Report

November 29, 2019

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1.1 1.

1.1.1

[1]:
```
import LRU, FIFO, LFU, RND
from random import *
import matplotlib.pyplot as plt
import matplotlib.gridspec as gridspec
import numpy as np
import pandas as pd
from datetime import datetime
```

1.1.2 +

Parameter

- input_size :
- input_max_value : 0 ~ input_max_value
- slot_size :

[13]:
```
def get_hit_result(input_size, input_max_size, slot_size):
    LRU_list = []
    LFU_list = []
    RND_list = []
    FIFO_list = []
```

```
    for slot_size in range(3, slot_size):

        tmp_LRU = 0
        tmp_LFU = 0
        tmp_RND = 0
        tmp_FIFO = 0
        for i in range(10):

            input_list = []

            for j in range(input_size):
                input_list.append(randint(0, input_max_size))

            tmp_LRU += LRU.LRU_implement(input_list, slot_size)
            tmp_LFU += LFU.LFU_implement(input_list, slot_size)
            tmp_RND += RND.Random_implement(input_list, slot_size)
            tmp_FIFO += FIFO.FIFO_implement(input_list, slot_size)

        LRU_list.append(tmp_LRU / 10)
        LFU_list.append(tmp_LFU / 10)
        RND_list.append(tmp_RND / 10)
        FIFO_list.append(tmp_FIFO / 10)

    #index = [i for i in range(3,slot_max_size)]
    #index = np.array(index)

    return LRU_list, LFU_list, RND_list, FIFO_list
```

[14]:
```
def get_time_result(input_size, input_max_size, slot_size):
    LRU_list = []
    LFU_list = []
    RND_list = []
    FIFO_list = []

    for n in range(3, slot_size):

        time_LRU = 0
        time_LFU = 0
        time_RND = 0
        time_FIFO = 0
        for i in range(10):

            input_list = []

            for j in range(input_size):
                input_list.append(randint(0, input_max_size))
```

```
            starttime = datetime.now()
            LRU.LRU_implement(input_list, slot_size)
            tmpTime_LRU = (datetime.now()-starttime).microseconds

            starttime = datetime.now()
            LFU.LFU_implement(input_list, slot_size)
            tmpTime_LFU = (datetime.now()-starttime).microseconds

            starttime = datetime.now()
            RND.Random_implement(input_list, slot_size)
            tmpTime_FIFO = (datetime.now()-starttime).microseconds

            starttime = datetime.now()
            FIFO.FIFO_implement(input_list, slot_size)
            tmpTime_RND = (datetime.now()-starttime).microseconds

            time_LRU += tmpTime_LRU
            time_LFU += tmpTime_LFU
            time_RND += tmpTime_RND
            time_FIFO += tmpTime_FIFO

        LRU_list.append(time_LRU / 10)
        LFU_list.append(time_LFU / 10)
        RND_list.append(time_RND / 10)
        FIFO_list.append(time_FIFO / 10)

    #index = [i for i in range(3,slot_max_size)]
    #index = np.array(index)

    return LRU_list, LFU_list, RND_list, FIFO_list
```

1.1.3

[15]:
```
def visualize(input_size, input_max_size):

    fig = plt.figure(figsize = (11,20))
    gs = gridspec.GridSpec(4,2)

    slot_list = [25,50,75,100]

    for i,slot_size in zip(range(4), slot_list):

        LRU_list, LFU_list, RND_list, FIFO_list = get_hit_result(input_size,␣
↪input_max_size, slot_size)
```

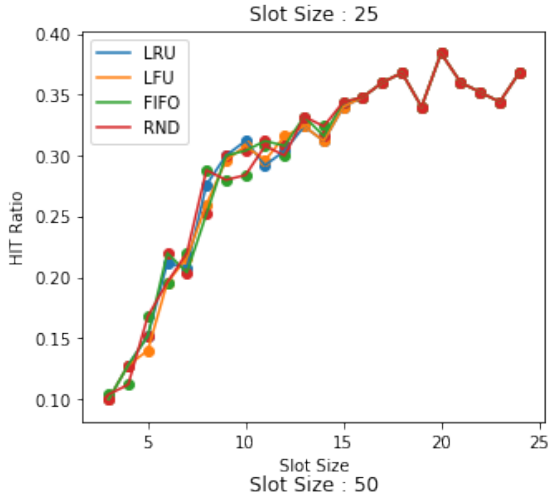
```
        LRU_tlist, LFU_tlist, RND_tlist, FIFO_tlist =␣
↪get_time_result(input_size, input_max_size, slot_size)

        index = ['LRU', 'LFU', 'RND', 'FIFO']
        columns = [i for i in range(3,slot_size)]

        ax1 = fig.add_subplot(gs[i,0])
        plt.plot(columns, LRU_list, label = 'LRU')
        plt.plot(columns, LFU_list, label = 'LFU')
        plt.plot(columns, FIFO_list, label = 'FIFO')
        plt.plot(columns, RND_list, label = 'RND')
        plt.scatter(columns, LRU_list)
        plt.scatter(columns, LFU_list)
        plt.scatter(columns, RND_list)
        plt.scatter(columns, FIFO_list)
        plt.title("Slot Size : " + str(slot_size))
        plt.ylabel("HIT Ratio")
        plt.xlabel("Slot Size")
        plt.legend(loc='best')

        ax2 = fig.add_subplot(gs[i,1])
        plt.plot(columns, LRU_tlist, label = 'LRU')
        plt.plot(columns, LFU_tlist, label = 'LFU')
        plt.plot(columns, FIFO_tlist, label = 'FIFO')
        plt.plot(columns, RND_tlist, label = 'RND')
        plt.scatter(columns, LRU_tlist)
        plt.scatter(columns, LFU_tlist)
        plt.scatter(columns, FIFO_tlist)
        plt.scatter(columns, RND_tlist)
        plt.title("Slot Size : " + str(slot_size))
        plt.ylabel("Excution Time")
        plt.xlabel("Slot Size")
        plt.legend(loc='best')
    plt.show()
```

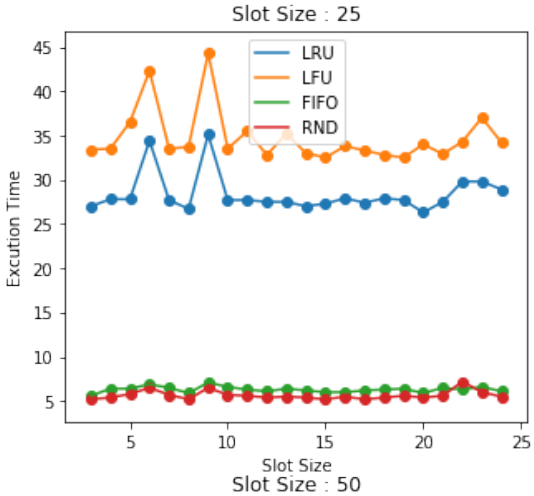
1.2 2.

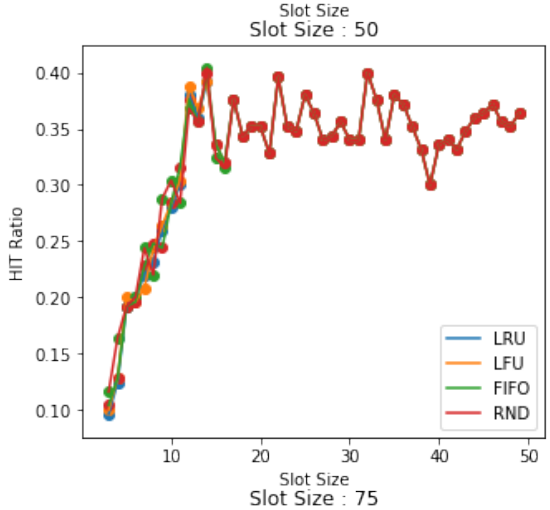
1.2.1 2.1 25

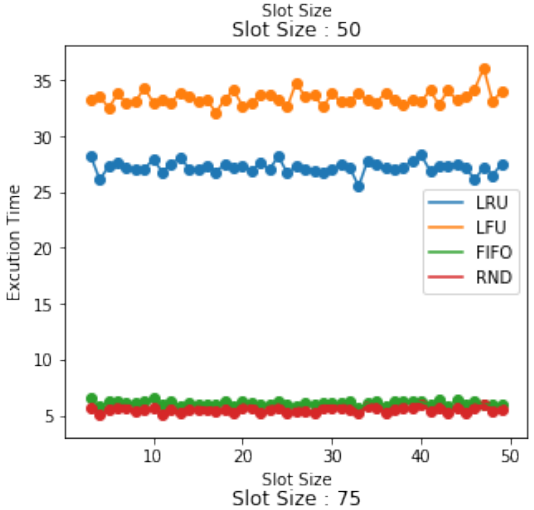
2.1.1 25 25,50,75,100

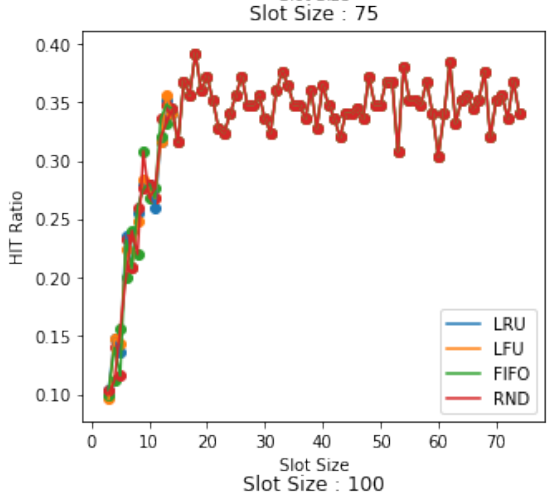
[16]:
```
visualize(input_size = 25, input_max_size = 25)
```

