**BRACT’s**

**Vishwakarma Institute of Information Technology, Pune**

Course Name: Artificial Neural Network in Engineering

**Skill and Competency Examination**

**Name:** Nikita Narendra Dara

**Roll No.:** 331071

**Gr No.:** 21920136

**Batch:** TY IT A

**Aim**

Time series forecasting using ANN

**Objective**

To forecast temperature one day in advance using ANN

**Study area/ data:**

Data collected from link: <https://www.imd.gov.in/Welcome%20T0%20!MD/Welcome.php>

Data is as follows:

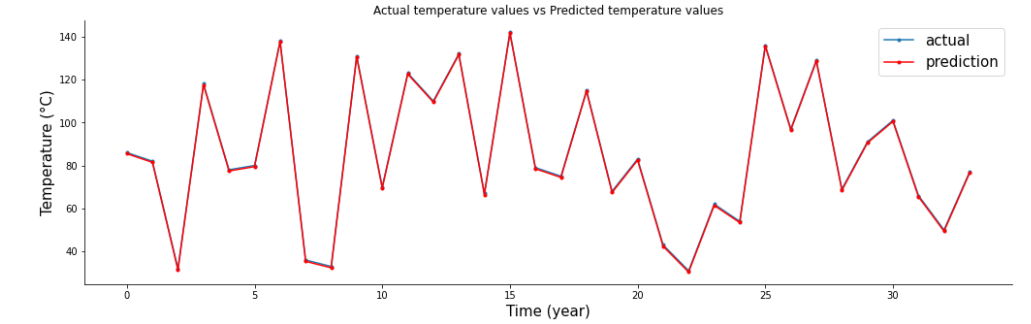
|  |  |
| --- | --- |
| **YEAR** | **OCT-DEC** |
| 1901 | 21.92 |
| 1902 | 21.49 |
| 1903 | 21.27 |
| 1904 | 21.42 |
| 1905 | 21.48 |
| 1906 | 22.08 |
| 1907 | 21.76 |
| 1908 | 21.17 |
| 1909 | 21.75 |
| 1910 | 20.96 |
| 1911 | 21.48 |
| 1912 | 21.29 |
| 1913 | 21.32 |
| 1914 | 21.52 |
| 1915 | 22.01 |
| 1916 | 21.27 |
| 1917 | 21.01 |
| 1918 | 21.54 |
| 1919 | 21.48 |
| 1920 | 21.85 |
| 1921 | 21.39 |
| 1922 | 21.2 |
| 1923 | 21.4 |
| 1924 | 21.52 |
| 1925 | 21.51 |
| 1926 | 21.26 |
| 1927 | 21.76 |
| 1928 | 21.81 |
| 1929 | 21.42 |
| 1930 | 21.71 |
| 1931 | 21.97 |
| 1932 | 21.75 |
| 1933 | 21.77 |
| 1934 | 21.55 |
| 1935 | 21.65 |
| 1936 | 21.86 |
| 1937 | 21.14 |
| 1938 | 21.31 |
| 1939 | 21.67 |
| 1940 | 21.91 |
| 1941 | 22.3 |
| 1942 | 21.72 |
| 1943 | 21.68 |
| 1944 | 21.76 |
| 1945 | 21.16 |
| 1946 | 22.13 |
| 1947 | 21.39 |
| 1948 | 21.73 |
| 1949 | 21.29 |
| 1950 | 21.14 |
| 1951 | 22.45 |
| 1952 | 21.77 |
| 1953 | 22.01 |
| 1954 | 21.15 |
| 1955 | 21.35 |
| 1956 | 21.41 |
| 1957 | 21.94 |
| 1958 | 22.13 |
| 1959 | 22 |
| 1960 | 21.84 |
| 1961 | 21.17 |
| 1962 | 21.47 |
| 1963 | 22.04 |
| 1964 | 21.58 |
| 1965 | 22.1 |
| 1966 | 21.83 |
| 1967 | 21.68 |
| 1968 | 21.69 |
| 1969 | 22.2 |
| 1970 | 21.55 |
| 1971 | 21.48 |
| 1972 | 21.88 |
| 1973 | 21.53 |
| 1974 | 21.38 |
| 1975 | 21.3 |
| 1976 | 22.25 |
| 1977 | 22.3 |
| 1978 | 22.22 |
| 1979 | 22.59 |
| 1980 | 22.17 |
| 1981 | 21.68 |
| 1982 | 22.02 |
| 1983 | 21.71 |
| 1984 | 21.82 |
| 1985 | 21.84 |
| 1986 | 21.9 |
| 1987 | 22.29 |
| 1988 | 22 |
| 1989 | 21.94 |
| 1990 | 22.11 |
| 1991 | 21.87 |
| 1992 | 22.04 |
| 1993 | 22.21 |
| 1994 | 21.97 |
| 1995 | 23.19 |
| 1996 | 21.76 |
| 1997 | 21.89 |
| 1998 | 22.42 |
| 1999 | 22.29 |
| 2000 | 22.68 |
| 2001 | 22.52 |
| 2002 | 22.58 |
| 2003 | 22.23 |
| 2004 | 22.24 |
| 2005 | 21.93 |
| 2006 | 22.66 |
| 2007 | 22.32 |
| 2008 | 22.87 |
| 2009 | 22.58 |
| 2010 | 22.6 |
| 2011 | 22.71 |
| 2012 | 22.35 |
| 2013 | 22.5 |
| 2014 | 22.47 |
| 2015 | 22.99 |
| 2016 | 24.2 |
| 2017 | 24.21 |

**Model Inputs (names)**

Model gets only one input column which is named as OCT-DEC column in the dataset, and then generates output for the temperature column of OCT-DEC month.

**Model Output(s)**

Output graphs after training the model and testing after its own values which were used as testing dataset. This is graph which shows the comparison between actual and predicted values.



**Number of layers**

There are three layers in this model, those are as follows.

1. Input layer
2. Hidden layer
3. Output layer

**Type of ANN:** FFBP (Feed Forward Back Propagation)

**Algorithm**

Standard back-propagation (Gradient descent)

**Transfer Functions:**

**Performance function:** MSE

**Data Division**

Data division is done by using a sklearn library method called train\_test\_split(), which divides the data into training dataset and testing dataset on the basis of training size given and random variable.

**Stopping Criteria**

Stopping criteria for the training phase is epoch made by the program. Size of 100 epochs are given for the training phase after that it will stop training the model.

**Results in Testing**

Results in training are as follows.

Chart, line chart

Description automatically generated

The loss plot after 100 epoch becomes almost the same as the training plot, this reduces the errors of the model.

**RMES and R between actual and predicted values**

Chart, line chart

Description automatically generated

**Scatter plot between actual and predicted values:**

Chart, scatter chart

Description automatically generated

**Discussion of results**

* Model gives error of 13.79.
* More data is needed for more accurate results.
* Model is not overfitting as we can see the results are consistent on several epochs.

**Conclusion**

This model can provide accurate results for forecasting as it’s trained on real time data.