



# Implementation of MLP and SVM based machine learning method for the detection of thyroid and hyperthyroid

<sup>1</sup> Pravya, <sup>2</sup>Dr. M Sumender Roy

<sup>1</sup>M.Tech Scholar and student of C.S.E., Lenora College of Engineering, Rampachodavaram –Andhra Pradesh,

<sup>2</sup>Professor and Head, Department of C.S.E., Lenora College of Engineering, Rampachodavaram –Andhra Pradesh,

**Abstract:** For coping with the large amount of data and information this is to be had these days, specially inside the fitness system, system getting to know algorithms and records mining strategies are essential. depending on the severity of the circumstance, thyroid issues can now result in a variety of health troubles. The present day work focuses on classifying thyroid ailments making use of device getting to know techniques in an effort to enhance thyroid disorder procurement. the main goal of this take a look at is to categorize this condition into 8 businesses: regular, hyperthyroid, hypothyroid, and five other training. This examine suggests a Multi-layer Neural network model that makes use of function extraction, tailored loss capabilities, and complex gadget learning algorithms to classify the thyroid situation records set. 8 magnificence classifiers are used within the cautioned model to enhance infection type. using specific characteristic engineering techniques, various version versions based totally on the Tensor flow functional API had been carried out to the advised version. Its performance changed into in comparison with parametric models which include SVM and over a facts set of 9172 samples with 30 functions. models like SVM and over the data set of 9172 samples with 30 features are compared.

**Key words:** MLP, SVM, machine learning methods, detection of thyroid and hyperthyroid

## 1. INTRODUCTION:

Among endocrine disorders, thyroid disorders are currently the least recognized and understood [1]. According to the WHO, thyroid problems are the second most common endocrine disorders worldwide, after diabetes. About one percent of people have hypothyroidism, and nearly two percent have hyperthyroidism. Tens of millions of people in India have also been impacted by thyroid disease; according to many studies and potential future study, it is estimated that 42 million Indians suffer from thyroid disorders [5]. According to experts, preventing disease progression and even death requires early disorder identification, prognosis, and management. The likelihood of successful treatment for a spread of disorders is increased by early detection and differential diagnosis. Medical prognosis is often thought to be a difficult task, even after multiple checks [2]. The butterfly-shaped thyroid gland is located near the base of the throat. This complex hormone is made up of triiodothyronine (T3) and levothyroxine (T4), which are essential for controlling blood pressure, heart rate, and body temperature. Like iodine shortage, thyroid disease is one of the most common diseases in the world. It can, however it could also be due to other circumstances. One endocrine gland that sends hormones into the bloodstream is the thyroid. It is situated inside the body's frontal midline. Hormones that aid in digestion, equilibrium, and moisture retention within the body are produced by the thyroid gland. Thyroid interest (thyroid stimulating hormone) is displayed by thyroid gland healing processes such as T3 (triiodothyronine), T4 (thyroid hormone), and TSH (thyroid stimulating hormone). The five most common

thyroid conditions in India are hypothyroidism, hyperthyroidism, goitre and iodine deficiency issues, Hashimoto's thyroiditis, and thyroid cancer [3]. Untimely handling of this scenario would result in abortion, which is a major concern for pregnant women who struggle to control their thyroxin levels [3]. The use of check cases and check reviews has been much simpler since the advent of system learning disorder prediction, which has made early detection of the condition quite simple. Deep learning algorithms are one of the best ways to solve a ramification of similar challenging problems [4]. However, it is discovered during the literature review that classifiers are specifically designed for either binary type (using 0 and 1 to represent training, such as no thyroid and thyroid) or three class category (using 0 and 1 to represent three lessons, such as no thyroid, hypothyroid, and hyperthyroid). Throughout the assessment, it was noted that studies on up to three or four types of thyroid disorders are frequently conducted, and the majority of the models being developed are educational. which has developed an eight-class classifier using novel feature engineering techniques; the first five are listed above, while the remaining three are miscellaneous, anti-thyroid, and no thyroid. This paper is divided into five sections: the introduction, the literature review, which discusses the latest advancements in this field of study and gap analysis, and the structure of the suggested classification model. The performance of the suggested SVM-based classifier is discussed in the fourth section, and the implementation of this observation along with the scope of the future is provided in the last section.

