

# Instruction for the use of code from the paper

## “Modelling and computation using NCoRM mixtures for density regression”

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## 1 Introduction

This folder contains Matlab function which implement the models described in the two examples and allow the examples to be run using the commands `run_group` for Example 5.1 and `run_mcycle` for Example 5.2.

## 2 Functions

### 2.1 Linear model example

```
[fpred, holdM, holdsigmasq1, holdsigmasq2, holdsigmasq_int  
= normal_2D(group, target, ypred, burnin, numbofits, every)
```

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## Inputs

- **group** – An  $(n \times 2)$ -dimensional matrix of input variables. The  $i$ -th contains the level of the two variables for the  $i$ -th observation.
- **target** – An  $(n \times p)$ -dimensional vector of response variables.
- **ypred** – An  $(m \times p)$ -dimensional matrix of the response values at which the posterior mean density will be evaluated.
- **burnin** – The number of iterations in the burn-in period,  $B$ .
- **numbofits** – The number of samples,  $N$ , to be collected.
- **every** – The level of thinning,  $K$ . The sampler is run for a total  $B + NK$  iterations.

## Outputs

- **fpred** – An  $(p \times n^* \times m)$ -dimensional matrix whose  $(i, j)$ -th entry is the posterior mean density of **ypred**[ $j$ ] evaluated at the  $i$ -th unique value of the input variables.
- **holdM** – An  $(N \times 1)$ -dimensional vector containing the sampled values of the parameter  $M$ .
- **holdsigmasq1** – An  $(N \times 1)$ -dimensional vector containing the sampled values of the parameter  $\sigma_1^2$ .
- **holdsigmasq2** – An  $(N \times 1)$ -dimensional vector containing the sampled values of the parameter  $\sigma_2^2$ .
- **holdsigmasq\_int** – An  $(N \times 1)$ -dimensional vector containing the sampled values of the parameter  $\sigma_{1,2}^2$ .

```
[fpred, uniquedata, holdM, holdsigmasq_stat, holdlengthscale, mupred]  
= normal_GaussP(data, target, ypred, burnin, numbofits, every)
```

## 2.2 Gaussian process example

### Inputs

- **data** – An  $(n \times 1)$ -dimensional vector of input variables.
- **target** – An  $(n \times 1)$ -dimensional vector of response variables.
- **ypred** – An  $(m \times 1)$ -dimensional vector of response values at which the posterior mean density will be evaluated.
- **burnin** – The number of iterations in the burn-in period,  $B$ .
- **numbofits** – The number of samples,  $N$ , to be collected.
- **every** – The level of thinning,  $K$ . The sampler is run for a total  $B + NK$  iterations.

### Outputs

- **fpred** – An  $(n^* \times m)$ -dimensional matrix whose  $(i, j)$ -th entry is the posterior mean density of `ypred[j]` evaluated at the  $i$ -th unique value of the input variables.
- **uniquedata** – An  $(n^* \times 1)$ -dimensional vector containing the unique values of the input variables.
- **holdM** – An  $(N \times 1)$ -dimensional vector containing the sampled values of the parameter  $M$ .
- **holdsigmasq\_stat** – An  $(N \times 1)$ -dimensional vector containing the sampled values of the parameter  $\phi$ .
- **holdlengthscale** – An  $(N \times 1)$ -dimensional vector containing the sampled values of the parameter  $L$ .
- **mupred** – An  $(n^* \times N)$ -dimensional matrix containing the sampled values of expected of the response evaluated at the unique values of the input variables.