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BATCH – 5

## Assignment – 2

Q.1

Fuzzy Logic resembles the human decision-making methodology. It deals with vague and imprecise information. This is gross oversimplification of the real-world problems and based on degrees of truth rather than usual true/false or 1/0 like Boolean logic.

Take a look at the following diagram. It shows that in fuzzy systems, the values are indicated by a number in the range from 0 to 1. Here 1.0 represents **absolute truth** and 0.0 represents **absolute falseness**. The number which indicates the value in fuzzy systems is called the **truth value**.

Q.2

### **1. Identifying Diseases and Diagnosis**

One of the chief ML applications in healthcare is the identification and diagnosis of diseases and ailments which are otherwise considered hard-to-diagnose. This can include anything from cancers which are tough to catch during the initial stages, to other genetic diseases. IBM Watson Genomics is a prime example of how integrating cognitive computing with genome-based tumor sequencing can help in making a fast diagnosis. Berg, the biopharma giant is leveraging AI to develop therapeutic treatments in areas such as oncology. P1vital's PReDicT (Predicting Response to Depression Treatment) aims to develop a commercially feasible way to diagnose and provide treatment in routine clinical conditions.



### **2. Drug Discovery and Manufacturing**

One of the primary clinical applications of machine learning lies in early-stage drug discovery process. This also includes R&D technologies such as next-generation sequencing and precision medicine which can help in finding alternative paths for therapy of multifactorial diseases. Currently, the machine learning techniques involve unsupervised learning which can identify patterns in data without providing any predictions. Project Hanover developed by Microsoft is using ML-based technologies for multiple initiatives including developing AI-based technology for cancer treatment and personalizing drug combination for AML (Acute Myeloid Leukemia).



### **3. Medical Imaging Diagnosis**

Machine learning and deep learning are both responsible for the breakthrough technology called Computer Vision. This has found acceptance in the InnerEye initiative developed by Microsoft which works on image diagnostic tools for image analysis. As machine learning becomes more accessible and as they grow in their explanatory capacity, expect to see more data sources from varied medical imagery become a part of this AI-driven diagnostic process.



### **4. Personalized Medicine**

Personalized treatments can not only be more effective by pairing individual health with predictive analytics but is also ripe for further research and better disease assessment. Currently, physicians are limited to choosing from a specific set of diagnoses or estimate the risk to the patient based on his symptomatic history and available genetic information. But machine learning in medicine is making great strides, and IBM Watson Oncology is at the forefront of this movement by leveraging patient medical history to help generate multiple treatment options. In the coming years, we will see more devices and biosensors with sophisticated health measurement capabilities hit the market, allowing more data to become readily available for such cutting-edge ML-based healthcare technologies.



### **5. Machine Learning-based Behavioral Modification**

Behavioral modification is an important part of preventive medicine, and ever since the proliferation of machine learning in healthcare, countless startups are cropping up in the fields of cancer prevention and identification, patient treatment, etc. Somatix is a B2B2C-based data analytics company which has released an ML-based app to recognize gestures which we make in our daily lives, allowing us to understand our unconscious behavior and make necessary changes.



### **6. Smart Health Records**

Maintaining up-to-date health records is an exhaustive process, and while technology

has played its part in easing the data entry process, the truth is that even now, a majority of the processes take a lot of time to complete. The main role of machine learning in healthcare is to ease processes to save time, effort, and money. Document classification methods using vector machines and ML-based OCR recognition techniques are slowly gathering steam, such as Google's Cloud Vision API and MATLAB's machine learning-based handwriting recognition technology. MIT is today at the cutting edge of developing the next generation of intelligent, smart health records, which will incorporate ML-based tools from the ground up to help with diagnosis, clinical treatment suggestions, etc.