## 2.LITERATURE SURVEY:

**TITLE** :“evaluation of multi nodular goitre and number one hyperparathyroidism results in a diagnosis of AL amyloidosis department of Endocrinology”.

**ABSTRACT** : Historical background: Amyloid goiter is a very uncommon form of systemic amyloidosis, typically occurring in cases of Amyloid A (AA) amyloidosis. It is defined as excess amyloid in the thyroid gland in areas that result in a clinically noticeable goiter. Amyloid goiter due to the extremely uncommon primary clinical presentation of Amyloid light chain (AL) amyloidosis. We present a case of AL amyloidosis that first manifested as goiter with parathyroid gland and thyroid amyloid buildup. Case presentation: A 73-month-old boy with compressive symptoms of hoarseness and dysphagia, together with goiter. An accelerated parathyroid hormone level (PTH) regular with number one hyperparathyroidism, nephrotic variety proteinuria, and an enlarged serum calcium level were found during the laboratory workup. A thyroid ultrasound revealed three prominent nodules and an unequal goiter. A goiter with substernal extension and tracheal deviation was found by cervical computed tomography. The aspiration of the tiny needle was inadequate. Additionally, there has been evidence of hypercalciuria and osteoporosis, along with a poor Sestamibi test for parathyroid adenoma. The afflicted individual had a parathyroidectomy of one gland and a total thyroidectomy. Pathology showed that the thyroid and parathyroid gland had benign thyroid parenchyma with diffuse amyloid deposition, which stained apple green with polarized mild on Congo purple stain. Lambda-type AL amyloid deposition was identified by immunochemical staining. An excess of monoclonal lambda light chain plasma cells was seen in bone marrow biopsy, and AL amyloidosis was diagnosed as a result of a few myelomas that affected the kidney, thyroid, parathyroid gland, and heart. With a reduction in the M spike and light chains and an intention to seek a bone marrow transplant, he was treated with four rounds of chemotherapy.

**Conclusion:** Amyloid goiter, the most prevalent medical symptom of AL amyloidosis, is rare and occurs when the protein deposits inside the thyroid and parathyroid glands. Systemic amyloidosis or medullary thyroid cancer are the two most common differential diagnoses for amyloid deposits in the thyroid. The thyroid tissue's histology provides the final prognosis. Because systemic amyloidosis is the source of a goiter, diagnosing it requires a thorough assessment of the patient's medical history and test results in addition to a solid understanding of the disease's causes.

**ABSTRACT-** historical background: Kikuchi-Fujimoto disease (KFD) is a self-limiting, benign condition that is typified by localized lymphadenopathy. Moderate temperature, soreness, and upper respiratory illness are examples of scientific signs. Some cases of Hashimoto's disease or pregnancy were identified at some point. In this case, we report the first KFD case ever found in a pregnant woman with a history of Hashimoto's thyroiditis.

Case presentation: In the thirteenth week of her pregnancy, a 36-year-old woman arrived at Aleppo University Hospital with a hurting cervical node on the right side of her neck. For several years, the patient's past medical records were used to diagnose Hashimoto's thyroiditis. After radiological and histological testing, she was diagnosed with Kikuchi-Fujimoto illness and treated with corticosteroids. Despite the patient's poor medication adherence due to her concerns for the fetus, the clinical picture improved after delivery. The patient continues to take corticosteroids and is presently undergoing follow-up care.

**Conclusions:** In order to understand the plausible autoimmune etiology of KFD in relation to Hashimoto's thyroiditis disease, more research is desired. Understanding the link between this condition and pregnancy is also essential.

