**Fitzhugh-Nagumo Model with 3 parameters**

Ground truths of parameter: a=0.3, b=0.15, c=0.5

ODE:

dx1 = c\* (x1 - (x1^3)/3 + x2)

dx1 = (1/c) \* (x1 - a + b \*x2)

initial state x0 = [-1 1];

observation of x1:

sigma2(std^2)= 0.01

final time: 10

observation time step: 1

parameter ranges:

a \in [0.1,0.9]

b \in [0,0.3]

c \in [0, 0.5]

number of interval on each dimension) numInt=50;

Factorization:

Compute the covariance by using 2500 MCMC samples, and use balanced partitioning to get 2 clusters:

Clusters{1} = a

Clusters{2} = b, c

**Laub-Loomis model with 13 parameters**

Ground truths of parameter: k1=0.9, k2=0.8, k3=0.3, k4=2.5, k5=1.3, k6=1.8, k7=1.4, k8=1.5, k9=0.6, k10=0.7, k11= 1.0, k12=3.1, k13=1.5

ODE:

dx1 = k7 \* x3 - k1 \* x1

dx2 = k4 \* x5 - k8 \* x2

dx3 = k9 \* x7 - k2 \* x3 \* x2

dx4 = 2 - k5 \* x4 \* x3

dx5 = k10 \* x1 - k11 \* x4 \* x5

dx6 = k3 \* x1 - k12 \* x6

dx7 = k6 \* x6 - k13 \* x7 \* x2

initial state x0 = [1.2 1.0 1.5 2.4 1.0 0.1 0.45]

observation of x1:

sigma2(std^2)= 0.0005

final time: 5

observation time step: 0.5

parameter ranges:

k1 \in [0, 3.2]

k2 \in [0, 3]

k3 \in [0, 2.5]

k4 \in [0, 5]

k5 \in [0, 3.5]

k6 \in [0, 5]

k7 \in [0, 3.8]

k8 \in [0, 3.8]

k9 \in [0, 2.9]

k10 \in [0, 2.9]

k11 \in [0, 3.3]

k12 \in [0, 6.4]

k13 \in [0, 4.7]

(number of interval on each dimension) numInt=40;

Factorization:

Compute the covariance by using 100000 MCMC samples, and use balanced partitioning to get 3 clusters:

Clusters{1} = k2, k3

Clusters{2} = k1, k4, k7, k8, k12

Clusters{3}= k5, k6, k9, k10, k11, k13

**Dalla Man model for the 20 parameters**

Ground truths of parameter:

k1 = 0.0581,

k2 = 0.5221,

k3 = 0.0171,

k4 = 0.0152,

k5 = 0.0121,

k6 = 0.4219,

k7 = 0.3150,

k8 = 0.0046,

k9 = 0.0046,

k10 = 0.0278,

k11 = 0.0078,

k12 = 0.0313,

k13 = 0.0871,

k14 = 0.0047,

k15 = 0.0871,

k16 = 0.0019,

k17 = 0.0078,

k18 = 0.0278,

k19 = 0.0026,

k20 = 0.0039,

ODE:

d\_Gs = 0.1\*(k2 \* Gp - Gs)

d\_Isc1 = -k3 \* Isc1 +0.97751710655\*0.5

d\_Isc2 = k4 \* Isc1 - k11 \* Isc2

d\_Gt = -k20\* (3.2267+k12\*X) \* Gt \* ( 1 - k19 \* Gt + (2.5097e-6) \*Gt^2) + k1 \*Gp - k13 \* Gt

d\_Gp = 4.7314 - k14 \* Gp - k5 \* Id - 1 - k1 \*Gp + k15\*Gt + (1.140850553428184e-4)\*temp^2\*50 + (6.134609247812877e-5)\*temp\*50

d\_Il = -k6 \* Il + 0.2250\* Ip

d\_Ip = -k7 \* Ip + 0.1545 \* Il + k16 \* Isc1 + k17 \* Isc2

d\_I1 = -k8 \* (I1 - 18.2129 \* Ip)

d\_Id = -k9 \* (Id - I1 )

d\_X = -k10 \* X + k18 \* ( 18.2129 \* Ip - 100.25)

d\_temp = 1

initial state:

Gs = 140;

Isc1 = 72.43;

Isc2 = 141.15;

Gt = 162.45;

Gp = 268.128;

Il = 3.2;

Ip = 5.5;

I1 = 100.25;

Id = 100.25;

X = 0.0;

temp = 0.0;

observation of Gs:

sigma2(std^2)= 0.01

final time: 40

observation time step: 1

parameter ranges:

k1 \in [0.05, 0.06]

k2 \in [0.5, 0.55]

k3 \in [0.01, 0.05]

k4 \in [0.01, 0.05]

k5 \in [0.01, 0.015]

k6 \in [0.2, 0.6]

k7 \in [0.2, 0.5]

k8 \in [0.001, 0.008]

k9 \in [0.001, 0.008]

k10 \in [ 0.01, 0.05]

k11 \in [0.005, 0.01]

k12 \in [0.01, 0.05]

k13 \in [0.05, 0.1]

k14 \in [0.001, 0.006]

k15 \in [0.05, 0.1]

k16 \in [0.001, 0.005]

k17 \in [0.005, 0.01]

k18 \in [0.01, 0.05]

k19 \in [0.001, 0.005]

k20 \in [0.001, 0.005]

(number of interval on each dimension) numInt=40;

Factorization:

Compute the covariance by using 300000 MCMC samples, and use balanced partitioning to get 6 clusters:

Clusters{1} = k1 k2 k4 k8 k13 k15

Clusters{2} = k5 k14

Clusters{3}= k3 k6 k7 k10 k12 k18

Clusters{4} = k9 k17

Clusters{5} = k11 k19

Clusters{6} = k16 k20