Lecture Notes in Networks and Systems 434

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Rising Threats in Expert Applications and Solutions

Proceedings of FICR-TEAS 2022

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Preface

The 2nd FICR International Conference on Rising Threats in Expert Applications and Solutions (FICR-TEAS 2022) was held at Jaipur, India, during 7–8 January 2022 in hybrid mode. The conference was organized by the "Department of Computer Science and Information Technology" and "International Cell IIS-TIE" at IIS (deemed to be University), Jaipur, and supported by Science and Engineering Research Board (SERB), DST, Government of India. The 1st FICR-TEAS International Conference "FICR-TEAS 2020" was successfully organized on 17–19 January 2020 at IIS (deemed to be University), Jaipur, in association with Springer Nature for publication (AISC Series) and supported by CSI, ACM, IEEE Ireland & UK Section. The conference addressed recent technological developments, specifically the "expert applications" followed by the analysis of the Rising Threats associated with them and eventually proposing solutions to these threats.

COVID-19 knows no boundaries or borders—the transfer of knowledge should not either. Technology has transformed with great speed in the last few decades, resulting in the development of expert applications making life more effortless. The conference raised awareness about issues related to increase in threats in expert applications and solutions, which will aid in the creation of better solutions for the society. The COVID-19 pandemic has impacted us more than any other event in most of our lifetimes. Companies, associations, and destinations globally are trying to navigate their way through this crisis, balancing the short-term need with a long-term strategy. While we are all in the same storm, we must realize that we are in different boats, and therefore, different solutions and strategies are necessary.

To understand another dimension of the conference abbreviation, it would be better to understand the word "FICR", Indian word (pronounced as "Ficr"), which means "Seeking Solutions For Worries", i.e. giving detailed thoughts to a particular issue by analysing all its pros and cons in advance, so that the issues can be addressed with proper planning and utmost care to benefit the concerned. Also, TEAS represents the most popular hot beverage "Tea" all over the world, which brings freshness. Here, through the conference "FICR-TEAS 2022", the "worries" (Ficr) of the rising threats in the expert applications would be discussed, analysed, and probably solved, during various tea sessions (and tea breaks) of the conference.

FICR-TEAS 2022 was organized keeping these dimensions at preference. The conference aimed to provide an international platform to the researchers, academicians, industry representatives, government officials, students, and other stakeholders in the field to explore the opportunities, to disseminate and acquire beneficial knowledge from the various issues deliberated in the paper presented on different themes in the conference. The technical program committee and advisory board of FICR-TEAS 2022 included eminent academicians, researchers, and practitioners from abroad as well as from all over the nation.

The conference received incredible response from both delegates and students in reference to research paper presentations. More than 256 papers were received, out of which 75 were selected after impartial plagiarism check and rigorous peer-review process. In all, 80 oral presentations were delivered, and six posters were presented. Paper presenters came to attend the conference from all corners of the country. We had international participants and delegates as well from countries like Italy, Nepal, Portugal, Romania, USA, Australia, Belgrade (Serbia), and Poland, to name a few.

We are deeply appreciative towards all our authors for having shown confidence in us and considering FICR-TEAS 2022 a platform for sharing and presenting their original research work. We also express our sincere gratitude to the focused team of chairs, co-chairs, international advisory committee, and technical program committee. We are also gratified to Mr. Aninda Bose, (Senior Publishing Editor, Springer Nature, India) for providing continuous guidance and support. Also, we extend our heartfelt thankfulness and appreciation towards the reviewers and technical program committee members for showing their concern and efforts in the review process. We are indeed thankful to everyone associated directly or indirectly with the conference, organizing a firm team and leading it towards success.

We hope you enjoy the conference proceedings and wish you all the best.

Jaipur, India

Prof. Dr. Vijay Singh Rathore
Prof. Joao Manuel R. S. Tavares
Prof. Subhash Chander Sharma
Dr. Catarina Moreira
Dr. B. Surendiran

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The organization of a successful conference always depends upon the support received during its planning and execution.

