به نام خدا

علوم اعصاب محاسباتی

تمرین سری دوم:بررسی جمعیت های نورونی

استاد درس:دکتر خردپیشه

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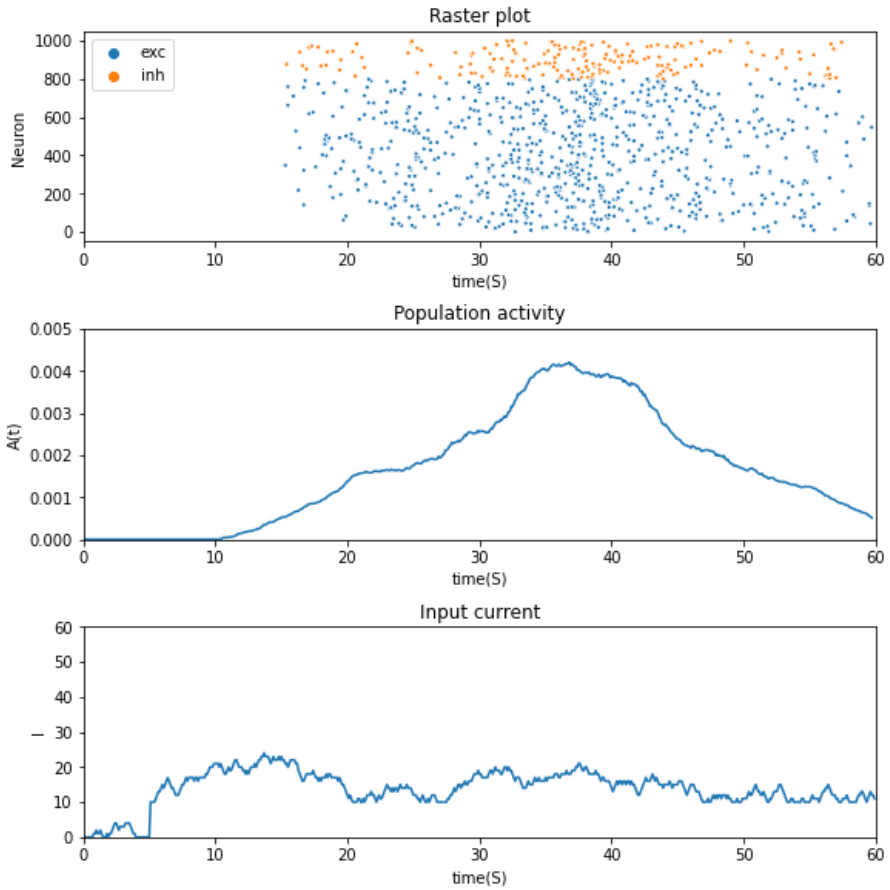
میخواهیم با استفاده از مدل های تمرین قبل،جمعیت های نورونی تشکیل شده از نورون های مهاری و تحریکی را بررسی کنیم. تعداد نورون ها به ترتیب 2و8 و در مجموع 10 تاست. در این جامعه آماری روابط نورون ها بسته به کامل بودن، گوسی یا رندوم بودن اتصالات بین آنها دسته بندی شده است.

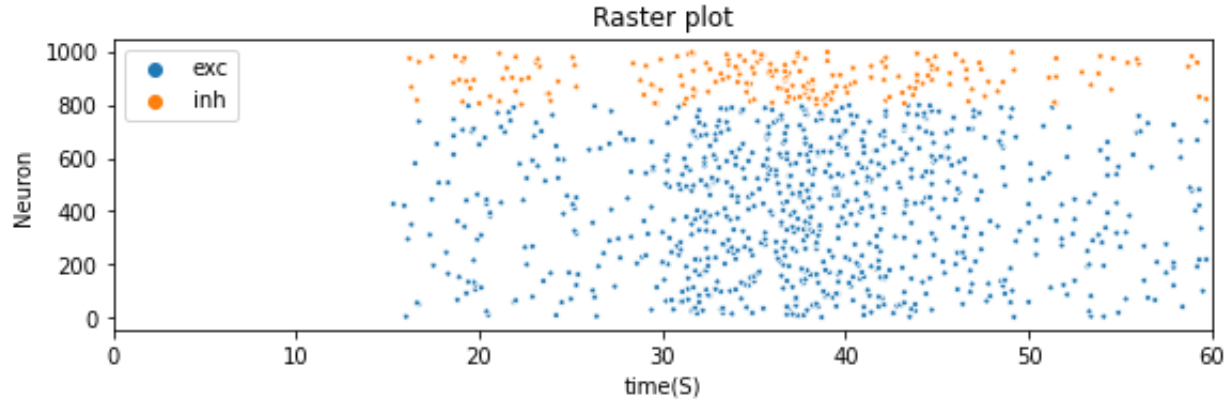
مثال ها:

