

ONTOLOGY BASED PERSONALIZED DIET RECOMMENDATION SYSTEM FOR SRI LANKAN

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Thesis/Dissertation submitted in partial fulfillment of the requirements for the degree
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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.

Signature:

Date: 21st July 2024

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

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Signature of the Supervisor:

Date: 21/07/2024

DEDICATION

To my devoted family and steadfast supporters, this thesis is dedicated. Your constant love, encouragement, and belief in my abilities have been the driving force behind my success. Your unwavering support has provided me with the strength and motivation to overcome challenges and achieve my goals. I will always be appreciative of your presence in my life and the significant influence you have had on my academic career. Thank you for being my rock and standing by my every step of the way.

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ABSTRACT

The hectic life cycle of human beings and negligence of health are the main causes for non-communicable diseases. Healthy diets help to prevent various non-communicable diseases such as diabetics, pressure, cholesterol etc. However, due to busy life cycle, people do not have time to consult dietitians and get their meal plans. The diet recommendation system can solve this issue by providing a fingerprint distance response. In this study, we developed ontology based Recurrent Neural Network-LSTM model for diet recommendation in Sri Lankan context. This system recommends diet plans for breakfast, lunch and dinner based on user's calorie requirement, macronutrient needs, user preference, cultural background, dietary restriction and disease information. We developed ontology, which is consist with food related information including their nutrients values. Then we developed RNN-LSTM model to predict target macronutrient values based on user information such as age, BMI, BMR and diseases information. The RNN-LSTM model demonstrated high performance with an R-squared value of 0.9704, a Pearson correlation coefficient of 0.9869, a mean squared error of 0.0209, a mean absolute error of 0.1239, and a root mean squared error of 0.1703. These metrics indicate that the RNN-LSTM model provided accurate predictions with a strong positive linear relationship between the actual and predicted value. Additionally, the RNN-LSTM model was compared with the KNN model using the same dataset. The RNN-LSTM model outperformed the KNN model across all evaluation metrics. Using content-based filtering and cosine similarity between target nutrient values and food nutrient values, system recommends the food for three meals. This recommendation properly aligns with the nutrients needs and calorie needs. Finally, we can conclude that there is greater potential for future work in the field of food recommendation using Artificial Intelligence. Future work of this study involves further development of an ontology based RNN model combined with micro nutrient needs.

Keywords: Diet Recommendation, Recurrent Neural Network (RNN), Long Short-Term Memory (LSTM), Ontology

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LIST OF ABBREVIATIONS

Abbreviation	Description
RNN	Recurrent Neural Network
LSTM	Long Short-Term Memory
BMI	Body Mass Index
BMR	Basal Metabolic Rate
WHO	World Health Organization
NCD	Non- Communicable Diseases
CF	Collaborative filtering
CBF	Content based filtering
ML	Machine Learning
OWL	Web Ontology Language
AI	Artificial Intelligence

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