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Systematic Review on Prediction and Monitoring of Climate Change

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ABSTRACT: Climate change poses a severe and very bad threat to human society and global ecosystems, necessitating careful planning, monitoring, and forecasting. This paper reviews spread a range of monitoring techniques and predictive models to better understand, anticipate, and mitigate the effects of climate change. Predictive models combine a wide and large range of methods, from statistical and machine learning-based models to complex Earth system models that integrate atmospheric, oceanic, and terrestrial components. These models look at historical data of history, greenhouse gas emissions, and various climate drivers to anticipate future climatic scenarios. Tracking changes in temperature, precipitation patterns, sea level rise, and other climate change indicators over time also requires the use of monitoring tools that include satellite observations, ground-based sensors, and remote sensing technology.. Creating sustainable behaviors to counteract the negative consequences of climate change, educating politicians, and integrating reliable monitoring systems and predictive models all help in the development of adaptive systems. To address the complexities, difficulties, and breakthroughs in climate change prediction and monitoring, scientists, policymakers, and stakeholders should work together.

KEYWORDS: Necessitating, Forecasting, Terrestrial, Precipitation, and Stakeholders

I. Introduction

Climate change is the phrase used to describe long-term variations in temperature and weather patterns. Significant volcanic eruptions or variations in the sun's activity might be the source of these swings. But since the 1800s, human activity—primarily the burning of fossil fuels like coal, oil, and gas—has been the main driver of climate change. As a result of the burning of fossil fuels, greenhouse gases are released into the atmosphere, enveloping the earth like a blanket and trapping solar heat, raising global temperatures. Methane and carbon dioxide are not the only greenhouse gases that contribute to climate change. These result, for instance, from using coal to heat a building or gasoline to operate a vehicle. Carbon dioxide can also be released through land clearing and forest destruction. The two main industries that emit methane are agriculture and oil and gas operations. The primary industries producing greenhouse gases are energy, industry, transportation, buildings, agriculture, and land use. Additionally, it is in the best interests of everyone to keep adversity in our surroundings clean and maintained.

II. Impact of Climate Change

The impacts of climate change on different sectors of society are interrelated. Drought can harm food production and human health. Flooding can lead to disease spread and damage to

ecosystems and infrastructure. Human health issues can increase mortality, impact food availability, and limit worker productivity. Climate change impacts are seen throughout every aspect of the world we live in. However, climate change impacts are uneven across the country and the world -even within a single community, climate change impacts can differ between neighbourhoods or individuals. Long-standing socioeconomic inequities which are not good can make underserved groups, who often have the highest exposure to hazards and the fewest resources to respond, more vulnerable. The projections of a climate change-impacted our future are not inevitable to us. Many of the problems and solutions off-site links are known to us now, and ongoing research continues to provide new ones. Experts believe there is still time to avoid the most negative of outcomes by limiting warming offsite links and reducing emissions to zero as quickly as possible. With reduction of our emissions of greenhouse gases will require investment in new technology and infrastructure, which will increase job growth. Additionally, lowering emissions will lessen harmful impacts on human health, saving countless lives and billions of dollars in health-related expenses.

We see climate change affecting our planet from pole to pole. NOAA monitors global climate data and here are some of the changes NOAA has recorded. You can explore more at the Global Climate Dashboard. Between 1901 and 2020, the global temperature increased by almost 1.8°F (1°C). For the most of the 20th century, sea level rise was 1.7 mm/year; starting in 1993, however, it has accelerated to 3.2 mm/year. The average thickness of 30 carefully examined glaciers has dropped by more than 60 feet since 1980, indicating that glaciers are receding. Since 1979, the area in the Arctic covered by sea ice at the end of summer has decreased by almost 40%. For instance, since 1850, Glacier National Park in Montana has lost over 150 glaciers, and since the mid-1990s, the oldest and thickest sea ice in the Arctic has been receding.during 1958, there has been a 25% increase in atmospheric carbon dioxide, and during the Industrial Revolution, there has been an approximate 40% increase. Averages over the long run show that snow melts in this year.

III. Remote Sensors and Satellite Imagery

To create sensor-based maps, most remote sensing systems expect to extrapolate sensor data about a reference point including distances between known points on the ground. This depends on the type of sensor used. For example, in conventional photographs, distances are accurate in the centre of the image, with the distortion of measurements increasing the farther you get from the centre. Another factor is that the

platen against which the film is pressed can cause severe errors when photographs are used to measure ground distances. The step in which this problem is resolved is called georeferencing and involves computer-aided matching of points in the image (typically 30 or more points per image) which is extrapolated with the use of an established benchmark, "warping" the image to produce accurate spatial data. As of the early 1990s, most satellite images are sold fully georeferenced. In addition, images may need to be radiometrically and atmospherically corrected. Radiometric correction allows the avoidance of radiometric errors and distortions. The illumination of objects on the Earth's surface is uneven because of different properties of the relief. This factor is taken into account in the method of radiometric distortion correction. Radiometric correction gives a scale to the pixel values, e. g. the monochromatic scale of 0 to 255 will be converted to actual radiance values. Topographic correction (also called terrain correction)In rugged mountains, as a result of terrain, the effective illumination of pixels varies considerably. The pixel on the sunny slope receives intense illumination and has a high radiance value, whereas the pixel on the shady slope receives weak illumination and has a low radiance value in a remote sensing image. For the same object, On the shaded slope, the pixel radiance value will differ from that on the sunlit slope. Furthermore, brightness values of distinct objects may be similar..