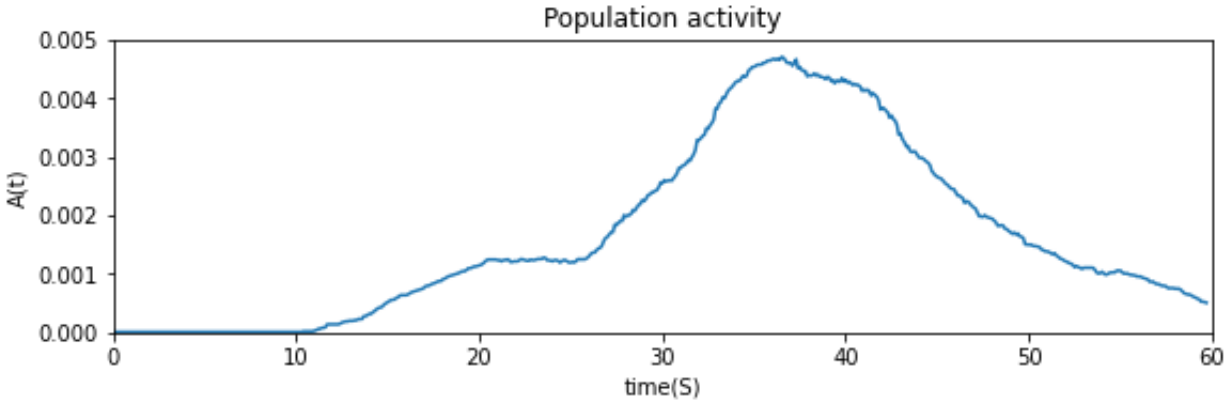
.1

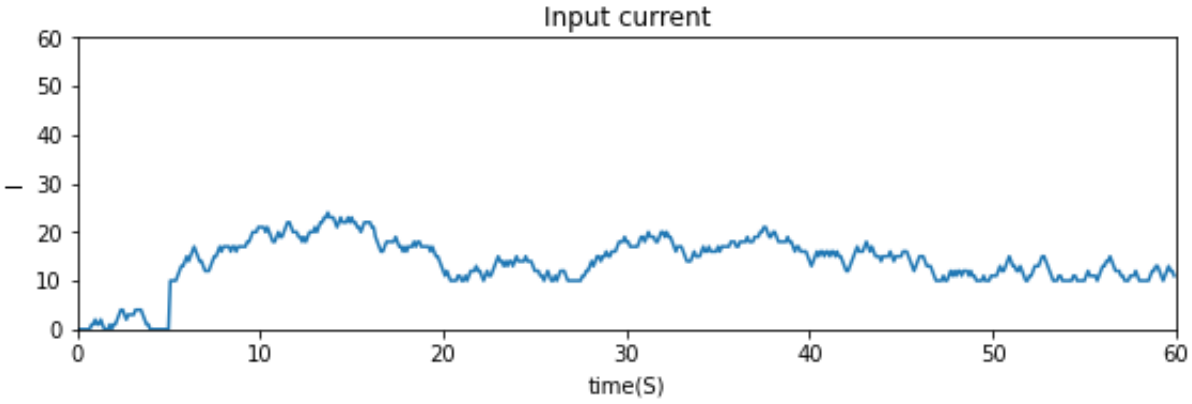
```
dt = 0.1
pop = Population(I_gen = lambda x:( random_I(x) +10*(x>5)))
connection = FullyConnected(pop, pop)
model = Model()
model.add_population(pop)
duration = 60
model.simulate(duration)
plot_result(model)
```