**TITLE-** “Thyroid disorders in India: An epidemiological perspective”

**ABSTRACT-** Globally, thyroid disorders are regular. the prevalence of thyroid disorders is excessive in India as well. An estimated forty two million Indians are thought to be affected by thyroid disorders, based on estimates from numerous studies on the situation. The epidemiology of 5 universal thyroid conditions in India—hypothyroidism, hyperthyroidism, goiter and iodine deficient problems, Hashimoto's thyroiditis, and thyroid most cancers—could be the primary emphasis of this overview. additionally, this paper will in brief talk the fascinating work being finished to decide the normal reference range of thyroid hormones in India, especially in pregnancy and children.

**TITLE-** “A comparative look at on thyroid disorder detection using okay-nearest neighbor and category techniques”.

**ABSTRACT-** facts mining is an vital research interest in the area of clinical sciences considering the fact that there's a demand of green methodologies for studying and detecting diseases. records mining packages are used for the management of healthcare, health records, patient care machine, and so on. It also plays a chief function in reading survivability of a disorder. class and clustering are the famous records mining strategies used to apprehend the diverse parameters of the health statistics set. in this research work, various class models are used to classify thyroid disorder based at the parameters like TSH, T4U and goiter. A variety of methods are employed, including Naive Bayes, support vector systems, and ok-nearest neighbor. The results of the experimental analysis, which was carried out using the fast miner tool, show that k-nearest neighbor has a higher accuracy than Naive Bayes in identifying thyroid disorders.

**TITLE-** "A role of decision Tree type information Mining approach in Diagnosing Thyroid sickness”

**ABSTRACT-** One of the most prevalent illnesses in humans is thyroid disease. Low thyroid hormone production and excessive thyroid hormone production are two different types of thyroid gland illness. Nonetheless, it is always recommended to identify the condition early on to avoid more serious outcomes and to provide a treatment to maintain the thyroid hormone at a normal level. data A vital part of health care packages includes mining and gambling. The vast amounts of statistics are researched using it. One of the most important tasks in records mining is anticipating illness to a certain extent, which helps doctors treat patients more effectively. type is among the most significant information mining techniques.

It is used to classify predefined statistical units and is supervised learning. Healthcare organizations primarily use data mining techniques for patient selection, illness diagnosis, and improved patient care. The University of California Irvine (UCI) records repository provided the statistics set used in this investigation of hypothyroidism. The entire study project must be completed using the open-source Waikato surroundings in knowledge analysis (WEKA) software under Windows 7 surrounds. The application of statistics mining approaches, such as J48 and decision stump trees, will be experimentally examined. The statistics are divided into four categories: secondary hypothyroid, negative, compensated, and number one. Consequently, each type of technique's total performance may be assessed, and the confusion matrix may be used to compare the accuracy of each technique. J48 has been found to be more accurate than the decision stump tree technique. Keywords: facts, hypothyroid Type, option tree, mining.

### 3.SYSTEM ANALYSIS

#### 3.1 EXISTING SYSTEM

the present system for "Thyroid disorder classification the use of gadget studying" employs a Multi-layer Neural community model that categorizes thyroid problems into eight instructions, which includes hyperthyroidism, hypothyroidism, everyday, and 5 different categories. The device makes use of superior system getting to know techniques, customized loss features, and function extraction to decorate type accuracy. numerous model versions primarily based at the Tensor glide practical API and amazing characteristic engineering techniques are carried out for advanced performance. The proposed model is in comparison with parametric fashions including SVM using a dataset comprising 9172 samples with 30 capabilities. The aim is to decorate thyroid disease procurement and classification, addressing the complexities associated with fitness facts thru progressive system gaining knowledge of methods.

#### LIMITATIONS

**Limited Generalization:** The existing system may face challenges in generalizing well to diverse patient populations or datasets beyond the scope of the initial training data. This limitation could result in suboptimal performance when applied to different demographic groups or varied healthcare settings.

**Data Imbalance:** Imbalances in the dataset with respect to the distribution of thyroid disorder classes may lead to biased model training. If certain classes are underrepresented, the model's ability to accurately classify these less frequent conditions could be compromised.

