

# A Granger Causality Measure for Point Process Models of Ensemble Neural Spiking Activity

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This is meant to guide users through the proper use of the software to assess Granger causality for point process models. This Matlab code allows users to identify Granger causality between multiple neural spike train data (simultaneously recorded from the primary motor cortex of a cat), when input data has a ( $\#neurons \times \#samples/trial \times \#trials$ ) structure.

To fit a GLM model:

1. In order to fit a GLM model, use the file **glmtrial.m**. There are a list of input variables that user should choose. For more information, refer to **demo\_real.m**.

To select a model order:

1. In order to calculate AIC, use the file **log\_likelihood\_trial.m**. For more information, refer to **demo\_real.m**.
2. In order to select a model order for each neuron, calculate AIC values according to different history durations and then select an optimum model order for each spike train data.

To plot a KS plot:

1. In order to plot a KS plot, use the file **ksplot\_trial.m**. For more information, refer to **ksplotting.m**.

To identify Granger causality between neurons:

1. Use **CausalTest.m** to obtain Granger causality matrix,  $\Phi$ ; and causal connectivity matrices,  $\Psi$ 's with and without false discovery rate (FDR) correction, respectively.

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