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Big data analyses prefer unsupervised learning

Abstract

Here we ***propose*** how we can study ***the Mediterranean, Pacific, and Atlantic Oceans,**** with ***Unsupervised***, perhaps l***ess-biased***, ***less-expensive*** experiemental determination in the coming decades, about how global warming affects major oceans differently through sonograms and unsupervised learning.

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Introduction

What is Big Data Analysis (BDA)? Usually BDA is done by human intuition based on early information. *We assume*[1] *every sparsely measured data set* to be *Gaussian centrally distributed*, then we have extended the small amount of measured data to hundred times bigger. *Furthermore we assume*[2] among all Gaussian distributed category sets can be furthermore sparsely reduced to few major category groups. For example, we assume three big ocean sets. ***Pacific Ocean, Atlantic Ocean and Mediterranean sea***, so that we can simplify the diversified Ocean Property to be an example of modern **BDA** that required furthermore **unsupervised learning,** we should mention in passing ***two historical facts*** as follows:

Since 1912 Big Earthquake in South Baikal where massively release **methane gas** into ocean salt water, that has affected the **ocean temperature and whale acoustic propagation property.**

"Continental Drift Hypothesis", cf. "Origin of Continents & Oceans" by late **Alfred Wegener, Dover 1966**} Prof. Alfred Wegener (1880-1930 died of Greenland Exhibition) proposed the **Earth has been holding together in one integrated mass (like 45 degree turn of a rectangular shape**) piece broken down, due to ***centrifugal force to current continental piece*s,** and thus made possible.

(i) The Pacific Ocean is also warming up differently and has a broader variety of effects due to its size and diverse ecosystems. The **warming has been observed especially in the equatorial regions**, contributing to the intensification of ***El Niño* and *La Niña.*** The effects of global warming on the ***Mediterranean Sea, the Atlantic Ocean, and the Pacific Ocean*** are distinct due to the unique characteristics of each body of water. Here's a comparison of how climate change affects these three regions:

(1)Temperature rise

(i) Mediterranean sea

a) The Mediterranean is experiencing warming at a faster rate than the global average, often referred to as "hotspot" warming. This is partly because the sea is relatively enclosed, with limited exchanges of water with the open ocean.

b) The warming of the Mediterranean has been more pronounced in recent decades, with temperatures rising by about 0.3–0.4°C per decade. As a result, summers are becoming hotter and longer, and winters milder.

c) This trend exacerbates issues like heatwaves, droughts, and water scarcity in surrounding countries.

(ii) Atlantic ocean

a) The Atlantic Ocean has also been warming, especially in its northern regions (like the North Atlantic). In particular, the Gulf Stream, which is part of the Atlantic Meridional Overturning Circulation (AMOC), has been weakening due to the melting of ice and freshwater influx.

b) Warming in the Atlantic Ocean leads to more intense hurricanes and changes in marine ecosystems. The North Atlantic is particularly vulnerable to changes in circulation patterns, which could impact weather in Europe and North America.

(iii)Pacific ocean

a) Phenomena.

b) Warming in the Pacific affects the western coast of the Americas, increasing the risk of severe droughts, heatwaves, and stronger cyclones. The Pacific also experiences large-scale shifts in marine species distribution due to temperature changes.

(2)Sea level rise

(i) Mediterranean sea

a) Sea levels in the Mediterranean are rising at a faster rate compared to the global average due to a combination of thermal expansion (warming water) and the melting of glaciers and ice sheets around Europe. This causes coastal erosion and increases the risk of flooding in low-lying areas, especially in cities like Venice and Alexandria.

(ii) Atlantic ocean

a) The Atlantic is also seeing rising sea levels, particularly along the eastern coasts of the Americas and northern Europe. The rate of sea-level rise is uneven, with the U.S. East Coast and the Gulf of Mexico facing some of the highest increases. The rise is partly driven by melting glaciers and thermal expansion of seawater.

b) Coastal areas like Florida and parts of New York and Boston are experiencing increased flooding risks.

(iii)Pacific ocean

a) The Pacific has regions, particularly around small island nations

in the Pacific that are extremely vulnerable to sea-level rise. Many island nations like the Maldives and Tuvalu are facing existential threats from rising seas, which is exacerbated by the loss of coral reefs that act as buffers.

b) Larger coastal areas like California and parts of Southeast Asia also face significant sea-level rise, although in some regions (e.g., the U.S. West Coast), the rise is slower than in the Atlantic.

(3) Ocean acidification

(i) Mediterranean sea

a) The Mediterranean Sea is experiencing increased acidification, which is impacting marine life, especially species like corals, mollusks, and some fish. The region's relatively low freshwater input and the enclosed nature of the sea make it more sensitive to changes in pH.

(ii) Atlantic ocean

a) Ocean acidification is a major issue in the Atlantic, particularly in the northern regions. The absorption of carbon dioxide from the atmosphere is causing the ocean's pH to decrease, affecting marine ecosystems, particularly shell-forming organisms like oysters and clams, as well as coral reefs.