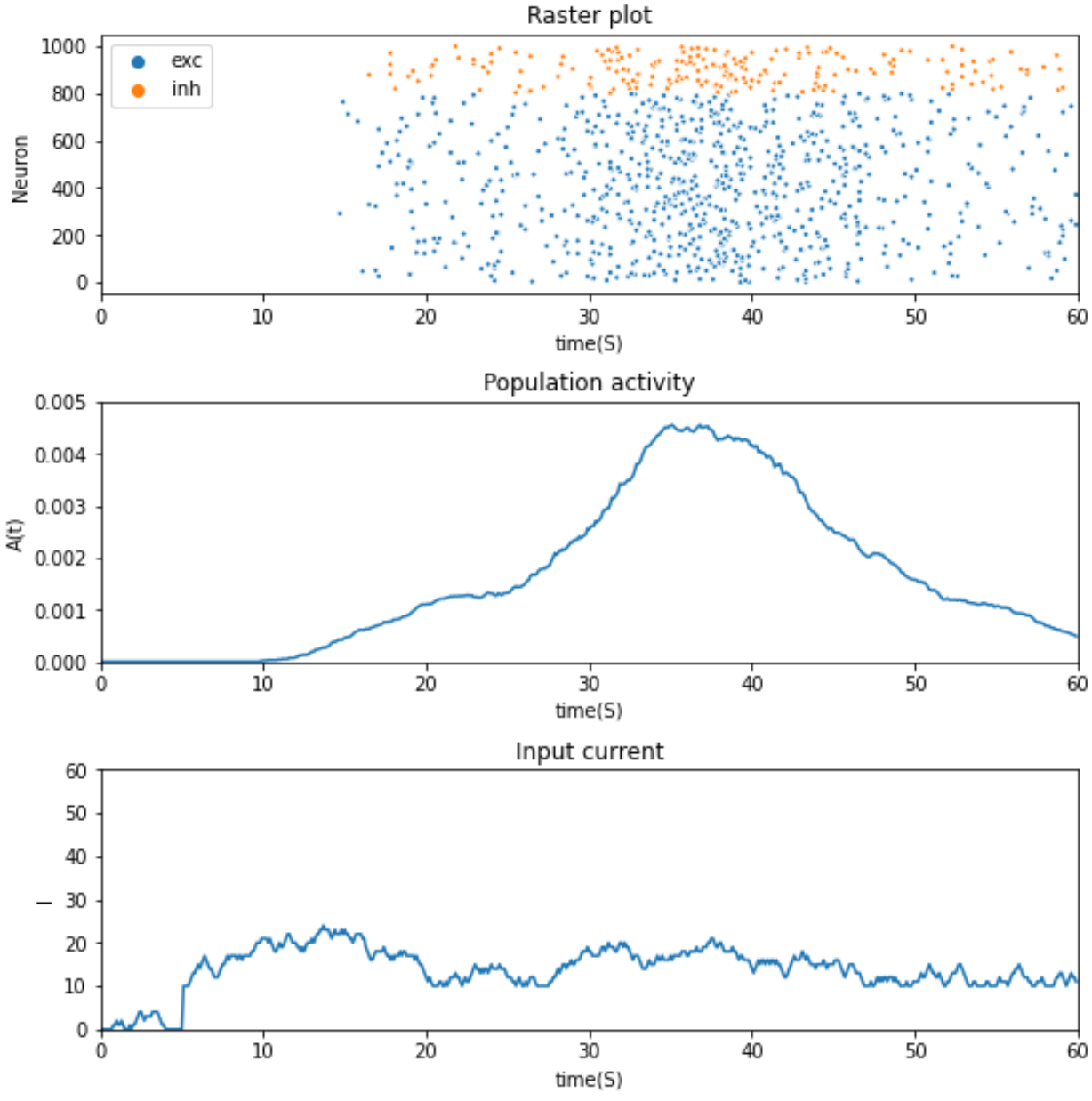
```
dt = 0.1
pop = Population(I_gen = lambda x:( random_I(x) +10*(x>5)))
connection = GaussianFullyConnected(pop, pop)
model = Model()
model.add_population(pop)
duration = 60
model.simulate(duration)
plot_result(model
```

