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Building Business Intelligence Data Extractor using NLP and Python

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Abstract: ***The goal of the Business Intelligence data extractor (BID- Extractor) tool is to offer high-quality, usable data that is freely available to the public. To assist companies across all industries in achieving their objectives, we prefer to use cutting-edge, business-focused web scraping solutions. The World wide web contains all kinds of information of different origins; some of those are social, financial, security, and academic. Most people access information through the internet for educational purposes. Information on the web is available in different formats and through different access interfaces. Therefore, indexing or semantic processing of the data through websites could be cumbersome. Web Scraping/Data extracting is the technique that aims to address this issue. Web scraping is used to transform unstructured data on the web into structured data that can be stored and analyzed in a central local database or spreadsheet. There are various web scraping techniques including Traditional copy-and-paste, Text capturing and regular expression matching, HTTP programming, HTML parsing, DOM parsing, Vertical aggregation platforms, Semantic annotation recognition, and Computer vision webpage analyzers. Traditional copy and paste is the basic and tiresome web scraping technique where people need to scrap lots of datasets. Web scraping software is the easiest scraping technique since all the other techniques except traditional copy and pastes require some form of technical expertise. Even though there are many webs scraping software available today, most of them are designed to serve one specific purpose. Businesses cannot decide using the data. This research focused on building web scraping software using Python and NLP. Convert the unstructured data to structured data using NLP. We can also train the NLP NER model. The study's findings provide a way to effectively gauge business impact.***

The solution has a greater impact when applied to:

- ✓ ***Analyzing companies' fundamentals***
- ✓ ***Analyzing better deal opportunities.***

Keywords: Web Scraping, Information Extraction

I. INTRODUCTION

Business Intelligence data extractor can be used by many of the world's leading industries to convert millions of web pages into meaningful information daily. To effectively gauge the impact on business, this solution might be made available as a service.

The following factors increase the impact of the solution:

1) Fundamental analysis of companies
2) Analyse prospects for better deals.

Data as a Service (DaaS) enables intelligent decision-making by providing high-quality structured data to improve business outcomes, acquire useful insight, and boost business outcomes. Any research, whether it be academic, marketing-related, or scientific. People may desire to gather and examine the information from several websites. the various websites that belong information shown according to the particular category are varied formats. You might not be able to compete even with one website to view all information at once. Data spans are possible. spans several pages and under different topics. The only available method is manually copying the website's data into a local file on your computer.
computer. This is an extremely time-consuming and laborious task.

II. OVERVIEW OF WEB DATA EXTRACTION

Web data extraction is a fantastic method for removing and converting unstructured data from websites. The information into structured information that may be stored and database-based analysis Web scraping also goes by the names Web harvesting, web data extraction, and web data scraping or scratching the screen. Data collected by web scraping is called mining. The process of web scraping is intended to: information from websites is extracted and transformed into a logical framework, such as databases and spreadsheets or a CSV (comma-separated values) file.

A. Challenges

Targeting websites, such as the "top 100 search results for this phrase" or "these 3 e-commerce websites for this product category," is the first step in web scraping. On the surface, this may seem simple, but the next step requires finding precise URLs that match these targets, which is difficult for web scraping. To create the target URLs for the required pages, a web scraper must locate the source URL. Broken links and websites with irrelevant information cause the algorithm to waste time and data storage while creating thousands of URLs for content that has no commercial value to the consumer.

To avoid having their services interrupted by heavy traffic, websites may try to prevent web scrapers. They accomplish this by "fingerprinting" the scraper in order to identify its origin and behavior. Examples of this include determining whether the same IP address is repeatedly attempting to scrape the same website, the scraper's device and operating system, and the speed at which requests are sent. According to a study, these fingerprints can be followed by websites once they have been recognized for an average of 54 days. This necessitates the usage of unique origins in each online scraping request and the requirement for web scrapers to anonymize themselves by altering their behavior to that of human users while scraping a website.

B. Solution

Web scraping is made easier by AI in two ways:

Algorithms for classifying data: Algorithms that have been trained on large data sets obtained via web scraping can recognize and categorize inactive URLs. This enables web scraping algorithms to focus their efforts on only a small fraction of potentially useful websites. Algorithms for natural language processing: A recent study recommends enhancing web scraping algorithms to use natural language processing to scan the scraped data and determine the content's relevance. In this method, the effort required for data processing and storage is optimized because data that is below the relevancy level would not be saved at all.