(iii) Pacific ocean

a) The Pacific Ocean, especially in regions like the Great Barrier Reef and the coral-rich areas of Oceania, faces significant challenges from ocean acidification. The Western Pacific and tropical zones are particularly vulnerable, as they support rich marine biodiversity and coral reefs that are essential for local economies and ecosystems.

(4) Ecosystem impacts

(i) Mediterranean sea

a) The warming of the Mediterranean is leading to shifts in the marine ecosystem, with certain species expanding northward (e.g., tropical fish) while others (such as cold-water species) are retreating. The biodiversity of the Mediterranean is being threatened, and there are signs of declining fish stocks.

b) The Mediterranean also faces increasing eutrophication, which is the over-enrichment of water with nutrients, often from agriculture, leading to harmful algal blooms and oxygen-depleted zones.

(ii) Atlantic ocean

a) The Atlantic's ecosystems are under stress from rising temperatures, which affect marine species, particularly fish stocks like cod, haddock, and anchovies. The warming and acidification are disrupting food chains, with implications for commercial fishing industries.

b) Coral reefs, such as those in the Caribbean, are increasingly vulnerable to bleaching events caused by temperature spikes.[3–10]

(iii) Pacific ocean

a) The Pacific Ocean is experiencing widespread ecological changes due to climate change. Coral bleaching is a significant concern in the tropical Pacific, as the reefs are extremely sensitive to even small changes in temperature. Fisheries are also affected by shifting fish populations, with some species moving to cooler waters.

b) The Pacific's high productivity is also threatened by rising temperatures and ocean acidification, which can impact marine food webs.

c) Discussion: It is ***extremely expensive*** to gather experimental data for years, particularly to do comparison study. Our review paper is only meant to sketch a theoretically possible using unsupervised learning algorithm: **Let the Computer do the job after data gathering** from sonogram speed profile computer to solve the inverse problem for density temperature etc. Then, we can verify the consistency with **sparse measurements**. The following is the well-known algorithm by Szu et al.

d) Unsupervised learning Mountain top rocks have lower entropy value, less uniformity than the beach sands which have more uniformity, higher entropy but less information compared to rocks (.cf. Harold Szu et.al. reviewed the generic unsupervised learning algorithms based on **Boltzmann maximum entropy or equivalently minimum Helmholtz free energy**).[11]

(5) Storms and extreme weather events

(i) Mediterranean sea

a) The Mediterranean is seeing an increase in the frequency and intensity of extreme weather events like heat waves, storms, and droughts. While hurricanes are rare, the region is experiencing more intense cyclonic activity, such as (*Mediterranean hurricanes*).

(ii) Atlantic ocean

a) The Atlantic is known for its hurricanes, which are intensifying due to warming sea temperatures. The U.S. East Coast and the Caribbean are particularly vulnerable to stronger hurricanes, while European countries can be affected by:

The Pacific experiences some of the most intense storms, including typhoons and cyclones, particularly in Southeast Asia and the Western Pacific. The frequency and intensity of these storms have increased in recent decades due to global warming.

Discussion

While all three bodies of water (Mediterranean, Atlantic, and Pacific) are impacted by global warming, the *Mediterranean Sea stands out for its more pronounced warming trends and vulnerability to temperature-related changes*. The **Atlantic Ocean** is facing significant changes in ***circulation patterns***, while the **Pacific Ocean** is experiencing ***widespread ecological disruptions*** due to ***warming, acidification***, and *storm intensification*. Each region has its own set remnants of Atlantic storms.

(i) Pacific Ocean: of challenges, but they all contribute to the broader issue of climate change and its impact on the world's oceans and coastal areas.

a) The Pacific experiences some of the most intense storms, including ***typhoons*** and ***cyclones,*** particularly in ***Southeast Asia and the Western Pacific***. The frequency and intensity of these storms have increased in recent decades due to global warming.

Conclusion

While all three bodies of water (Mediterranean, Atlantic, and Pacific) are impacted by global warming, the **Mediterranean Sea** stands out for its more pronounced warming trends and vulnerability to temperature-related changes. The **Atlantic Ocean** is facing

significant changes in circulation patterns, while the **Pacific Ocean** is experiencing widespread ecological disruptions due to warming, acidification, and storm intensification. Each region has its own set of challenges, but they all contribute to the broader issue of climate change and its impact on the world's oceans and coastal areas.

*affecting the 7 Seas Ocean differently where the "Seven Seas" is a historical term referred to various bodies of water around the world.

1. Arctic ocean,*
2. North Atlantic ocean,
3. South Atlantic ocean,
4. North Pacific ocean,
5. South,
6. Pacific ocean,
7. For instance, in Roman times, the Seven Seas were considered to be parts of the Mediterranean, but as navigation expanded, the term grew to encompass larger bodies of water.

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Conflict of interest

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