DOMAIN SPECIFIC VOICE INTENT CLASSIFICATION WITH BLSTM

Hellarawa Mudiyanselage Madushika Jayani Hellarawa

(199325F)

Degree of Master of Science in Computer Science

Department of Computer Science and Engineer

University of Moratuwa
Sri Lanka

October 2022

DOMAIN SPECIFIC VOICE INTENT CLASSIFICATION WITH BLSTM

Hellarawa Mudiyanselage Madushika Jayani Hellarawa

(199325F)

Thesis/Dissertation submitted in partial fulfillment of the requirements for the degree
Master of Science in Computer Science

Department of Computer Science and Engineering
Faculty of Engineering

University of Moratuwa
Sri Lanka

October 2022

DECLARATION

I declare that this is my own work and this thesis/dissertation does not incorporate without acknowledgement any material previously submitted for a degree or diploma in any other University or Institute of higher learning and to the best of my knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text.

I retain the right to use this content in whole or part in future works (such as articles or books).

Signature: UOM Verified Signature Date: 16.10.2022

Name: H.M.M. Jayani Hellarawa

The above candidate has carried out research for the Master's thesis/dissertation under my supervision. I confirm that the declaration made above by the student is true and correct.

Signature: UOM Verified Signature Date: 16.10.2022

Name: Dr.T.Uthayasanker

ACKNOWLEDGEMENTS

I would like to express my appreciation and the gratitude for those of who supported me throughout process as this research would not be possible without those. My sincere gratitude goes to my supervisor Dr. Uthayasanker Thayasivam for his continuous support and guidance throughout. And also, for all the academic and non-academic staff, Department of Computer Science and Engineering, Faculty of Engineering, University of Moratuwa Sri Lanka for their support.

My sincere thanks should go to all my friends and colleagues who helped me to make this a success.

Finally, I must express my profound gratitude to my parents, friends and colleagues who helped me to make this a success by providing me with unfailing support and continuous encouragement. This accomplishment would not have been possible without them. Thank you.

Author
Jayani Hellarawa

ABSTRACT

With the current global pandemic all countries around the globe are facing difficulties managing their healthcare services in a way that ensures the high availability of critical services while maintaining the safety of both the patient and the staff. According to Gartner's top 10 strategic technology trends 2021 [1], it says *"Rather than building a technology stack and then exploring the potential applications, organizations must consider the business and human context first."* where it highlights the need for human centric development while stating that it is the IT leaders that decides what combination of the trends to involve in driving the most innovation and strategy.

A decade ago, simply having a website was enough to impress prospective customers and help them find their way to a service or information need and to establish a brand loyalty or identity. The growth of the technology is demanding more innovative strategies to adopted to every small to large industries that are at any stage of maturity of their roadmap to success. The increasing demands of the clients and the ability to keep a loyal customer base has highlighted the need of having a more natural way of handling a customer's inquiry gives a competitive advantage for any business.

The disappointment due to a customer getting added to a call waiting queues to reach a particular service is very critical and can even cause a loss of business opportunity. Understanding call intents can help a service provider to adapt the business engagement with the outside in a way that customers are positively satisfied which could in return increases the sales revenue. Not only that, but indirectly enables the ability for business to allocation agents or help-desk staff optimally thus avoid understaffing and overstaffing situation, which are indirect costs for any revenue-based figure.

Automation is where the technology is used to automate tasks that once required humans. Here, the menu-based call center automations can be taken as a replacement to the legacy call center agent where the human tasks were replaced by automation. The concept of hyperautomation is where the businesses are rapidly adopting it's revenue-based processes and IT process for automation. And the current state-of-the-art deals with lot of advanced technologies like Machine Learning (ML) and Artificial Intelligence (AI). Where AI and ML are used for extending the capabilities of automations.

The building of a speech recognition (ASR) systems for an open domain has been research for a lone time. Where the most of those are accomplished by collecting the voice corpus, convert them into text and performing a text classification on top of the converted text. However, this comes with lot of limitations, thus is not identified as the most feasible way of deriving intents of a speech query for a specific domain [2]. Therefore, in this research, that is focused on domain specific voice intent classification will be aligned with the healthcare domain for the English language based on a neural network with Bidirectional Long Short-term Memory (BLSTM).

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS

ASR	- Automatic Speech Recognition
BLSTM	- Bidirectional Long Short-term Memory
LSTM	- Long Short-term Memory
ROI	- Return on Investment
SVM	- Support Vector Machine
CTC	- Connectionist Temporal Classification
DNN	- Deep Neural Network
DCT	- Discrete Cosine Transform
MFCC	- Mel-Frequency Cepstral Coefficient
RASTA	- Relative Spectral Amplitude Filtering
PLP	- Perceptual Linear Predictive
LPC	- Linear Predictive Coding
WFST	- Weighted Finite State Transducer
AM	- Acoustic Model
LM	- Language Model
SVM	- Support Vector Machine
FFT	- Fast-Fourier-Transformation
TL	- Transfer Learning
ML	- Machine Learning
AI	- Artificial Intelligence
LRL	- Low Resource Languages
HIPAA	- Health Insurance Portability and Accountability Act