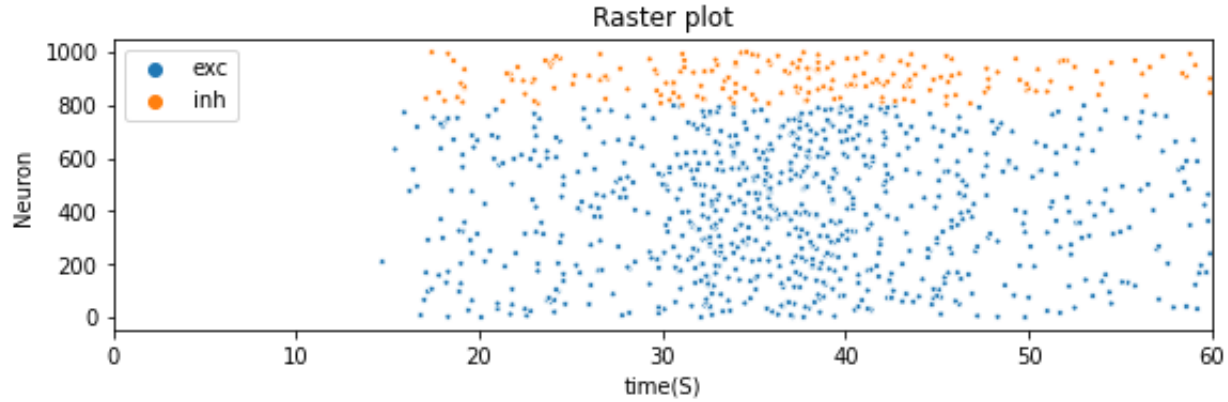


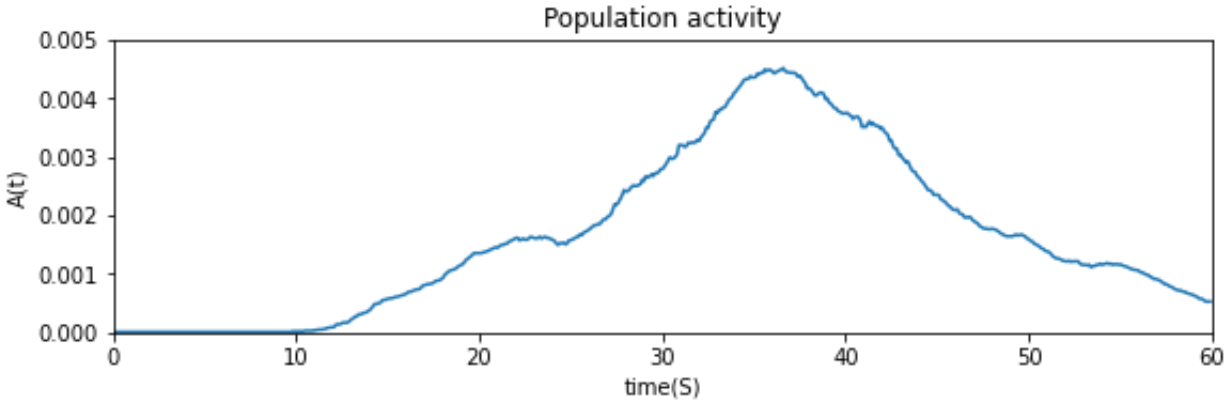


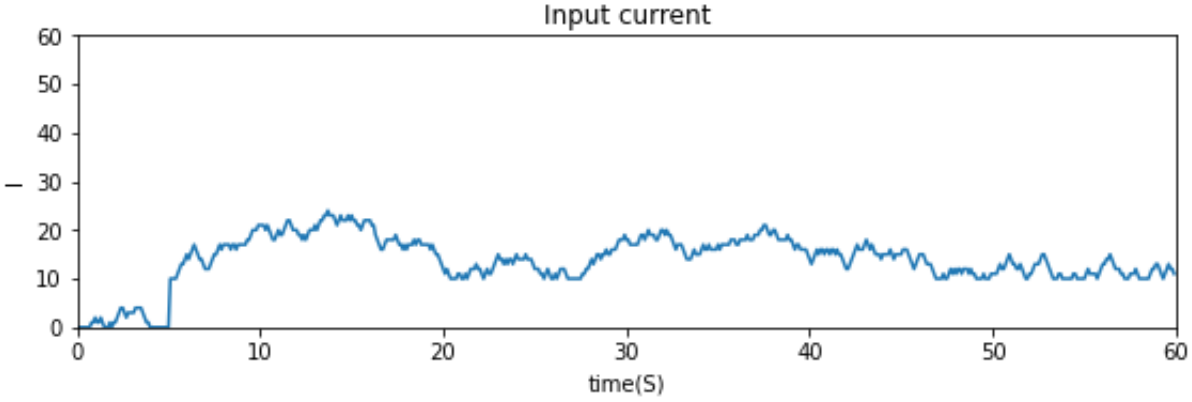


```
dt = 0.1
pop = Population(I_gen = lambda x:( random_I(x) +10*(x>5)))
connection = FixedCouplingPConnection(pop, pop)
model = Model()
model.add_population(pop)
duration = 60
model.simulate(duration)
plot_result(model)
```




Raster plot
exc
inh
Neuron
time(S)