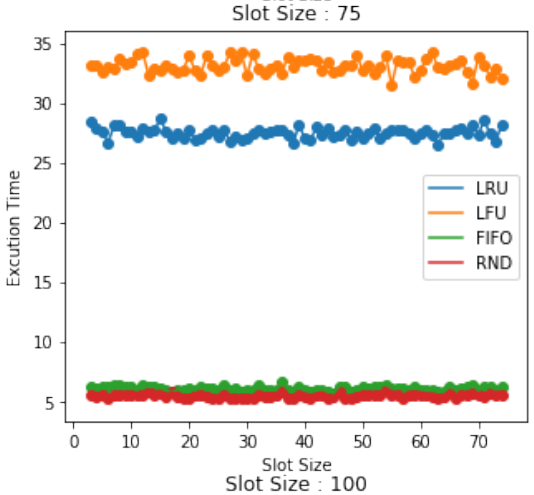

Slot Size : 25
HIT Ratio
Slot Size
LRU
LFU
FIFO
RND

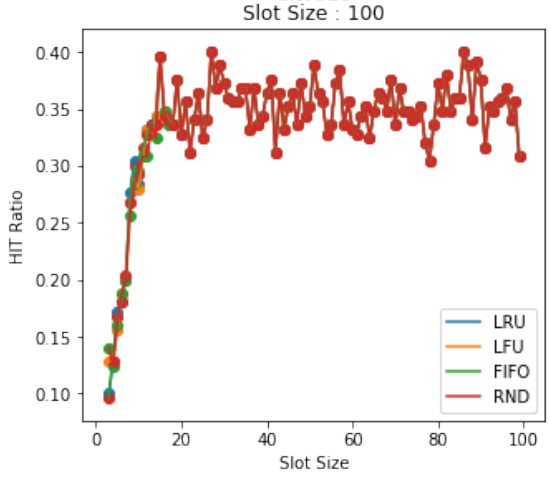

Slot Size : 25
Excution Time
Slot Size
LRU
LFU
FIFO
RND

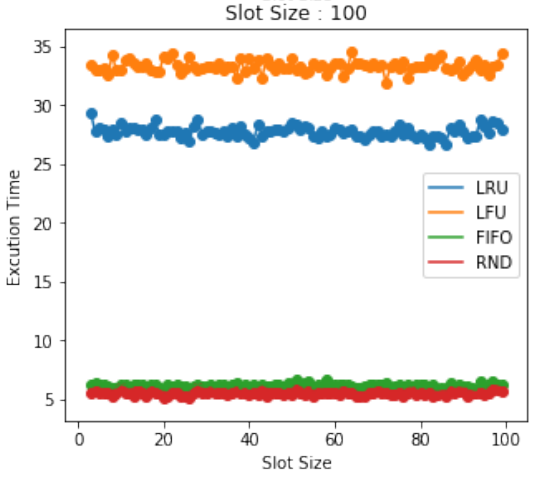

Slot Size : 50
HIT Ratio
Slot Size
LRU
LFU
FIFO
RND


Slot Size : 50
Excution Time
Slot Size
LRU
LFU
FIFO
RND


Slot Size : 75
HIT Ratio
Slot Size
LRU
LFU
FIFO
RND

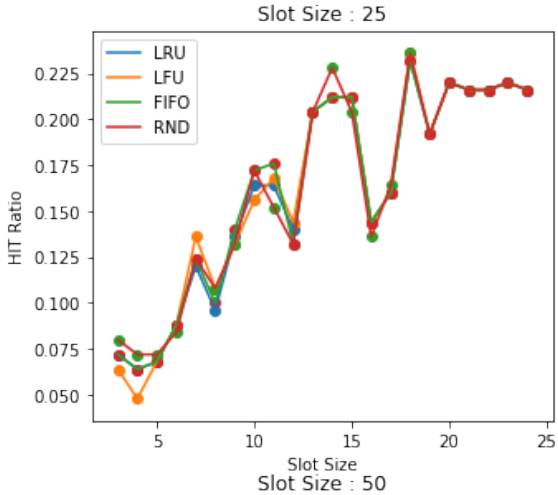

Slot Size : 75
Excution Time
Slot Size
LRU
LFU
FIFO
RND

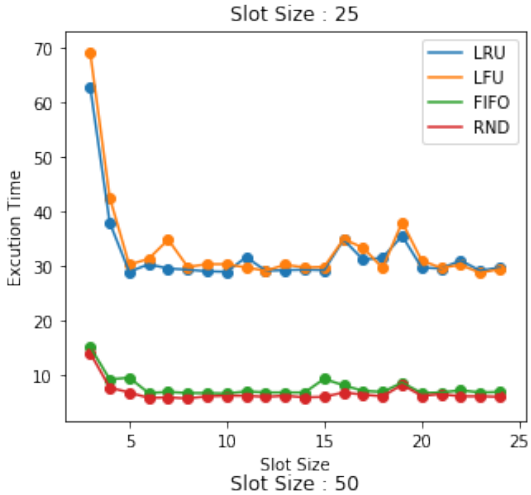

Slot Size : 100
HIT Ratio
Slot Size
LRU
LFU
FIFO
RND

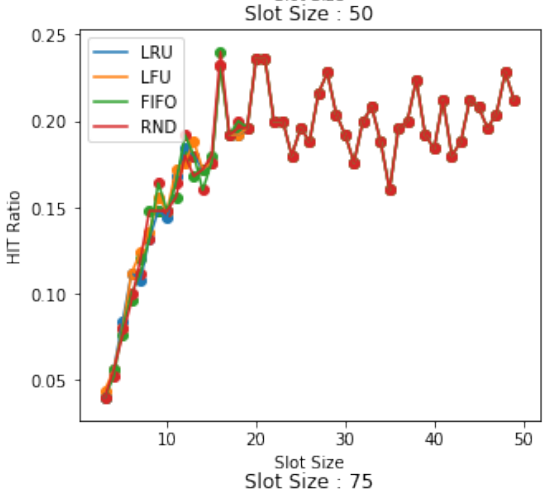

Slot Size : 100
Excution Time
Slot Size
LRU
LFU
FIFO
RND

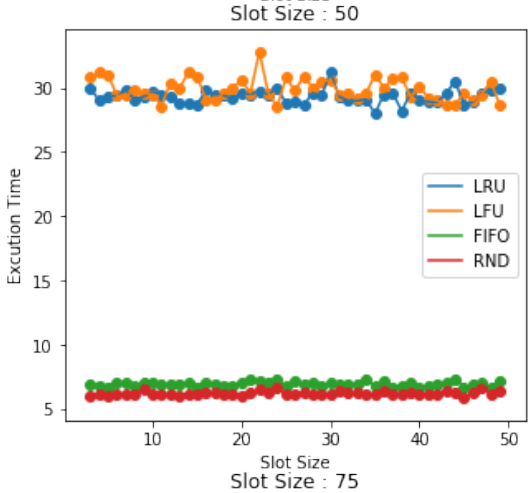
2.1.2 50 25,50,75,100

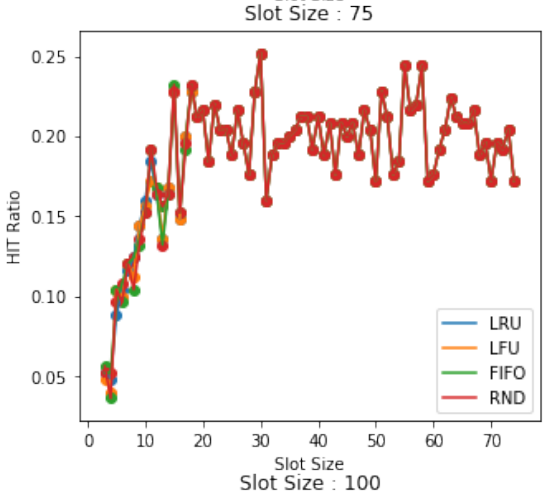
[17]:
```
visualize(input_size = 25, input_max_size = 50)
```