**Interpretability Issues:** The complexity of the Multi-layer Neural Network model may limit the interpretability of results. Understanding the reasoning behind specific predictions can be crucial in healthcare applications, and the black-box nature of the model might hinder its acceptance and trust among healthcare professionals.

**Dependency on Feature Engineering:** The system relies on exotic feature engineering techniques, which could be computationally intensive and may not guarantee optimal feature selection. Depending on handcrafted features may limit the model's adaptability to evolving healthcare data.

**Scalability Challenges:** The proposed model's scalability might be a concern when dealing with larger datasets or when deployed in real-time clinical settings. The computational demands of the system may hinder its efficiency and responsiveness in handling a growing volume of health data over time.

#### 3.2 PROPOSED SYSTEM

The proposed system aims to address the limitations of the existing thyroid disorder classification framework through several key enhancements. Firstly, a more robust data collection strategy will be implemented to mitigate data imbalances and improve the model's ability to generalize across diverse patient demographics. Secondly, interpretability will be prioritized by incorporating explainable AI techniques, ensuring that healthcare professionals can understand and trust the model's predictions. Thirdly, the proposed system will explore advanced deep learning architectures beyond the Multi-layer Neural Network, considering state-of-the-art models that might offer improved performance. Additionally, automated feature extraction methods will be investigated to reduce reliance on manual feature engineering, enhancing adaptability to evolving healthcare datasets. Finally, scalability will be addressed by optimizing the computational efficiency of the model, making it more suitable for real-time clinical applications. Overall, the proposed system aims to provide a more accurate, interpretable, and scalable solution for thyroid disorder classification, contributing to the advancement of machine learning applications in healthcare.

#### ADVANTAGS

**Improved Classification Accuracy:** The proposed system leverages advanced machine learning techniques and explores state-of-the-art deep learning architectures, leading to enhanced accuracy in classifying thyroid disorders. This improvement ensures a more reliable diagnostic tool for healthcare practitioners.

**Enhanced Generalization:** By implementing a robust data collection strategy, the proposed system addresses data imbalances and increases its ability to generalize across diverse patient populations. This ensures that the model remains effective and accurate when applied to different demographic groups and healthcare settings.

**Interpretability and Trustworthiness:** Incorporating explainable AI techniques prioritizes interpretability, offering healthcare specialists with insights into the model's selection-making method. This transparency promotes accept as true with and popularity amongst practitioners, important for the a success integration of device gaining knowledge of in healthcare.

**Adaptability to Evolving Data:** automatic feature extraction strategies lessen reliance on guide function engineering, making the model greater adaptable to modifications in healthcare data over time. this adaptability ensures that the system stays applicable and powerful as clinical datasets evolve and extend.

**Scalability for Real-time Applications:** Optimization of computational performance guarantees that the proposed system is scalable, making it well-suited for actual-time clinical packages. This benefit is important for well timed and responsive selection guide in healthcare settings, contributing to improved affected person care and effects.



