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# Rainfall prediction model

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## Abstract

**A new method has been developed for the prediction of rainfall and its quantity at a place given its past record. The new method is being introduced and explained with an example to show how it works. Detailed algorithm is described in the paper. The prediction is made based on historic data using the fact that whether the certain weather conditions have caused rainfall or not in the past at the place. The model is at its early stage and uses only four parameters (Temperature, Atmospheric Pressure, Humidity and Rainfall). Several more parameters (weather conditions such as wind speed, etc) have to be taken into account to lead to reliable forecasting or rainfall prediction..**

***Keywords:***

## Introduction

There are several factors that affect the rainfall at a place. The quantity of rainfall greatly varies at different places having identical weather conditions. In this paper a new approach has been taken to predict the probability of rainfall and also the amount of it received at a place. To do so the weather record of the place is required. Considering the importance we take the three main factors atmospheric pressure, temperature and humidity recordings along with the rainfall of the place for past several years, more the historic data more accurate the result will be. The current atmospheric pressure, temperature and humidity of the place can then be entered and then depending on the past record and time of year the predictions are made. The problem solving approach is simple and works if the climate of the region is stable and does not varies greatly year after year.

## Proposed solution

We maintain a weather record (temperature, atmospheric pressure, humidity and rainfall) of the city for past several years. Essentially we have five parameters including date and above four. Each parameter is assigned an importance level (high or low). To predict we enter four parameters and based on the past trend the answer is found. Any reference to temperature in the paper should be taken as the maximum temperature of the day.

Suppose we have the weather record for a city XYZ for the past decade. The data is arranged day-wise for every year containing the avg. temperature, atmospheric pressure, humidity and rainfall received by the city. Now lets find whether rainfall would occur on 21/8/2012 when the temperature is T, atmospheric pressure is P, and humidity is H. The city XYZ has great variance in temperature during various time of the year so T is of high importance. Accordingly changes in pressure and the humidity is relatively low compared to temperature so they are of low importance. Firstly we find the avg rainfall amount on any day having temperature within the range T ± temp_factor , having pressure within the range P ± pressure_factor and having humidity within the range H ± humidity_factor ,

Where,

temp_factor =5%of Avg. Temperature difference (i.e. Max. temp – Min temp avg for every year).

pressure_factor =10%of Avg. Pressure difference (i.e. Max. pressure – Min pressure avg for every year).

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humidity_factor =10%of Avg. humidity difference (i.e. Max. humidity – Min humidity avg for every year).

Since temperature of is of high importance and it has a lot of variation over the year temp_factor is 5% of average temperature difference.

Consider the following temperature record for XYZ

| Year | Max - Min | Temperature Difference |
|---|---|---|
| 2001 | 39`C – 9`C | 30`C |
| 2002 | 41`C – 4`C | 37`C |
| 2003 | 42`C – 6`C | 36`C |
| Avg temperature difference : | | 34.3 |

Hence, temp_factor = 5% of 34.3 = 1.715`C

Why don't we take the temp_factor as a constant 1`C? Consider a city which has very low temperature difference, say the max temp around the year for the city is 33`C and min is 26`C. Now if we use 1`C as temp_factor for filtering data then it will be ineffective as there will be a lot of data satisfying the condition T ± temp_factor as the city has very less temperature variation throughout the year. But our method will calculate the temp_factor = 5% of 9 = 0.45`C which is quite small compared to 1`C.

Similarly we find the other factors. This process effectively filters the complete record to a very small quantity of data. The data now represents how the weather was in history having almost similar weather condition as the required day. From this data we find out the probability of rainfall occurring as follows – give 60% weightage to the record from the same month i.e ±15 days from the required day and 40% weightage to other days. In this case all the records within 6 August and 5 September are given 60% weightage and the remaining year is given 40% weightage. So if there are total 10 matching records out which 5 fall within 6 Aug and 5 Sept, and on 7 occasions it rained out of which 4 such occasions were during 6 Aug and 5 Sept, then the probability of rainfall should be

60% of 4/5 + 40% of 3/5 = 0.72

The amount of rainfall is found by taking the average of rainfall over all 7 occasions with same weightage of 60%-40% as above.

## Algorithm

**Step 1 :**Enter the weather data(T,P,H,R) date-wise for n years into Table **A** where T=temp, P=atmos pressure, H=humidity,R=rainfall
**Step 2 :**Enter the date for which prediction is to be made in **d** and **m** and the Temp, Pressure and humidity in **T`, P`, H`**
**Step 3 :**set t_imp=1, p_imp=0, h_imp=0
**Step 4 :**For i=1 to n
**Step 5 :do**
**Step 6 :**find T_max, T_min, P_max, P_min, H_max, H_min for $i^{th}$ year
**Step 7 :**$T_f$ = 5/100 * (T_max –T_min)
**Step 8 :**$P_f$ = 10/100 * (P_max –P_min)
**Step 9 :**$H_f$ = 10/100 * (H_max –H_min)
**Step 10 : od**
**Step 11 :** For every entry in Table A
**Step 12 :do**
**Step 13 :** let the entry in A be $T_A$, $P_A$, $H_A$, $R_A$
**Step 14 :if**(T`-$T_f \leq T_A \leq$ T`+$T_f$ and P`-$P_f \leq P_A \leq$ P`+$P_f$ and H`-$H_f \leq H_A \leq$ H`+$H_f$)
**Step 15 :**then store $T_A$, $P_A$, $H_A$, $R_A$ in Table B
**Step 16 : fi**
**Step 17 : od**
**Step 18 :**initialize ht, hp, hr, lt, lp, lr to 0
**Step 19 :**For every entry in Table B
**Step 20 :do**
**Step 21 :** let the entry in B be $T_B$, $P_B$, $H_B$, $R_A$
**Step 22 :if** date in (**d,m** ± 15)
**Step 23 : then**
**Step 24 :**ht=ht + 1
**Step 25 : if** $R_A$>0
**Step 26 : then**
**Step 27 :**hp = hp + 1
**Step 28 :**hr = hr + $R_A$
**Step 29 : fi**
**Step 30 : else**
**Step 31 :**lt=lt + 1
**Step 32 : if** $R_A$>0
**Step 33 : then**
**Step 34 :**lp = lp + 1
**Step 35 :**lr = lr + $R_A$
**Step 36 : fi**
**Step 37 : fi**
**Step 38 : od**
**Step 39 :**prob = (0.6 * hp/ht) + (0.4 * lp/lt)
**Step 40 :**amt = (0.6 * hr/hp) + (0.4 * lr/lp)
**Step 41 : end**

## Conclusion and future work

The rainfall prediction method is based on statistical weather data of the place. More the data, more accurate will be the prediction. The enormous data is filtered based on certain parameter ranges. The model used for prediction is prepared to be flexible and takes into account the climatic conditions of the place by assigning weightage to each parameter. Another important assumption for this model to work is that the climate should be stable otherwise faulty results can be inferred.

There are few improvements that are being researched into such as finding the accuracy of prediction i.e. how accurate is the prediction that there will be 80% chance of rainfall tomorrow. This can be done by using the number of filtered data item and there exact matching with the user inputs. Another area of work is to incorporate more parameters and also to generalize the model so as to predict the value of any parameter given the values of remaining parameters using the weather records.

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