Table of Contents

The toggle switch example

This toggle switch example was generated will a Hill kinetics model trained to a subset of the data provided in Lugagne et al. 201x. The example is baised in pseudo experimental-data which means that all data is generated by the model we have previously trained. This is a standard procedure that serves as means of benchmarking the algorithm.

```
clear variables;
clc;
close all;
noise_pseudo_data=0.05;
```

Start SBL and load default settings

```
SBL_init;
```

A number of settings is defined in the default configuration file. The assertiveness of these settings is problem dependent. Settings such as the number optimzation solver settings, the experiments considered, or number of models (sparsity cases) have default values that should be tailored to the problem.

```
SBL_config_defaults;
```

As example we modify sbl_config.exp_idx for considering only experiments 1 and 2.

```
sbl_config.exp_idx=1:2;
```

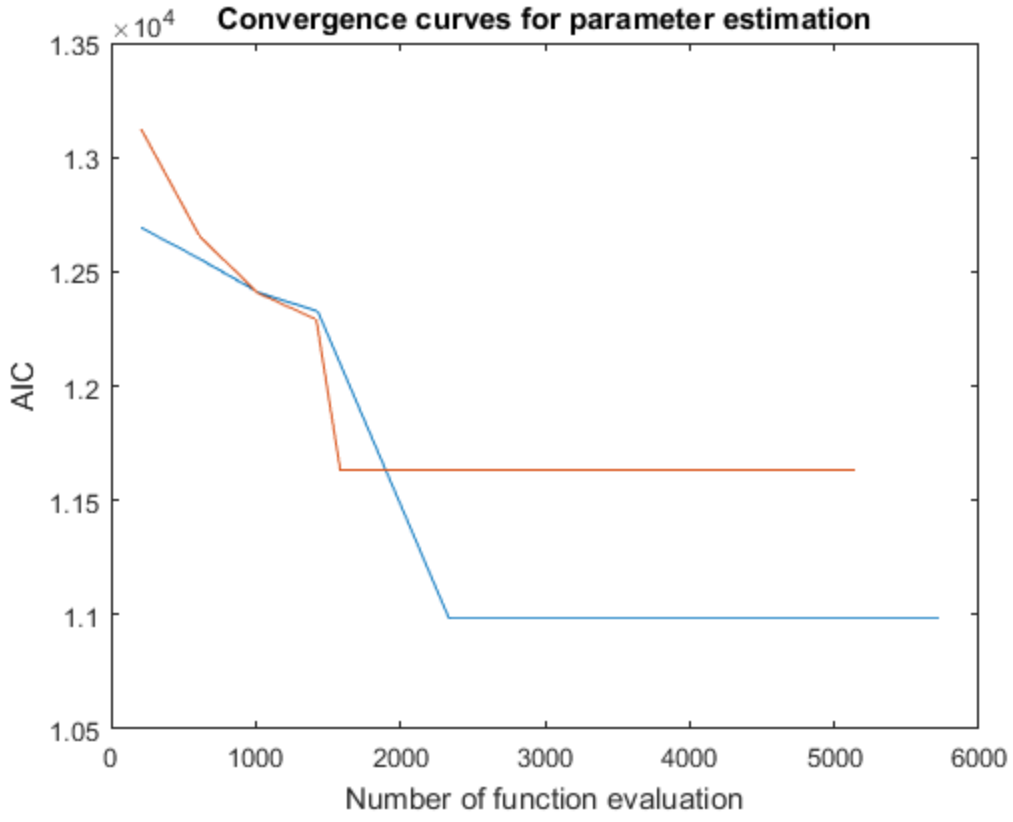
Generate and fit a family of models

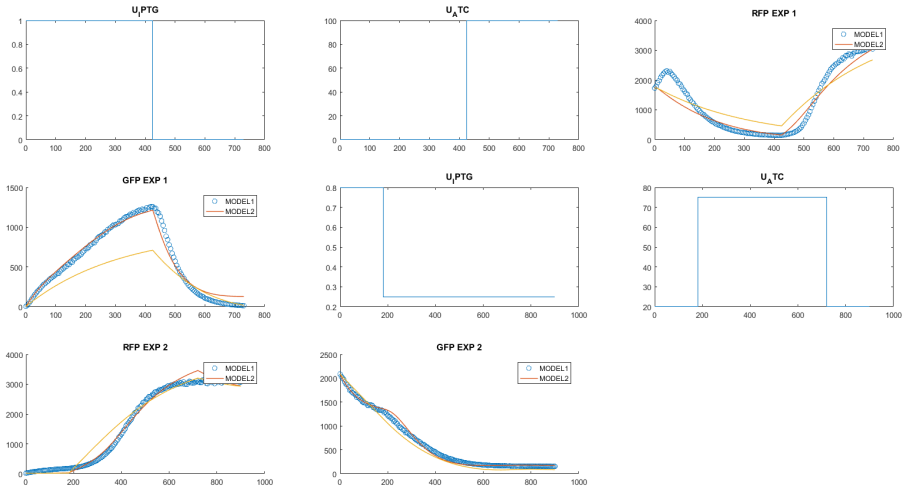
We generate a family of models with SBL and fit with AMIGO+scatter search The convergence curves are given scatter search. Time courses for each modeled observable are also ploted along with the pseudo experimental data. There is substantial progess made by the parameter estimation process.

```
MODELS=SBL_gen_model_family(sbl_config);
SBL_plotFamilyFit(MODELS);
set(gcf, 'Units', 'Normalized', 'OuterPosition', [0, 0.04, 1, 0.96]);
```

```
21-Aug-2019 16:49:08 | loop iter: 1, generating SBL data
21-Aug-2019 16:49:08 | file: experimental_data_loop_1.csv was
 successfully imported | 2  experiments was selected
21-Aug-2019 16:49:08 | loop iter: 1, running SBL
runnging sparsity case: 1/2
runnging SBL on state: 1/2
```

```
SBL iter: 1/10 took 1.01439 sec
SBL iter: 2/10 took 1.88639 sec
SBL iter: 3/10 took 2.07416 sec
SBL iter: 4/10 took 3.03529 sec
SBL iter: 5/10 took 1.28554 sec
SBL iter: 6/10 took 2.13526 sec
SBL iter: 7/10 took 2.21759 sec
SBL iter: 8/10 took 2.33308 sec