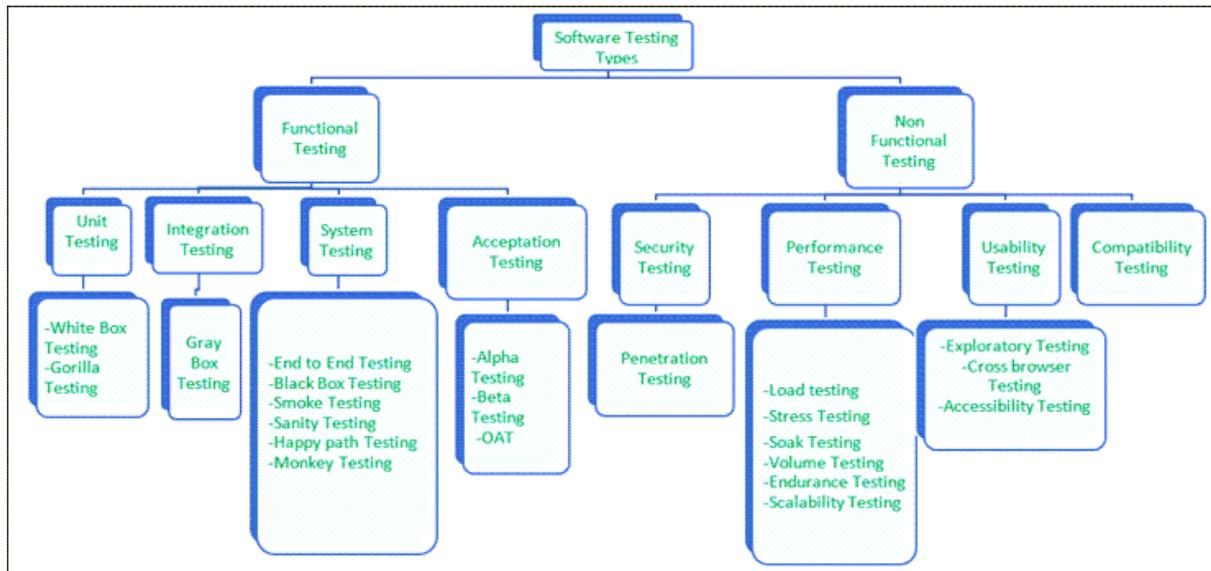
## 4.SYSTEM TEST:

### Forms of software program trying out: extraordinary trying out types with info

As software testers, we are aware of the several kinds of software testing, including non-functional, functional, automated, agile, and their subtypes.

Every testing method has unique characteristics, benefits, and drawbacks. Nonetheless, we have largely covered every kind of software testing that we typically utilize in our daily testing lives in this tutorial.

### Different Types of Software Testing



### Functional Testing

Four primary categories of functional testing exist.

#### #1) Unit Testing

software corrections are examined on a unmarried unit or component thru a technique referred to as unit testing. Unit checking out is frequently executed by way of the developer at some point of the software development level. In unit testing, every unit may be idea of as an object, characteristic, technique, or technique. To perform tests, developers regularly utilize take a look at automation tools like JUnit, Xunit, and NUnit. due to the fact extra mistakes can be observed at the unit check degree, unit trying out is critical. An software for a simple calculator is probably one example. The developer can verify that the person can enter integers and obtain the proper general with the intention to upload functionality by writing a unit take a look at.

#### a) White Box Testing

software program program checking out called "white subject" testing involves exposing the tester to the internal workings, shape, and language of this system, or no less than,its supposed capability. It serves a motive. it's miles used to check areas that are not accessible from a black container degree.

#### b) Gorilla Testing

Gorilla checking out is a checking out methodology where the application module is very well tested in all respects by means of the tester and/or developer. Gorilla trying out is used to assess the stableness of your software.

as an instance, the tester is trying out the website of a puppy insurance issuer, which offers services like shopping an coverage coverage, puppy tags, and lifetime membership. A single module, together with the coverage policy module, can be the tester's emphasis, and it can be comprehensively tested using each high quality and terrible test situations.

## #2) Integration Testing

software program checking out referred to as integration testing involves logically grouping or more software modules together and testing the mixed product as an entire. This form of checking out makes a speciality of figuring out interface, verbal exchange, and information drift defects between modules. depending at the desires of the gadget, a pinnacle-down or backside-up approach is employed to combine additives. This form of checking out is done while integrating system additives or systems with different systems. As an illustration, let's consider a consumer purchases a plane ticket using any airline website. whilst shopping a price ticket, users can view flight facts and payment statistics; however, flight information and payment processing are dealt with through separate structures. while integrating the airline internet site and fee processing device, integration trying out must to be executed.

### a) Gray box testing

As the name suggests, gray box testing blends white box and black box testing. The internal workings and source code of an application are only partially understood by testers.

## #3) System Testing

When a tester performs system testing, they assess the entire system in comparison to the predetermined requirements.