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We are grateful to a number of people without whom we would not have been able to successfully organize this mega event and are personally thankful to Prof. R. S. Salaria, Guru Nanak Technical Institutions, Hyderabad; Dr. Yogesh Singh Chauhan, IlT, Kanpur; Prof. Subhash Chander Sharma IlT, Roorkee, India; Prof. Mike Hinchey, Chair, University of Limerick, Ireland; Mr. Aninda Bose, Springer Nature, Germany; Prof. Joao Manuel R. S. Tavares, University of Porto, Portugal; Prof. Milan Tuba, Singidunum University, Belgrade, Serbia; Prof. Rosalina Babo, Polytechnic Institute of Porto, Portugal; Prof. Vincenzo Piuri, University of Milan, Italy; Prof. Zdzislaw Polkowski, Jan Wyzykowski University, Poland; Mr. Peter Kent, UKEI, London, UK; Dr. Catarina Moreira, Queensland University of Technology, Brisbane, Australia; Dr. B. Surendiran, NIT Karaikal, Pondicherry, India; Prof. M. N. Hoda, Bharti Vidyapeeth University, New Delhi; Prof. Valentina Emilia Balas, Aurel Vlaicu, University Of Arad, Romania; Dr. Dharm Singh, Namibia University of Science and Technology, Namibia; Prof. (Dr.) M. Hanumanthappa, Banglore University, Bengluru; Dr. Satish Kumar Singh, IIIT Allahabad; Prof. (Dr.) Durgesh Kumar Mishra, Sri Aurobindo Institute of Technology, Indore; Prof. Vipin Tyagi, Computer Society of India; Dr. Nilanjan Dey, JIS University, Kolkata; Dr. Niko Phillips, International, Activate Learning, City of Oxford College, Oxford, UK; Prof. Cornelia-Victoria Anghel Drugărin, Babeș-Bolyai University Cluj-Napoca, România; Dr. Dana Rad, Aurel Vlaicu, University of Arad, Arad, Romania; Dr. Daniele Ritelli, University of Bologna, Bologna, Italy; Dr. Marina Popolizio,

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We are deeply appreciative towards all our authors for having shown confidence in us and considering FICR-TEAS 2022 a platform for sharing and presenting their

original research work. We also express our sincere gratitude to the focused team of chairs, co-chairs, reviewers, international advisory committee, and technical program committee.

We are also thankful to Shri. Aninda Bose—Senior Editor, Hard Sciences, Springer, for providing continuous guidance and support.

No task in this world can be completed successfully without the support of your team members. We would like to extend our heartfelt appreciation to Dr. Anubha Jain, Head (CS and IT), IIS (deemed to be university), and Organizing Secretary, FICR-TEAS 2022; Dr. Neha Tiwari and Dr. Navneet Sharma, Co-convenor, FICR-TEAS 2022, for their keen support and novel suggestions. Thanks is also due to Dr. Ruchi Nanda and Dr. Amita Sharma, Co-Organizing Secretary, FICR-TEAS 2022 for their contribution.

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Finally, we are grateful to one and all, who have contributed directly or indirectly in making FICR-TEAS 2022 successful.

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The Role of Artificial Neural Network in Word Sense Disambiguation (WSD)—A Survey

H. R. Roopa and S. Panneer Arockiaraj

Abstract The chore of reducing ambiguity in distinct sense of words is known as word sense disambiguation (WSD). It's a key area of research in computational linguistics to deal with the senses being assigned automatically to the words in a particular circumstances (Yuan et al. in Semi-supervised word sense disambiguation with neural models [1]). Human are naturally excellent at WSD and can tell the difference between senses utilized in the vocabulary through verbal language. On the contrary, computers have a hard time distinguishing between proper and incorrect meanings of words. Knowledge-based, Supervised, Semi-Supervised, and Unsupervised techniques have all been used to make progress in the problem of disambiguation. A better knowledge of human language will aid to computer performance in a variety of applications, including search and retrieval. The major goal of the paper is to describe a supervised neural network model that uses multiple strategies to maximize sense detection accuracy. The neural network's input layer will be made up of binary valued nodes based on whether or not frequently recurring context words connected to the ambiguous phrases are present. Amount of nodes in the outer layer will be equal to the amount of senses of the ambiguous word.

