**RELATED WORK**

**Text Summarization for Weather Forecasting using Machine Learning**

The field of weather forecasting holds significant importance in our everyday lives, exerting influence on a wide range of businesses such as agriculture and transportation, and shaping decision-making processes across diverse domains [1]. The increasing importance of accurate and fast weather forecasts has prompted research efforts to utilize modern methodologies such as machine learning, deep learning, and natural language processing to improve the accuracy and availability of weather predictions. This literature review critically analyzes a variety of works that investigate novel methodologies for weather forecasting, text summarization, and image captioning. The analysis aims to provide insights into the potential applications of these approaches in addressing the dynamic issues faced in the fields of meteorology and information retrieval. In the current age of extensive data availability, there is a growing emphasis on the processes of condensing and deriving practical implications from vast datasets. Additionally, there is a recognized significance placed on improving the comprehensibility and ease of access to information through the utilization of image captions. These two aspects have emerged as pivotal areas of concentration. Furthermore, the influence of weather forecasts spans all industries, highlighting the significance of employing machine learning and deep learning methods to enhance the precision and effectiveness of predictions. This study offers a complete examination of the aforementioned research and their potential implications for the field of weather forecasting, highlighting the need of employing context-specific methodologies and utilizing high-quality data to optimize their effectiveness.

The process of compressing time series data is essential in many areas, including the prediction of weather. This challenge was tackled by Sowdaboina, Chakraborti, and Sripada [2], who focused on "content selection" within the framework of summarization. The primary goal of the research was to identify the best level of abstraction for summarizing time series data. The team used machine learning techniques to compare various approaches and suggest a novel approach that combines numerical and textual weather forecast data in a parallel corpus. In particular, the weather prediction industry can benefit greatly from using the given corpus for training and evaluating machine learning models. When summarizing time series data, the study's findings provide a solid and applicable foundation on which to take on the crucial issue of content selection [2].

For text summarization and image captioning in today's information-rich world, Mahalakshmi and Fatima [3] emphasized the value of incorporating deep learning approaches into information retrieval systems. Researchers have developed a novel algorithm that can summarize textual data and provide informative captions for photographs, making visual content more accessible. Results showed that when deep learning techniques were used, precision, recall, and F-score were significantly improved during testing [3]. This research proved that deep learning can help with search and summarization, offering a practical solution to the problem of too much data. The computing requirements of deep learning were also acknowledged.

In their study, Mekuria and Jagtap [4] presented a specialized method for Amharic text summarization, which integrated both extractive and abstractive techniques. In order to tackle the distinctive difficulties associated with summarizing texts in Amharic, the researchers utilized the PageRank algorithm to assess the relevance and importance of sentences. This paper makes a noteworthy addition by addressing the task of linguistic summarizing beyond the English language, with a specific emphasis on the Amharic language and textual material. However, this research represents a significant advancement in the development of summarizing algorithms that may effectively capture a wider range of linguistic variations [4].

Dhanya et al., [5] set out to analyze and assess cutting-edge methods of automatic text summarization. Strategies that extracted data and those that abstracted it were among those used. A comprehensive look of how such summarization techniques are used in different scientific and business contexts was the focus of this study. Researchers and practitioners both in the field of information retrieval can benefit greatly from the insights gleaned from this survey. Investigating various methods for text summarization and their practical implications has led to these contributions. In doing so, it has presented a thorough assessment of the most recent advancements in the field of text summarization [5].

As part of their research into weather forecasting, Singh et al., [6] used the random forest classification technique to create a system that could better predict the weather. Accurate weather forecasts were shown to be especially crucial in the study's focus area of agriculture. The machine learning technique known as random forests has shown promise for efficiently evaluating complex data sets in order to generate reliable forecasts. However, the research acknowledged the critical importance of the quality of input meteorological data and the potential geographical restrictions that may impair the effectiveness of the system [6]. We cannot stress enough the need of prioritizing data quality and recognizing geographical variability in order to construct effective weather forecasting systems.

Salman et al., [7] conducted a study to examine the potential application of deep learning techniques, specifically Recurrent Neural Networks (RNN) and Convolutional Networks (CN), in the domain of weather prediction. The objective of their study was to assess the capability of deep learning in accurately capturing temporal and spatial patterns in meteorological data. The research examined the significance of accurate weather prediction in several industries and recognized that the efficacy of deep learning models can fluctuate based on variables such as the dataset and the specific geographic area under consideration [7]. The focus on contextual variables highlights the necessity for tailoring weather prediction systems to specific circumstances.

Holmstrom et al. [8] conducted a study that centered on the utilization of machine learning techniques in the field of weather forecasting, with a specific emphasis on improving temperature predictions for a duration of seven days. The research highlighted the benefits of utilizing machine learning models in comparison to traditional approaches for making long-term forecasts, with a specific focus on temperature forecasting. Nevertheless, it is important to acknowledge that the performance of the model may differ depending on the timeframe of the prediction. This highlights the significance of carefully choosing suitable modeling techniques that are tailored to the specific forecast periods.

The study conducted by Sharma et al. [9] aimed to assess the viability of predicting solar power generation through the utilization of meteorological forecasts. The objective of the study was to develop prediction models for solar power generation that are tailored to individual locations, taking into account variables such as regional climate and the positioning of solar farms. The study underscored the need for precise solar power projections and examined different regression algorithms to achieve this goal. Additionally, it discussed the potential consequences of mistakes in weather forecasts for renewable energy systems.

Scher and Messori's [10] research used deep learning techniques to try to quantify the uncertainty of weather forecasts. The researchers stressed the significance of taking into account the dynamical nature of meteorological occurrences. Researchers developed a practical method for gauging how much we can trust projections; this has important implications for areas as diverse as emergency management, farming, and power distribution as a result of the study's findings. However, the study did note some of the obvious caveats of machine learning, such as its efficiency limitations and the differences between its models and those of ensemble methods.

Haupt et al. (2011) conducted a study to investigate the real-world implementation of machine learning techniques, with a specific focus on the utilization of the Dynamic Integrated foreCasting (DICast®) System. The authors examined its practicality in several domains such as renewable energy, transportation, and wildfire prediction. This study demonstrated the efficacy of machine learning in tackling practical obstacles and emphasized its wide-ranging influence in several fields. Although the study largely emphasized practical applications, it also underscored the wide potential of machine learning in domains beyond meteorology.

In summary, the aforementioned works together contribute to the advancement of knowledge on the potential and obstacles associated with improving weather forecasting. This is achieved through the utilization of diverse methodologies, including machine learning, deep learning, and sophisticated statistical models. The user's statement underscores the need for accurate and reliable data, the contextual specificity of predictive models, and the wide-ranging utility of these technologies across several industries. Moreover, these findings advocate for additional investigation into the reduction of constraints and disparities in machine learning and deep learning methodologies to enhance the precision and availability of weather forecasts in diverse situations and domains.

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