Q.3 The website is in its nascent stage and has listed all the movies for the users to search and watch. What the website misses here is a recommendation system. This results in users browsing through a long list of movies, with no suggestions about what to watch. This, in turn, reduces the propensity of a user to engage with the website and use its services. Therefore, the simplest way to fix this issue is to use a popularity based recommendation system. Top review websites like IMDb and Rotten Tomatoes maintain a database of movies and their popularity in terms of reviews and ratings. Utilising this data to recommend the most popular movies to users based on their star ratings, could increase their content consumption.

The popularity-based recommendation system eliminates the need for knowing other factors like user browsing history, user preferences, the star cast of the movie, genre, and other factors. Hence, the single-most factor considered is the star rating to generate a scalable recommendation system. This increases the chances of user engagement as compared to when there was no recommendation system.

Q.4 Web-based learning has become commonplace in education and can take many forms, from massive open online courses (MOOCs) to virtual learning environment (VLE) and learning management system (LMS). In MOOCs, students can study anytime and from nearly any location [1]. MOOCs provide a new way to train students, change the traditional approach to studying, and attract students from around the world. The best-known platforms are Coursera, Edx, and Harvard. Additionally, MOOCs have contributed to higher education [2]. In MOOCs and other web-based systems, students often register to download videos and materials but do not complete the entire course. As a result, the total number of activities a student engages in falls below the recommended threshold [3]. Therefore, teachers must understand the engagement of their students.

In the traditional approach to education, teachers take various steps to appraise students' levels of performance, motivation, and engagement [4], such as conducting exams, checking student attendance, and monitoring studying via security cameras. However, in web-based platforms, there are no face-to-face meetings, and it is difficult to determine student engagement levels in online activities such as participating in discussion forums or watching videos. Therefore, in web-based systems, student data represent the only source through which instructors can assess student performance and engagement.

Q.5 Rule-based classifiers are just another type of classifier which makes the class decision depending by using various “if..else” rules. These rules are easily interpretable and thus these classifiers are generally used to generate descriptive models. The condition used with “if” is called the **antecedent** and the predicted class of each rule is called the **consequent**.

- **Coverage:** The percentage of records which satisfy the antecedent conditions of a particular rule.
- The rules generated by the rule-based classifiers are generally not mutually exclusive, i.e. many rules can cover the same record.
- The rules generated by the rule-based classifiers may not be exhaustive, i.e. there may be some records which are not covered by any of the rules.
- The decision boundaries created by them is linear, but these can be much more complex than the decision tree because the many rules are triggered for the same record.

Q..6

ResNet, short for Residual Networks is a classic neural network used as a backbone for many computer vision tasks.

Deep residual networks like the popular ResNet-50 model is a convolutional neural network (CNN) that is 50 layers deep. A residual neural network (ResNet) is an artificial neural network (ANN) of a kind that stacks residual blocks on top of each other to form a network.

VGG stands for Visual Geometry Group and consists of blocks, where each block is composed of 2D Convolution and Max Pooling layers. It comes in two models — VGG16 and VGG19 — with 16 and 19 layers. As the number of layers increases in CNN, the ability of the model to fit more complex functions also increases

Q.7

What Is Semantic Analysis? Simply put, semantic analysis is **the process of drawing meaning from text**. It allows computers to understand and interpret sentences, paragraphs, or whole documents, by analyzing their grammatical structure, and identifying relationships between individual words in a particular context.

Q.8 Association rule learning is a type of unsupervised learning technique that checks for the dependency of one data item on another data item and maps accordingly so that it can be more profitable. It tries to find some interesting relations or associations among the variables of dataset. It is based on different rules to discover the interesting relations between variables in the database.

The association rule learning is one of the very important concepts of [machine learning](#)

, and it is employed in **Market Basket analysis, Web usage mining, continuous production, etc.** Here market basket analysis is a technique used by the various big retailer to discover the associations between items. We can understand it by taking an example of a supermarket, as in a supermarket, all products that are purchased together are put together.

For example, if a customer buys bread, he most likely can also buy butter, eggs, or milk, so these products are stored within a shelf or mostly nearby.