Keywords WSD · Neural network · Ambiguous word · Word embeddings

1 Introduction

Word Sense Disambiguation (WSD), which is a subset of Natural Language Processing (NLP) that deals with the issues of identifying the accurate meaning of a word in a given phrase. Various terms in the English language have multiple meanings or connotations. The challenge of determining the correct meaning is addressed by

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WSD. The answer to this challenge has an impact on search engine relevance. WSD is a skill, that the human mind excels at. A basic context is all that is required for people to comprehend the exact idea or meaning of a term. The logical ability of neural networks in the individual brain has resulted in the development of human languages. In computer science, developing the ability for computers to conduct processing the language with the same extent as human has been a long-term difficulty (Fig. 1).

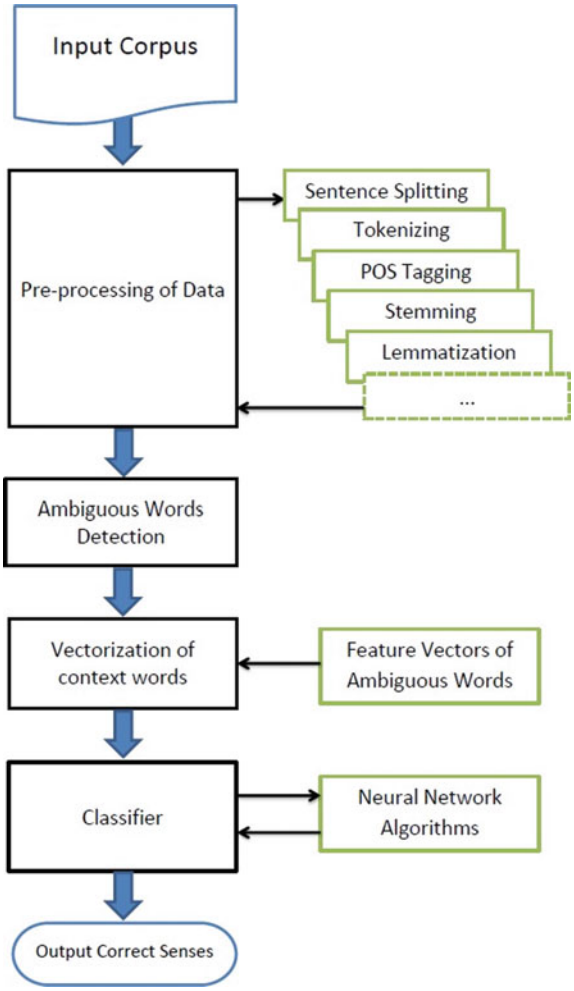

Fig. 1 Word sense disambiguity (WSD) using neural network

1.1 Artificial Neural Network (ANN)

A neural network is a collection of artificial neurons or nodes that form a network or circuit of neurons. ANNs are layers of the computing units which analyzes the input independently to replicate the functioning of the human brain. ANNs, like human brain learn via experience and exhibit gains in tasks as the amount of data available increases. ANNs with single or more concealed layers are known as Shallow Neural Networks (SNNs), whereas ANNs with multiple hidden layers are known as Deep Neural Networks (DNNs) (Fig. 2).

Input Layer: This layer receives inputs from the external world to the model to learn and draw conclusions. It is also referred as input nodes. The inputs from these nodes are passed to the next layer called hidden layer.

Hidden Layer: Inputs from the input layer are passed to set of neurons for computation. The number of hidden layers in a neural network is not restricted. A simple network consists of a single hidden layer.

Output layer: Once the computation is performed, conclusion is drawn from the output layer. Nodes in the output layer can be one or more in number based on the classification problem. For a binary classification problem the output node is 1 where as in case of multi classification problem, output nodes can be more than 1.

