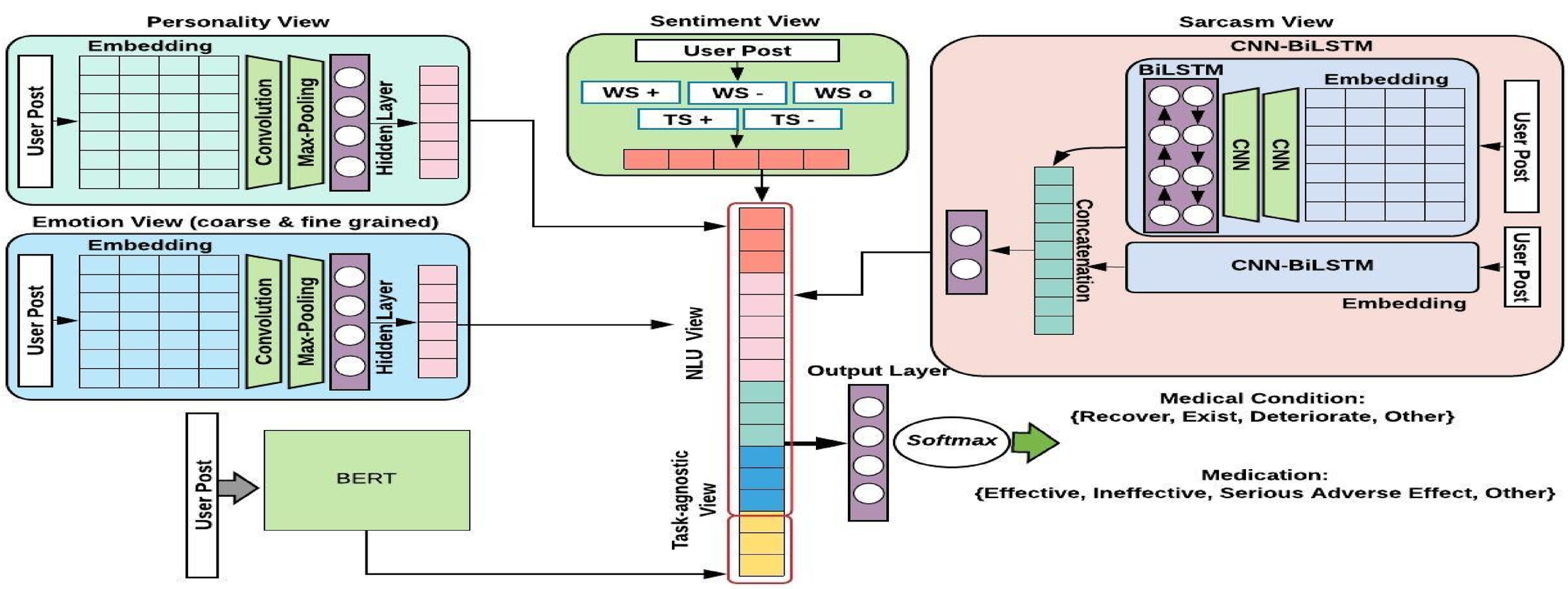
Introduction

- This study aims to inspect the efficacy of different aspects of Natural Language Understanding (NLU) to identify the severity of the users health state in relation to two perspectives (tasks) (a) Medical Condition (i.e., Recover, Exist, Deteriorate, Other) and (b) Medication (i.e., Effective, Ineffective, Serious Adverse Effect, Other) in online health communities.
- We propose a multi-view learning framework that allows the integration of different semantics captured from social media texts to support several aspects of NLU required by the health severity assessment task.
- A demonstration of the effectiveness of various views such as emotion, sarcasm, personality, and sentiment on the diseases/disorders which provides the complementary information for assessing the severity of health states.

Exemplar Description of Tasks and Dataset

Task 1: Medical Condition		**Task 2: Medication**	
Health Blog-post	**Class-labels**	**Health Blog-post**	**Class-labels**
"my high resolution CT scan came back normal...I'm doing better after a long, breathless blue journey"	Recover	*"I think the plaquenil is helping- been on it for almost 3 months"*	Effective
"Been having eye problems ...lots of swelling redness and eye discharge."	Exist	*"I have been on Hizentra for almost a year...I don't seem to be getting sick as much or as bad (yay) but things areen't normal, that's for sure"*	Ineffective
"It's been just over three months and I'm actually feeling worse! my IgG levels are rising from 766 to 1423, but I don't feel good..."	Deteriorate	*"I was given propranolo for migraine associated vertigo. I've only taken 5 mgs fir last 2 nights and I've had bad nausea since starting it, I want to know if I can just stop taking it now without any problems "*	Serious Adverse Effect
"Not everyone uses or likes Facebook. Let's remember there are so many who are looking for information and support on this cvid forum.– Our voice can help Other"	Other	*"Hello ladies, I am curious if anyone has any knowledge or experience with kidney symptoms resulting from using either Gammagard or other IG therapy brands"*	Other

Architecture of Proposed Methodology



Experimental Results

Models	Techniques Used	Medical Condition			Medications		
		Precision	Recall	F-Score	Precision	Recall	F-Score
Baseline 1	BERT	72.70	73.15	72.89	86.64	87.55	86.81
Baseline 2	BioBERT	72.42	72.30	72.28	86.68	86.97	86.76
Baseline 3	MTL [8]	66.71	64.33	65.5	85.33	81.90	83.58
Proposed Approach	NLU based Multi-view Learning	75.52	80.25	77.45	89.52	89.91	89.57

Index	View	Medical Condition	Medications
(1)	All	77.45	89.57
(2)	- Emotion (coarse)	75.08	87.32
(3)	- Emotion (fine)	75.44	88.61
(4)	- Sarcasm	77.10	86.82
(5)	- Personality	74.91	87.66
(6)	- Word-level Sentiment	74.54	85.94
(7)	- Target-specific Sentiment	75.85	85.27

Performance comparison of our proposed model with the baselines methods (L) and ablation study (R) on both the tasks

Conclusion and Future Works

- This research explore a new dimension of social media to identify the severity of a user's health state by analyzing different medical aspects (such as medical condition and outcome of treatment).
- We have proposed a deep learning model leveraging various NLU views such as emotion, sarcasm, personality, and sentiment along with the textual content for classifying the medical forum posts. The evaluation reveals that combining the content view to context views is an effective way to boost the classification performance.
- In the future, we would like to explore the other facets of a user's health state like 'Consequence of a treatment' and 'Certainty of a diagnosis'.