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**Big Data**

(6CS030)

Utilization of Big data to improve weather forecasting.

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Abstract:

In many different businesses, weather forecasting is crucial for reducing risk and decision-making. However, complicated weather patterns are difficult for traditional approaches to anticipate accurately, especially considering climate change. This paper explores the use of big data in forecasting to address issues and offer recommendations for improving accuracy. This research aims to enhance the accuracy and precision of weather predictions by employing sophisticated algorithms and data integration. The findings might significantly affect the field of meteorological study. A movement toward improved decision-making and adaptive techniques in response to changing weather patterns is being driven by industries that are impacted by weather conditions and the necessity of preparing resilience against climate change.

# Background of the study

## Generic Statement:

Weather forecasting is crucial for daily planning, crop management, transportation, and emergency readiness. Because of the complexity of today's climate, traditional forecasting methods have difficulty predicting the weather with any degree of accuracy. However, employing big data analytics has the potential to enhance and increase the accuracy of forecasting.

## Problem statement:

Imagine planning a flight or an outdoor event, only to have your plans derailed by unanticipated weather conditions. Although conventional forecasting techniques are helpful, they can have difficulty comprehending the intricacies of weather systems, which can result in mistakes and uncertainty. Studies reveal that traditional forecasting methods often fail to predict extreme weather occurrences in time, resulting in significant financial losses and disruptions to daily activities. Considering climate change, this problem becomes even more urgent as weather patterns become more unpredictable and difficult to predict. The need for more advanced forecasting techniques is highlighted by visual displays of historical forecast mistakes.

## Aim and objective:

Our goal is to find out how big data can overcome the drawbacks of conventional techniques to transform weather forecasting. Our objective is to make more accurate and timely forecasts by utilizing a variety of data sources. Our goal is to increase the accuracy of weather forecasts and improve readiness for weather-related hazards and calamities by applying sophisticated data analytics and machine learning techniques.

## Target Domain:

Meteorologists, climatologists, researchers, weather-dependent companies (such as aviation, energy, transportation, and agriculture), emergency management organizations, legislators, and the public are the domain's target audiences.

## Information Needs:

Access historical weather data to learn about past temperatures, precipitation totals, wind patterns, humidity readings, and air pressure. Current Weather Reports: Get the most recent information on current weather conditions, predictions, and alerts for geographical areas to stay informed. Predictive analytics: Make use of machine learning algorithms and sophisticated data analytics to get predictions for future weather patterns and trends. Effects of Climate Change: Recognize how weather patterns and long-term climate modelling are affected by climate change. Research Papers and Studies: Examine scholarly investigations, case studies, and white papers regarding big data's application to weather forecasting.

# Related work

Predicting the weather is essential for our daily activities, and using big data analysis could improve its accuracy. Through the analysis of sizable data sets, big data techniques can reveal obscure patterns and insightful discoveries in meteorological data. This research explores the use of big data analytics for weather prediction from 2014 to August 2020 through a systematic analysis of recent publications. It offers a technique, technology, and hybrid strategy-based classification scheme for the examined papers. It also compares these categories based on several quality parameters, including execution time, accuracy, scalability, and others. The study also discusses the many types of modelling tools, measurement environments, and algorithms, as well as the advantages and disadvantages of each that have been noted in published works.

Predictive techniques based on data, like deep learning, are showing their worth in several domains. These techniques are being used with increasing attention to predict global weather patterns several days ahead of time. Comparing the outcomes of various studies is challenging, nevertheless, due to the absence of uniform data sets and assessment guidelines. This work introduces a standardized data set designed for medium-range (3–5 days) weather forecasting to overcome this problem. The information was preprocessed for machine learning applications after being taken from the ERA5 repository. Additionally, the researchers offer precise assessment standards to facilitate direct comparisons of various forecasting methodologies. Simple linear model initial results are used as benchmarks for additional investigation.

In my report, I focus on exploring in-depth the techniques used for preparing data and building models. I will highlight the original ideas and advancements in our study, showcasing any special methods or approaches we used. I also plan to talk about the difficulties we faced during our research and how we solved them, giving useful insights into using data for weather forecasting. Furthermore, I will investigate the possible impacts and future possibilities of our discoveries, giving a forward-looking view of this fast-changing field. By offering a detailed and insightful analysis, my report will be seen as a valuable contribution

References:

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