- Predicting functional connectivity(FC) using dynamic mean field model for a given structural connectivity(SC) matrix

  The file *DMF_lesioned.m* implements dynamic mean field model described in Deco et al., 2014. Use the below syntax to call this function.

  [fc, maxfrN] = DMF_lesioned(scPath, scName, fic, ffi, simTime, dt, G, noiseAmp, lesionAreas, ficWeights, setFICWeights);

  Input parameters

scPath	: Path to SC matrix file
scName	: SC matrix path in the given hdf5 file
fic	: true or false, set it to true to use feedback inhibtion control(FIC) algorithm as proposed in Deco et al., 2014 and false otherwise
ffi	: true or false, set it to true to enable feedforward inhibition
simTime	: simulation time in milliseconds
dt	: Step size for numerical integration
G	: Global coupling strength
noiseAmp	: noise amplitude
lesionAreas	: Index of the areas which are lesioned in the SC
ficWeights	: local inhibitory synaptic coupling initialization values
setFICWeights	: [True/False] if set true ficWeights will be used for initialization

  Return Values

fc	: Predicted functional connectivity.
maxfrN	: maximum firing rate of excitatory population in each area throughout the simulation.

  Example 1: Simulation for predicting FC of a healthy subject.

  This example assumes SC matrix is stored in /home/data/Human_68.hdf5 under the name 'C'. Simulates 8 minutes of activity.

  ```
  scPath = '/home/data/Human_68.hdf5';
  scName = '/C';
  fic = true;
  ffi = false;
  simTime = 8*60*1000;
  dt = 0.1;
  G = 0.5;
  noiseAmp = 0.001;
  lesionAreas = [];
  ficWeights = [];
  setFICWeights = false;
  [fc, maxfrN] = DMF_lesioned(scPath, scName, fic, ffi, simTime, dt, G, noiseAmp, lesionAreas, ficWeights, setFICWeights);
  ```

- Generating virtually lesioned SC from the SC of healthy subjects.

  The file gen_lesioned_sc_nn.m implements a function to generate virtually lesiond SC matrix from SC of healthy subjects.

  ```
  lSC = gen_lesioned_sc_nn(scPath, centresPath, scName, centreName, lesionIdx,
                           lesionPercent, saveDir);
  ```

Input Parameters

scPath	: Path to SC matrix file
centresPath	: Path to file(hdf5 formate) with spatial coordinates of centres of each area.
scName	: SC matrix path in the given hdf5 file
centresName	: Path to centres matrix in the hdf5 file located at centresPath
lesionIdx	: Index of the area that should act as lesion centre
lesionPercent	: Percentage of total areas that would be lesioned along with lesion centre. This many nearest neighbours to lesion centre would be also lesioned
saveDir	: Directory where lesioned SC matrix should be saved

Return Values

lSC	: A virtually lesioned SC matrix with lesion centre given by lesionIdx

Example2: Generating a virtually lesioned SC with lesion centre as ROI number 25. Along with lesion centre, 5 nearest neighbours of lesion centre in the same hemisphere are also lesioned.

Assuming there are a total of 68 ROIs (34 per each hemisphere) and 5 nearest neighbours are lesioned along with

```
scPath =  '/home/data/Human_68.hdf5'
centresPath = '/home/data/ROI_centres.hdf5'
scName = '/C';
centreName = '/Centres';
lesionIdx = 25;
lesionPercent = (5.0/68)*100;
saveDir = '/home/results/';
lSC = gen_lesioned_sc_nn(scPath, centresPath, scName, centresName, lesionIdx,
lesionPercent, saveDir);
```

- Predicting FC using DMF model and lesioned SC.

Lesioned structural connectivity from example 2 will be stored as */home/results/sc_l25_nn5.hdf5*. Predicting FC with such lesioned SC is similar to example 1 except now the SC is a lesioned one. Use the below syntax for predicting FC of a lesioned SC. Changes from example 1 are highlighted in yellow.

```
ScPath = '/home/results/sc_l25_nn5.hdf5';
scName = '/C';
fic = true;
ffi = false;
simTime = 8*60*1000;
dt = 0.1;
G = 0.5;
noiseAmp = 0.001;
lesionAreas = [25];
ficWeights = [];
setFICWeights = false;
[fc, maxfrN] = DMF_lesioned(scPath, scName, fic, ffi, simTime, dt, G, noiseAmp, lesionAreas,
                            ficWeights, setFICWeights);
```