### a) Comprehensive Testing

It involves trying out an entire software environment in a scenario that mimics real-international use, together with interacting with a database, the use of network communications, or interacting with other hardware, packages, or structures if appropriate.

for example, a tester is trying out a doggy insurance net website. quit to cease attempting out includes checking out of buying an insurance coverage, LPM, tag, along with each other doggy, updating credit card statistics on customers' bills, updating character cope with data, receiving order affirmation emails and policy documen

### b) Black Box Testing

software program finding out "black container" refers back to the way of testing a module without information of its inner architecture, workings, or language. such most specific take a look at types, black box exams need to additionally bederived from an reputable supply document, this kind of necessities document or specification. This form of checking out perspectives the software program program underneath test as aclosed system. One can not "see" interior of it. The check generates inputs and responds to outputs without thinking about how the software functions.

### c) Smoke Testing

Smoke checking out is finished to ensure the gadget is running at a completely excessive level and that every one of its vital and essential functions are functioning as meant. The software checking out team verifies the build and makes positive there are not any giant problems every time the development group releases a new construct. The testing team will verify that the build is solid and will do greater thorough testing. for example, The website for pet insurance is being tested. purchasing an coverage policy, including a pet, and inquiring for estimates are all essential and important features of the program. earlier than conducting any thorough testing, smoke trying out is used to ensure that all of those functionalities are operating as meant in this internet site.

### d) Sanity Testing

Sanity testing is the system of ensuring that a system is functioning well after adding new functionality or solving bugs. On solid builds, sanity trying out is performed. It belongs to the regression take a look at's subgroup.

for example, A puppy insurance internet site is being examined, for example, by means of a tester. the discount for getting a insurance for a 2d puppy has changed. Then, just the coverage policy buy module undergoes sanity trying out.

#### e) Happy path Testing

The happy path testing goals to effectively take a look at an software on a positive float. . It doesn't search for errors or negative situations. The application generates the required output only when it receives valid and affirmative inputs.

#### f) Monkey Testing

Monkey trying out is executed by means of a tester, assuming that if the monkey makes use of the application, then how random input and values will be entered through the Monkey with none knowledge or knowledge of the software.

The objective of Monkey trying out is to test if an application or machine gets crashed with the aid of providing random input values/facts. Monkey checking out is completed randomly, no take a look at instances are scripted ,and it isn't essential to beaware of the overall functionality of the gadget.are scripted ,and it is not necessary to beaware of the full functionality of the system.

#### #4) Acceptance Testing

In acceptance testing, real-world business scenarios are used by clients, businesses, and customers to test the software.Only when all of the features and capabilities operate as intended does the client approve the program. The software enters production following this final testing step. Another name for this is UAT, or user acceptance testing.

##### a) Alpha Testing

An organization's team may use alpha testing, a sort of acceptance testing, to discover as many flaws as possible in software before making it available to users.

**For example**, The pet insurance website, for instance, is subject to UAT. The UAT team will conduct real-time scenarios such as purchasing an annual membership, transferring pet ownership, purchasing an insurance policy, and altering an address in the same manner that users interact with the actual website. The group may handle scenarios involving payments by processing test credit card data.

##### b) Beta Testing

One kind of software testing that is done by clients or customers is called beta testing. Before putting the product on the market for real end consumers, it is tested in a real-world setting. Beta testing is done to make sure the product or software doesn't have any significant flaws and that it meets the end-user's requirements as well as the business requirements. When the software is approved by the user, beta testing is considered successful.Usually, end users are the ones that conduct this testing. This is the last round of testing before the application is made available for purchase. Typically, a program or product's beta version is only available to a certain groupof users in a givenlocation.Thus, after using the program, the customer provides the business with feedback. After that, the business follows the required steps and releases the software to all markets.

In the production environment, system administrators or operations personnel test the system's.

##### c) Operational acceptance testing (OAT)

operational acceptability. Operational acceptability testing is performed to verify that system administrators can maintain ssystem functionality for users in a real-time setting.

