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# AI based Climate Prediction System

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**ABSTRACT:** Water resources and Climate changes goes hand in hand as one impacts the other. Researchers focus on the Climate changes, as climate changes damages to the livelihood of the living organisms. The life cycle of the all living organisms depend on climate changes, which seeds on temperature & water. Any alternation in these factors will have varied impact globally. The temperature is the yardstick to the climate, as any extremes of temperature will affect the water level and thereby adaptability. A sustained high or low temperature in any part of the globe, make the area a non-livable. Considering its importance, in this paper, we will discuss on the predictability model using AI/ML methodology, as technology has the free hand, devising all the industries to adapt and drive the essential business.

**KEYWORDS:** Water resource, Climate change, Artificial Intelligence, Machine learning, climatic models.

## I. INTRODUCTION

“Climate is the long-term average of weather, typically averaged over a period of 30 years. Some of the meteorological variables that are commonly measured are temperature, humidity, atmospheric pressure, wind, and precipitation. In a broader sense, climate is the state of the components of the climate system, which includes the ocean and ice on Earth. The climate of a location is affected by its latitude, terrain, and altitude, as well as nearby water bodies and their currents”[8] The various changes in the temperature, the water content in the air or water vapors plays a vital role in determining the climate. The imbalance water resources quality and quantity due the climate changes, leads to wicked issues which has inherent challenges in resolving due to complexity, uncertainty[5]. Water demand and supply discrepancies due to climate changes reflects the global power generation & high temperature results in deficiency in cooling process in power generation[7]. The intergovernmental panel reports on the impacts on water resources, that climate change impacts global hydrological cycle & water resources of ground and surface. Temperature variation as part of climate change, upstream, will raise sea level & evaporation, dried up soil and low down the water levels at lakes, rivers and the variations in Climate will affect eco system, crop yields, apart from human life cycle and extreme environmental changes are characteristics of swift change of climate[2]. As climate change to the globe high priority issue, it is the subject of interest to researchers to understand, forecast through models. Models like General Circulation model GCM, Earth System Models ESM are used for the present condition analysis and prediction. Forecasting uncertainties, deviations from predictions leads to strengthen the research and analysis of models through various innovative technological developments [6]

## II. DEVELOPMENT IN TECHNOLOGICAL LANDSCAPE

The information and communications technologies (ICT) revolution, development of Big Data and development of various advanced Artificial Intelligence (AI) methodologies, enabled large volume data acceptance, recording and processing any dimension of weather data precisely and in a desired time limits[1]. Artificial intelligence (AI), the ability of a digital computer to perform tasks commonly associated with intelligent beings includes developing systems endowed with the intellectual processes characteristic of humans, such as the ability to reason, discover meaning, generalize, or learn from past experience[9]. Artificial neural network is methodology ANN in AI, which can be deployed for computations of value derivations or processing of signal tasks with an array of individual artificial neurons and ANN is well utilized in field of geophysics, climatology, medicine and forecasting of renewable-resource availability and drought[3].

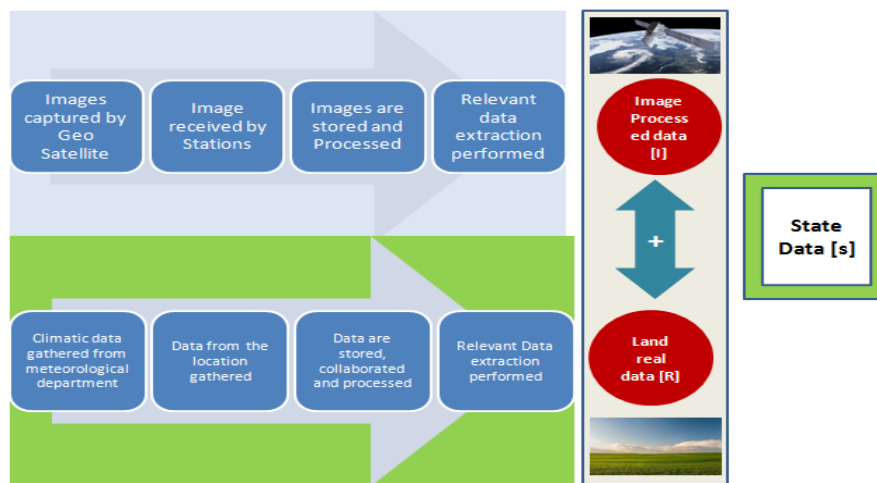
By well understanding the power of AI and ML, technological identification of climate changes and climate trends, future predictions weather events can be well established. By doing this, we minimize the impacts and damages of climate changes, towards healthy world. Technology today, handles floods of day, be it semi-structured or

