DJFNN Toolbox for Matlab (R2017a)

This is the Matlab implementation of "Disjunctive Fuzzy Neural Networks: A New Splitting-Based Approach to Designing T-S Fuzzy Model", which is a new way constructing a Takagi-Sugeno fuzzy rule model based on inputs-output samples.

The folder includes:
1. DJFNN.m : train DJFNN based on input-output data
2. DJFNN_Pre.m : predict outputs based on the trained model at new input sites
3. fuzzification.m : uniform-frequency or uniform-width fuzzification method
4. MSE.m : calculate the mean squared error
5. demo.m : taking the dataset ***wankara*** as an example to show how to use the code
6. wankara-5-5tra.dat,wankara-5-5tst.dat: training and test data of the demo

To use DJFNN in Matlab you have to define first the training and test data:

```
data_tr; % training data matrix, a matrix with each row represent a sample and each column represent complement of inputs or outputs. The DJFNN also applies to multi-responses case.
data_te; % test data matrix, the same meaning with data_tr.
p; % dimension of inputs.
x_tr = data_tr(:,1:p); y_tr = data_tr(:,p+1:end);
x_te = data_te(:,1:p); y_te = data_te(:,p+1:end);
```

Then conduct fuzzification step:

```
fn = 3*one(1,p); % set number of membership functions along each dim, they can be the same e.g. 3, or different e.g. [3,2,…,5] with p components for the p inputs.
fuzzi = fuzzification( data_tr(:,1:p),fn,1);
```

Then train the model based on training samples:

```
C = 9; % number of fuzzy rules
order = 1; % order of consequence in T-S model
model = DJFNN ( x_tr, y_tr, fuzzi,C,order );
```

Finally predict the outputs at test inputs:

```
[B,y_pre] = DJFNN_Pre ( model, x_te );
```

You can validate the model using MSE of real test outputs and the predictions:

```
mse = MSE(y_te(:),y_pre(:));
```

Reference: Ning Wang, Witold Pedrycz, Wen Yao, Xiaoqian Chen, Yong Zhao, Disjunctive Fuzzy Neural Networks: A New Splitting-Based Approach to Designing T-S Fuzzy Model, IEEE Trans on Fuzzy System, 2020.
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