SBL iter: 9/10 took 1.91069 sec
SBL iter: 10/10 took 1.15343 sec
runnging SBL on state: 2/2
SBL iter: 1/10 took 1.54769 sec
SBL iter: 2/10 took 0.545094 sec
SBL iter: 3/10 took 0.496911 sec
SBL iter: 4/10 took 0.474108 sec
SBL iter: 5/10 took 0.504044 sec
SBL iter: 6/10 took 0.4943 sec
SBL iter: 7/10 took 0.525202 sec
SBL iter: 8/10 took 0.521226 sec
SBL iter: 9/10 took 0.500886 sec
SBL iter: 10/10 took 0.493309 sec
Elapsed time is 0.513223 seconds.
state: x_1 zero_th: 9.49847e-05 dict_num: 4 (0.249532%)
state: x_2 zero_th: 9.49847e-05 dict_num: 6 (0.747198%)
ODE simulation OK
...
```





Execute OED for model discrimination

Optimal experimental design for model discrimination seeks to find the experiment that maximizes the predicted different between the models.

```
modelsAfterOED=OED4SBLdiscrimination(MODELS,sbl_config);
SBL_plotDiscriminationResult(modelsAfterOED);
set(gcf, 'Units', 'Normalized', 'OuterPosition', [0, 0.04, 1, 0.96]);
```

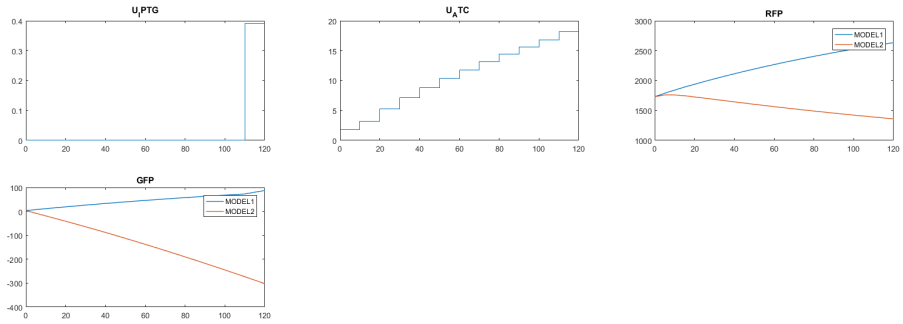
```
**********************************
     AMIGO2, Copyright @CSIC
     AMIGO2_R2017a [March 2017]
**********************************

*Date: 21-Aug-2019

------>Pre processing....this may take a few seconds.


------>Checking inputs....
n_exp
exp_type
n_obs
obs_names
obs
exp_y0
t_f
n_s
t_s
u_type
u_interp
n_steps
t_con
```

```
u_min
u_max
u
exp_data
...
```



Generate new pseudo experimental data

```
data_file2=fullfile(pwd,'Data','experimental_data_2.csv');
gen_pseudo_data(modelsAfterOED{1}
{1}.exps,noise_pseudo_data,data_file2,'model1');
sbl_config.data_dir_name = 'Data';
sbl_config.data_file_name = data_file2;

Not enough input arguments.

Error in gen_pseudo_data (line 4)
[inputs,privstruct,INITIALU]=compile_example(model_name);

Error in run_toggle_switch (line 60)
gen_pseudo_data(modelsAfterOED{1}
{1}.exps,noise_pseudo_data,data_file2,'model1');
```

Second iteration

```
sbl_config.exp_idx=1:3;
% %% Generate and fit a new family of models
% MODELS=SBL_gen_model_family(sbl_config,1:1);
```

Published with MATLAB® R2016b