unstructured, on weather, used to identify the forecasting, vulnerabilities of risk and facilitate decision making process to handle the extreme weather stats like hurricanes, rising sea levels and higher temperatures[4].

### III. PREDICTION APPROACH OF CLIMATE CHANGES USING AI

The basic idea of using AI will help to predict the necessary futuristic climate changes. Climates conditions can be feathered by its characteristics. Leveraging the technology to identify the climate condition by the feature and characteristic, will result which is closer to reality. By keeping this as the base, climate model approach can be derived. In order the position the approach, for selected location, images shared by Geo Satellites, on the climatic conditions. High end super computers are deployed to grab, analyze and process the images shared by the Geo satellites. The image data will have the Arial identity of the cloud structure and processing the image will land in identifying the longitude and latitude position of the area and other components of the climate, possible. On the other side, the real data on the climate of the location is gathered from the Meteorological Department. This set data should contain information for all the components or factors of the climate. The various, combination of the image data and the real data of the location of different time period are gathered. Using super computers the same are correlated & analyzed to get the climatic models.

The real data (R) will have all the climatic variables and corresponding the Image data (I) will have all the data, extracted from the image processing (climatic variables). Now this forms a climatic condition referred as State(s), expressed as set(R,I), ie.  $s=f(R,I)$  where, R and I are functionally defined through various factors like temperature, moisture, water level, air force, pollution level etc. This collection of state data forms the historical data, to be given to ML to study, understand and extract knowledge and interpret to have intelligence. The various periodic data of 'state' is kept on ML study to have depth understanding leading to knowledge domain.



### IV. PROPOSED AI PHASES IN APPROACH

#### (a) Identifying the climatic changes

Any climatic condition data of the location, is given to the system as the input, captured in the process, defined above, is analysed and interpreted with the knowledge domain based on the characteristic of the input climatic condition. The system will result in identifying exactly the climatic condition nature, which can be used for the precautionary measures and actions.

#### (b) Forecasting the climate changes

The state data of closer time element are grouped which is nothing but neighborhood state data  $S=\{s_1,s_2,s_3\dots s_n\}$ . By extending the correlation analysis on these data and extrapolating results change patterns or trending of climatic changes. This patterns or trending characteristics are studied and stored as references for forecasting of climate changes.



These models are iterated cohesively through ML, in such a way that the migration of one state to another are thoroughly studied on the factors of 'how'. This exercise makes the ML matured to record the various states and capable enough to identify the climate state, when any new data is provided from the climatic model, it learned. It further help to advise the migration of the climate from one to another state, by its intuited knowledge.

#### V. CHALLENGES

The minimal critical success factors CSS or challenges are listed below in this approach (i) Strength of AI tools (ii) Strength of image processing capability (iii) Availability of real data in alignment to the image time span. (iv) Number of Climate factors involved in the 'state' data (v) Volume of history data and algorithm of ML in knowledge domain building. (vi) Result interpretation and action transformation

#### VI. CONCLUSION

Climate forecasting is global challenge and any forecasting technology or model nearer to reality, is adaptable by every region to control and maintain nature resources and wellness of livings. The AI based state model approach will perform forecasting based on the factors under consideration of computation and the strength of knowledge domain.

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