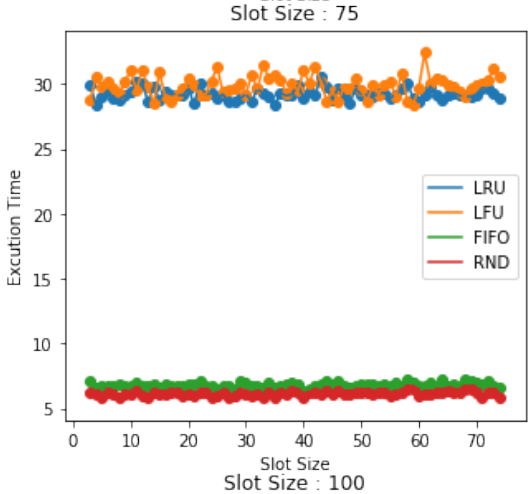

Slot Size : 25
LRU
LFU
FIFO
RND
HIT Ratio
Slot Size

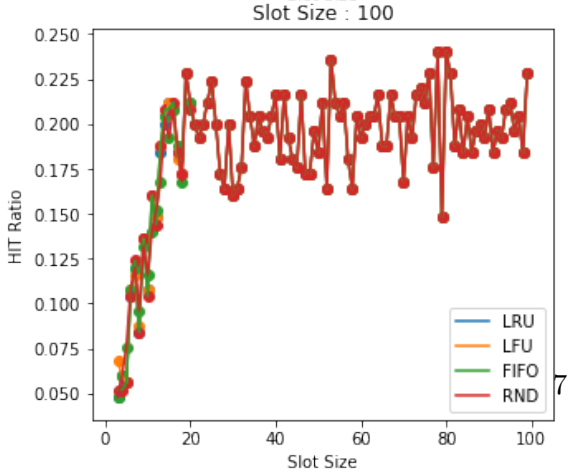

Slot Size : 25
LRU
LFU
FIFO
RND
Excution Time
Slot Size

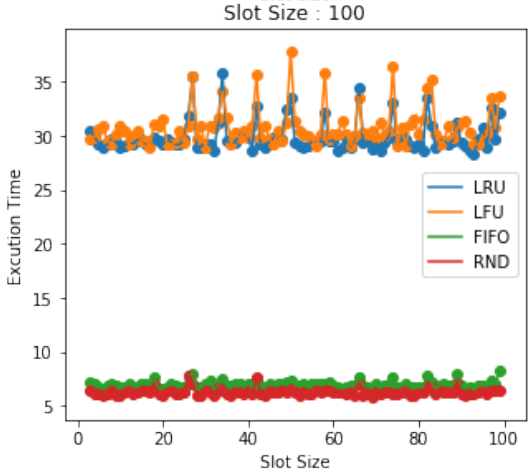

Slot Size : 50
LRU
LFU
FIFO
RND
HIT Ratio
Slot Size


Slot Size : 50
LRU
LFU
FIFO
RND
Excution Time
Slot Size


Slot Size : 75
LRU
LFU
FIFO
RND
HIT Ratio
Slot Size

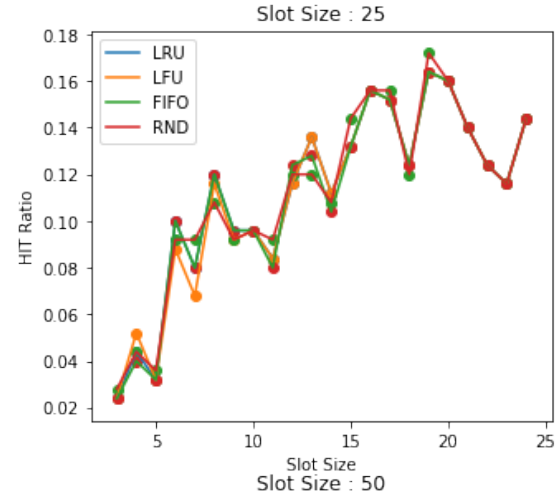

Slot Size : 75
LRU
LFU
FIFO
RND
Excution Time
Slot Size

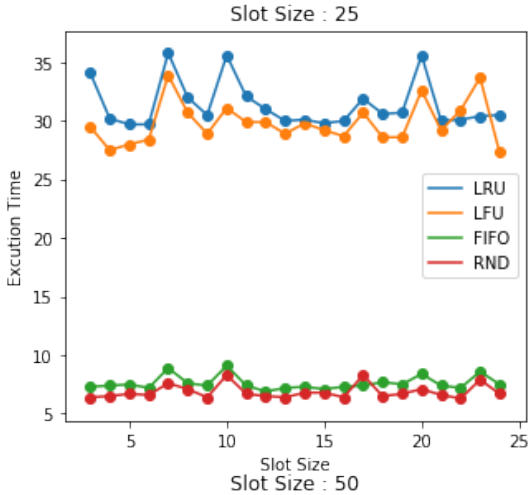

Slot Size : 100
LRU
LFU
FIFO
RND
HIT Ratio
Slot Size

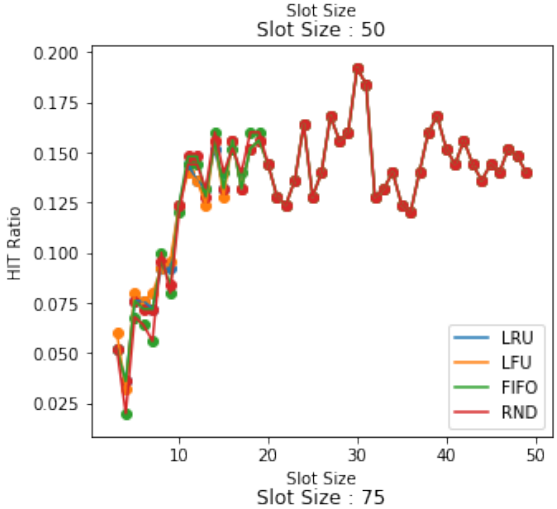

Slot Size : 100
LRU
LFU
FIFO
RND
Excution Time
Slot Size

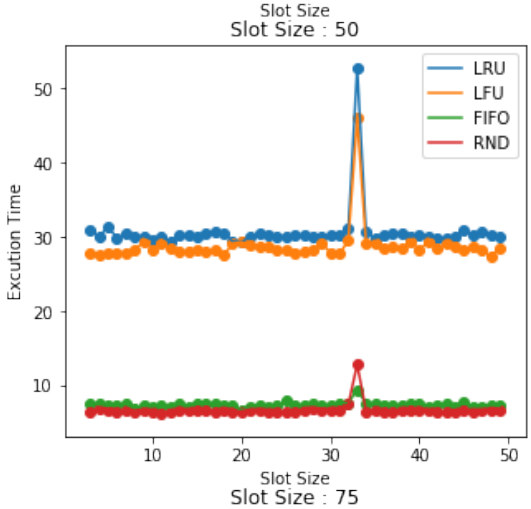
2.1.3 75 25,50,75,100

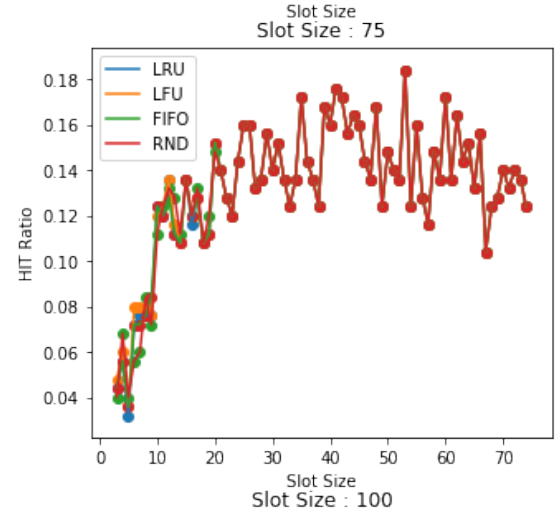
[21]:
```
visualize(input_size = 25, input_max_size = 75)
```

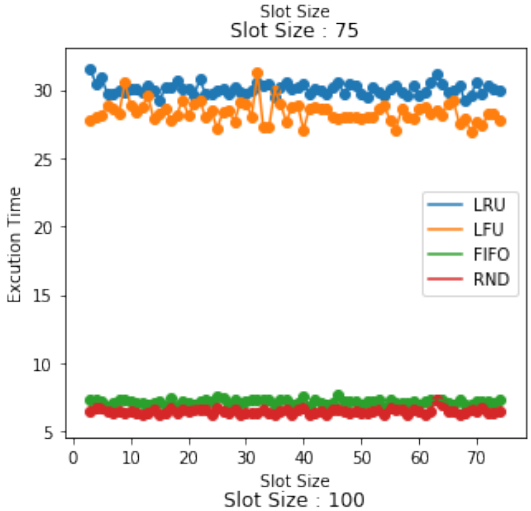

Slot Size : 25
HIT Ratio
Slot Size
LRU
LFU
FIFO
RND

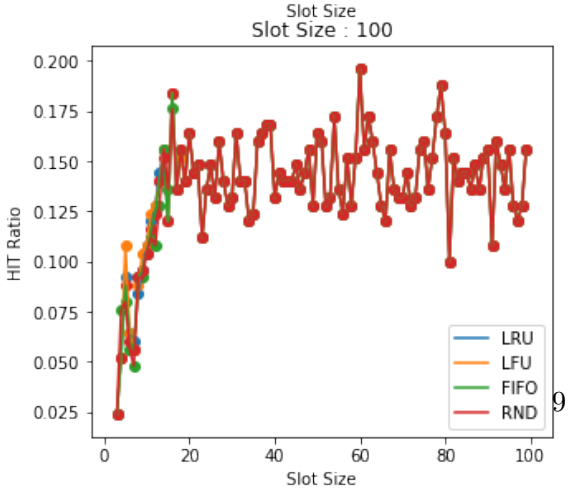

Slot Size : 25
Excution Time
Slot Size
LRU
LFU
FIFO
RND

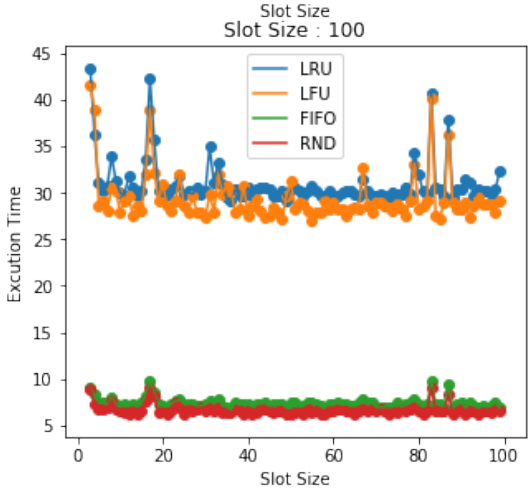

Slot Size : 50
HIT Ratio
Slot Size
LRU
LFU
FIFO
RND


Slot Size : 50
Excution Time
Slot Size
LRU
LFU
FIFO
RND


Slot Size : 75
HIT Ratio
Slot Size
LRU
LFU
FIFO
RND

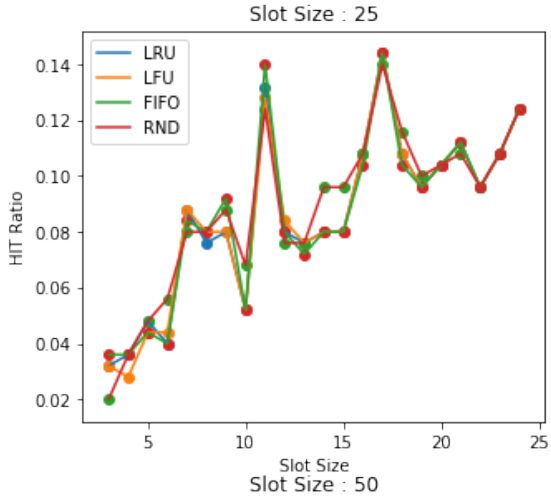

Slot Size : 75
Excution Time
Slot Size
LRU
LFU
FIFO
RND

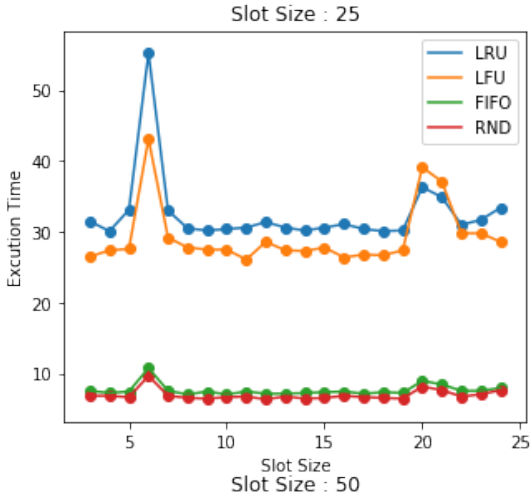

Slot Size : 100
HIT Ratio
Slot Size
LRU
LFU
FIFO
RND

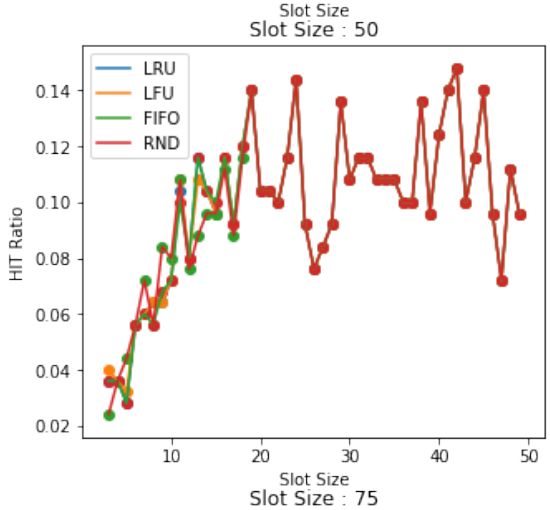

Slot Size : 100
Excution Time
Slot Size
LRU
LFU
FIFO
RND

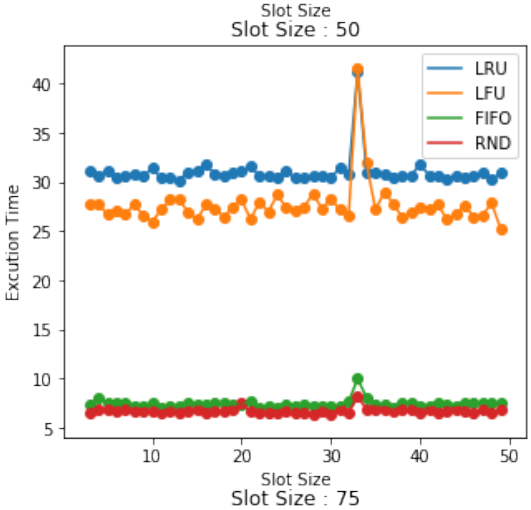
2.1.4 100 25,50,75,100

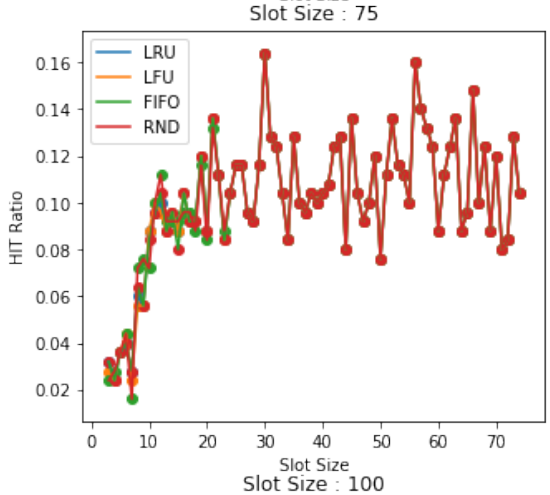
[22]:
```
visualize(input_size = 25, input_max_size = 100)
```

