



e-ISSN: 2319-8753 | p-ISSN: 2347-6710

IJRSET

International Journal of Innovative Research in
SCIENCE | ENGINEERING | TECHNOLOGY

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

Volume 12, Special Issue 2, April 2023

ISSN INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA

9940 572 462

6381 907 438

ijirset@gmail.com

www.ijirset.com

Comparative Analysis between Linear and Nonlinear Methods for Weather Prediction Using Machine Learning Algorithms

Humsavardhini V, Meenakshi P, Pavithra G, Amirthavalli R

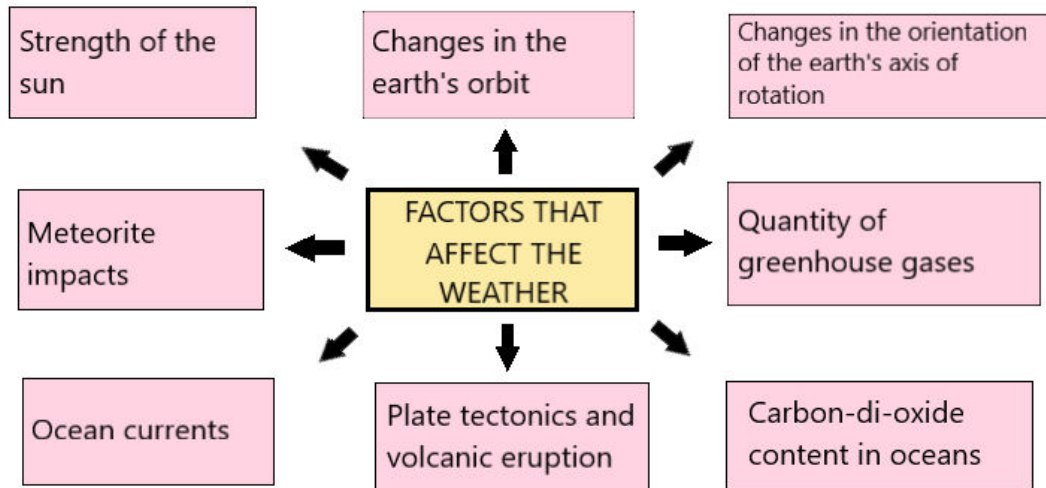
U.G. Students, Department of Computer Engineering, Velammal Engineering College, Chennai,
Tamil Nadu, India

Associate Professor, Department of Computer Engineering, Velammal Engineering College, Chennai,
Tamil Nadu, India

ABSTRACT: Weather forecast is extremely important for our daily life because the prediction of climatic parameters such as temperature, humidity, and precipitation is very important for us. Very important for agriculture, forestry, commercial enterprises, etc. Weather conditions are notoriously unstable. And often unpredictable. The weather varies from a few days to a few months, but climate change is long-term. Traditionally, weather forecasts have been made using large and complex physical models that use different atmospheric conditions. These conditions are often unstable due to interference from weather systems, causing models to provide inaccurate forecasts. The field of machine learning is of great interest to the scientific community. Due to its applicability in various fields, it is interesting to investigate whether various machine learning algorithms can be good candidates for forecasting weather conditions combined with large datasets. In this project, a comparative analysis of linear methods such as state vector machines and nonlinear methods such as K-Nearest Neighbour and Naive Bayes, a probabilistic classifier, is carried out to show the differences between the performance of linear algorithms and nonlinear temperature prediction models.

