Glossary

**Activation Function**: An activation function controls the amplitude of the output of the neuron. An acceptable range of output is usually between 0 and 1, or -1 and 1.

**Ant Colony Optimization (ACO)**: The ACO algorithm is a probabilistic technique for solving computational problems which can be reduced to finding good paths through graphs.

**Artificial Intelligence**: Is a science that tries to make computers more intelligent.

**Artificial Neural Network**: A computational system consisting of a set of highly interconnected processing elements, which are called neurons for processing information as a response to external stimuli.

**Backpropagation**: When a learning pattern is clamped, the activation values are propagated to the output units, and the actual network output is compared with the desired output values, we usually end up with an error in each of the output units.

**Biomedical Signal Processing**: An indispensable tool for extracting clinically significant information hidden in the signal.

**Bipolar Neurons**: The dendrite and axon are the neuron’s two separate processes. Bipolar neurons have a subclass called pseudo-bipolar neurons, which are used to send sensory information to the spinal cord.

**Breast Cancer**: In breast cancer diagnosis, for predicting the recurrence of the tumor after removal of the breast, five years are needed after operation to final verification for the prediction.

**Classification**: Data items are classified into one or several classes. A set of rules are generated using the classification models, based on various features of the data in the training set.

**Crossover**: A process of exchanging the genes between the two individuals that are reproducing.

**Data Mining**: A branch of AI to be applied for information extraction from patients’ data. Essentially, Data mining gives information that would not be available otherwise.

**Decision Analysis and Utility Theory**: This theory is associated with
a cost of obtaining of each piece of information. In other words, it is a measure of the benefit to be derived from having it.

**Decision Support Systems (DSS):** They are any type of application that support the decision making process. A generic DSS receives a certain amount of data as input, processes it using a specific methodology and offers as a result some output that can help decision-makers.

**Decision Trees:** In which a sequence of decisions is structured in the form of a tree. Each node represents a particular question, and the answer determines which branch of the tree to follow to get to the next question.

**Dendrites:** Originating from the cell body are thin and widely branching fibers, reaching out in different directions and make connections to a larger number of cells within the cluster.

**DXplain:** This system is used for assisting the physicians and it makes the decisions by using some of the findings by physicians.

**Electrocardiogram:** The electrocardiogram -ECG- describes the electrical activity of the heart. It is obtained by placing electrodes on the chest, arms and legs.

**Expert System:** Expert systems are the problem solving methods for finding the solution in a wide range of problems such as medicine, mathematics, engineering, geology, computer science, business, law, and education.

**Feature Extraction:** Feature extraction is the process of reduction of the attributes of data. In feature extraction, the focus is on the similarity of data.

**Feedforward Network:** A “feedforward” neural network has an input layer that is connected to a hidden layer. This hidden layer can then be connected to another hidden layer or directly to the output layer.

**Flow Diagrams:** Drawing flow diagrams is an effective strategy to extract rules for designing an intelligent system. Physicians diagnose the diseases based on flow diagrams.

**Fuzzy Logic:** Fuzzy logic is a branch of artificial intelligence techniques. It simulates the human reasoning and deals with uncertainty in knowledge in incomplete or fuzzy data.

**Genetic Algorithm:** An evolution inspired algorithm from the category of computational models. The original idea came from biological evolution process in chromosomes.

**Gravitational Search Algorithm (GSA):** In their algorithm, the searcher agents are a collection of masses that interact with each other based on Newtonian gravity and the laws of motion.

**Hidden Layer:** All the layers between the input and output layer in the neural network are called hidden layers.

**Inference Engine:** It is a basic component of an expert system. The expert system draws deductions using the inference engine from the rules in the KB.

**Input Layer:** The first layer of the neural network is the input layer.

**Knowledge Base (KB):** One of the basic components of an expert system.
The KB contents in information that is obtained by interviewing people who are specialist and experts in the area of question.

**Lung Cancer:** This disease in one of the common reasons of death in the world and many patients suffer from this disease.

**Machine Learning:** Machine learning systems can be used to develop the knowledge bases used by expert systems. A machine learning system provides a description using the extracted features from a set of clinical cases that act as examples.

**Median Filter:** A moving median filter is a sliding-window spatial filter that takes a set of points, and given a span for the filter, takes a subset of those points, and returns the median for the subset.

**Medical Artificial Intelligence:** Medical artificial intelligence is primarily concerned with the construction of AI programs that perform diagnosis and make therapy recommendations.

**Medical Data:** Are used to clarify the true incidence of diseases, to identify and extract the critical features and to measure therapeutic efficacy of drugs and procedures.

**Medical Image Processing:** Clinicians use the medical image analysis to identify, manipulate and quantify the anatomical information of the patients.

**Multipolar Neurons:** Are most common in mammals. Examples of these neurons are spinal motor neurons, pyramidal cells and Purkinje cells (in the cerebellum).

**Mutation:** The process of randomly altering the chromosomes.

**Neuron:** In the nervous system of the living creatures, there are fluid-filled sacs which bound by a lipid bilayer for separating the intracellular contents from the extracellular space and they are called Neurons, or brain cells.

**Non-Fuzzy Logic:** In the non-fuzzy logic, there are only two “truth values”, true and false. This cause unnatural restriction, since we think about subjects nearly true, partly false, truer than certain other statements, and so on.

**Output Layer:** The last layer of the neural network is called output layer.

**Particle Swarm Optimization Neural Network (PSONN):** The ANN that is trained by PSO.

**Particle Swarm Optimization:** A simple concept adapted from nature decentralized and self-organized systems such as choreography of a bird flock and fishing schooling.

**Selection:** A process for choosing a pair of organisms to reproduce.

**Supervised Learning:** The inputs to the supervised network are applied along with an expected response. The network is trained by pairs of stimulus-response records.

**Swarm Intelligence:** A bio-inspired technique and the latest an artificial intelligence technique based around the study of collective behavior in decentralized and self-organized systems.

**Time Series Analysis:** Value of an attribute examined over a time period usually at evenly spaced time intervals.
**Training:** The process of determining the weights for connections in the network.

**Turing Test:** In Turing test, questions are asked by the interrogator that are wide-ranging as he or she likes, and computer will give any response to cause wrong identification. For example the computer might answer “No” in response to “Are you a computer?” or might have long pause. The interrogator uses help of the foil to make a true decision about the identification. The role of the interrogator is played by a number of different people.

**Unipolar Neurons:** That have a single process (dendrites and axon are located on the same stem), and are most common in invertebrates.

**Unsupervised Learning:** The unsupervised network is provided with only stimulus.

**WISER:** Wireless Information System for Emergency Responders or WISER is a web-based system designed to assist First Responders in hazardous material incidents.