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Paper Authors   **Dr.N.Baskar**

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IMPLICATIONS OF INDUSTRIAL APPLICATIONS USING PYTHON WITH NEURAL NETWORKS

Dr.N.Baskar, Assistant Professor in Computer Science and Engineering
Malla Reddy Engineering College for Women (Autonomous), Secunderabad – 500 100
baskarsrkv@gmail.com

Abstract: Python is a programming language is used to create web sites, software, gaming applications, CAD (computer aided design), GUI (photo based totally operating gadget), medical programs, etc. Python programs have speedily evolved reputation amongst builders from extraordinary areas. It has the ability to transfer in many regions is marvellous. All of the credit score goes to its huge and numerous library and gear. Neural networks can help computers make intelligent decisions using python with limited human assistance.

Keywords: ANN, IIoT, Machine Learning, Deep Learning, Industrial Applications

I. Introduction

One of the most well-liked computer languages in both coding and data science is Python. Python is a high-level, general-purpose, open-source programming language that combines elements of functional, object-oriented, and structural programming. Python can be used to increase a bunch of programs, which include internet apps, gaming apps, agency-stage packages, ML apps, photograph processing, text processing, and a lot greater [1]. Artificial intelligence is responsible for giving computers the ability to assume, feel, and discover new paths. Deep Learning, a subset of gadget gaining knowledge of, makes use of layers of algorithms that bypass information thru digital alerts from one layer to the next, proceeding from the input layer to the output layer with one or extra hidden layers in-among. Every layer includes one or greater nodes that method facts. Such layers of algorithms, cumulatively referred to as an Artificial Neural Network (ANN), permit computers analyse data, understand human speech, and visually recognize items [6]. Python is free to use and distribute, even for commercial purposes, as it was created under the open source initiative approved license [7].

II. Python in Industrial Automations

Industry 4.0 is the Industrial Internet of Things (IIoT), which connects industrial machinery on a local network for real-time machine-to-machine (M2M) communication and to provide a steady stream of sensor data for analytics. Python is famed for its ability to deal with big facts sets. Guido Van Rossum, Python's inventor, designed it for excessive clarity, a key trait when more than one engineers will paintings on or hold the equal code and a function that fuels the fireplace of innovative new release [2].

The organization used python Frameworks are Django, Flask, Bottle, Pyramid, Falcon and so on. An ecosystem of open source software maths, science and engineering. The SciPy ecosystem are Numpy, SciPy library, Pandas, Scikit-image, Scikit-learn, and more. The organizations are RedHat, Google, NASA, YouTube, Instagram, Facebook, Microsoft and many more industries used Python automation process.

Machine Learning

Python has the most influence in machine learning (ML), a kind of artificial intelligence (AI) in which algorithms learn from data without explicitly implementing any rules. Predictive security and autonomous robotics are common industry bundles. Most modern machine learning is written in Python. Frameworks like PyTorch and Google's open source TensorFlow use Python.

Computer Vision

Enter Computer Vision (CV), a branch of AI that enables robots to use their cameras as eyes and, more importantly, to comprehend the objects they perceive. In actuality, it's not difficult to see how Python is helpful for CV when considering its enormous importance in ML. OpenCV is now one of the best options for open source CV development. Even though the library is still written in C++, the Python wrapper, opencv-python, is ideal for ML applications like deep learning for CV because it retains the speed of the original C++ code while still unlocking the benefits of Python.

Opencv-python creates NumPy arrays as output, then immediately port our data over to other Python tools like SciPy, Matplotlib, or our ML platform of choice.
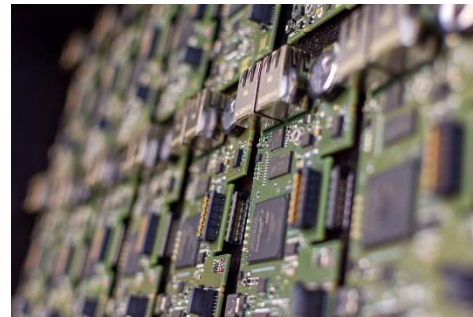
Creating a Bridge for a Connected Ecosystem