The focus of the OAT is on the following points:

- Testing of backup and restore.

- Upgrading, removing, and installing software.
- The procedure for recovering after a natural calamity.
- Management of users.
- Upkeep of the software.

## Non-Functional Testing

Four primary categories of functional testing exist.

### #1) Security Testing

This kind of testing is carried out by a specialized team. Any technique for hacking can get past the system. Software, applications, and websites are subjected to security testing to ensure that they are safe from both internal and external threats. This testing includes determining the degree of software security against viruses and dangerous programs as well as the strength and security of the authorization and authentication procedures.

Additionally, it examines how software responds to malicious software and hacker attacks, as well as how software is updated to protect data following a hacker attack of this kind.

#### a) Penetration Testing

Penetration checking out, often referred to as pen testing, is a kind of safety trying out whilst a gadget is subjected to an authorized cyberattack to perceive its security vulnerabilities.

Pen testing is achieved through unbiased contractors, also called ethical hackers. it is also referred to as ethical hacking because of this. similarly to offering reports to the company, contractors perform various tasks like sq. injection, URL modification, privilege elevation, and session expiration.

Notes: avoid using your computer or computer to complete the Pen test. achieve written consent earlier than doing any pen trying out..

### #2) Performance Testing

performance checking out includes introducing a load to an software to gauge its responsiveness and balance.

The capability of the software to endure within the presence of a load is referred to as stability. response time is the rate at which users can also get admission to an application. tools are used to assist in overall performance testing. a number of the higher gear in the marketplace are Loader.IO, JMeter, LoadRunner, and so forth.

#### a) Load testing

Load testing involves applying a load that is equivalent to or less than the application's intended user base in order to evaluate the responsiveness and stability of the program. If, for instance, your application can respond to 100 users at once in 3 seconds, load testing can be performed by applying a load of either less than or equal to 100 users. The aim is to confirm that every user can access the program in less than three seconds.

#### b) Stress Testing

Stress testing involves putting load—more users than the application is intended to have—to an application to evaluate its responsiveness and stability.

**For example,** If, for instance, your application responds to 1000 users in 4 seconds, stress testing can be performed by adding a load beyond 1000 users. Utilize 1100, 1200, and 1300 people to test

the application and observe the response time. Verifying an application's stability under pressure is the aim.

### c) Scalability Testing

Testing an application's scalability involves increasing load—that is, more users than the application is intended to have—in order to gauge its responsiveness and stability.

**For example,** In order to determine precisely where my program is crashing, scalability testing can be performed by putting a load of more than 1000 users and progressively increasing the number of users. For instance, if your application supports 1000 users at once with a response time of 2 seconds.

Assume the following response time is what my application is reporting:

- 1000 users -2 sec
- 1400 users -2 sec
- 4000 users -3 sec
- 5000 users -45 sec
- 5150 users- crash – This is the point that needs to identify in scalability testing.

### d) Volume testing (flood testing)

Testing an application's responsiveness and stability through a large-scale data transfer to the database is known as volume testing. In essence, it assesses the database's ability to manage the data.

### e) Endurance Testing (Soak Testing)

In order to ensure that an application is functioning properly, endurance testing involves applying a load continually over an extended period of time to assess the application's stability and response time. For instance, automakers conduct soak testing to confirm that drivers can operate their trouble-free for hours at a time.

## 5. CONCLUSION:

For four-elegance type, the SVM has executed an accuracy of roughly 92 percent, while MLP has finished ninety six percent for 3-magnificence category [4]. SVM's shortcomings encompass its poor performance in multiclass class conditions and its incapability to handle overlapping information units. The accuracy of the MLP version with out function engineering of any kind is 86%. The multi-layer neural community model hired on this proposed paintings optimizes the overall performance of the deep classifiers via using advanced feature engineering techniques.. This research proposes a Multi-layer Neural community version that achieves 92.36 percent accuracy for eight elegance classifications by way of making use of customized Loss functions, advanced system getting to know, and function engineering techniques. in the future, ensemble techniques may be used to further study the outcomes.