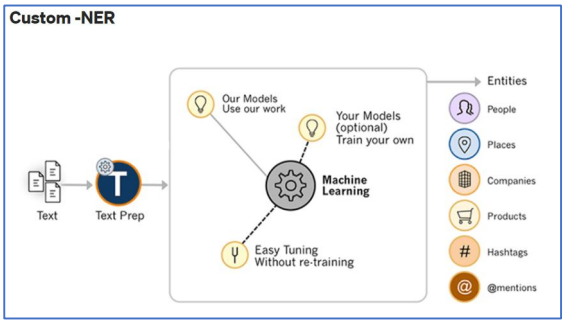
Dynamic proxies, which require the web scraper to dynamically alter their IP address with each web scraping request, are a frequent solution to this problem. Other factors do, however, still aid websites in identifying automated web scrapers. Dynamic proxy technology is supported by AI solutions that optimize the other parameters. Web scrapers can use this training data to make sure the new parameters they employ are considerably different from the fingerprints they generated in the past as each attempt at web scraping generates a fingerprint on the scraper end.

AI techniques can produce adaptive parsing models that gain knowledge via practice. Parsing models can learn how to effectively classify distinct sections of the scraped data and weed out unneeded pieces by utilizing parsed data as a training set. Some of these features, despite having separate website structures, might also be present on related websites. For instance, a data parsing algorithm may identify the approximate location of a product's image and details and use this as a proxy to identify where to look for the necessary data in a different dataset because many e-commerce websites have similar layouts to display the product image and details, such as price.

We will use SpaCy to train custom NER model.

SpaCy is an open-source software library for advanced natural language processing, written in the Programming languages Python and Cython were used to create the open-source software library known as SpaCy, which is used for sophisticated natural language processing. To train our custom-named entity recognition model, we'll need some relevant text data with the proper annotations. We will use open-source US data to train the NER model.

In contrast to NLTK, which is frequently used for research and education, spaCy concentrates on offering software for use in actual production. By combining statistical models trained by well-known machine learning libraries like Tensor Flow, PyTorch, or MXNet through its machine learning library Thinc, spaCy now supports deep learning workflows as of version 1.0.



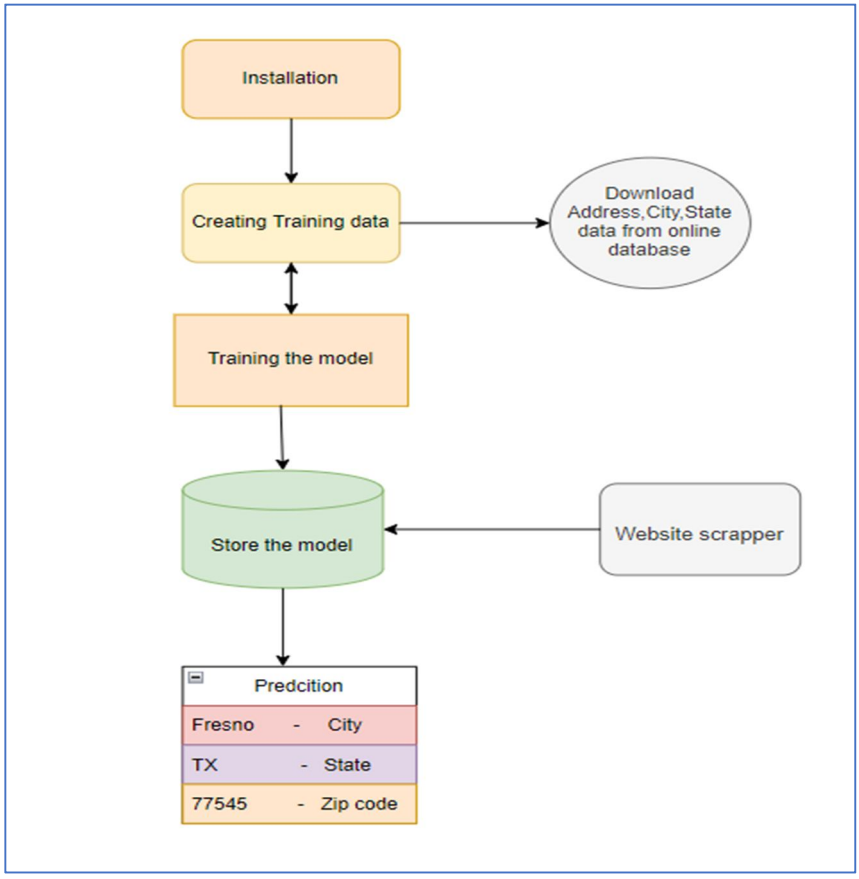
Now, the major part is to create custom entity data for the input text where the named entity is to be identified by the model during the testing period.
At its core, all entity recognition systems have two steps:

1) Detecting the Entities in Text

Categorizing the entities into named classes. In the first step, the NER detects the location of the token or series of tokens that form an entity. Inside-outside-beginning chunking is a common method for finding the starting and ending indices of entities. The second step involves the creation of entity categories. These categories change depending on the use case, but here are some of the most common entities classes:

- Person
- Organization
- Location
- Time
- Measurements or Quantities
- String patterns like email addresses, phone numbers, or IP addresses

2) NLP NER Model building



Web scraping's significance in machine learning

Web scraping in machine learning is primarily focused on the fundamental issue of obtaining high-quality data.
Although the internal data gathered on routine business operations can offer insightful information, such data is insufficient. Therefore, even though it is a more difficult process, getting information from outside sources is crucial. When scraping, accuracy and poor data quality become major issues. As a result, every scraping project must always include a final clean-up process, although this will be covered in more detail later in this guide.

C. Technical Architecture and Workflow

Below are the steps to be performed to get this tool running

1) Select type to web scrapping – Text, Geo coordinates from maps or Images.
2) Input the web URL from where data is to be extracted.
3) Tool will navigate to the web URL and display the web page in the display panel
4) User selects elements/links from where data is to be extracted
5) Select if data is to be extracted from multiple pages.
6) Run the tool and extract data

The following example collects historical stock prices using web scraping. Data points, such as daily opening, daily highest, daily lowest, and daily closing, will be collected as well. Thankfully, numerous websites provide such data, and it's usually, conveniently, presented in a table. Typically, you'll see the HTML code that renders these tables, such as the following image.

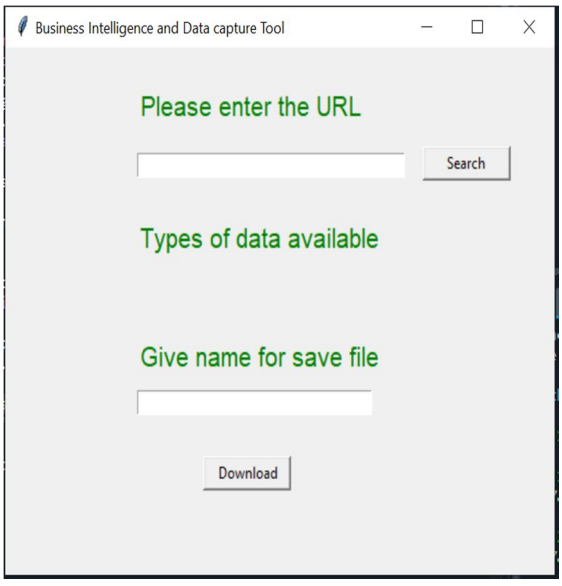
Dynamic Fingerprinting Powered by AI

How might AI- and ML-based anti-bot algorithms be best defeated? developing a crawling method that uses AI and ML. Finding reliable data is not difficult because the indicators of success and failure are clear-cut. Anyone who has previously engaged in web scraping ought to already have a sizable collection of fingerprints that could be valued. These fingerprints might be tagged, saved in a database, and used as training data.

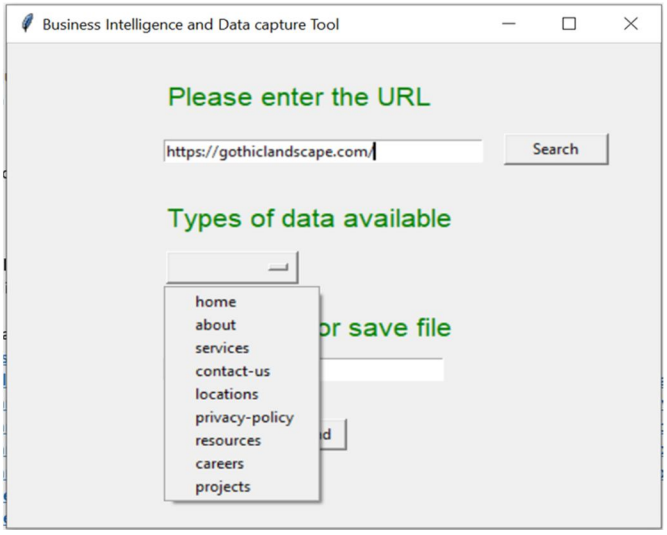
Testing and validation, however, will be slightly more challenging. Some fingerprints may experience blocks more frequently than others because not all fingerprints are created equal. The AI will be significantly improved over time by gathering information on success rates per fingerprint and developing a feedback loop.

