

**Centre for Knowledge Analysis and Ontological Engineering**

**A report**

**on**

**ANALYSIS OF INDIAN RAINFALL**

**Submitted by**

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**ABSTRACT:**

Rainfall is one of the most important element in affecting the climate, economy and the lives of the people of the country. Being an agricultural country, good rainfall is the key to bountiful agriculture and food for the Indians. The success or failure of the harvest and water scarcity in any year is always considered with the greatest concern. These problems are closely relinked with the behaviour of the summer monsoon rains in India(Rajeevan,2001).

**SOFTWARES USED:**

Programming : R, Weka API's, Google API's

Tools: Weka, Microsoft Office, Google Fusion Table

**METHODS USED AND CONCLUSIONS:**

The Indian rainfall series data from 1871 to 2011 from the IITM website was used for the analysis purpose. Indian continent is divided into 36 meteorological subdivisions Initially the mean values of annual rainfall using R was plotted for all sub divisions. The same was repeated for monsoon rainfall data also. But no notable trend was observed and the graph was random.

We then did the time series analysis using R and tried to analyze the different components of the time-series(seasonal,trend and random) but no significant result was obtained.

In the next stage, the moving average of 3 years for all the years, of all the subdivisions were plotted. The plot obtained here was smoother and showed increasing and decreasing trends for random number of years but still no significant conclusions could be made from the moving averages plot.

Further weka tool was used to find any possible correlation between the annual rainfall of the sub divisions. We observed a high correlation in the sub divisions which are closely located. This shows that the rainfall of closely located geographical areas has higher correlation but this was not true in all cases and therefore was superficial for our research.

Then we tried to find the 60 years cycle relationship in the data using a formula for RMS(root mean square) for different sub divisions and obtained the range between 400 to 2100 for them, which was not consistent and hence was not sufficient to prove the hypothesis of 60 years cycle.

We moved ahead to visually representing the data. The annual rainfall of the sub divisions were graphically represented on the map with the help of geo-charts and geo-maps(Google Apps). ( The regions were approximately plotted and was not up to scale.)

As we needed internet connectivity to view these maps, we tried to write code which turned out to be cumbersome and useless as we still needed Google APIs to run them. So we moved to fusion tables provided by Google to represent and plot the required maps and charts.

We then used Weka APIs to calculate the correlation values for all the subdivisions and using that value, we plotted the correlogram using fusion tables.

The highest common factor of the rotation periods of all the planets in the solar system is approximately 60 years. Considering this fact, we plotted a periodogram with periods as 10,20,30,40,50,60,70 years for both annual rainfall and monsoon rainfall of all sub divisions. The graph showed a high peak value for 40 and 60 years. The possible existence of cycle of 60.6 years is already published in a paper. So we need to look into the possiblity of 40 years cycle.

**FUTURE IMPROVEMENTS:**

* + 1. To find the significance of this peak at 40years in the periodiogram.
    2. Conduct a confidence level test.
    3. Moving average for 30 and 60 years.
    4. Draw plots of ACF and PACF and find the existence of the peak.
    5. Verification of wet and dry period analysis(1990) done in the given paper( as 1987).

Note: The data used, snapshots of all the graphs plotted during the analysis phase have been put into separate folders and has been given along with this document.