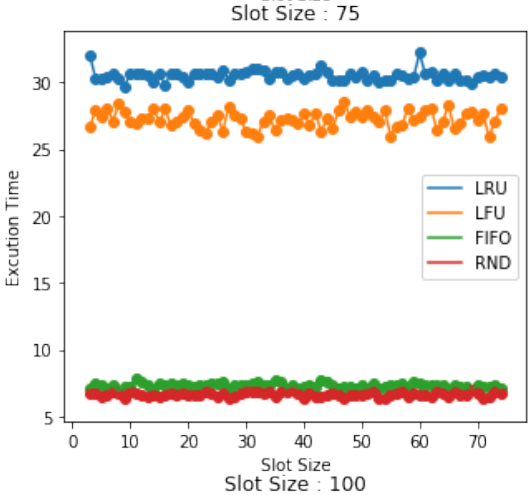

Slot Size : 25
HIT Ratio
Slot Size
LRU
LFU
FIFO
RND

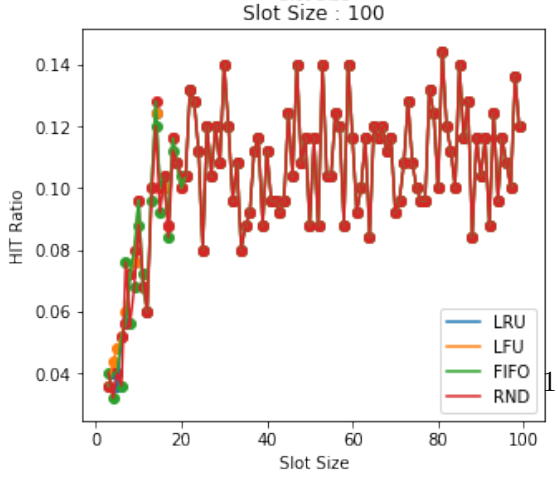

Slot Size : 25
Excution Time
Slot Size
LRU
LFU
FIFO
RND

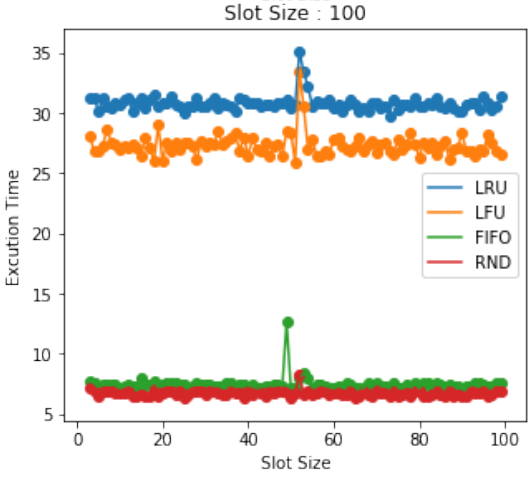

Slot Size : 50
HIT Ratio
Slot Size
LRU
LFU
FIFO
RND


Slot Size : 50
Excution Time
Slot Size
LRU
LFU
FIFO
RND


Slot Size : 75
HIT Ratio
Slot Size
LRU
LFU
FIFO
RND


Slot Size : 75
Excution Time
Slot Size
LRU
LFU
FIFO
RND

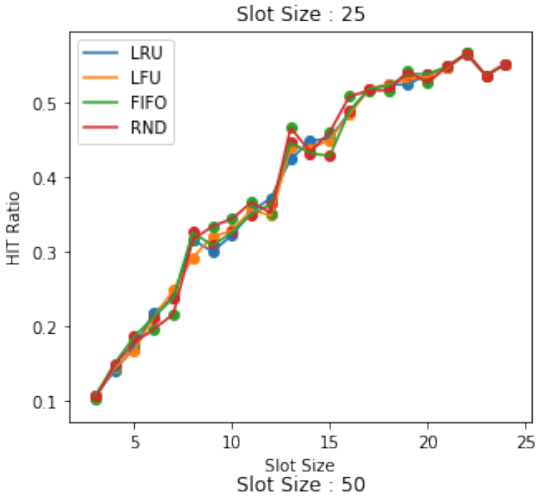

Slot Size : 100
HIT Ratio
Slot Size
LRU
LFU
FIFO
RND

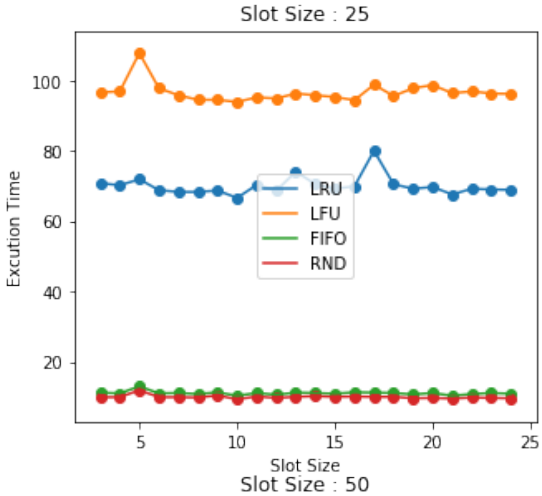

Slot Size : 100
Excution Time
Slot Size
LRU
LFU
FIFO
RND

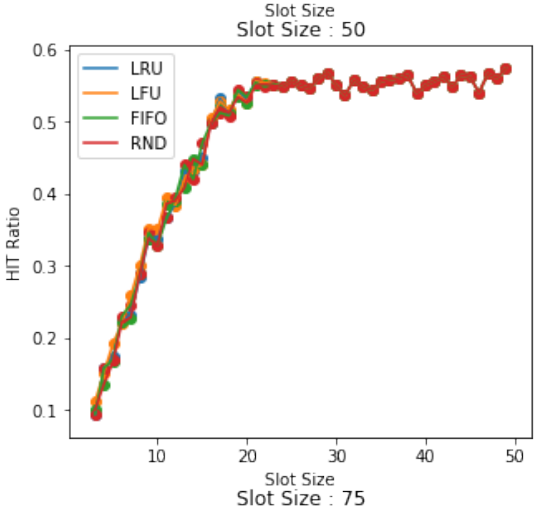
1.2.2 2.2 50

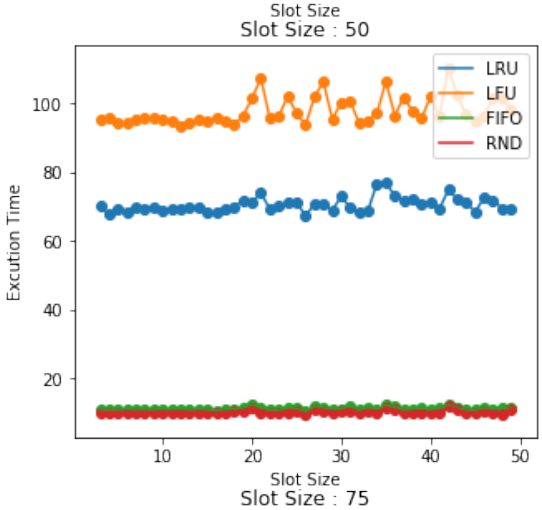
2.2.1 25 25,50,75,100

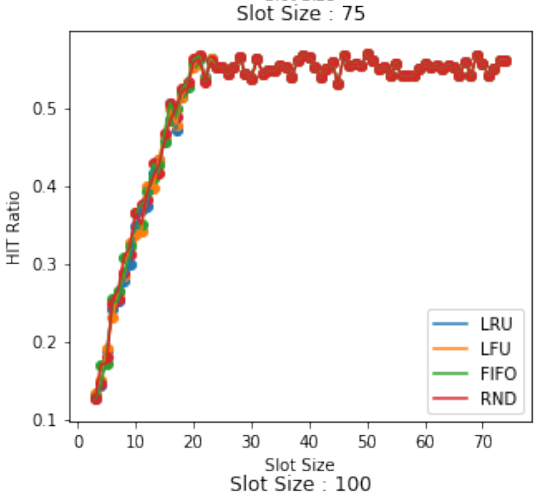
[23]:
```
visualize(input_size = 50, input_max_size = 25)
```