whilst machine producers ship gadgets, they don't usually prioritize the potential to talk with anything apart from the human machine interface(HMI). Programs like OpenMTC act as a middleware, or "software glue," for M2M and IoT applications. For instance, if put this middleware on a device as simple as a Raspberry Pi, then the Python script takes data from one source, converts it, and sends it to a different machine in a format that it can read. A Simple example is any temperature-sensitive manufacturing process [2].
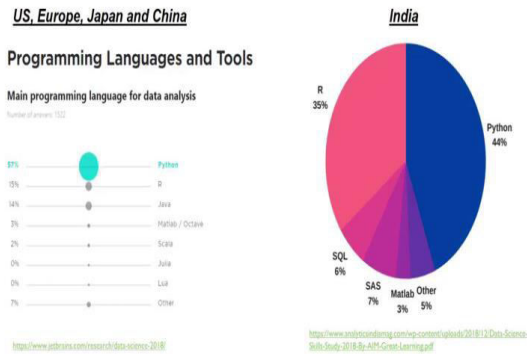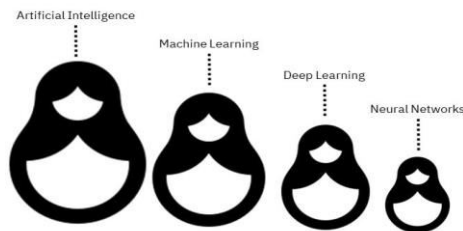

Figure 1. Python Applications [8]

Figure 2. Python Trends across the globe[7]

III. Neural Networks in Industrial Applications

In the domains of Artificial Intelligence (AI), machine learning, and deep learning, neural networks can solve common issues because they mimic the behavior of the human

mind.

Different sectors frequently use neural networks. Startups and large corporations both employ this technology. Neural networks are frequently used in a variety of industries, from eCommerce to auto manufacturing.

Some examples of neural network applications in different areas. Mostly, in:

- ecommerce
- Finance
- Healthcare
- Security

- Logistics. etc.,

eCommerce

The personalization of the shopping experience in eCommerce is made possible by artificial neural network technology. For instance, Amazon, AliExpress, and other eCommerce platforms use AI to show the related and recommended products.


Amazon shows related products

As for more complicated applications of neural networks in eCommerce, there is a very interesting startup called PixelDTGAN. This product is developed to help sellers save the budget on photographers' services. There is no need to organize photo sets as the special algorithm automatically makes the pictures of the clothes worn by models. All is needed to do is to resize the images of the items to 64*64, and get the result.


Examples of PixelIDTGAN work results

Finance

In industries used for neural network packages for fraud detection, management, and forecasting.
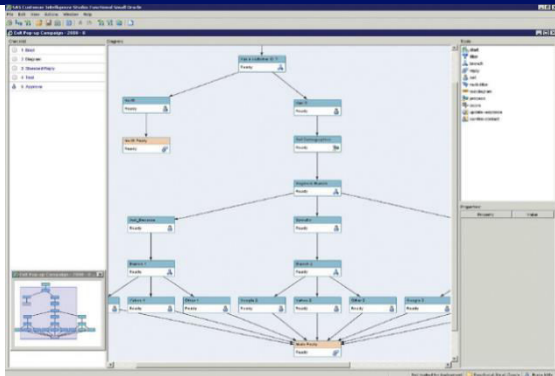
SAS real Time choice manager is a fantastic illustration of a neural network finance application. It enables banks to find answers to business difficulties (such as whether or not to grant credit to a favourable character right away). reading potential risks and profits. The screenshot of SAS Real Time Decision Manager

