

Encoder Decoder Manual

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ay_main_function: This function calls both the encoder and decoder functions. This wrapper function was written to show how different parameters can be set to the encoder and decoder functions.

ay_run_encoder: Encoder function, which builds the training and testing data set for the decoder function.

ay_run_decoder: Decoder function, which runs different decoder models and saves the decoding result.

How to interpret performance files:

Performance files keep the decoding result per each time step, and they have different entries depending on which decoding method is being called.

Exact solution: Each line of the performance file keeps the following information.

- Timestep: 2,3,4,5,...
- Number of Spikes: 0,1,...- mostly 0 and 1
- Sample time: Sec
- Rat Position in X: mm
- Rat Position in Y: mm
- In 95% HPD Coverage Area: 0 or 1
- Prediction distance error: mm, using mean of posterior
- Prediction distance error: mm, using mode of posterior
- Area of 95% HPD: mm²
- Prediction of rat position in X: mm, mean of posterior
- Prediction of rat position in Y: mm, mean of posterior
- Processing time: Sec

Gaussian/GMM 2D solution: This is very similar to the exact, except it keeps number of mixture per each time steps. Each line has the following information.

- Timestep: 2,3,4,5,...
- Number of Spikes: 0,1,...- mostly 0 and 1
- Sample time: Sec

- Rat Position in X: mm
- Rat Position in Y: mm
- In 95% HPD Coverage Area: 0 or 1
- Prediction distance error: mm, using mean of posterior
- Prediction distance error: mm, using mode of posterior
- Number of Mixtures: 1,2,3,...
- Area of 95% HPD: mm²
- Prediction of rat position in X: mm, mean of posterior
- Prediction of rat position in Y: mm, mean of posterior
- Processing time: Sec

Gaussian/GMM 4D solution: This is very similar to the Gaussian/GMM 2D, except it keeps extra information about new dimensions. Each line has the following information.

- Timestep: 2,3,4,5,...
- Number of Spikes: 0,1,...- mostly 0 and 1
- Sample time: Sec
- Rat Position in X: mm
- Rat Position in X: mm
- Rat Velocity in X axis: mm/s
- Rat Velocity in Y axis: mm/s
- In 95% HPD Coverage Area: 0 or 1
- Prediction distance error: -, using mean of posterior (4D)
- Prediction distance error: -, using mode of posterior (4D)
- Number of Mixtures: 1,2,3,...
- Prediction distance error: mm, using mean of posterior (2D)
- Area of 95% HPD: mm²
- Prediction of rat position in X: mm, mean of posterior
- Prediction of rat position in Y: mm, mean of posterior
- Processing time: Sec

Particle Filter solution: For the particle filter, we keep the following information per each time step.

- Timestep: 2,3,4,5,...
- Number of Spikes: 0,1,...- mostly 0 and 1
- Sample time: Sec
- Rat Position in X: mm
- Rat Position in X: mm
- Prediction distance error: -, using mean of posterior (4D)
- Prediction of rat position in X: mm, mean of posterior
- Prediction of rat position in Y: mm, mean of posterior
- Processing time: Sec

Which Folder Keeps What?

rat_cell_data: This folder keeps all experimental data

encoder_files: This folder might be used to keep encoder files

decoder_performance: This folder might be used to keep decoder performance files - the one which is described in the previous section

decoder_per_timestep: This folder might be used to keep the decoding result per each time step. This includes particles for the particle filter solution, posterior distribution using the exact solution, and GMM/Gaussian models using proposed solution.