

# A NEURAL MODEL FOR PREDICTING DEMENTIA FROM LANGUAGE



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# DEMENTIA PREDICTION VIA SPEECH ANALYSIS



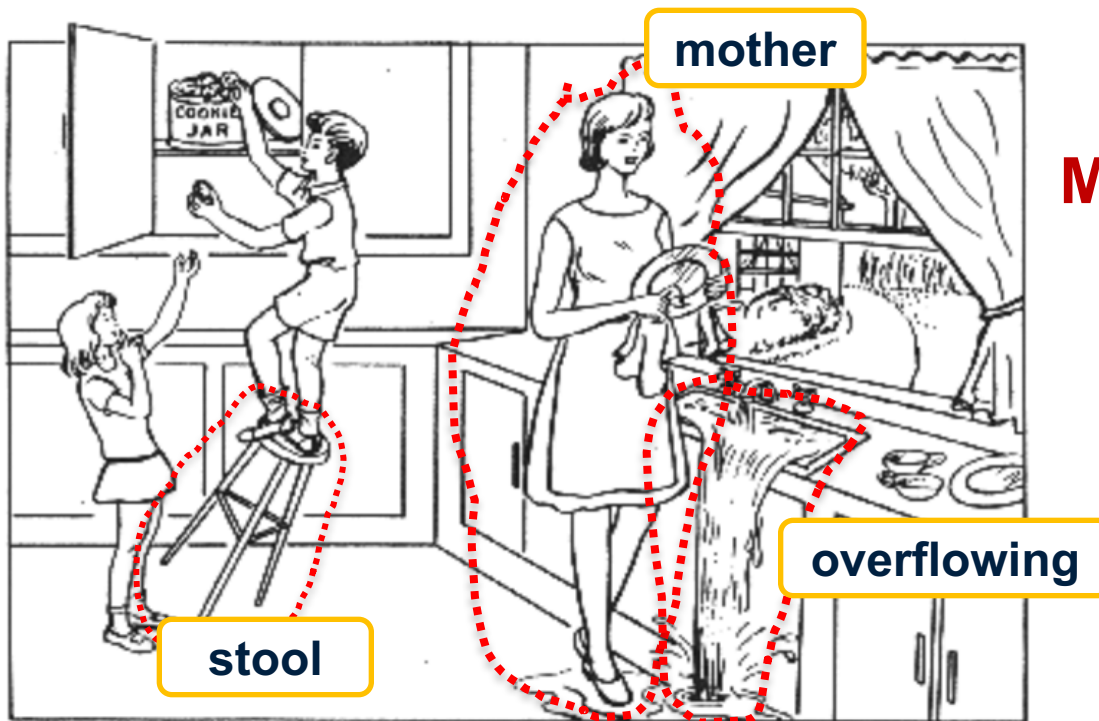
- Diagnosis of dementia
  - Cognitive performance on standardized tests
  - Resource-intensive specialized tests
  - Expensive, time-consuming and invasive
- **Language** is one of the first facilities afflicted by the disease.
  - Subtle changes in language are observed a year or more before dementia is diagnosed (Kempler, 1995).

**ML and NLP based approaches  
for automated dementia prediction.  
Non-invasive, inexpensive and easy to administer**

# DATASET

- **DementiaBank**

- Audio recordings and manual transcripts
- 257 Alzheimer's disease (AD) vs. 242 elderly healthy control.
- **Information units** capture key concepts in the picture