There are many tools available for financial forecasting that can foresee changes in exchange rates. For instance, the business Finprophet has developed software that makes predictions about a variety of financial assets, such as currencies, cryptocurrencies, stocks, and futures, using a neural network of deep learning.
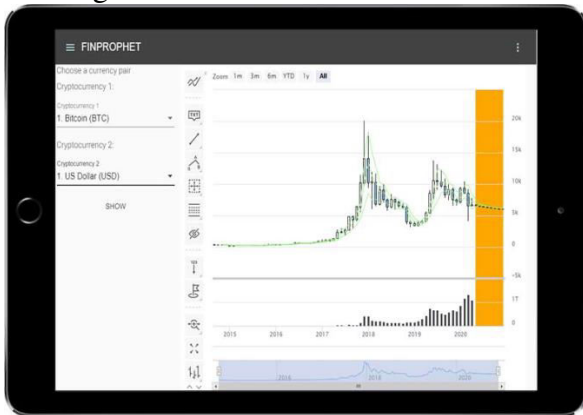

Healthcare

It demands such high accuracy, building and training a neural network for use in the healthcare industry is highly challenging. It was thought for many years that using this generation to examine and diagnose patients was a myth. However, it is now finally feasible.

The most potent artificial intelligence in the world is IBM Watson. The neural network needed two years to be trained for use in medicine. Medical academic publications, patient records, and other documents totalling millions of pages were submitted to the system for learning. And now it can prompt the diagnosis and propose the best treatment pattern based on the patient's complaints and anamnesis.
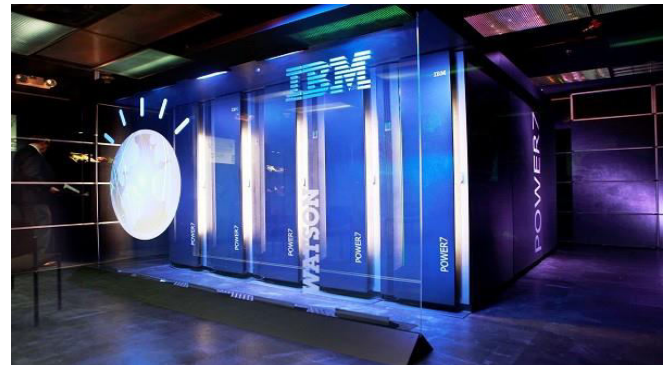
This is the original version of IBM Watson, which includes 2800 processor cores and 15 terabytes of memory.
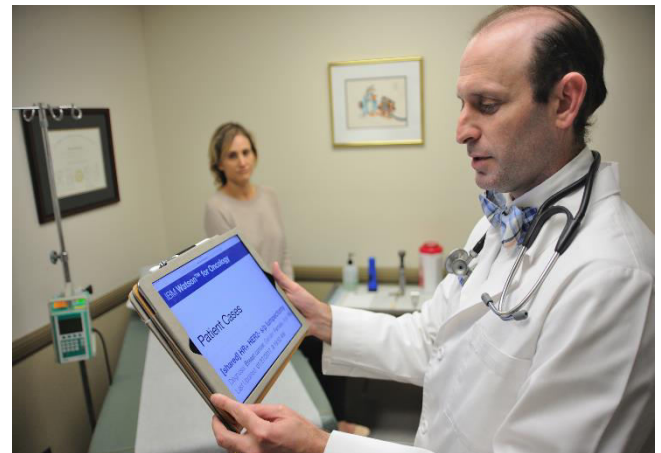

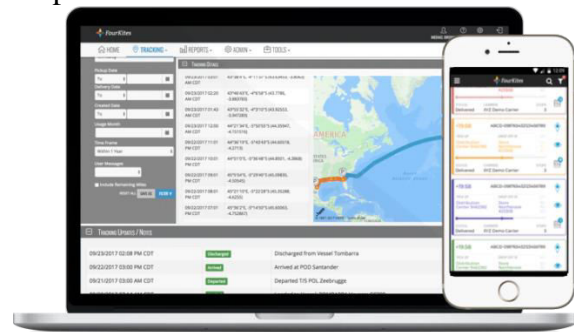Doctors can use the abilities of IBM Watson with the help of tablets with cloud connection

Security

Neural networks are frequently used to protect against fraud, laptop viruses, and other threats. The Symantec product ICSP Neural is one of the examples. It defends against cyberattacks by identifying dangerous USB

devices carrying malware and taking advantage of zero-day vulnerabilities.
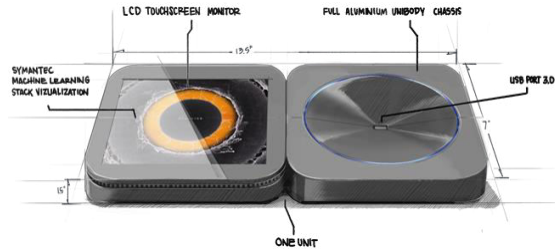
ICSP Neural scanning station

### *Logistics*

The workforce of numerous organizations must manage the industry manually in order to meet its varied needs. However, neural networks nowadays are capable of dispatching and routing.

