Presentation Abstract

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Title: Automated Outcome Classification of Emergency Department CT Imaging Reports

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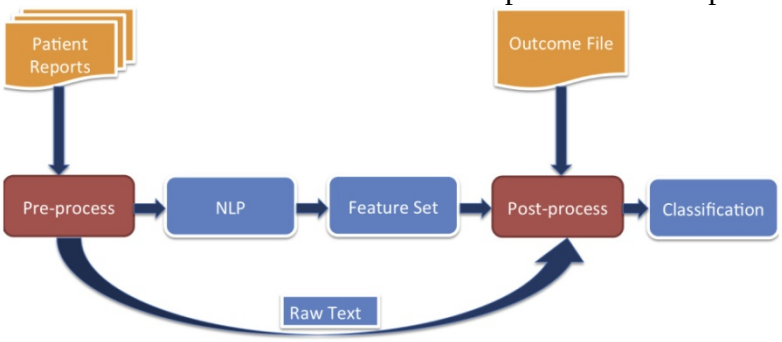
Abstract: **Background:** Reliably abstracting outcomes from free text electronic medical records remains a challenge. While automated classification of free text has been a popular medical informatics topic, its evaluation in real-world clinical settings has been limited. The two main approaches are linguistic (natural language processing) and statistical (machine learning). We have developed a hybrid system for abstracting CT reports for specified outcomes.
Objectives: To measure performance of a hybrid natural language processing (NLP) and machine learning system for automated outcome classification of ED CT imaging reports. Our hypothesis is that such a system is comparable to medical personnel.
Methods: We performed secondary analysis of a prior diagnostic imaging study on 3,710 blunt facial trauma victims. Staff radiologists dictated CT reports as free text, which were then de-identified. A trained data abstractor manually coded the reference standard outcome of acute orbital fracture, with a random subset double-coded for reliability. The dataset was randomly split evenly for training and testing. We used training patient reports as input to the Medical Language Extraction and Encoding (MedLEE) NLP tool to create structured output containing standardized medical terms and modifiers for certainty and temporal status. Findings were filtered for low certainty and past/future modifiers, and then combined with the manual reference standard to generate decision tree classifiers using data mining tools WEKA 3.7.5 and Salford Predictive Miner 6.6. Performance of decision tree classifiers was evaluated on the testing patient reports.
Results: The performance of machine learning alone was comparable to prior NLP studies (precision=0.95, recall=0.93, f-score=0.94) and the combined use of NLP and machine learning shows further improvement (precision=0.97, recall=0.97, f-

score=0.97). This performance is similar, or better, to that of medical personnel in previous studies (our own abstraction kappa was 0.97).
Conclusion: A hybrid NLP and machine learning automated classification system shows promise in coding free-text electronic clinical data. Future work will use other real-world data sets to demonstrate consistent performance, potentially streamlining data collection for clinical research and performance improvement.



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