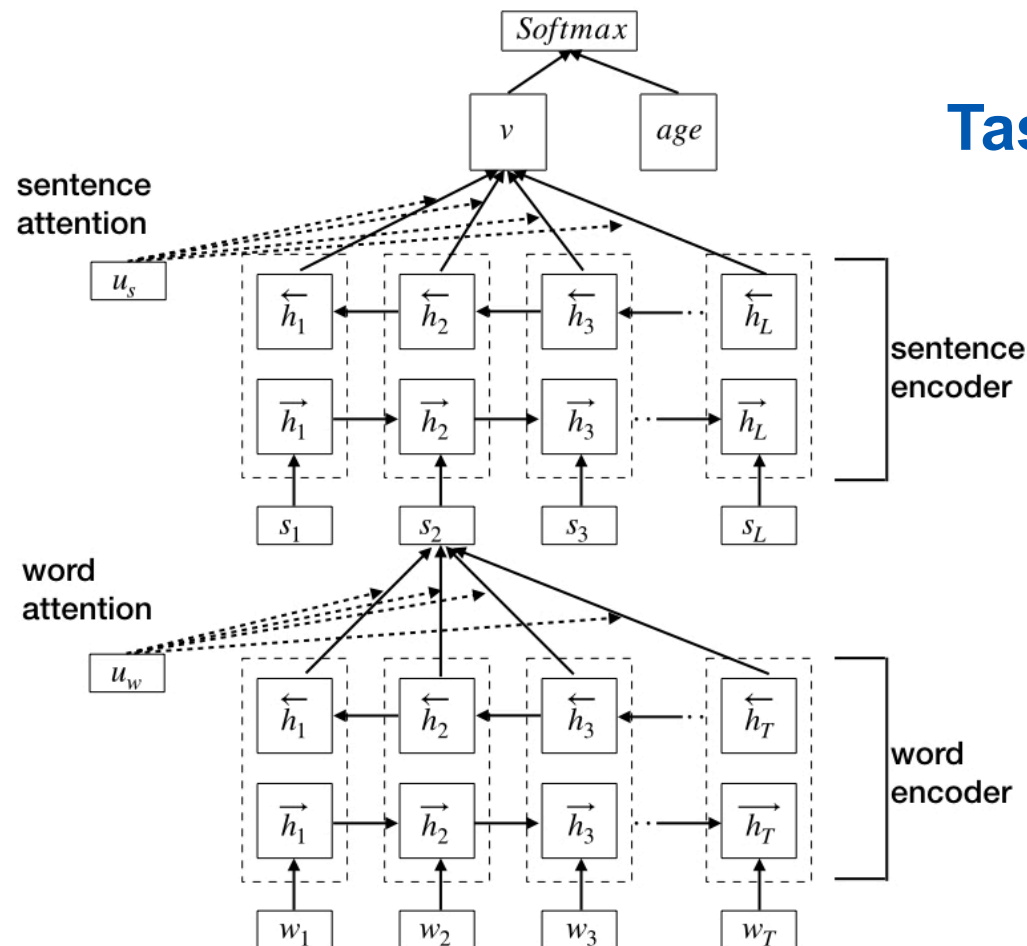
**Manually defined!  
Task specific!**

# HIERARCHICAL ATTENTION NETWORKS (HAN)



- An end-to-end neural text classification model (Yang et al., 2016)

**Task agnostic**



# RESULT SUMMARY



- **Age** is important!
- Without age (HAN)
  - Comparable to the performance of the best traditional model using task-specific features
- With age (HAN-AGE)
  - State-of-the-art performance
  - Large boost over the top-performer traditional method which also uses age

# NEURAL ATTENTION ANALYSIS



- Attention mechanism
  - allows HAN to learn important sentences/words for prediction

0.1371 well the girl is telling the boy to get the cookies down but do n't tell your mother .

0.1794 and the boy is also falling over off the stool .

0.1187 and the mother is letting the water run out of the sink .

0.1784 and she 's drying dishes .

0.091 i do n't quite get that but then ...

0.1479 uh she has water on the floor and and basically it 's kindof uh a distressing scene .

0.0887 everything 's going haywire .

0.0361 she needs to turn off the water .

0.0192 if she turned off the water she 'd be a hundred percent better off .

**capture key concepts similar to info units**



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our poster for details.

Thank you!

# SELECTED REFERENCES



- Daniel Kempler. Language changes in dementia of the alzheimer type. *Dementia and communication*, pages 98–114, 1995.
- Zichao Yang, Diyi Yang, Chris Dyer, Xiaodong He, Alex Smola, and Eduard Hovy. Hierarchical attention networks for document classification. In *Proceedings of the 2016 Conference of the North American Chapter of the Association for Computational Linguistics: Human Language Technologies*, pages 1480–1489, 2016.