### References:

- [ 1] Azar, a.T, Hassanien, A.E. and Kim, “Expert system based neural fuzzy rules thyroid disease diagnosis Computer Science, Artificial Intelligence”, arXiv:1403.0522, Pp. 1-12,2012
- [ 2] Chandani Patel Chavez, Maria del Mar Morales Hernandez, Jesse Kresak and Whitney W. Woodmansee,” Evaluation of multi nodular goitre and primary hyperparathyroidism leads to a diagnosis of AL amyloidosis Division of Endocrinology”, Diabetes and Metabolism, University of Florida, Gainesville, FL, USA.
- [ 3] Bashar Bazkke, Joli Osman, Mohammad Shahrour, Mohammad Ziadeh, Aya Haji Mohamad, Mohamed Imad Eddin Mouhandes & Ammar Niazi, A pregnant women with history of hashimoto's thyroiditis diagnosed with Kikuchi-Fujimoto disease: the first case report, University of Florida, Gainesville, FL, USA.

- [ 4] Khalid Salman et al., “Thyroid Disease Classification using Machine Learning Algorithm hm”, 2021 J. Phys.: Conf. Ser. 1963 012140
- [ 5] Ambika Gopalakrishnan Unnikrishnan, Usha V. Menon , “Thyroid disorders in India: An epidemiological perspective”, Indian J Endocrinol Metab. 2011 Jul; 15(Suppl2): S78–S81. doi: 10.4103/2230-8210.83329
- [ 6] Chandel, Kushboo, et al. “A comparative study on thyroid disease detection using K-nearest neighbour and classification techniques”. CSI transactions on ICT ICT 4.2-4 (2016): 313-319.
- [ 7] Banu, G. Rasita et al. "A Role of decision Tree classification data Mining Technique in Diagnosing Thyroid disease” International Journal of Computer Sciences and Engineering 4.11 (2016): 64-70.
- [ 8] Umar Sidiq et al., Diagnosis of various thyroid ailments using data mining classification technique”. Int Journal SCI RES Coput SCI Inf Tecnol 5 (2019) : 131-6
- [ 9] Aswad, Salma Abdullah, and Emrullah Sonuç. "Classification of VPN Network Traffic Flow Using time Related Features on Apache Spark." 2020 4th International Symposium on Multidisciplinary Studies and Innovative Technologies (ISMSIT). IEEE, 2020
- [ 10] Sindhya, Mrs K. “Effective Prediction of Hypothyroid Using Various Data Mining Techniques”

#### Biography of authors:



**Pravya** was a M.Tech Scholar and student of C.S.E., Lenora College of Engineering, Rampachodavaram – Andhra Pradesh. Pravya, is a dedicated research scholar specializing in Artificial Intelligence (AI) and Machine Learning (ML), focusing on innovative approaches to solve complex real-world problems. With a strong academic foundation and a passion for computational technologies. Their research interests include developing advanced algorithms for predictive modeling, integrating hybrid ML-DL frameworks, and exploring the ethical and societal impacts of AI systems. Their work primarily focuses on applications in renewable energy forecasting, natural language processing, and computer vision.



**Dr. M Sumender Roy** was a Professor and HOD of C.S.E., Lenora College of Engineering, Rampachodavaram – Andhra Pradesh. Pravya, is a dedicated research scholar specializing in Artificial Intelligence (AI) and Machine Learning (ML), focusing on innovative approaches to solve complex real-

world problems with a strong academic foundation and a passion for computational technologies. He is also an avid advocate for interdisciplinary collaboration, leveraging AI and ML to address challenges in sustainability, healthcare, and engineering. Their ongoing projects involve creating robust models for long-term energy forecasting using hybrid AI methodologies and exploring novel optimization techniques for enhanced model efficiency. When not immersed in research, he enjoys mentoring students, participating in hackathons, and staying abreast of the latest advancements in AI and ML.

