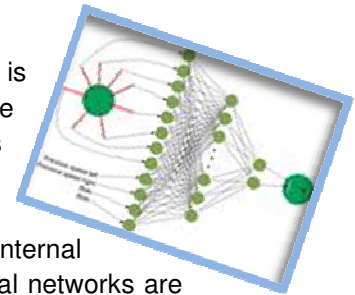


# Design of Neuro-Fuzzy Advisory System Using Type 2 Fuzzy Logic

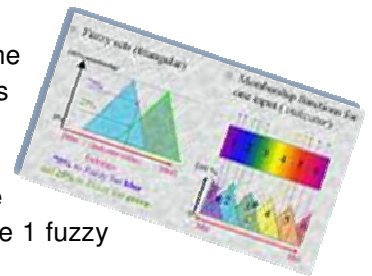
## Abstract

In our routine life we often seek advice of our close one before taking any decision, this tendency of human nature stand true for any kind of decision making which has impact on our lives. Thus we need an expert's unbiased advice. Hence we propose to create a framework to generate expert advisory systems to solve different problems pertaining to their respective domains. To create such advisory system, we will use hybridization of two most important concept of AI, i.e. Neural Networks, Fuzzy Logic (Type 1 and Type 2).

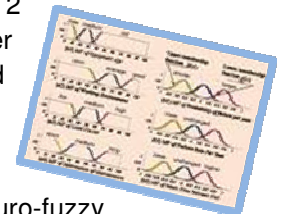
An **artificial neural network (ANN)**, usually called "neural network" (NN), is a mathematical model or computational model that tries to simulate the structure and/or functional aspects of biological neural networks. It consists of an interconnected group of artificial neurons and processes information using a connectionist approach to computation. In most cases an ANN is an adaptive system that changes its structure based on external or internal information that flows through the network during the learning phase. Neural networks are non-linear statistical data modeling tools. They can be used to model complex relationships between inputs and outputs or to find patterns in data.



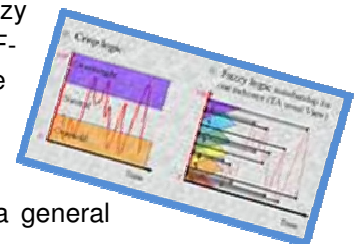
**Fuzzy logic** is multi valued logic derived from crisp logic, fuzzy logic is used when the condition presented are not clear or where accurate answer to a real world situation is not possible. A simple example can be: driving a car is better to ride than a scooter for someone. Here the word better does not represent a clear picture. Hence we provide a range for the word 'better' and it can be used as per situations. I.e. we obtain multiple values for single crisp value. Generalization of this kind of crisp logic is termed as type 1 fuzzy logic and systems based on it are called as type 1 fuzzy logic system.



**Type 2 Fuzzy Logic** is an extension of type 1 fuzzy logic. Unlike type 1 fuzzy logic type 2 fuzzy logic process data in fuzzy to fuzzy format which represents uncertainty far better than type 1 fuzzy logic systems. Type 2 fuzzy systems are closer to human brain and represents human logical thought process in more precise manner. Hence type 2 fuzzy logic can be applied to any kind of system who has vague information.



**Neuro-Fuzzy** refers to combinations of artificial neural networks and fuzzy logic. Neuro-fuzzy hybridization results in a hybrid intelligent system that synergizes these two techniques by combining the human-like reasoning style of fuzzy systems with the learning and connectionist structure of neural networks. Neuro-fuzzy system incorporates the human-like reasoning style of fuzzy systems through the use of fuzzy sets and a linguistic model consisting of a set of IF-THEN fuzzy rules. The main strength of neuro-fuzzy systems is that they are universal approximators with the ability to solicit interpretable IF-THEN rules.



Hence we combine neural networks with fuzzy logic which is extended to type 2. Thus we can create variety of advisory systems on different domains based on a general framework which will serve as solution for different complicated tasks.

A generic library will be created which will have different methods for neural networks, fuzzification and defuzzifications along with inference. These methods will act as framework to design different kind of neuro-fuzzy advisory systems.