III. DESIGN OF SOFTWARE

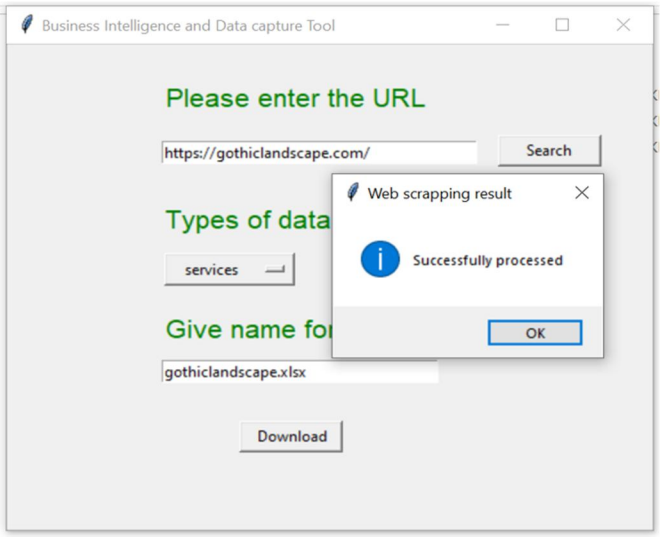
A. Enter the URL and click on Search



B. Select the type of data to be extracted



C. Click on Download Button



D. Output in Excel File

1) Service Data Extraction

Services	Description
Landscape construction	Since 1984, Gothic's Construction Division has created inspiring commercial landscapes across the Southwest. We've built beautiful parks for families to enjoy, created desert resort oases, transformed barren spaces into incredible streetscapes and turned city rooftops into lush gardens.Through strong relationships with leading developers, builders, general contractors, municipalities and property owners, Gothic Landscape offers a wide range of market-leading landscape construction services.
Landscape management	Gothic Landscape Management Division offers integrated landscape services designed to enhance and strengthen the value of your landscape assets. Our specialized services are designed to meet the unique service needs of each individual property and exceed the client's expectations to create enduring beauty and value.
Environmental restoration	Native land can be disturbed by a number of natural processes but mostly by the processes of development and construction. Gothic's Environmental Restoration Division specializes in erasing the construction footprint and restoring the beauty of the environment

2) Location data Extraction

Parent Comp	Sub-Brand (if relevant)	Branch Type (If relevant)	Street	City	State	Zip Code	Other Comments	Link
Yellowstone	NA	Commercial landscape main	821 Evergreen Street	Fresno	TX	77545	346-307-6691	https://ww
Yellowstone	NA	Commercial landscape main	2819 Industrial Aven	North Charleston	SC	29405	843-225-2380	https://ww
Yellowstone	NA	Commercial landscape main	8525 20th St	Vero Beach	FL	32966	772-200-4571	https://ww
Yellowstone	NA	Commercial landscape main	6108 33rd Street East	Bradenton	FL	34203	941-251-8080	https://ww
Yellowstone	NA	Commercial landscape main	2269 2nd Avenue No	Lake Worth	FL	33461	561-241-2424	https://ww
Yellowstone	NA	Commercial landscape main	2665 SW Domina Roa	Port St. Lucie	FL	34953	772-200-4571	https://ww
Yellowstone	NA	Commercial landscape main	30319 Commerce Dri	San Antonio	FL	33576	813-223-6999	https://ww
Yellowstone	NA	Commercial landscape main	9506 North Trask Str	Tampa	FL	33624	813-886-7755	https://ww
Yellowstone	NA	Commercial landscape main	12007 West Peoria A	El Mirage	AZ	85335	480-454-1396	https://ww
Yellowstone	NA	Commercial landscape main	25106 South 122nd S	Chandler	AZ	85249	480-782-5296	https://ww
Yellowstone	NA	Commercial landscape main	1773 Business Center	Kissimmee	FL	34758	407-396-0529	https://ww
Yellowstone	NA	Commercial landscape main	2809 Forsyth Road	Winter Park	FL	32792	407-814-2400	https://ww
Yellowstone	NA	Commercial landscape main	195 Green Pond Roa	Rockaway	NJ	7866	908-850-5516	https://ww
Yellowstone	NA	Commercial landscape main	50 US-46 East	Hackettstown	NJ	7840	908-850-6600	https://ww
Yellowstone	NA	Commercial landscape main	212 Sabal Palm Road	Naples	FL	34114	888-581-5151	https://ww

IV. CONCLUSION

At some time soon, applying AI and machine learning to unstructured data will become inevitable. This business intelligence data extraction can help to create a financial news sentiment analysis to assess the effect on market value and other drivers that aid in strategic planning and assist management in identifying key strategic levers.