IV. Future Scope

Addressing climate change requires a two-pronged strategy: Mitigation involves cutting back on emissions of greenhouse gases that trap heat in the atmosphere and stabilizing their levels, whereas adaptation refers to preparing for impending climate change. Solar panel adaptation and mitigation Trekandshoot/ Shutterstock is credited. Reducing the flow of heat-trapping and heat sensing greenhouse gases into the atmosphere is known as mitigation, and it can be achieved in two ways: either by reducing or lessing the quantity of the sources of these gases (such as the burning of fossil fuels for transportation, electricity, or heat) or by improving the "sinks" that absorb and store these gases (such as the oceans, forests, and soil). In order to "stabilize greenhouse gas levels in a timeframe sufficient to allow ecosystems to adapt naturally to climate economic development to proceed sustainably," mitigation aims to prevent major human intervention with Earth's climate(from the United Nations Intergovernmental Panel on Climate Change's 2014 report on Climate Change Mitigation). Adjusting the current or anticipated future climate is a necessary and important part of adaptation, or living in a changing climate. The objective is to reduce the risks associated with climate change's negative effects (such as rising sea levels, more intense extreme weather events, or food insecurity). It's crucial to seize any opportunities brought about by climate change, too (such as extended growing seasons or enhanced yields in some locations).

V. Business Model

A. Climate Impact Monitoring and Prediction Service.

Service Offering: Real-time Climate Impact Monitoring: Offer real-time access to data from remote sensors and satellite imagery. Climate Prediction Models: Develop and provide climate change impact prediction models. Customization: Tailor services to the specific needs of governments, environmental organizations, and industries. Revenue Streams: a. Subscription-Based Model: Offer subscription plans for access to real-time data and prediction models. Different tiers of subscriptions for varying levels of access and features.

B. Data Licensing: License your collected and processed data to research institutions, government agencies, and businesses for their analyses.

C. Consulting and Advisory Services: Utilize the data analysis and insights from your system to provide consulting services. Give advice about reducing the effects of climate change and adjusting to it.

D. Data Analysis and Customization: Charge for the data analytics and model customization you do for particular projects or sectors.

Key Partnerships:

a. Government Agencies: Collaborate with government departments responsible for environmental monitoring and regulation to provide data and insights that inform policy decisions.

b. Environmental Organizations: Partner with non-profits and NGOs focused on climate change for joint projects and data sharing.

c. Scientific Institutions: To improve your models even more and have access to their knowledge, work together with universities and research centers. Satellite Providers: To obtain a trustworthy data source, establish collaborations or agreements for shared data. Data Monetization: Take into account offering anonymised, aggregated data for market research and product development to businesses. Marketing and Outreach: a. Education and Awareness: Run public education and outreach programs to increase knowledge of climate change and the benefits of your offerings. Marketing using Content: To develop thought leadership, publish papers, articles, and whitepapers based on your research and data. Attending Climate Conferences and Workshops: To network and increase visibility, attend and present your findings at climate-related events. Sustainability and Scalability. Research and development should never stop. To be competitive, spend money on enhancing data analysis and prediction models. Invest in Cutting-Edge Technologies: To improve prediction accuracy, investigate advances in AI and machine learning. International Expansion: Take into account extending your offerings to nations and areas where climate change is having a significant influence. Sustainability Initiatives: In order to fulfill your objective, adopt ecologically friendly procedures throughout your business. Data Security and Privacy: To keep stakeholders and clients

trusting you, put strong data security measures in place and make sure that data protection laws are followed. Social Impact: Highlight the beneficial social effects of your efforts to mitigate climate change. This may be a powerful selling point for partners and clients.

VI. Conclusion

In summary, the biggest issue the world is currently facing is climate change. The rate of global warming is rising daily. If we don't stop it as quickly as we can, there will be unfavorable effects on our planet. Our formidable weapons in the fight against climate change are artificial intelligence and machine learning, both of which have lately made significant advancements. Studies on these topics have been conducted recently in an effort to address climate change. It is also the duty of governments, nonprofits, and businesses to carry out and support these investigations.

Artificial intelligence and machine learning and its uses, which have been quite being advanced recently, are our immense weapons and infantries in the fight against climate change. Recently, studies have been carried out to tackle climate change and its problems with these subjects. Governments, non-profit organizations and companies also have the responsibility to implement, reunion and contribute to these studies.

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