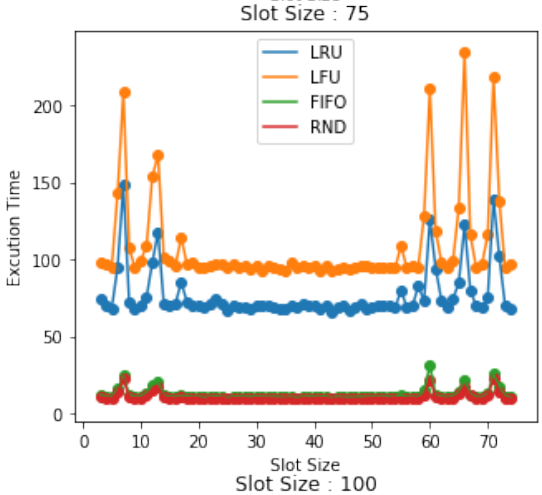

Slot Size : 25
LRU
LFU
FIFO
RND
HIT Ratio
Slot Size

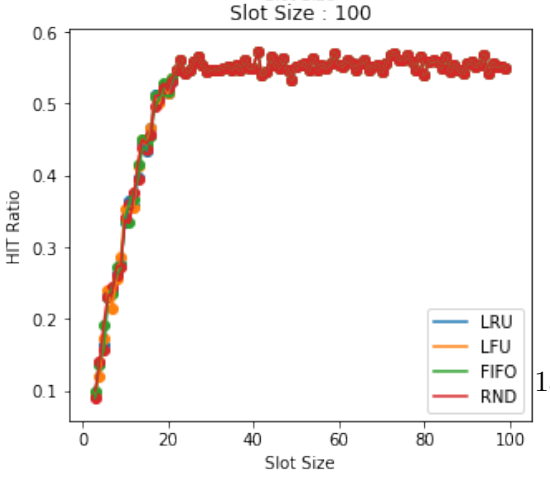

Slot Size : 25
LRU
LFU
FIFO
RND
Excution Time
Slot Size

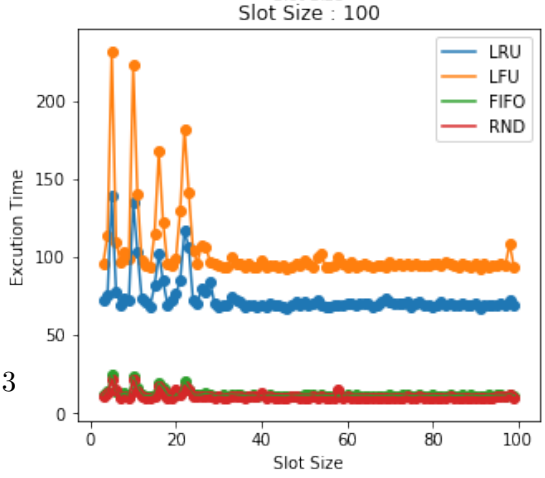

Slot Size : 50
LRU
LFU
FIFO
RND
HIT Ratio
Slot Size


Slot Size : 50
LRU
LFU
FIFO
RND
Excution Time
Slot Size


Slot Size : 75
LRU
LFU
FIFO
RND
HIT Ratio
Slot Size

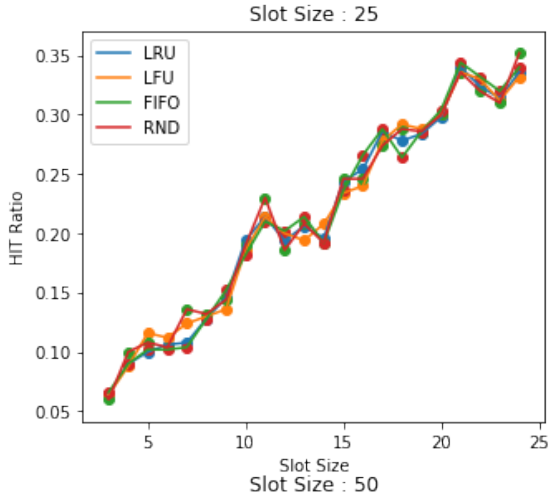

Slot Size : 75
LRU
LFU
FIFO
RND
Excution Time
Slot Size

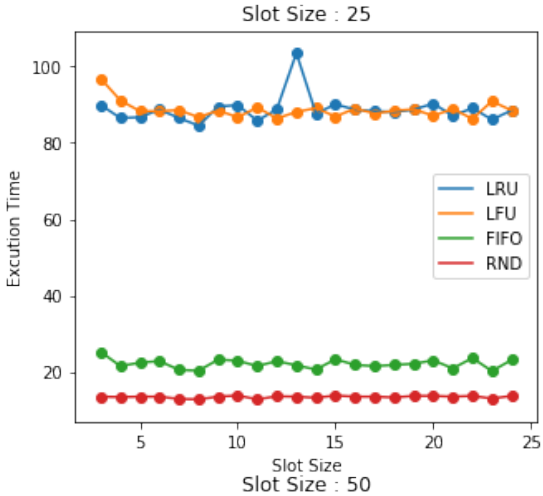

Slot Size : 100
LRU
LFU
FIFO
RND
HIT Ratio
Slot Size

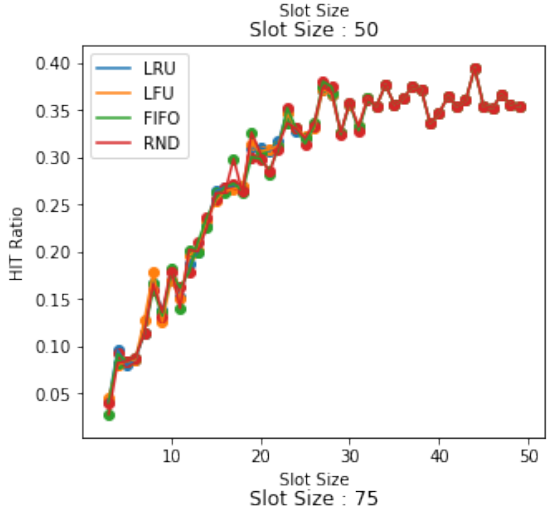

Slot Size : 100
LRU
LFU
FIFO
RND
Excution Time
Slot Size

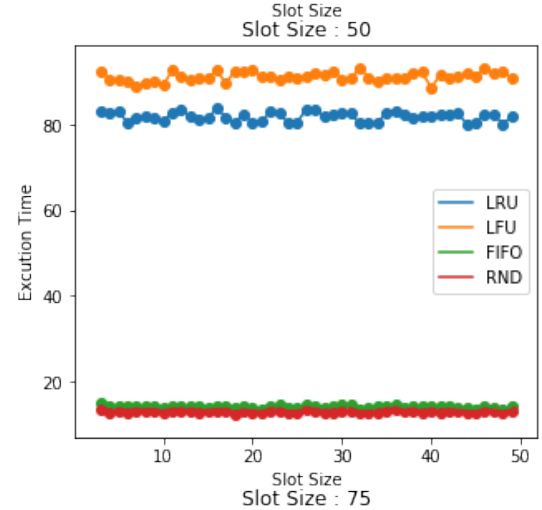
2.2.2 50 25,50,75,100

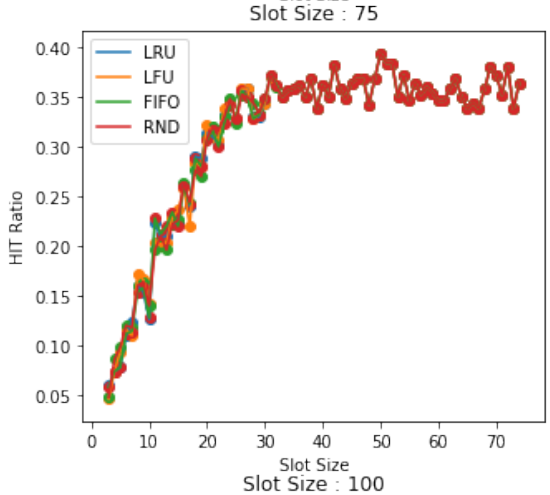
[25]:
```
visualize(input_size = 50, input_max_size = 50)
```

