Indian Postal Service Automation

*Abstract*— India has the world's most widely distributed postal system, with a collection of around 1.5 lakh post offices. More than 100 million parcels are delivered every year on average. This paper addresses the most common and essential problem in the postal department of parcel segregation tasks by proposing a fully-automated solution. The proposed methodology uses bidirectional LSTM for handwritten address recognition, followed by address parsing techniques and the construction of knowledge graphs to pinpoint the accurate location of the delivery. This proposed solution can bring the parcel segregation process from hours to minutes.

Keywords— Automation, Postal Service Automation

# Introduction

India is one of the world's most significant postal systems, with roughly 1.5 lakh post offices and around 6 lakh post boxes for collecting packages. The suggested solution employs BiLSTM for handwritten address recognition, then employs address parsing methods and knowledge graph creation to determine the precise location of the delivery.

Bidirectional LSTM (BiLSTM) is a recurrent neural network used primarily for natural language processing. Unlike standard LSTM, the input flows in both directions and can utilize information from both sides. It is also a powerful tool for modeling the sequential dependencies between words and phrases in both directions of the sequence.

Address parsing is breaking down an address into its parts. Many applications, such as geocoding and record linking, depend on this activity. Determining the various components of a lesson can be helpful when locating a specific location using textual information.

## BIDIRECTIONAL LSTM

Bidirectional Long Short-Term Memory (BiLSTM) is a type of recurrent neural network (RNN) that has the ability to process a sequence of data in both forward and backward directions simultaneously.

In a traditional LSTM, the hidden state at each time step is updated based on the previous hidden state and the current input, as well as a memory cell that allows information to be stored over time. However, a BiLSTM takes into account both past and future information by adding a second set of hidden states that process the input in reverse order.

To be more specific, a BiLSTM network consists of two LSTM layers. The first layer processes the input sequence in the forward direction, while the second layer processes the input in the reverse direction. The output of each layer is concatenated at each time step, allowing the model to capture information from both directions.

The architecture of a BiLSTM is especially useful in tasks where both past and future context is important, such as speech recognition, named entity recognition, and sentiment analysis. By processing the input sequence in both directions, a BiLSTM is able to capture a more complete representation of the input, resulting in improved performance on these tasks.

In summary, a Bidirectional LSTM is a type of RNN that processes a sequence of data in both forward and backward directions simultaneously, allowing it to capture information from both past and future context. It has shown to be effective in various tasks that require a comprehensive understanding of the input sequence. Fig 1.1 refers to basic structure of Bi LSTM.

## NAMED ENTITY RECOGNITION

Named entity recognition (NER) is a natural language processing (NLP) task that involves identifying and classifying entities in text into predefined categories such as people, organizations, locations, and more. NER is a critical component of various NLP applications, including information retrieval, machine translation, question answering systems, and text summarization.

The process of NER involves identifying all the entities in a given text and classifying them into predefined categories. This task can be performed using various approaches, including rule-based systems, statistical models, and machine learning algorithms. Many state-of-the-art NER systems use deep learning models that have shown superior performance in NER tasks.

In recent years, there has been a growing interest in developing NER systems that can handle more complex entities such as events, relations, and emotions. These systems are referred to as extended NER or entity relation extraction (ERE) systems.

NER has numerous real-world applications, such as named entity disambiguation, entity linking, and entity summarization. Named entity recognition is also used in various fields such as biomedicine, social media analysis, and legal documents.

In conclusion, Named Entity Recognition is an essential natural language processing task, with numerous applications in various fields. As research in NER continues to evolve, there is potential for further improvements and advancements in the field.

## C. MOTIVATION

Every day, millions of letters and couriers are delivered worldwide. Indian postal services earn around 1700 crores per annum. There are almost 6Lac post boxes from which letters are collected.

Usually when a courier or mail is sent to PO, a person manually reads and segregates the letters based on which city and state the letter is supposed to go. Automatic sorting of mailing items plays a crucial role in the postal service system. In such a situation, an OCR module is required to recognise the postal address on mailing items and a parser module to parse the address.

# Proposed methodology

# Previous Work References

# Results and Discussions

# Conclusion

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