Funky Systems and Neural Networks

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Part I

Fuzzy System

Firstly we started by deciding between which type of fuzzy system we should implement: Mamdani, Takagi-Sugeno or Tsukamoto. From the project statement we observe that the output *CLPVariation* is not any clear function of the input, rulling out Takagi-Sugeno, also meaning that our output is a Fuzzy Set. If we wish for our output to be monotonic then the choice would be Tsukomoto, since we did not want this restriction and decided for starting with a simple approach then later on adding difficulty when needed. (Early on we decided to try to make data-driven decisions with an iterative improving process)

0.1 First Iterations

For the first iteration the choice of variables, through common sense, *ProcessorLoad*, *MemoryUsage* and *Latency* were the first choices, and for output *CLP*We chose triangular Membership Functions with 4 intervals for each variable (low, medium, high, critical) for *ProcessorLoad* and *MemoryUsage* and (poor, fair, good, great) for *Latency*.
?Show image?
Then, we decided to experiment with exchanging the membership function to gaussian
3D graph of Gaussian
Whilst experimenting different membership functions the necessity of visualizing arose, a helper script was developed [fuzzy/visualization/fuzzy_system_to_dataframe] that receives the FuzzySystem python object and dynamically creates a dataframe to aid in plotting the membership functions.

0.2 Generalized Bell

We decided to experiment with a more generic Membership function, so we extended simpful's Base Membership Function class and created Bell_MF [in fuzzy/models/bell_mf.py]. The first results are shown in the figure bellow.

0.3 Architecture

This should contain choice of architecture and why.

Linguistic Variable CLP
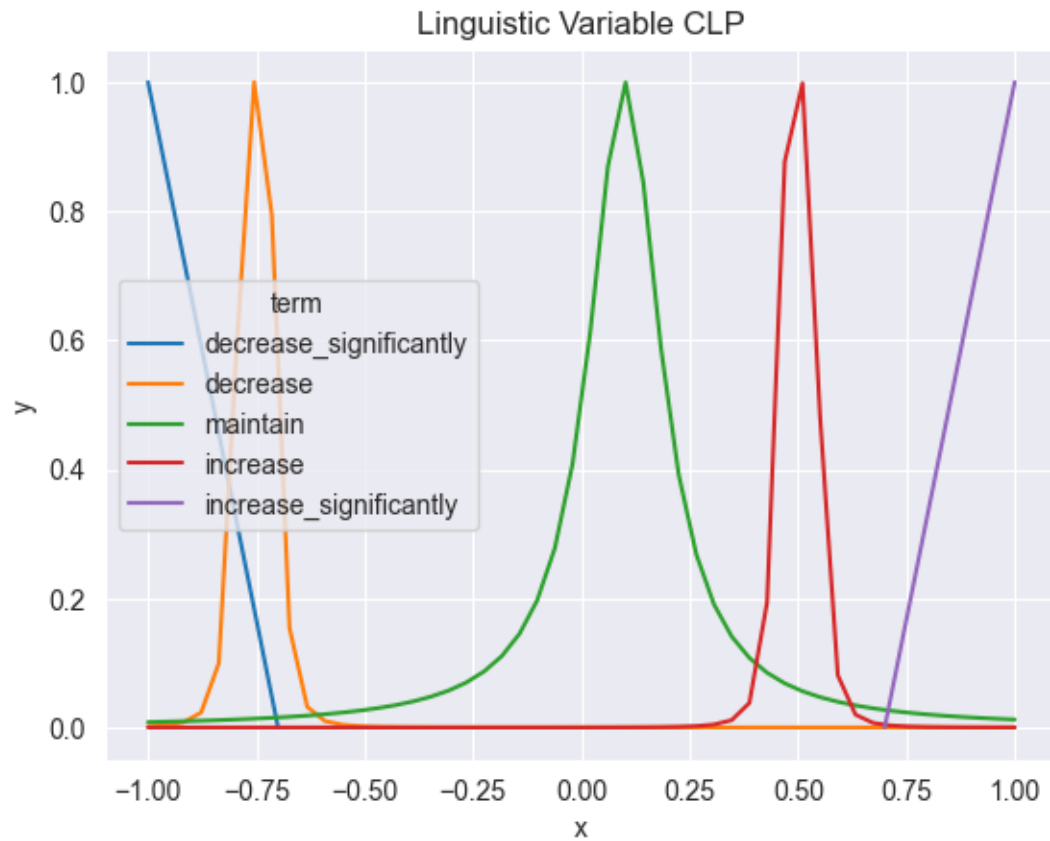
0.4 Membership Functions

all the membership functions and linguistic terms

0.5 Rules

rules

0.6 Results

CLP Variation		Latency			
		low	moderate	high	very high
System Load	low	IS	IS	I	I
	moderate	I	I	I	I
	high	M	M	D	D
	critical	DS	DS	DS	DS

Part II

Neural Networks