Using Speech Recognition and Social Media to Diagnose Mental Illness

Lynne Diep
Computer Science Department, Jack Baskin School of Engineering
University of California, SantaCruz

Introduction

Using artificial intelligence in the medical field is no shock, but what if we use these same methods in diagnosing mental illness? Current algorithms in use are rated in their performance in the table below, and have helped doctors determine medical illness effectively. Surely the same contemplative process the machine goes through can help those in the psychiatric field. Here we will discuss the incorporation of artificial intelligence in a psychological setting. The results of this research will provide more insight on better determining mental illness to those who seek professional help in specific circumstances.

Classifier	Performance	Transparency	Explanation	Reduction	Missing data handling
Assistant-R	Good	Very good	Good	Good	Acceptable
Assistant-I	Good	Very good	Good	Good	Acceptable
LFC	Good	Good	Good	Good	Acceptable
Naive Bayes	Very good	Good	Very good	No	Very good
Semi-naive Bayes	Very good	Good	Very good	No	Very good
Backpropagation	Very good	Poor	Poor	No	Acceptable
k-NN	Very good	Poor	Acceptable	No	Acceptable

Conclusion

- RNN is able to translate an output to a decoded transcription that displays proper sentences easier to read and understand.
- With SVM, the ability to analyze an image post's textual descriptions and "tags" the user has associated with is possible, and presents doctors more evidence when diagnosing a patient.
- Using features like color, texture, shape and SIFT when analyzing an image can uncover impactful data that would of otherwise been overlooked by human means.
- There is more research to be done in order for AI to successfully diagnose patients with mental illness. Important for AI to consider all types of mental illness and its various symptoms because not all cases are the same.

References

[1] M. De Choudhury et al. "Connecting content to community in social media via image content, user tags and user communication". In: *2009 IEEE International Conference on Multimedia and Expo*. June 2009, pp. 1238–1241.

[2] Awni Y. Hannun et al. "Deep Speech: Scaling up end-to-end speech recognition". In: *CoRR* abs/1412.5567 (2014). arXiv: 1412.5567.

[3] Adam Sadilek and Henry Kautz. "Modeling the Impact of Lifestyle on Health at Scale". In: *Proceedings of the Sixth ACM International Conference on Web Search and Data Mining*. WSDM '13. Rome, Italy: ACM, 2013, pp. 637–646. ISBN: 978-1-4503-1869-3.

Contact Details

Lynne Diep
University of California, Santa Cruz
Email: lytdiep@ucsc.edu
Phone: (345)234-4567

Speech Recognition

- The core of a speech recognition system is a Recurrent Neural Network, or RNN trained to ingest speech spectrograms and generate English text transcriptions.
- Each utterance a user makes is a vector of audio features.
- Spectrograms will act as the features, which denote the power of the frequency bin in the audio frame at time.
- The goal of our RNN is to convert an input sequence into a sequence of character probabilities for the transcription.
- RNN algorithm can learn to generate readable character-level transcriptions.

The results of this algorithm is satisfactory, as it transcribes the input into a readable, define output. In the table below, an example of transcription is given. [2]

RNN Output	**Decoded Transcription**
what is the weather like in bostin right now	what is the weather like in boston right now
prime miniter	prime minister
arther n tikets for the game	are there any tickets for the game

Table 1: Transcription Example

Text and Image Analysis on Social Media

- Support Vector Machine, or SVM is a part of machine learning and is used to analyze textual descriptions and classify them using predetermined set of terms.
- Phrases will be analyzed and specific weights will be added to them to determine the significance.
- As each word in the patient's phrase is analyzed and assigned weights, the total weight is a part of a determining factor in a psychiatrist's diagnosis.
- The correlation between text analysis and actual health statistics is not inaccurate either, so it does provide stable evidence when diagnosing an individual as seen in Figure 1.[3]

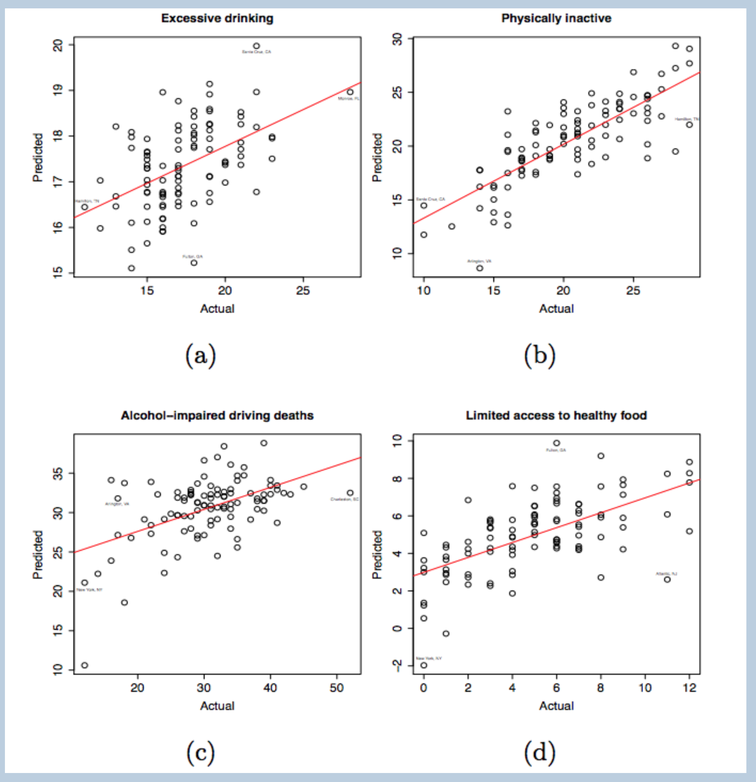

Figure 1: Predicted vs. actual health statistics value

- Using features like color, texture, shape and Scale Invariant Feature Transform (SIFT) when analyzing an image can uncover impactful data that would of otherwise been overlooked by human means.
- Image analysis is able to pinpoint specific shapes within the image, like a syringe or bottle.
- Texture is another strong feature; users are able to edit their photos and change the tone of it, as some filters correlate with mental illness as seen in Figure 2.[1]

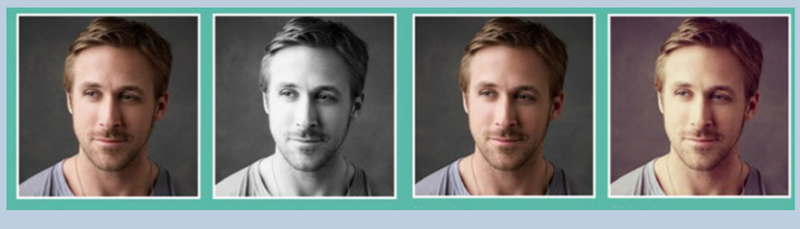

Figure 2: Inkwell - correlates with depression (left); Valencia - most likely used by healthy individuals(right)