I. INTRODUCTION

Weather conditions around the world change rapidly and continuously. Correct forecasts are essential in today's daily life. From agriculture to industry, from traveling to daily commuting, we are dependent on weather forecasts heavily. As the entire world is suffering from continuous climate change and its side effects, it is very important to predict the weather without any error to ensure easy and seamless mobility, as well as safe day-to-day operations. Due to an interest in weather monitoring in the general public, today a large number of weather stations are connected to the internet, and are thus available as cheap, distributed sensors. Additionally, several organizations that are involved in the collection of meteorological data offer online data servers with accessible Weather forecasting is an essential process that can affect several areas such as agriculture, farming, sea selling, etc, and also for saving the life of living beings from climate hazard, earthquake and many more. Weather forecasting can be understood as the interpretation of atmospheric data which includes temperature, rainfall, wind speed, wind direction, and humidity. These conditions can be changed dynamically. Large numbers of tools are available to forecast the weather data, but the amount of data generated for weather forecasting is of high volume and unstructured. Hence, predicting the weather on the behalf of the weather data is not an easy task and it involves a large number of parameters that can rapidly change as per atmospheric conditions. To prevent climatic hazards in the future due to weather, several meteorological departments are working in this direction through sharing of information. Weather forecasting can be viewed as a significantly challenging problem and can be required the latest technology equipment and technology for accurate prediction of future predictions. It consists of two factors i.e. human activities and technological advances. For accurate prediction, various researchers have identified meteorological characteristics by applying different methods. It is observed that few methods predict the weather more accurately in comparison to others. Weather forecasting measures the change that occurred in the present state of the atmosphere. The present condition of the weather is obtained from observations like ground observation, sea observation, and the observation of air data through radars. Several devices are used to collect this information such as ships, radar, aircraft, satellites, and radio sounds. After collecting the desired information, it can be processed and analyzed to find the different patterns. In this work, large numbers of high-end computers are used to process the data and tried to find significant and effective pieces of information.



III.RELATED WORK

Weather prediction is mainly made up of 3 steps namely observation and analysis,extrapolation, and estimation of specific variables.There are 3 types of weather forecasting they are short-range, medium-range, and long-range forecasting. Short-range forecasting is done between one and seven days before it happens.Medium-range is usually done between one week and four weeks prior.Long-range is done between one month and a year in advance.Weather prediction uses different tools, observational data, etc to forecast the weather hours, days, and months prior for a specified location.In the early days, weather prediction was made by observation. In 1995 the first-evercomputerized weather prediction was made. Meteorologists use various tools to compute and collect data.Around 300B.C., Chinese astronomers made a calendar that divides annum into 24 festivals, each associated with various types of weather.Internationally the most accurate weather company is AccuWeather. A weekly forecast can precisely predict the weather about 80% of the time however a five-day forecast can accurately forecast the weather up to 90% of the time whereas a longer forecast is only correct about 50% of the time.

IV.METHODOLOGY

The test process is initiated by developing a comprehensive plan to test the general functionality and special features on a variety of platform combinations. Strict quality control procedures are used. The process verifies that the application meets the requirements specified in the system requirements document and is bug-free. The following are the considerations used to develop the framework from developing the testing methodologies.

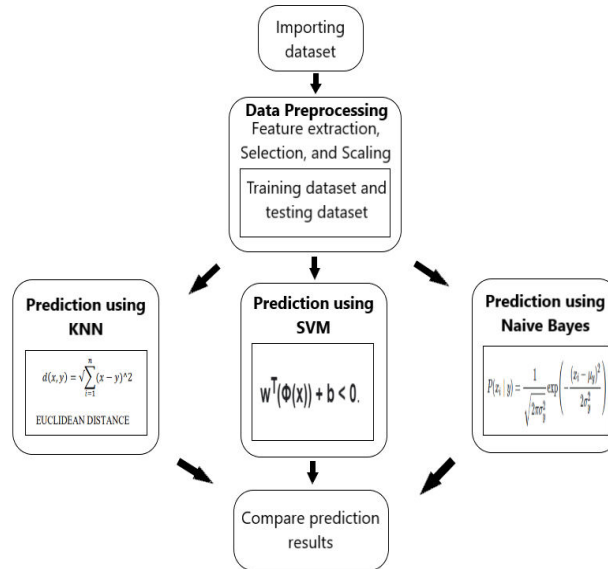
Types of tests:

- Unit testing
- Functional test
- System test
- Performance test
- Integration testing
- Acceptance testing



Organized by

Department of CSE, Velammal Engineering College, Chennai, India



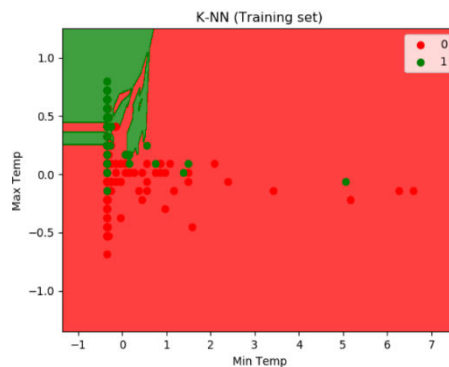
V. EXPERIMENTAL RESULTS

K-Nearest Neighbour:

Confusion matrix of KNN

	0	1
0	38	1
1	10	17

Training set result KNN



Accuracy

```

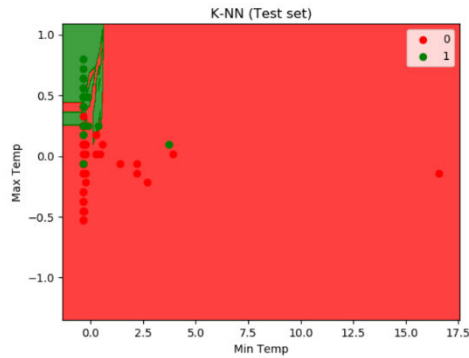
In [10]: from sklearn.metrics import accuracy_score
...: accuracy_score(y_test,y_pred)*100
Out[10]: 83.33333333333334
    
```



Organized by

Department of CSE, Velammal Engineering College, Chennai, India

Testing set result KNN

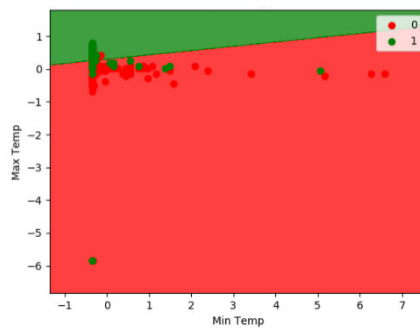


SUPPORT VECTOR MACHINE:

Confusion matrix of SVM

	0	1
0	35	4
1	6	21

Training set result SVM

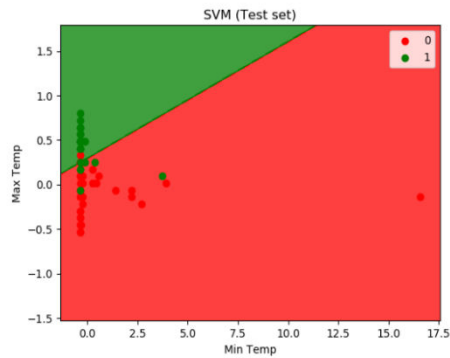


Accuracy

```
In [18]: from sklearn.metrics import accuracy_score
...: accuracy_score(y_test,y_pred)*100
Out[18]: 84.84848484848484
```



Testing set result SVM

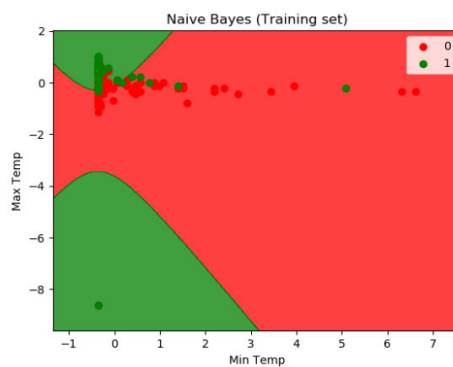


NAÏVE BAYES:

Confusion matrix of Naïve Bayes

	0	1
0	22	19
1	2	23

Training set result Naïve Bayes

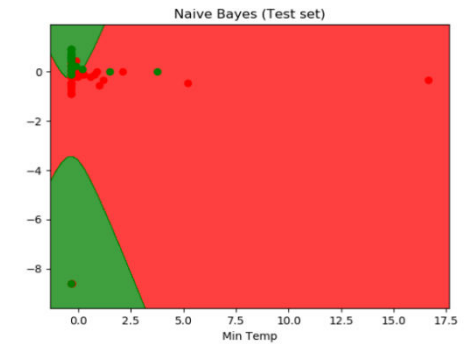


Accuracy

```
In [11]: from sklearn.metrics import accuracy_score
...: accuracy_score(Y_test,Y_pred)*100
Out[11]: 68.18181818181817
```



Testing set result Naïve Bayes



VI. CONCLUSION

The application of the State Vector Machine, The K Nearest Neighbour classifier algorithm, and The Naïve Bayes results in the following accuracy which is in the table below. As mentioned in the table below State Vector Machine algorithm shows more accuracy than The K Nearest Neighbour classifier algorithm and The Naïve Bayes algorithm. The project now takes more time to calibrate and give the result so in the further process we are in the idea to predict in more factors added.

