Towards Verifying Results from Biomedical NLP Machine Learning Models Using the UMLS: Cases of Classification and Named Entity Recognition

Joan Byamugisha[1], Waheeda Saib[1], Theodore Gaelejwe[1], Asad Jeewa[1], Maletsabisa Molapo[1]

[1]IBM Research Africa

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Background

Current biomedical NLP ML tools are not explainable, resulting in low clinical adoption.

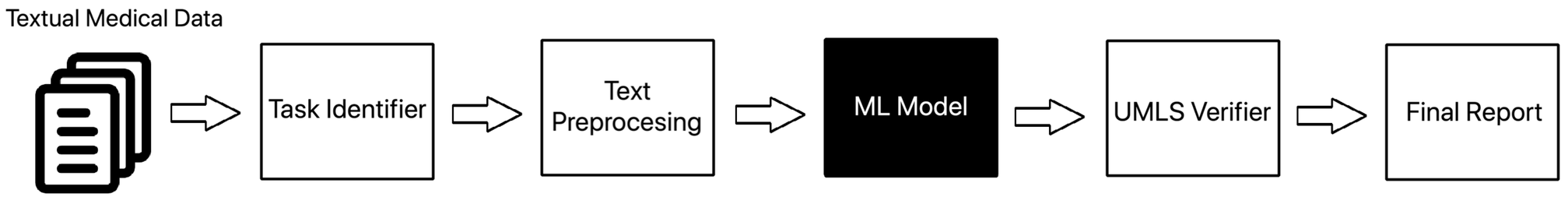
Motivation

The UMLS, with trusted healthcare knowledge, can be used to verify ML model outputs.

Objectives

To develop a model-agnostic UMLS-based verifier that retrospectively evaluates ML model outputs

Proposed UMLS-Based Architecture



Classification

- NCI terminology mappings produce ICD-O Topographical Ranges

Models

Input	1964 breast cancer pathology reports
	Most salient 1400 TF-IDF features
Model	Multi-task CNN, hard-parameter sharing
Output	ICD-O topography codes

Named Entity Recognition

- 16 terminologies mappings produce NER tags

Models

Input	Breast & colon cancer pathology reports
Model	Character-level & FastText word embeddings
	Hunflair: Pre-trained BiLSTM-CRF
Output	Disease entities

Results

- Inverse relationship between number of inconsistent entities and model confidence
- Verifier categorises annotations which are correlated directly to model confidence

Future Work

- Evaluate on additional biomedical texts
- Consider more biomedical NLP tasks
- Apply verifier and model simultaneously to improve accuracy on-the-fly

Email: asad.jeewa@ibm.com