Building AI and machine learning models could appear to be a difficult undertaking to some people. Web crawling, however, is a game with a lot of moving components. It's not necessary to develop a single, all-encompassing ML model that could perform every task. Attend to the lesser chores first (such as dynamic user agent creation). Small ML-based models will eventually allow you to construct the whole web crawling system.

It can also help business to create an intelligent search engine to gain visibility into multiple competitors' products, services offered and their presence in different regions based on up-to-date and comprehensive data for making better deals and to get competitive edge.

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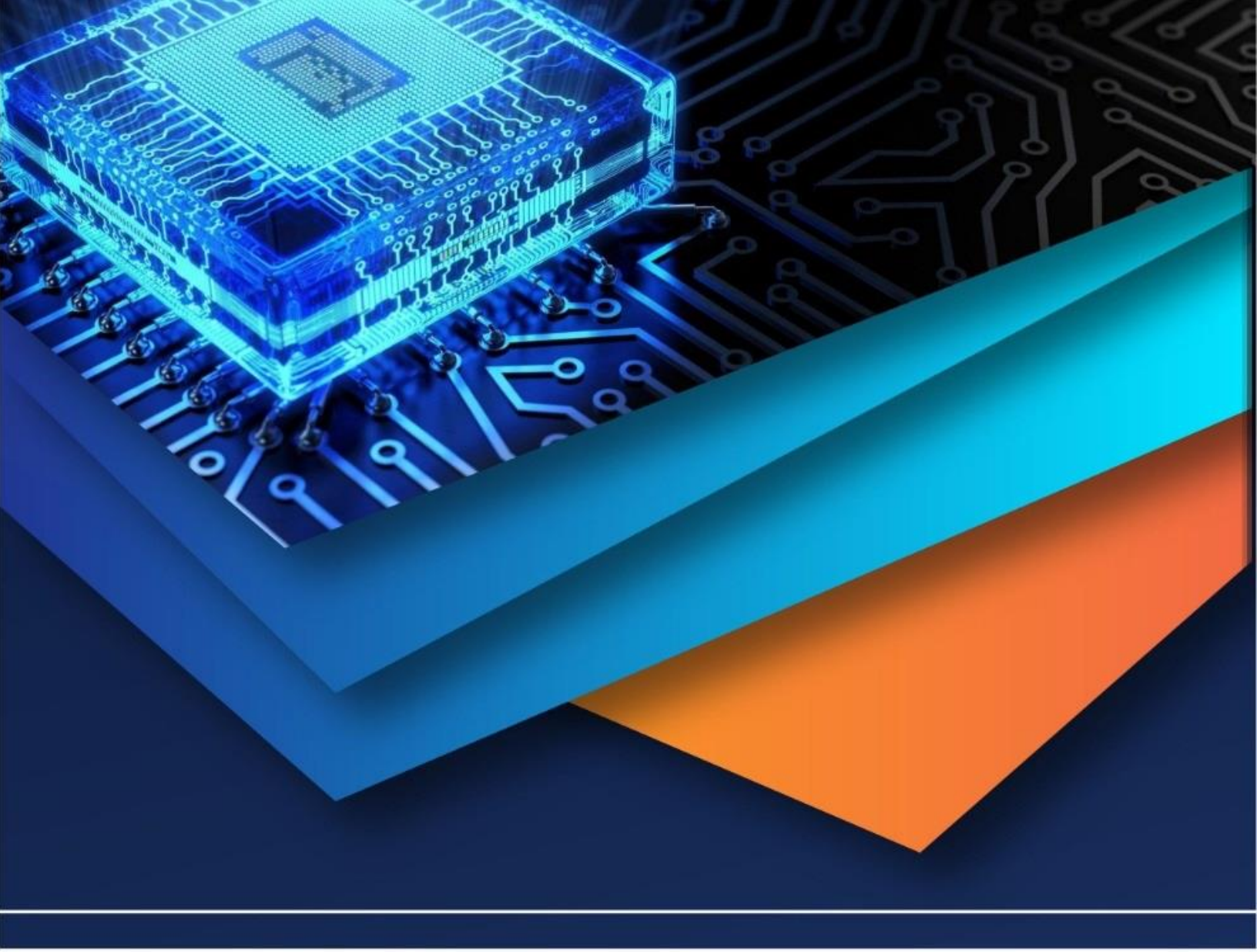
BIOGRAPHY OF AUTHOR

Tamilselvan Arjunan is working as an Assistant manager at Ernst and Young strategy. He has a total of 7 years of hands-on experience in Machine learning, Data Science and Python. He has built many AI-based products for clients. He is certified in Data Science and Python. He completed a bachelor's degree in mechanical engineering from Anna University.



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