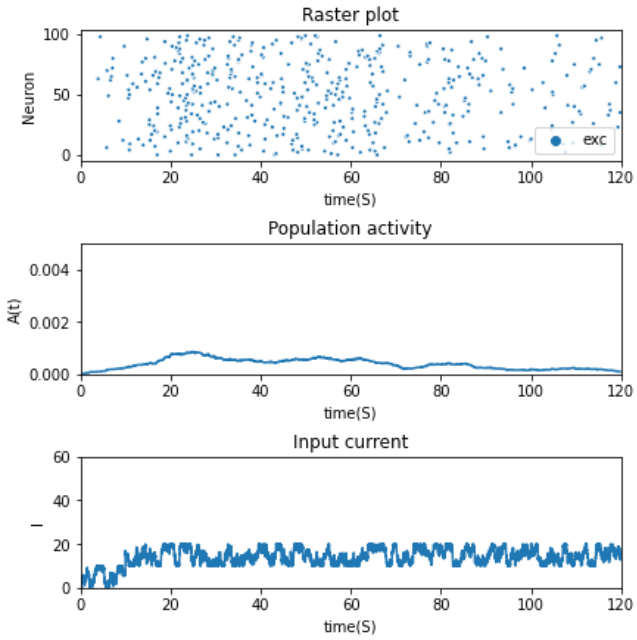

Population activity
A(t)
time(S)


Input current
I
time(S)

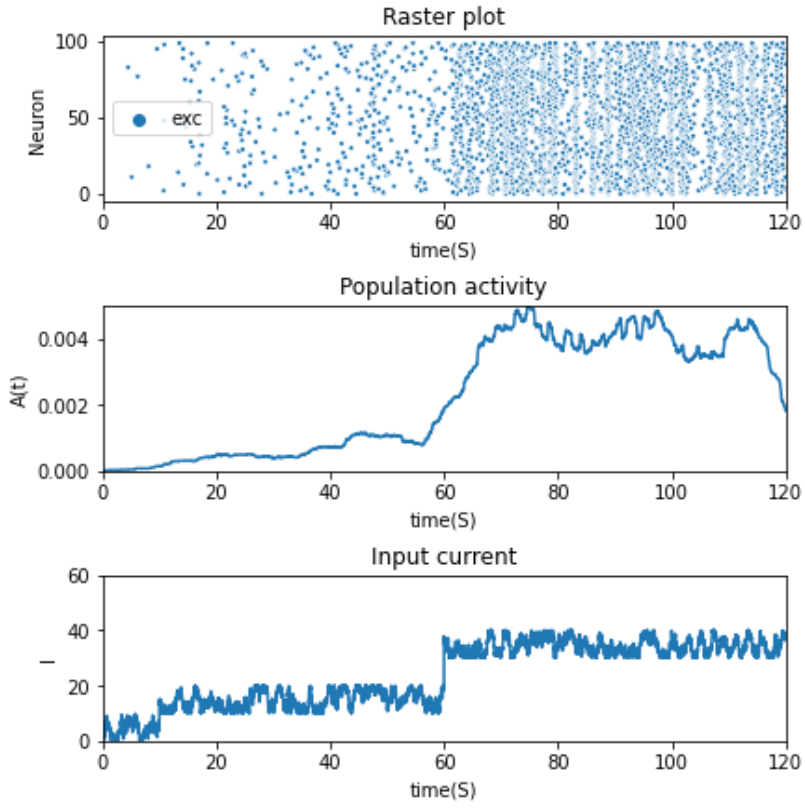
در قسمت آخر کانکشن بین 3 جمعیت نورونی شامل 2 جمعیت کاملا تحریکی و یک جمعیت کاملا مهاری با تعداد مشخص اسپایک در هر جمعیت را بررسی میکنیم