2 Different Approaches of WSD

WSD (Word Sense Disambiguation) approaches have been investigated and researched extensively in the past. The different approaches of WSD are:

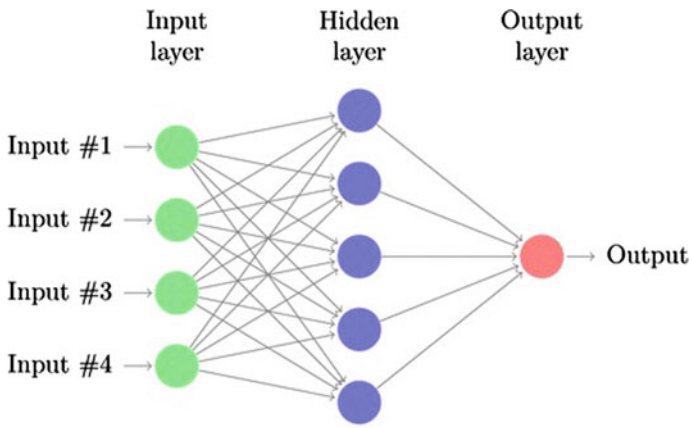

Fig. 2 Simple neural network

- Knowledge Based Approach
- Supervised Approach
- Semi-Supervised Approach
- Unsupervised Approach.

2.1 Knowledge Based Approach

To determine the correct sense of words, algorithms based on knowledge utilize lexical resource such as Machine Readable Dictionaries (MRDs) and WordNet. These Algorithms are simple to use and were the first to be created while attempting to address the WSD challenge. To begin the process of disambiguation, a knowledge based system just needs access to dictionary resources. The performance of the algorithm is restricted by the speed with which they can search for and retrieve these resources. Latency increases as the size of the resources grows, and performance suffers as a result [2].

2.2 Supervised Approach

The term "supervised technique" comes from the fact that it necessitates human intervention. To make supervised models to function as predicted, a large amount of labeled data is required. The greater the data set supplied, the better the system's forecast accuracy. A defined learning set is created to allow the system to guess, true meaning of an ambiguous words based on a few texts that each has a distinct meaning for that word [2]. Based on the defined learning set, system determines the true sense of an ambiguous word in a certain situation. Supervised strategy consistently outperforms all other methods.

2.3 Semi-supervised Approach

Many WSD algorithms employ semi supervised approach, which is a hybrid of supervised and unsupervised learning methods. It accepts both labeled and unlabeled data, making them beneficial when training data is scarce. For each word, the boot strapping processes begin with a little quantity of data. A small quantity of tagged or labeled data is utilized to guide the primary classifier using any of the supervised approaches. After then, unlabeled data is supplied to the classifier in order to extract a larger labelled dataset with only flawless classification. Typically, such methods are iterative, with each iteration involving training on a larger dataset. The resulting data set grows in size till the end of the process after a particular amount of iterations or until the dataset's upper limit size is achieved.

2.4 Unsupervised Approach

For WSD researchers, unsupervised learning approaches are the most difficult to deploy. We, mainly mean that meanings of the words can be derived using additional similar phrases when we use unsupervised methodologies. The idea behind unsupervised learning is that words with similar meaning are surrounded by similar words. The goal is to classify new occurrence into derived clusters, and word senses are created by constructing clusters of word occurrences. This approach finds clusters rather than assigning sense labels.

3 Supervised Approach to Resolve WSD

Various approaches to resolving word sense ambiguity have been proposed. The supervised method to WSD has been shown to yield the most accuracy among all the approaches. As a result, a supervised technique is applied in the proposed model. Artificial Neural Networks replicate the environment in which an ambiguous word occurs and the neural network should be able to correctly forecast the ambiguous word's right meaning. Because this type of model is supervised, it necessitates a large amount of labeled data in order to create an accurate neural net classifier.