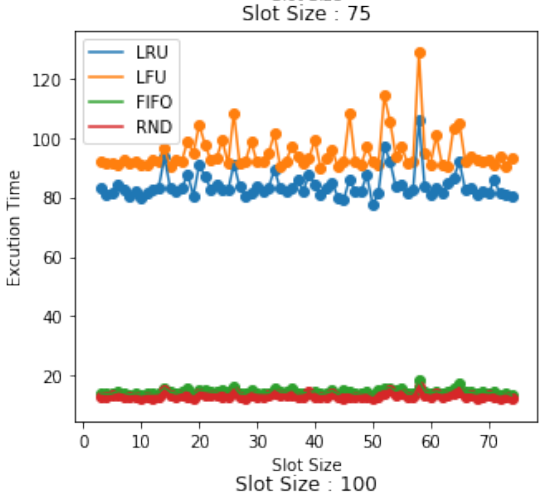

Slot Size : 25
HIT Ratio
Slot Size
LRU
LFU
FIFO
RND

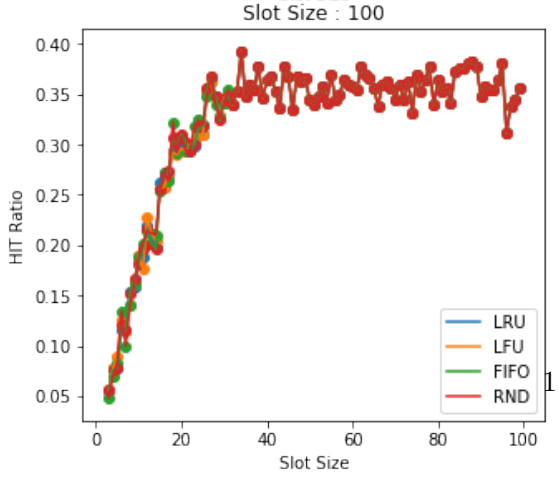

Slot Size : 25
Excution Time
Slot Size
LRU
LFU
FIFO
RND

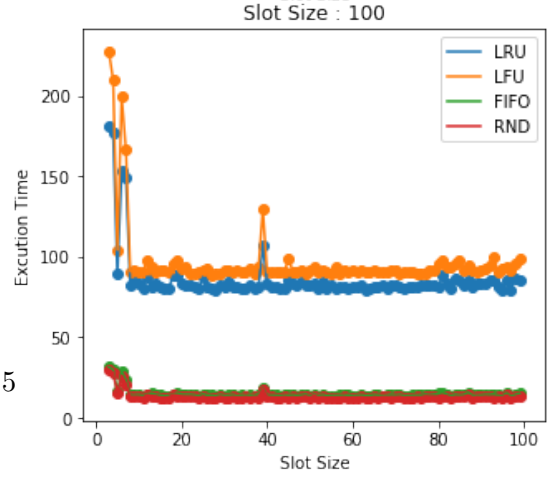

Slot Size : 50
HIT Ratio
Slot Size
LRU
LFU
FIFO
RND


Slot Size : 50
Excution Time
Slot Size
LRU
LFU
FIFO
RND


Slot Size : 75
HIT Ratio
Slot Size
LRU
LFU
FIFO
RND

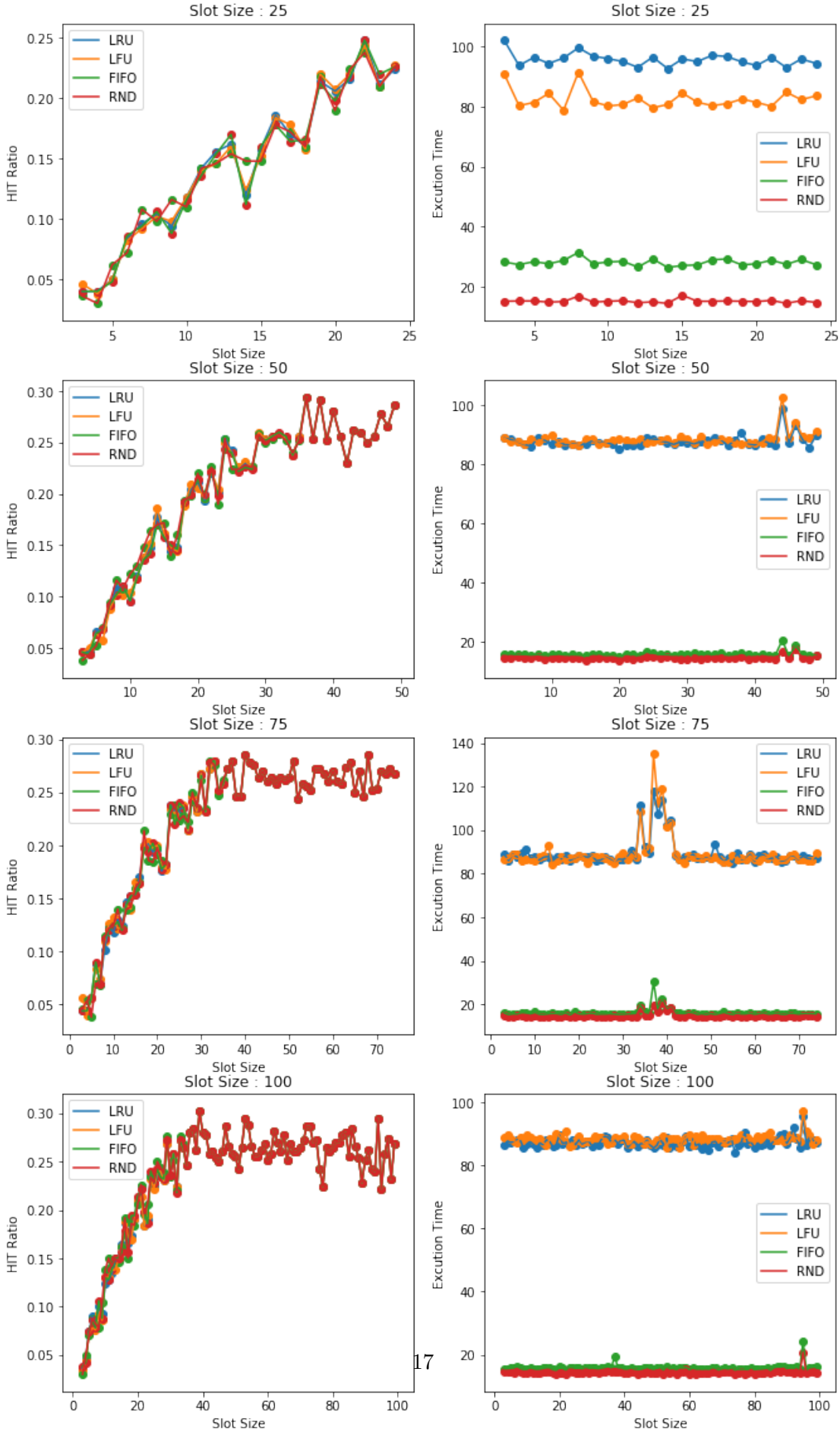

Slot Size : 75
Excution Time
Slot Size
LRU
LFU
FIFO
RND


Slot Size : 100
HIT Ratio
Slot Size
LRU
LFU
FIFO
RND


Slot Size : 100
Excution Time
Slot Size
LRU
LFU
FIFO
RND

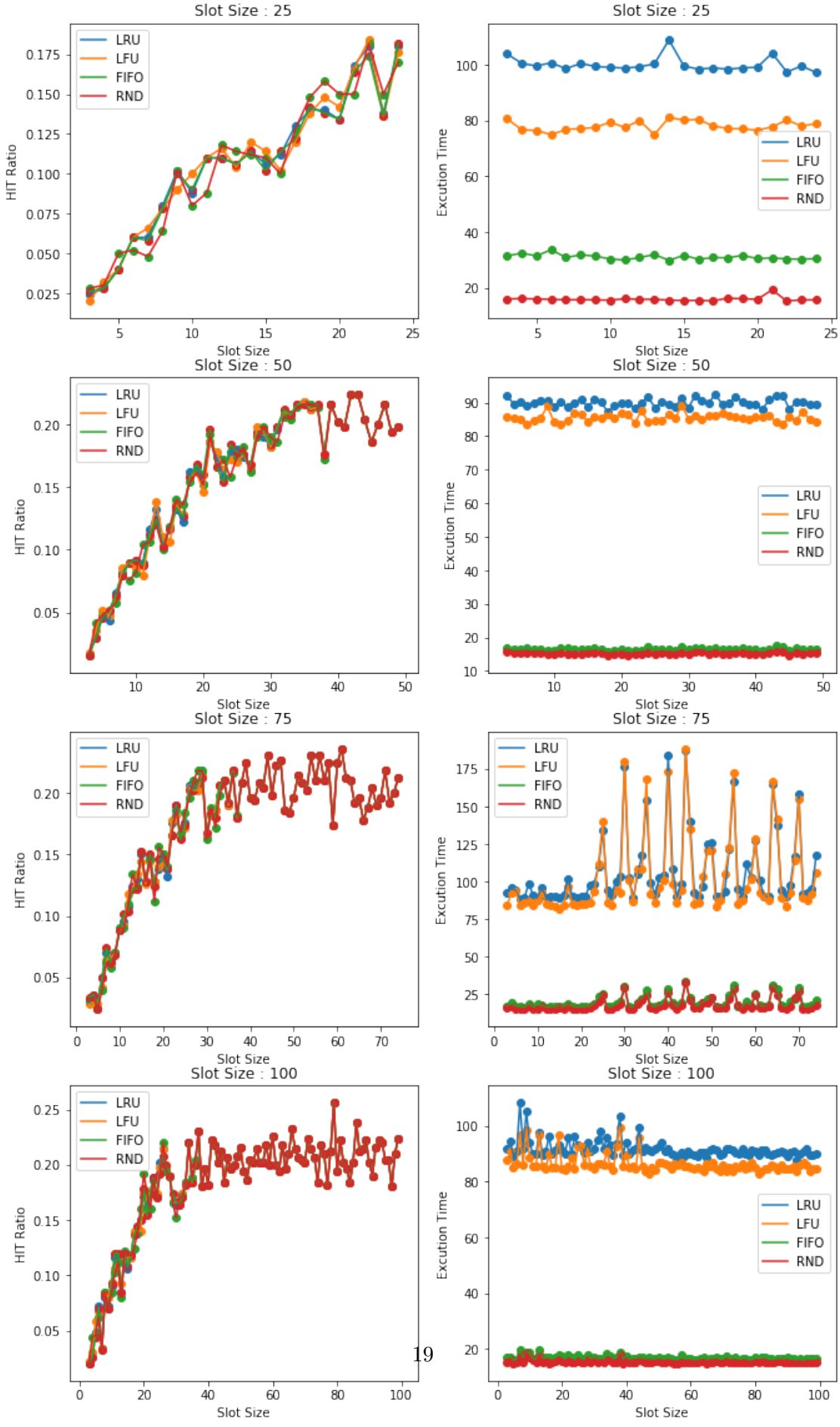
2.2.3 75 25,50,75,100

[26]:
```
visualize(input_size = 50, input_max_size = 75)
```


Slot Size : 25
HIT Ratio
Slot Size
LRU
LFU
FIFO
RND
Slot Size : 25
Excution Time
Slot Size
LRU
LFU
FIFO
RND
Slot Size : 50
HIT Ratio
Slot Size
LRU
LFU
FIFO
RND
Slot Size : 50
Excution Time
Slot Size
LRU
LFU
FIFO
RND
Slot Size : 75
HIT Ratio
Slot Size
LRU
LFU
FIFO
RND
Slot Size : 75
Excution Time
Slot Size
LRU
LFU
FIFO
RND
Slot Size : 100
HIT Ratio
Slot Size
LRU
LFU
FIFO
RND
Slot Size : 100
Excution Time
Slot Size
LRU
LFU
FIFO
RND

2.2.4 100 25,50,75,100

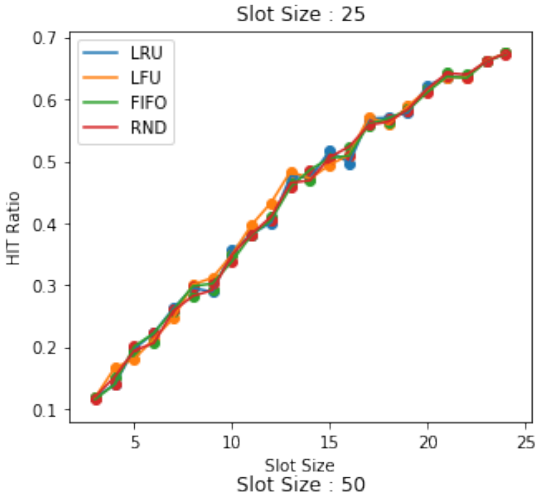
[27]:
```
visualize(input_size = 50, input_max_size = 100)
```

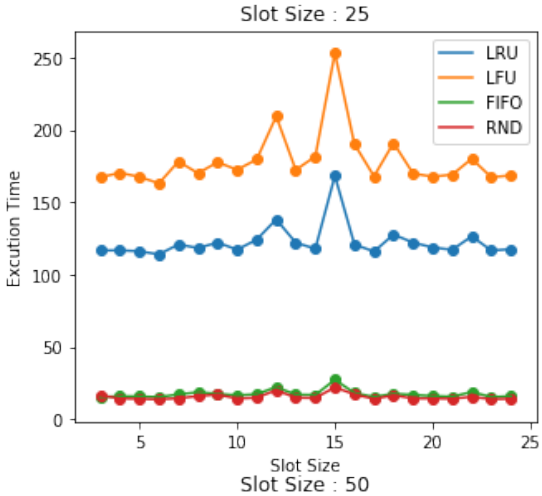

Slot Size : 25
HIT Ratio
Slot Size
LRU
LFU
FIFO
RND
Slot Size : 25
Excution Time
Slot Size
LRU
LFU
FIFO
RND
Slot Size : 50
HIT Ratio
Slot Size
LRU
LFU
FIFO
RND
Slot Size : 50
Excution Time
Slot Size
LRU
LFU
FIFO
RND
Slot Size : 75
HIT Ratio
Slot Size
LRU
LFU
FIFO
RND
Slot Size : 75
Excution Time
Slot Size
LRU
LFU
FIFO
RND
Slot Size : 100
HIT Ratio
Slot Size
LRU
LFU
FIFO
RND
Slot Size : 100
Excution Time
Slot Size
LRU
LFU
FIFO
RND

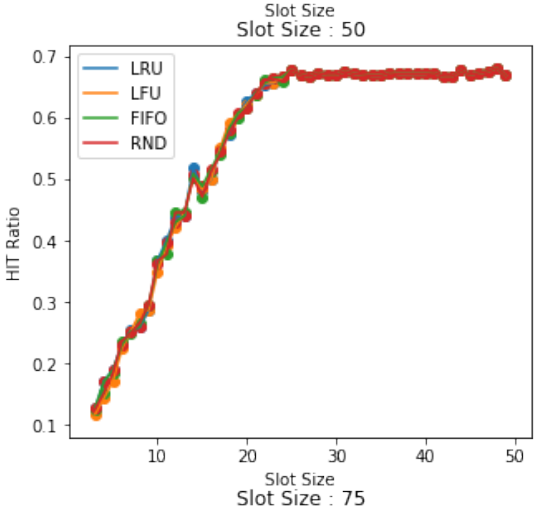
1.2.3 2.3 75

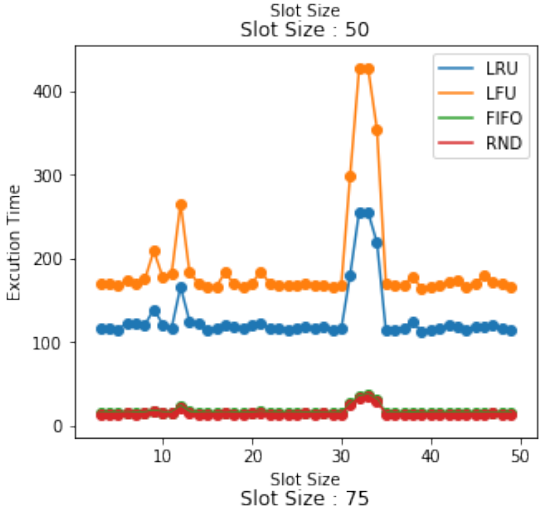
2.3.1 25 25,50,75,100

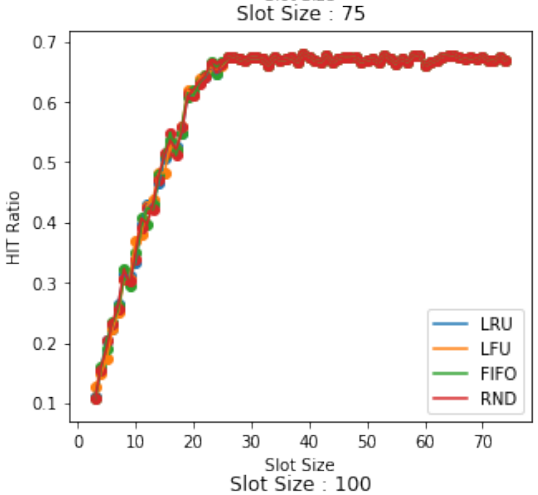
[28]:
```
visualize(input_size = 75, input_max_size = 25)
```

