Customer Sentiment Analysis from Audio Data Using Deep Learning

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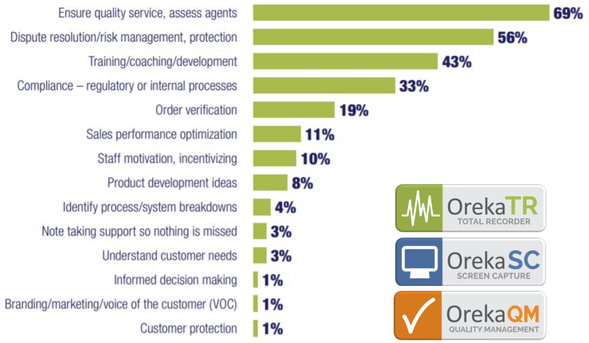
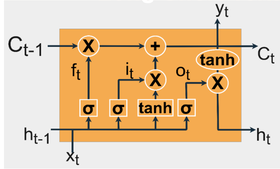
Background

Global Call Centers Market to Reach US$496 Billion by the Year 2027.



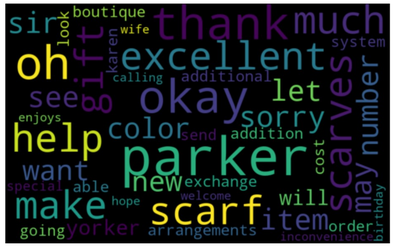
OrekaTR TOTAL RECORDER
OrekaSC SCREEN CAPTURE
OrekaQM QUALITY MANAGEMENT

Long Short Term Memory (LSTM)

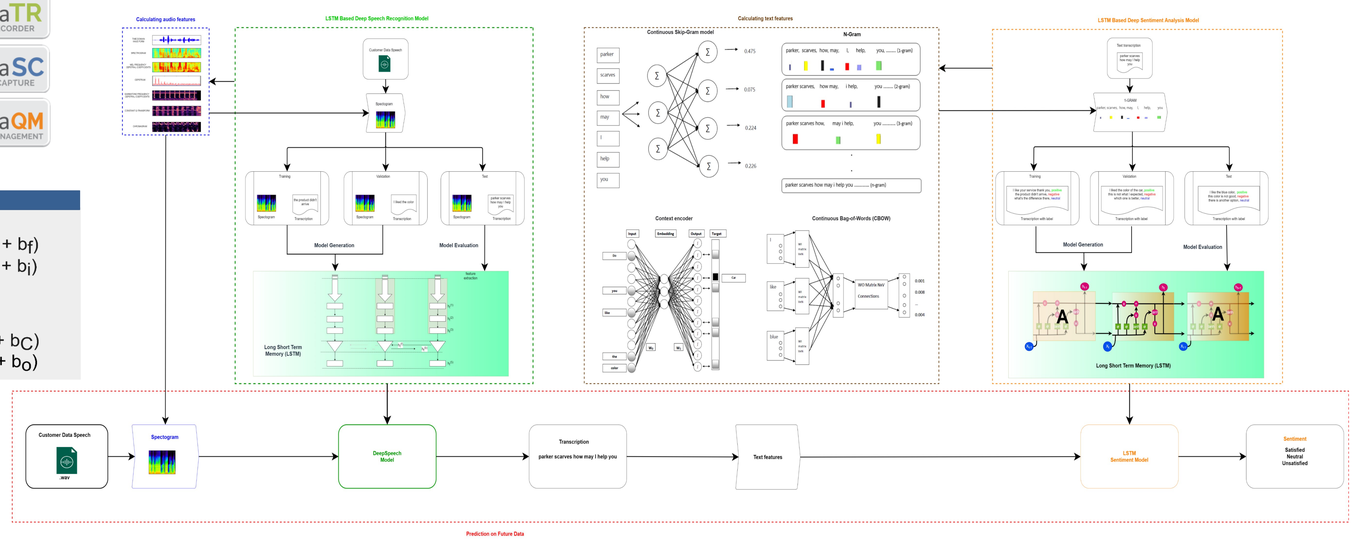


$f_t = \sigma\,(W_f.[C_{t-1}, h_{t-1}, x_t] + b_f)$
$i_t = \sigma\,(W_i\ .[C_{t-1}, h_{t-1}, x_t] + b_i)$
$h_t = o_t * \tanh\,(C_t)$
$C_t = f_t * C_{t-1} + i_t * \hat{C}_t$
$\hat{C}_t = \tanh\,(W_C.[h_{t-1}, x_t] + b_C)$
$O_t = \sigma\,(W_O\ .[C_t, h_{t-1}, x_t] + b_O)$

Positive sentiment



Negative sentiment



Flowchart of Customer Sentiment Analysis Using Deep Learning

Performance Evaluation

Fine tuning process	WER	CER	Loss
Deep Speech Model	0.348	0.193	35.91
Fine tuned by customer call dataset	0.111	0.056	14.51

Original	→	it's right by my office
DeepSpeech Model	→	it is it's very fine office
Fine-tuned Model	→	it's right by my office
Original	→	okay what is your name sir
DeepSpeech Model	→	okay i what is your name sir
Fine-tuned Model	→	okay what is your name sir
Original	→	what's the difference there
DeepSpeech Model	→	i was so different there
Fine-tuned Model	→	what's the difference there

Conclusions and Future Works

- ❖ Deep Learning can successfully transcribe customer call audio data as well as conduct sentiment analysis from text data
- ❖ Long Short Term Memory (LSTM) based algorithm can successfully transcribe audio data to text and then text to sentiment analysis.
- ❖ In future we would like to exploit different features such as word2vec, context encoder for sentiment analysis.
- ❖ In addition, we would like to implement feature selection strategy for selecting important audio features.

Contact

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References

1. Ya-Nan Jia and Sony SungChu, “A Deep Learning System for Sentiment Analysis of Service Calls,” ArXiv,2020.
2. B. Li, D. Dimitriadis and A. Stolcke, "Acoustic and Lexical Sentiment Analysis for Customer Service Calls," *ICASSP 2019*
3. S. Ezzat, N. Gayar, and M. Ghanem, Sentiment Analysis of Call Centre Audio Conversations using Text Classification. IJCISIMA, 2012.