For example, wise structures are a self-reliant machine which shall we a user:
• plan routes and screen them;
• personalize shipping routes in actual-time with the help of predictive capabilities.
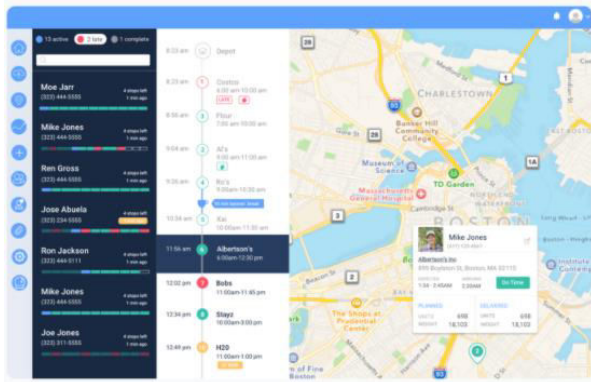
Screenshot of Wise Systems

FourKites is an additional solution. This real-time visibility application operates in such manner. Predicting the time of delivery and planning and observing routes are both

helpful.

The interface of FourKites on laptop and mobile phone

Vehicle building

To automate the procedures of constructing vehicles, this industry uses artificial intelligence and machine learning. As an illustration, Tesla uses a neural network for their in-car autopilot system. It uses trained artificial intelligence to help it understand road markings, identify obstructions, and improve street safety for moving vehicles [3]. The Tesla-developed neural network powers the computer, serving as the basis for training and developing Autopilot. This advanced system offers a comprehensive perspective of the surroundings, surpassing the capabilities of a human driver by perceiving in multiple directions and across wavelengths beyond human sensory abilities.

Tesla Autopilot Vehicle

Insurance

One of the few advantages provided by NNs is insurance. Insurance companies use neural networks to forecast future loss costs and modify fees. Their profit margin thus grows.

Banking

Neural networks are frequently used to protect against fraud, laptop viruses, and other threats. The Symantec product ICSP Neural is

one of the examples. It defends against cyberattacks by identifying dangerous USB devices carrying malware and taking advantage of zero-day vulnerabilities.

Retail and sales

Following on from the preceding commercial use of ANN, retail and income also are finding these structures and algorithms to be tremendously beneficial. They may be used for demand forecasting and income forecasting. An ANN-powered system can compute the range of goods that stores ought to have accessible. Thus, they will consciousness on increasing their profitability [4].

AI Translation Tools

The ANUVADINI: Voice & Document AI Translation Tools consisting of a multitude of features and functionalities desires to close this gap arising due to language [5].

IV. Experimental

The above Common Python program use to execute other programming languages.
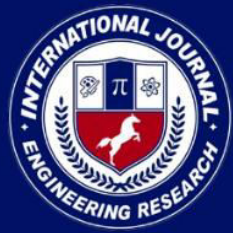

Commands with Solutions

V. Conclusion

Python applications have grown in the subject of data technology and device studying. Python has conveyed in numerous changes to the industry given it is easy to use as well as comes full of powerful libraries. Python to control robotic hardware or interface with manufacturing equipment, that doesn't mean this programming language doesn't have industrial packages. The roles in Python pay big programs over time and Python builders are in excessive call for. AI and ML are the future of all of the industries. The above dialogue packages and experimental effects are suggesting that the power of python with commercial packages use in neural networks developing speedy within the industries. Those technologies assist to make choices, automate the operating techniques, prevent fraud, and do other jobs.

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