3.1 Word Embeddings

The neural network's input feature vectors for an ambiguous word will be produced by making use of its word embeddings. Neural word embeddings are the vectors that are utilized to represent words. Word embeddings are made up of words that are similar and regularly used in context. They can be made using a variety of methods, including Word2Vec, recurrent RNN models like LSTM, and so on. Word Embeddings calculates a binary value for the input, i.e. no match is represented by 0 and total match is represented by 1.

3.2 Feature Vectors

Dataset input and word embeddings will be used to build input vectors for the neural network. If embedded terms are present in the input framework, they will have a value of '1' in the feature vector, otherwise a value of '0'. After each word in the input context is confirmed for its existence in word embeddings, the produced feature vector will be passed to the neural network input layer. As a result, the input

layer of the Neural Net will have the same number of nodes as the number of word embeddings.

Consider an example, let the input sentence be "THE QUICK BROWN FOX JUMPS OVER THE LAZY DOG".

The vocabulary words in the given input sentence are THE, QUICK, BROWN, FOX, JUMPS, OVER, THE, LAZY, DOG. The word 'BROWN' is represented in the vector form as: [0 0 1 0 0 0 0 0 0].

The input vector given to a neural network with a single hidden layer is as shown in Fig. 3.

The number of nodes in the outer layer of the neural network is equal to the number of alternative senses for the ambiguous word. The projected sense will be represented by the node with the maximum integer value calculated among the several output nodes [3]. If maximum value is found in the third node of the output layer, the system has anticipated the third sense (Fig. 4).

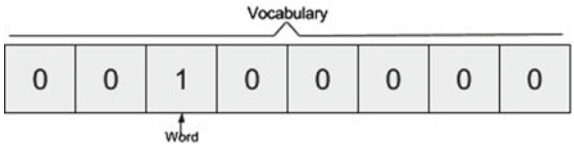

Fig. 3 Input vector with a single hidden layer

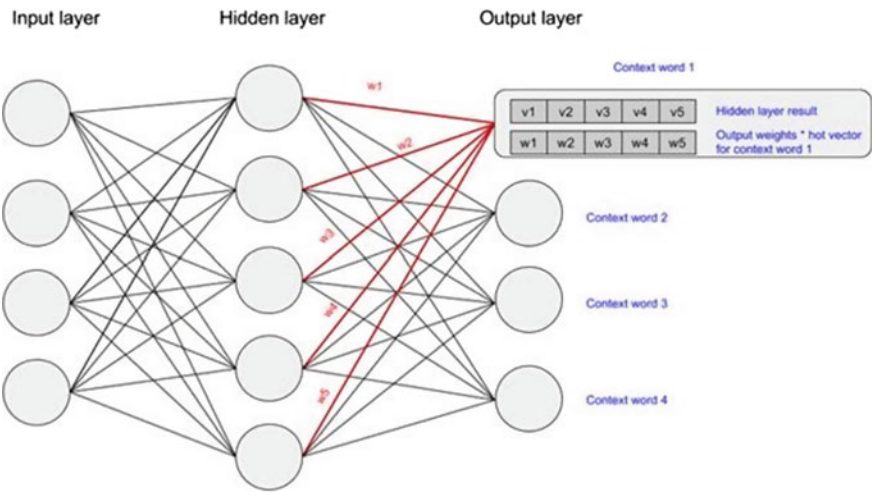

Fig. 4 The state of the context word's output layer

4 Conclusion

In this paper, various approaches to resolving word sense disambiguity have been proposed. The four techniques, knowledge based approach, supervised approach, semi supervised approach, and unsupervised approaches are used by majority of the systems. The supervised method to WSD has been shown to yield the most accurate of these approaches. As a result, a supervised approach is applied to the proposed model. Artificial Neural Network replicate the environment in which ambiguous words occur and neural network should be able to correctly forecast the ambiguous word's right meaning. Because this type of model is supervised, it necessitates a large amount of labeled data in order to create an accurate neural net classifier. Also, this paper suggested a WSD model based on neural network with a goal of maximizing accuracy for a specific natural language processing job.

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