Classifier	Accuracy
KNN	83.333334
SVM	84.848485
Naïve Bayes	68.181819

REFERENCES

1. Teggi, P. P., Natarajan, S., &Malakreddy, B. (2020, March). Intelligent FORecasting Model for Climate Variations (InFORM): An Urban Climate Case Study. In 2020 7th International Conference on Computing for Sustainable Global Development (INDIACom) (pp. 130-137). IEEE.
2. Naik, A. R., Deorankar, A. V., &Ambhore, P. B. (2020, March). Rainfall Prediction based on Deep Neural Network: A Review. In 2020 2nd International Conference on Innovative Mechanisms for Industry Applications (ICIMIA) (pp. 98-101). IEEE.
3. Joshi, Y. K., Chawla, U., & Shukla, S. (2020, January). Rainfall Prediction Using Data Visualisation Techniques. In 2020 10th International Conference on Cloud Computing, Data Science & Engineering (Confluence) (pp. 327-331). IEEE.
4. Eyre, J. R., English, S. J., & Forsythe, M. (2020). Assimilation of satellite data in numerical weather prediction. Part I: The early years. Quarterly Journal of the Royal Meteorological Society, 146(726), 49-68.
5. Weyn, J. A., Durran, D. R., & Caruana, R. (2020). Improving data-driven global weather prediction using deep convolutional neural networks on a cubed sphere. arXiv preprint arXiv:2003.11927.
6. Naveen, L., & Mohan, H. S. (2019, March). Atmospheric Weather Prediction Using various machine learning Techniques: A Survey. In 2019 3rd International Conference on Computing Methodologies and Communication (ICCMC) (pp. 422-428). IEEE.
7. Weber, N. J., & Mass, C. F. (2019). Subseasonal weather prediction in a global convection-permitting model. Bulletin of the American Meteorological Society, 100(6), 1079-1089.
8. Olson, J. B., Kenyon, J. S., Djalalova, I., Bianco, L., Turner, D. D., Pichugina, Y., ... & Akish, E. (2019). Improving wind energy forecasting through numerical weather prediction model development. Bulletin of the American Meteorological Society, 100(11), 2201-2220.
9. Alley, R. B., Emanuel, K. A., & Zhang, F. (2019). Advances in weather prediction. Science, 363(6425), 342-344.



10. Sharaff, A., & Roy, S. R. (2018, May). Comparative Analysis of Temperature Prediction Using Regression Methods and Back Propagation Neural Network. In 2018 2nd International Conference on Trends in Electronics and Informatics (ICOEI) (pp. 739-742). IEEE. 58
11. Jakaria, A. H. M., Hossain, M. M., & Rahman, M. A. (2018). Smart Weather Forecasting using Machine Learning: A Case Study in Tennessee.
12. Abrahamsen, E., Brastein, O. M., & Lie, B. (2018, November). Machine Learning in Python for Weather Forecast based on Freely Available Weather Data. In Proceedings of The 59th Conference on Simulation and Modelling (SIMS 59), 26-28 September 2018, Oslo Metropolitan University, Norway (No. 153, pp. 169- 176). Linköping University Electronic Press.
13. Kurniawan, A. P., Jati, A. N., & Azmi, F. (2017, August). Weather prediction based on a fuzzy logic algorithm for supporting a general farming automation system. In 2017 5th International Conference on Instrumentation, Control, and Automation (ICA) (pp. 152-157). IEEE.
14. Pandey, A. K., Agrawal, C. P., & Agrawal, M. (2017, February). A Hadoop-based weather prediction model for the classification of weather data. In 2017 Second International Conference on Electrical, Computer and Communication Technologies (ICECCT) (pp. 1-5). IEEE.
15. Setyaningrum, A. H., & Swarinata, P. M. (2014, November). Weather prediction application based on ANFIS (Adaptive neural fuzzy inference system) method in West Jakarta region. In 2014 International Conference on Cyber and IT Service Management (CITSM) (pp. 113-118). IEEE.



SJIF: 8.423



INTERNATIONAL
STANDARD
SERIAL
NUMBER
INTERNATIONAL CENTRE



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

 **9940 572 462**  **6381 907 438**  **ijirset@gmail.com**



www.ijirset.com

Scan to save the contact details