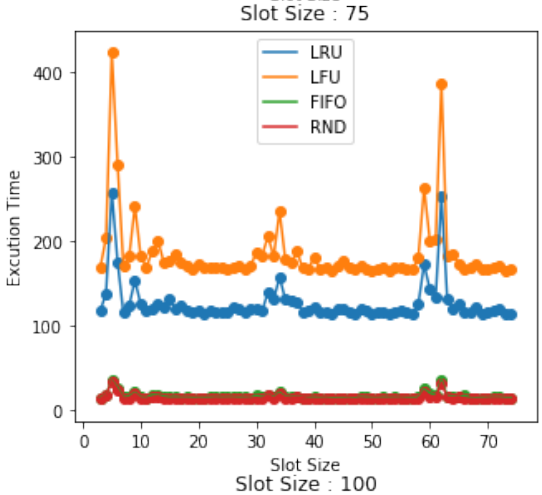

Slot Size : 25
HIT Ratio
Slot Size
LRU
LFU
FIFO
RND

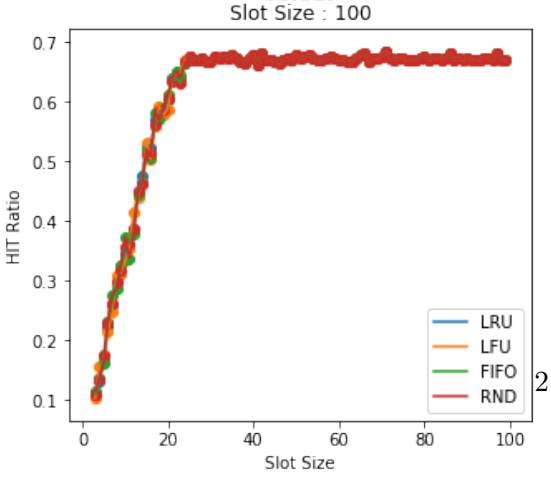

Slot Size : 25
Excution Time
Slot Size
LRU
LFU
FIFO
RND

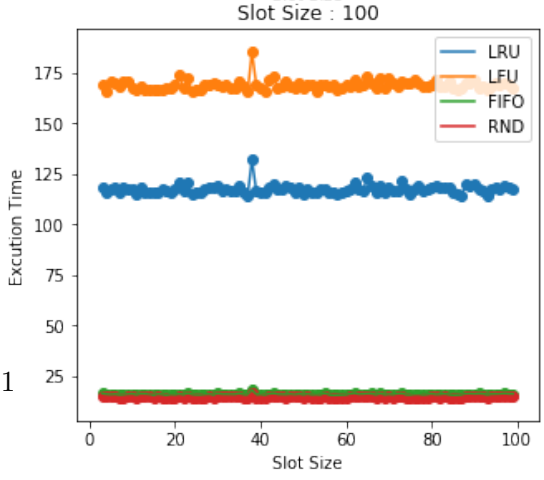

Slot Size : 50
HIT Ratio
Slot Size
LRU
LFU
FIFO
RND


Slot Size : 50
Excution Time
Slot Size
LRU
LFU
FIFO
RND


Slot Size : 75
HIT Ratio
Slot Size
LRU
LFU
FIFO
RND

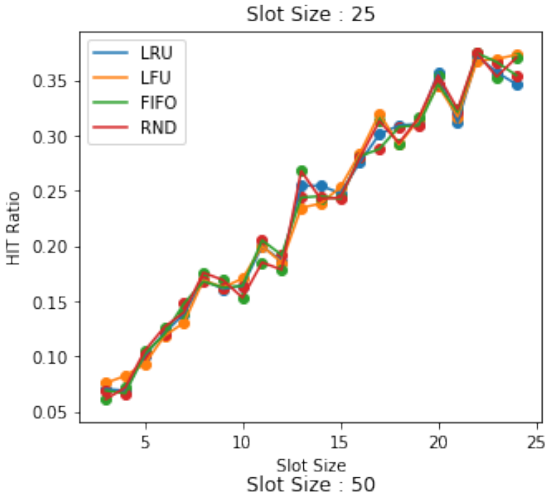

Slot Size : 75
Excution Time
Slot Size
LRU
LFU
FIFO
RND

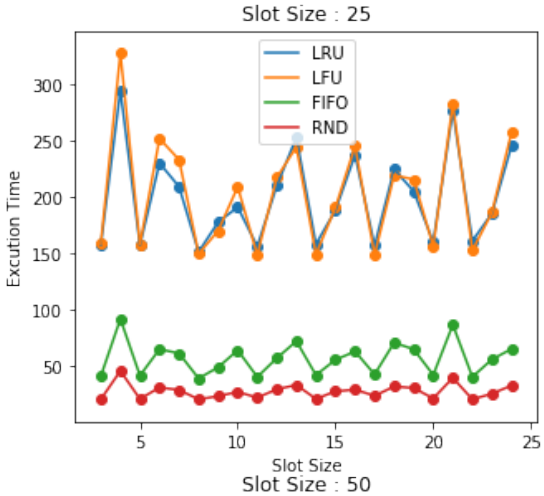

Slot Size : 100
HIT Ratio
Slot Size
LRU
LFU
FIFO
RND

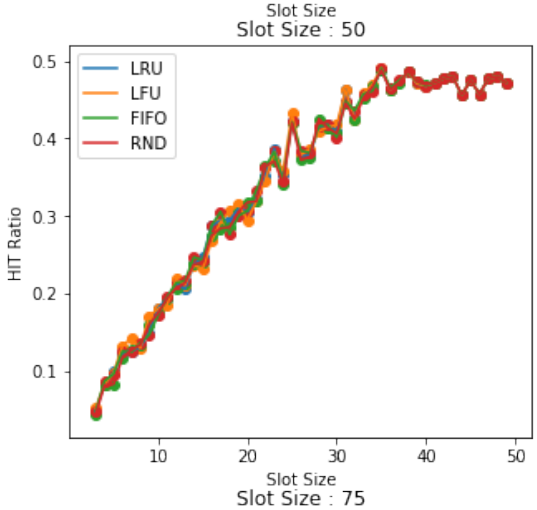

Slot Size : 100
Excution Time
Slot Size
LRU
LFU
FIFO
RND

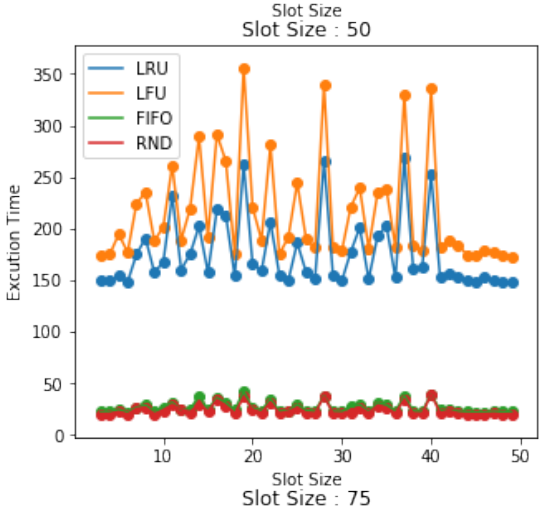
2.3.2 50 25,50,75,100

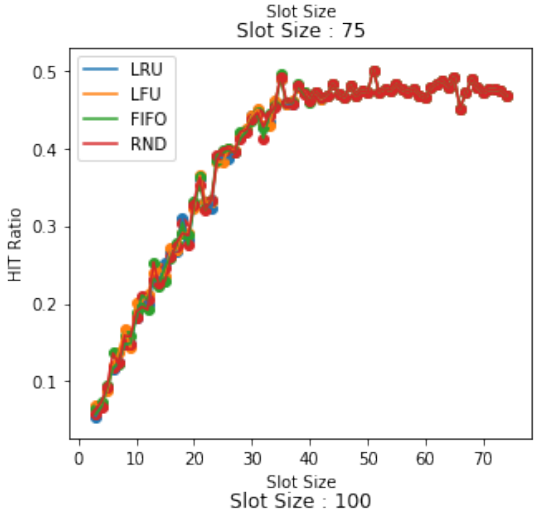
[29]:
```
visualize(input_size = 75, input_max_size = 50)
```

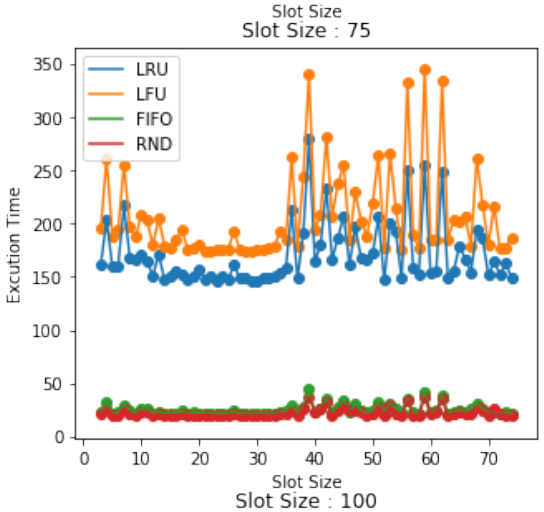

Slot Size : 25
LRU
LFU
FIFO
RND
HIT Ratio
Slot Size

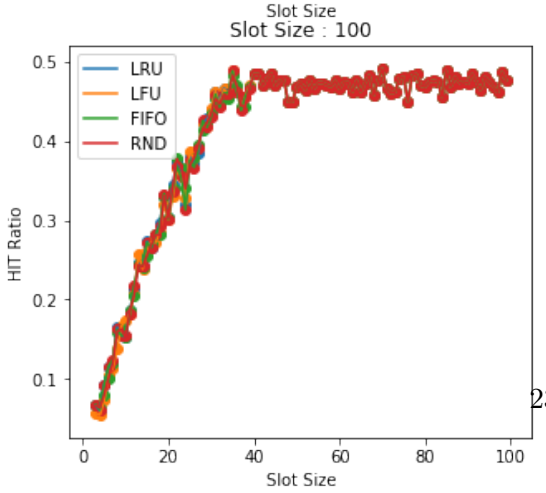

Slot Size : 25
LRU
LFU
FIFO
RND
Excution Time
Slot Size

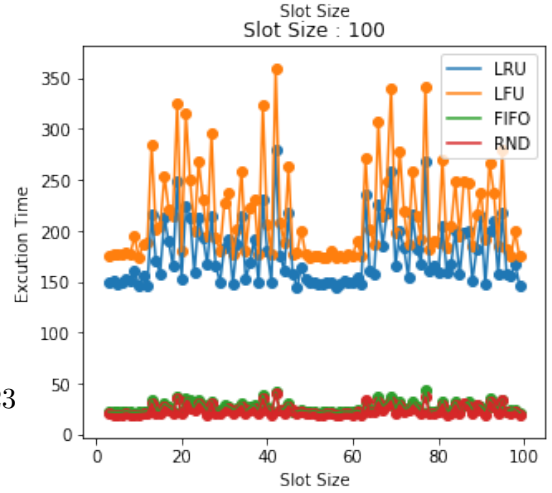

Slot Size : 50
LRU
LFU
FIFO
RND
HIT Ratio
Slot Size


Slot Size : 50
LRU
LFU
FIFO
RND
Excution Time
Slot Size


Slot Size : 75
LRU
LFU
FIFO
RND
HIT Ratio
Slot Size

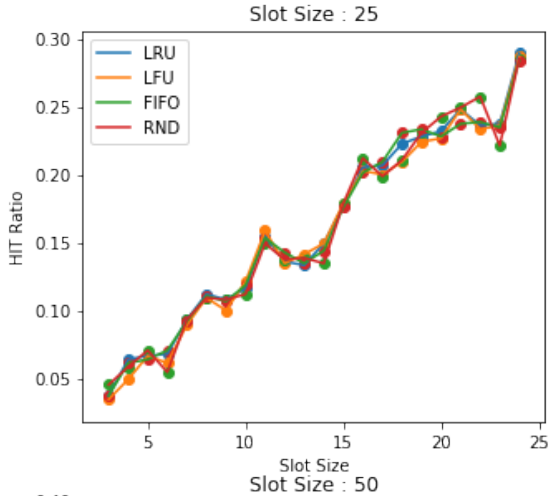

Slot Size : 75
LRU
LFU
FIFO
RND
Excution Time
Slot Size

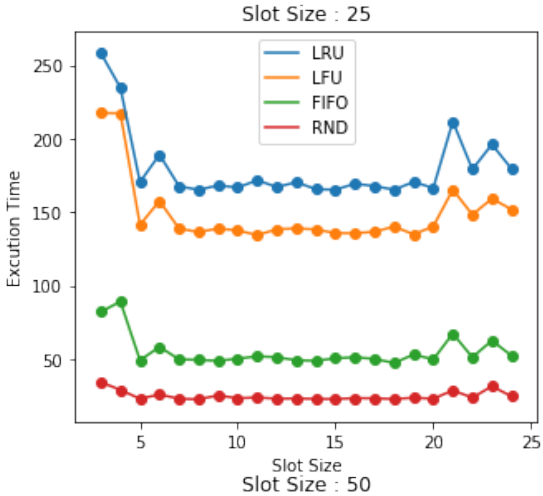

Slot Size : 100
LRU
LFU
FIFO
RND
HIT Ratio
Slot Size

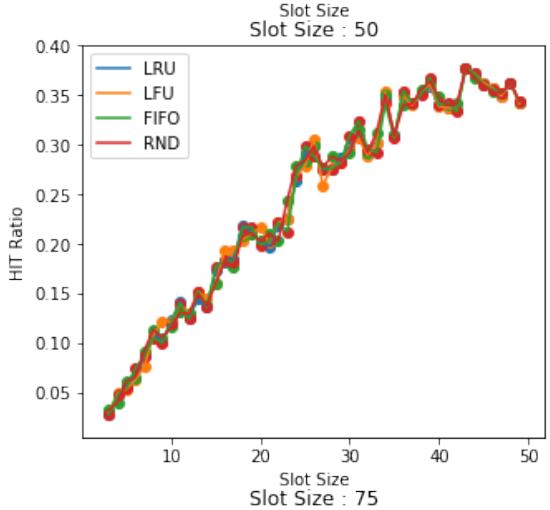

Slot Size : 100
LRU
LFU
FIFO
RND
Excution Time
Slot Size

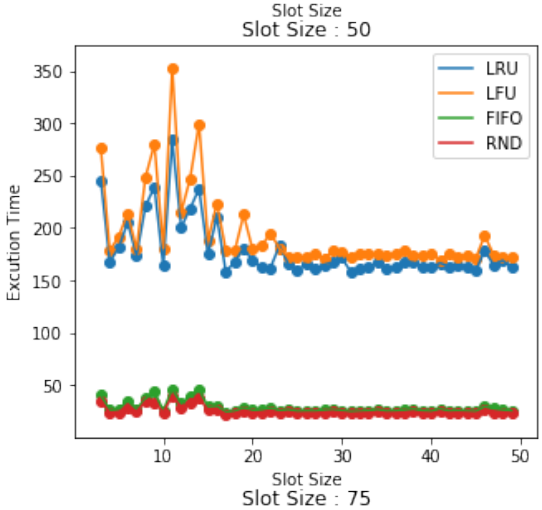
2.3.3 75 25,50,75,100

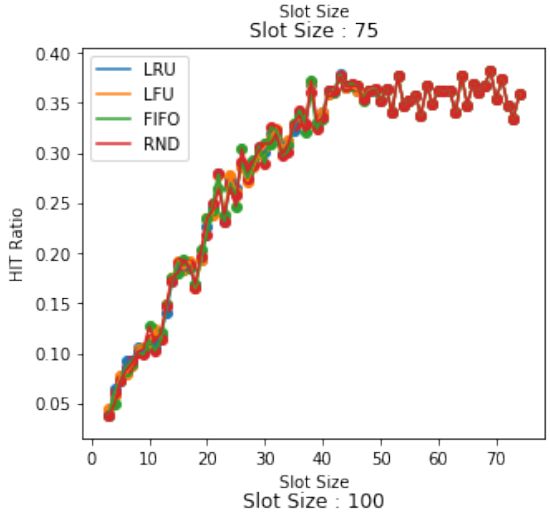
[30]:
```
visualize(input_size = 75, input_max_size = 75)
```