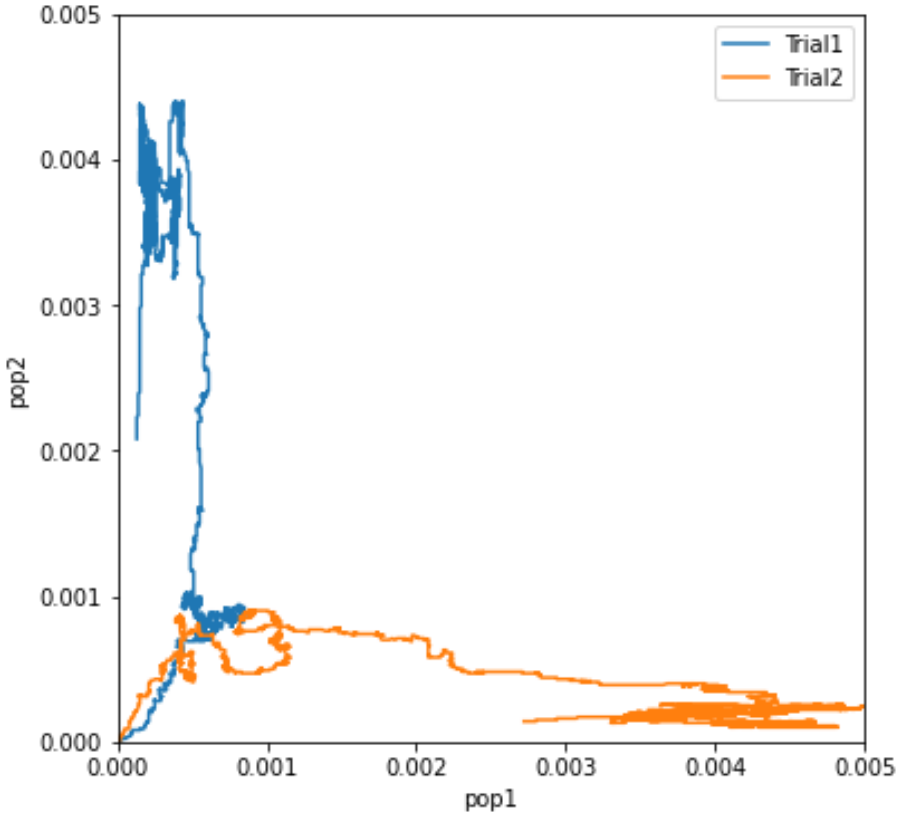
مثال1.

```
base_I = 10
decision_I = 20
exc_pop1 = Population(size = 100 , exc_p = 1, I_gen =  lambda x:random_I(x)+base_I*(x>10))
exc_pop2 = Population(size = 100 , exc_p = 1, I_gen = lambda x:( random_I(x)+base_I*(x>10)+decision_I*(x>60)))
inh_pop = Population(size = 100, exc_p = 0, I_gen = lambda x:random_I(x)+base_I*(x>10))
connection = PreFixedConnection(exc_pop1, exc_pop1, n_neighbors=30)
connection = PreFixedConnection(exc_pop2, exc_pop2, n_neighbors=30)
connection = PreFixedConnection(exc_pop2, inh_pop, n_neighbors=10)
connection = PreFixedConnection(inh_pop, exc_pop2, n_neighbors=10)
connection = PreFixedConnection(inh_pop, exc_pop1, n_neighbors=10)
connection = PreFixedConnection(exc_pop1, inh_pop, n_neighbors=10)
model = Model()
model.add_population(exc_pop1)
model.add_population(exc_pop2)
model.add_population(inh_pop)
duration = 120
model.simulate(duration)
plot_result(model, 0)
plot_result(model, 1)
plot_result(model, 2)
pop_act1, pop_act2 = exc_pop1.get_pop_activity(conv_size = 100, full= False), exc_pop2.get_pop_activity(conv_size = 100, full= False)
```



```
base_I = 10
decision_I = 20
exc_pop1 = Population(size = 100 , exc_p = 1, I_gen =  lambda x:random_I(x)+base_I*(x>10)+decision_I*(x>60))
exc_pop2 = Population(size = 100 , exc_p = 1, I_gen = lambda x:random_I(x)+base_I*(x>10))
inh_pop = Population(size = 100, exc_p = 0, I_gen = lambda x:random_I(x)+base_I*(x>10))
connection = PreFixedConnection(exc_pop1, exc_pop1, n_neighbors=30)
connection = PreFixedConnection(exc_pop2, exc_pop2, n_neighbors=30)
connection = PreFixedConnection(exc_pop2, inh_pop, n_neighbors=10)
connection = PreFixedConnection(inh_pop, exc_pop2, n_neighbors=10)
connection = PreFixedConnection(inh_pop, exc_pop1, n_neighbors=10)
connection = PreFixedConnection(exc_pop1, inh_pop, n_neighbors=10)
model = Model()
model.add_population(exc_pop1)
model.add_population(exc_pop2)
model.add_population(inh_pop)
duration = 120
model.simulate(duration)
plot_result(model, 0)
plot_result(model, 1)
plot_result(model, 2)
```





روند فعالیت نورون های تحریکی در هر دو جمعیت