

On Mental State Detection and Tagging in Nursing Records

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1 Abstract

Staff at geriatric care facilities compile nursing records, containing information from patients' vital signs over treatments suggested by doctors to comments about patients' interactions with nursing staff, their families and other patients. The analysis of these reports may yield important clues to possible health risks in the life of the elderly. In addition to that, nurses' comments on patients' emotional well-being can be interpreted to examine the connection between physical and emotional state of health. However, it is difficult for service providers to analyze the records in addition to the daily burden of geriatric care.

In the hope of facilitating such analysis, the authors propose to apply emotion detection and classification strategies to enable efficient discovery of mental health status changes.

2 Introduction and Motivation

The nursing records at hand are compiled by a number of nurses at the Sakurano-mori geriatric care facilities. Nursing records are kept for each patient, and new entries will be added several times a day by different nurses. Entries are between a number of keywords to several sentences in length, with contents ranging from purely numerical data like blood pressure values over comments about patients' diets or prescriptions to nurses' comments on the way patients interact with each other, the nursing staff or their families.

The latter type of entry frequently consists of nurses giving accounts of conversations with patients, recording patients' utterances and their manner of speaking, as reproduced in Fig. 1. As opposed to the majority of nursing record entries, which comment mostly on physical health issues, these entries seem to hold valuable clues as to how patients feel about themselves and their therapy.

Since numerous accounts seem to prove the strong effect emotions have on physical health (e.g., [4]), we believe it will be worthwhile to keep track of the mental condition of patients alongside their physical condition.

At the moment, invaluable observations about changes in patients' emotional well-being may be lost in the unmanageable flood of nursing records. We hope to present in this paper a strategy which will facilitate the detection of "emotional entries", thus enabling geriatric care providers to predict and react to mental health status changes.

3 Our Proposal

Our goal is to automatically identify nursing record entries with emotional content and determine whether the

Example	Tag
朝食摂取後、すぐに居室へ戻られている。歯磨きしトイレに行かれた後、ベッドに臥床し休まれている。「あの人がいるから、ホールには居たくない。テーブルを叩いたり怒鳴ったり、おっかない。」と話されている。	☹
Patient went back to her room directly after breakfast. After brushing her teeth and using the bathroom, she rested, confined to bed. She said: "I don't want to be in the hall when those people are there. They bang on the table with their fists, they yell, it's scary!"	
「下に行きたい」との訴えあり。〇〇さんに連れて行っていただく。デイルームにてゲームをされ過ぎた様子。帰って来ると「友達いっから、楽しいんだ～」と笑顔で話されていた。	😊
Patient said "I want to go downstairs". She took Ms. XY along and they played a game in the day room. Upon coming back, patient said with a smile: "It's so nice to spend time with your friends!"	
BP103/52 P77 KT35.9 両眼の腫れ (+)	😐
[blood pressure, pulse and body temperature values] swelling on both eyes (+)	

Figure 1: An example of emotion-tagged nursing report entries.

entry can be classified as positive, negative or neutral. To enable us to do so, we propose the following strategy:

- Create a training set out of 5 of the 120 nursing records at hand by manually assigning one of the three emotion categories to each entry. Compare Fig. 1 for an example.
- Attempt to create "author profiles" for three of the nurses in our data set and create from each a simple grammar for nursing records, allowing us to build specific models for each author's writing style and preferred vocabulary.
- Evaluate several machine-learning techniques to automatically estimate emotion categories for nursing reports. We are planning to start with the conditional random fields (CRF) technique as used by [1], who designed an algorithm to detect and classify emotional expressions based on parts of speech and positional information (see 4).

4 Related Work

[2] created an emotion word corpus using 1200 sentences from the *Japanese-English Emotion Dictionary*, a collection of dialog sentences. The sentences were manually tagged and assigned to one of eight emotion categories, Joy, Hate, Love, Sorrow, Anxiety, Surprise, Anger, and Respect. We deemed these eight categories too fine-grained for our current purposes, but may extend our emotion tag set at a later point in time. To this end, we are also evaluating the POMS (compare [3].) mood state rating scale.

[1], building on Minato's findings and the emotion word corpus, proposed several methods to automatically detect and classify "emotional expressions". A first, simple approach uses Minato's corpus and an emotional polarity correspondence table (cf. [5]), which assigns values ranging from -1 to 1 according to the polarity (negative, positive) of emotion words and to the intensity of the emotion. A second approach exploits positional and part-of-speech information and the conditional random fields (CRF) machine learning technique to estimate the categories of emotion words.

While we expect Matsumoto's method to be applicable to our problem, too, there are differences in both the requirements and the data set used: Matsumoto processed dialog sentences, where the point of view can always be attributed to the speaker. Nursing record entries, on the other hand, are more ambiguous. Although they frequently contain parts of dialogues between nurses and patients, they also incorporate opinions of the nurses, doctors or the patients' families. Separating patient's opinions from this sort of "noise" will be one of the biggest challenges when adapting Matsumoto's algorithm.

5 Conclusion and Future Work

We have proposed in this paper an application of emotion classification techniques to extract clues to patients' emotional well-being in a collection of nursing records. Due to the unique nature of the nursing records, previously used algorithms, as presented in, e.g., [1] will have to be adapted to the data set. Furthermore, extensive preprocessing will be necessary to isolate patients' emotions and clearly set them apart from nurses' comments on physical health issues. The future will see the execution and evaluation of the strategy outlined in this paper.

Since the research presented in this paper is being conducted alongside [6]'s efforts in applying physical health topic detection techniques on the same set of nursing reports, we hope to combine the two strategies in the future. Ideally, we want to extract event chains of physical health topics and automatically identify the emotions accompanying them, in order to improve the early detection of risks both for the physical and mental health of geriatric patients.

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