9.Which are applications of neural networks

**Applications of Neural Networks**

Neural Networks are regulating some key sectors including finance, healthcare, and automotive. As these artificial neurons function in a way similar to the human brain. They can be used for image recognition, character recognition and stock market predictions. *Let’s understand the diverse applications of neural networks*

**1. Facial Recognition**

Facial Recognition Systems are serving as robust systems of surveillance. Recognition Systems matches the human face and compares it with the digital images. They are used in offices for selective entries. The systems thus authenticate a human face and match it up with the list of IDs that are present in its database.   
**Convolutional Neural Networks (CNN)**are used for **facial recognition and image processing.** Large number of pictures are fed into the database for training a neural network. The collected images are further processed for training.

Sampling layers in CNN are used for proper evaluations. Models are optimized for accurate recognition results.

**2. Stock Market Prediction**

*Investments are subject to market risks.* It is nearly impossible to predict the upcoming changes in the highly volatile stock market. The forever changing bullish and bearish phases were unpredictable before the advent of neural networks. But well what changed it all? Neural Networks of course…

To make a successful stock prediction in real time a**Multilayer Perceptron MLP***(class of feedforward artificial intelligence algorithm)*is employed.  MLP comprises multiple layers of nodes, each of these layers is fully connected to the succeeding nodes. Stock’s past performances, annual returns, and non profit ratios are considered for building the MLP model.

 Check out this video to know how the LTSM model is built for making predictions in the stock market.

**3. Social Media**

No matter how cliche it may sound, social media has altered the normal boring course of life. Artificial Neural Networks are used to study the behaviours of social media users. Data shared everyday via virtual conversations is tacked up and analyzed for competitive analysis.

 Neural networks duplicate the behaviours of social media users. Post analysis of individuals' behaviours via social media networks the data can be linked to people’s spending habits. **Multilayer Perceptron ANN**is used to mine data from social media applications.

MLP forecasts social media trends, it uses different training methods like **Mean Absolute Error (MAE),**[**Root Mean Squared Error (RMSE),**](https://www.researchgate.net/publication/284169605_Application_of_Artificial_Neural_Network_in_Social_Media_Data_Analysis_A_Case_of_Lodging_Business_in_Philadelphia)**and Mean Squared Error (MSE).** MLP takes into consideration several factors like user’s favourite instagram pages, bookmarked choices etc. These factors are considered as inputs for training the MLP model.

In the ever changing dynamics of social media applications, artificial neural networks can definitely work as the best fit model for user data analysis.

**4. Aerospace**

Aerospace Engineering is an expansive term that covers developments in spacecraft and aircraft. Fault diagnosis, high performance auto piloting, securing the aircraft control systems, and modeling key dynamic simulations are some of the key areas that neural networks have taken over. Time delay Neural networks can be employed for modelling [non linear time dynamic systems.](https://www.hindawi.com/journals/ijae/2011/247294/)

**Time Delay Neural Networks** are used for **position independent feature recognition.**  The algorithm thus built based on time delay neural networks can recognize patterns. *(Recognizing patterns are automatically built by neural networks by copying the original data from feature units).*

Other than this TNN are also used to provide stronger dynamics to the NN models. As passenger safety is of utmost importance inside an aircraft, algorithms built using the neural network systems ensures the accuracy in the autopilot system. As most of the autopilot functions are automated, it is important to ensure a way that maximizes the security.

**5. Defence**

Defence is the backbone of every country. Every country’s state in the international domain is assessed by its military operations. Neural Networks also shape the defence operations of technologically advanced countries. The United States of America, Britain, and Japan are some countries that use artificial neural networks for developing an active defence strategy.

Neural networks are used in logistics, armed attack analysis, and for object location. They are also used in air patrols, maritime patrol, and for controlling automated drones. The defence sector is getting the much needed kick of artificial intelligence to scale up its technologies.

**Convolutional Neural Networks(CNN),** are employed for determining the presence of underwater mines. Underwater mines are the underpass that serve as an illegal commute route between two countries. [**Unmanned Airborne Vehicle (UAV),**](https://www.scribd.com/document/365257419/02-10) and **Unmanned Undersea Vehicle (UUV)**these autonomous sea vehicles use convolutional neural networks for the image processing.

**Convolutional layers**form the basis of Convolutional Neural Networks. These layers use different filters for differentiating between images. Layers also have bigger filters that filter channels for image extraction.

**6.  Healthcare**

*The age old saying goes like “Health is Wealth”.* Modern day individuals are leveraging the advantages of technology in the healthcare sector. **Convolutional Neural Networks**are actively employed in the healthcare industry for**X ray detection,** **CT Scan** and **ultrasound.**

As CNN is used in image processing, the medical imaging data retrieved from aforementioned tests is analyzed and assessed based on neural network models. **Recurrent Neural Network (RNN)** is also being employed for the development of voice recognition systems.  
[Voice recognition systems](https://www.delltechnologies.com/en-us/blog/healthcare-trends-in-neural-networks/)are used these days to keep track of the patient’s data. Researchers are also employing **Generative Neural Networks**for drug discovery. Matching different categories of drugs is a hefty task, but generative neural networks have broken down the hefty task of drug discovery. They can be used for combining different elements which forms the basis of drug discovery.

**7. Signature Verification and Handwriting Analysis**

Signature Verification , as the self explanatory term goes, is used for verifying an individual’s signature. Banks, and other financial institutions use signature verification to cross check the identity of an individual.

Usually a signature verification software is used to examine the signatures. As cases of forgery are pretty common in financial institutions, signature verification is an important factor that seeks to closely examine the authenticity of signed documents.

**Artificial Neural Networks** are used for **verifying the signatures.** ANN are trained to recognize the difference between real and forged signatures. ANNs can be used for the verification of both offline and online signatures.

For training an ANN model, varied datasets are fed in the database. The data thus fed help the ANN model to differentiate. **ANN model employs image processing**for [extraction of features.](http://www.iosrjournals.org/iosr-jce/papers/Conf.16051/Volume-1/7.%2028-35.pdf)

Handwriting analysis plays an integral role in forensics. The analysis is further used to evaluate the variations in two handwritten documents. The process of spilling words on a blank sheet is also used for behavioural analysis. **Convolutional Neural Networks (CNN)** are used for handwriting analysis and handwriting verification.

**8. Weather Forecasting**

The forecasts done by the meteorological department were never accurate before artificial intelligence came into force. Weather Forecasting is primarily undertaken to anticipate the upcoming weather conditions beforehand. In the modern era, weather forecasts are even used to predict the possibilities of natural disasters.

**Multilayer Perceptron (MLP), Convolutional Neural Network (CNN) and Recurrent Neural Networks (RNN)** are used for weather forecasting. Traditional ANN multilayer models can also be used to predict climatic conditions 15 days in advance. A combination of different types of neural network architecture can be used to predict air temperatures.

Various inputs like air temperature, relative humidity, wind speed and solar radiations were considered for training neural network based models. **Combination models (MLP+CNN), (CNN+RNN)** usually works better in the case of weather forecasting.