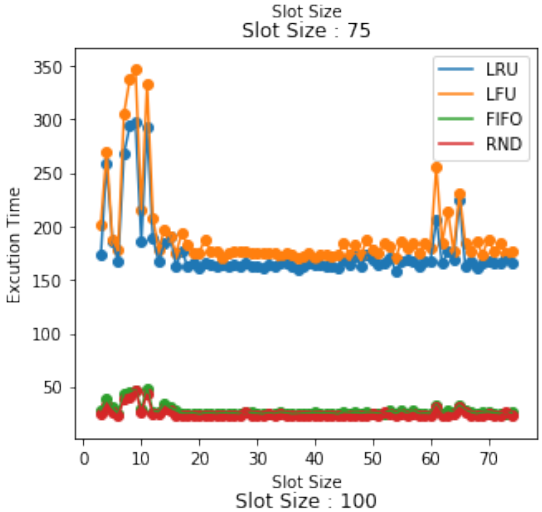

Slot Size : 25
LRU
LFU
FIFO
RND
HIT Ratio
Slot Size

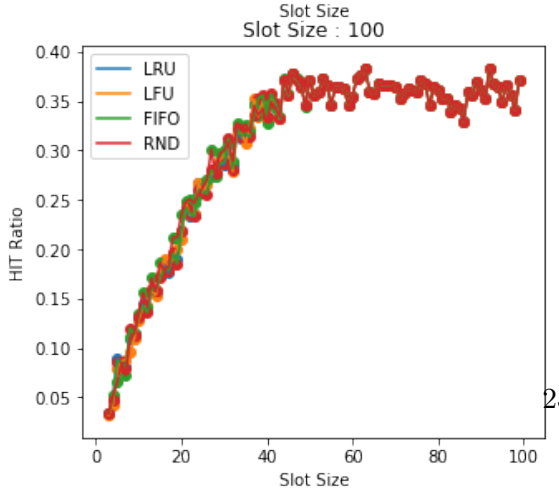

Slot Size : 25
LRU
LFU
FIFO
RND
Excution Time
Slot Size

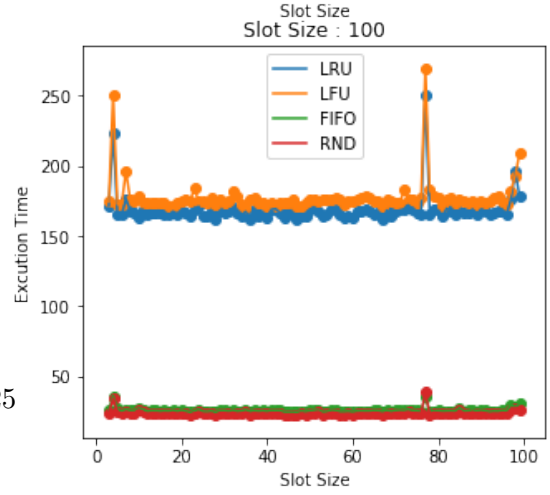

Slot Size : 50
LRU
LFU
FIFO
RND
HIT Ratio
Slot Size


Slot Size : 50
LRU
LFU
FIFO
RND
Excution Time
Slot Size


Slot Size : 75
LRU
LFU
FIFO
RND
HIT Ratio
Slot Size

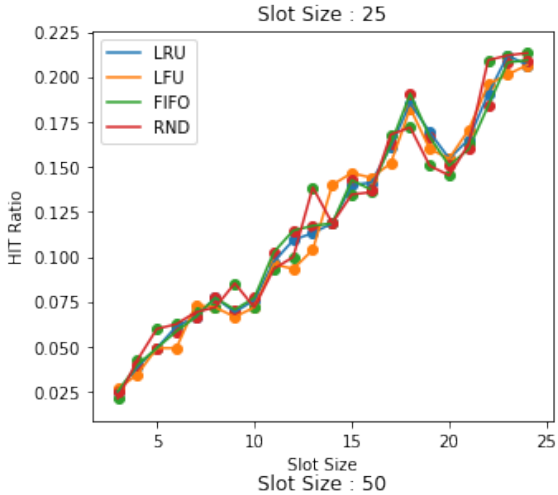

Slot Size : 75
LRU
LFU
FIFO
RND
Excution Time
Slot Size

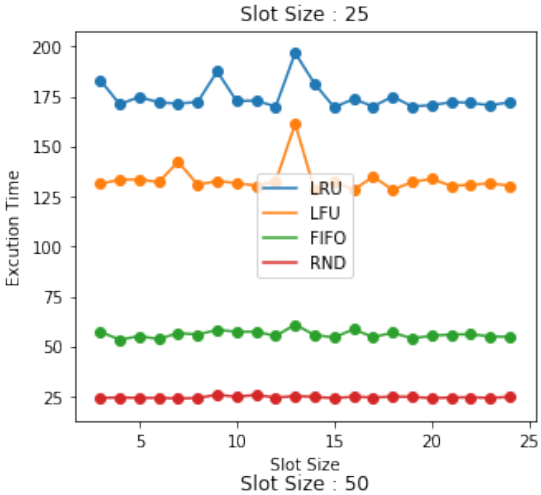

Slot Size : 100
LRU
LFU
FIFO
RND
HIT Ratio
Slot Size

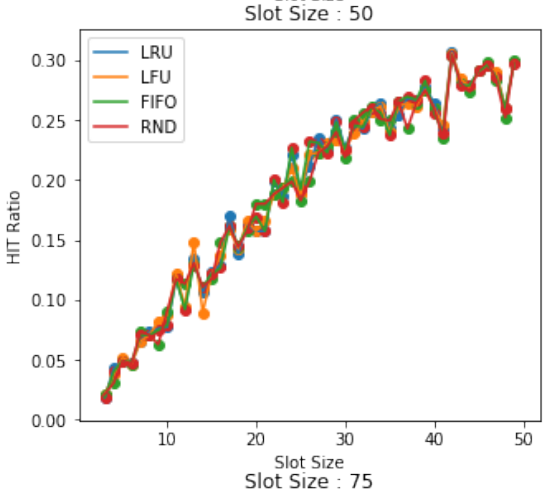

Slot Size : 100
LRU
LFU
FIFO
RND
Excution Time
Slot Size

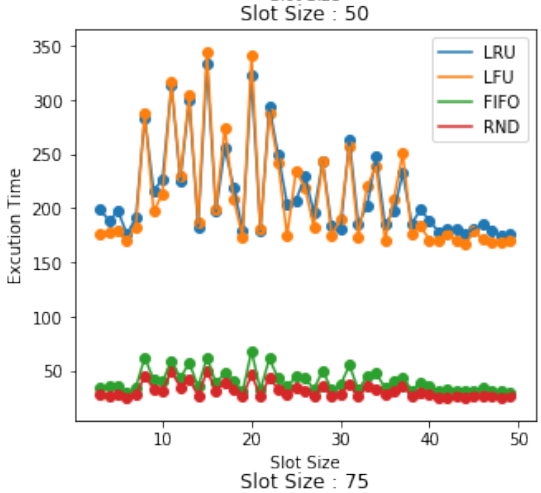
2.3.4 100 25,50,75,100

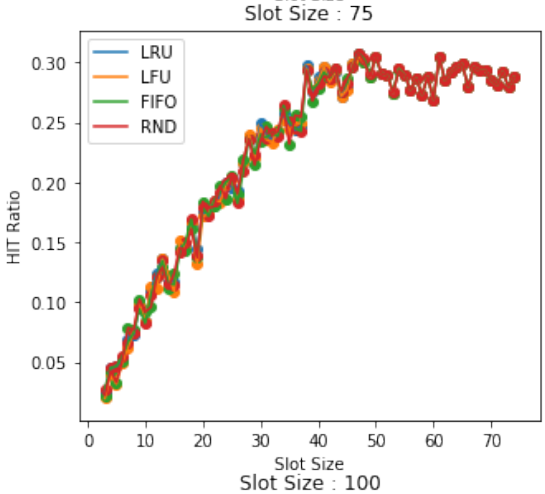
[31]:
```
visualize(input_size = 75, input_max_size = 100)
```

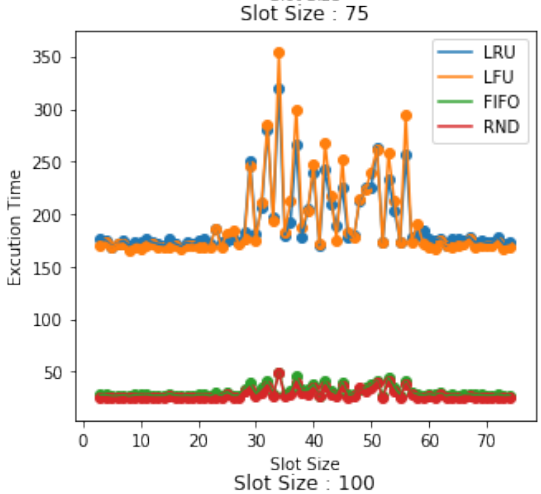

Slot Size : 25
LRU
LFU
FIFO
RND
HIT Ratio
Slot Size

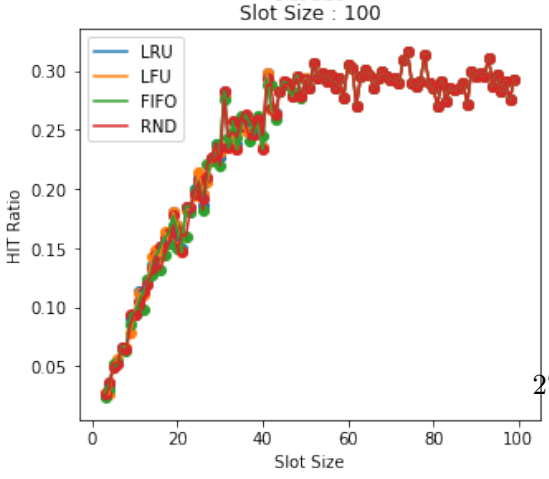

Slot Size : 25
LRU
LFU
FIFO
RND
Excution Time
Slot Size

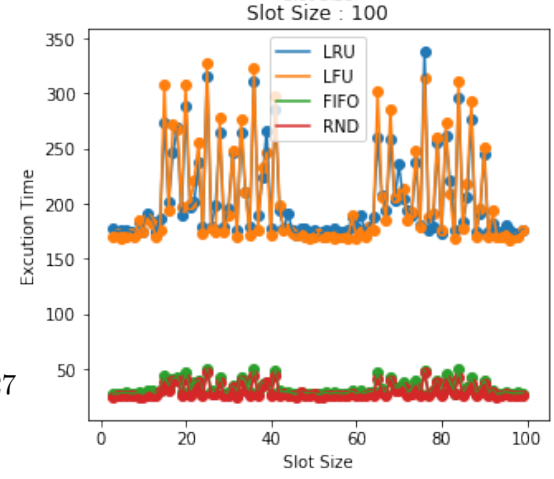

Slot Size : 50
LRU
LFU
FIFO
RND
HIT Ratio
Slot Size


Slot Size : 50
LRU
LFU
FIFO
RND
Excution Time
Slot Size


Slot Size : 75
LRU
LFU
FIFO
RND
HIT Ratio
Slot Size


Slot Size : 75
LRU
LFU
FIFO
RND
Excution Time
Slot Size

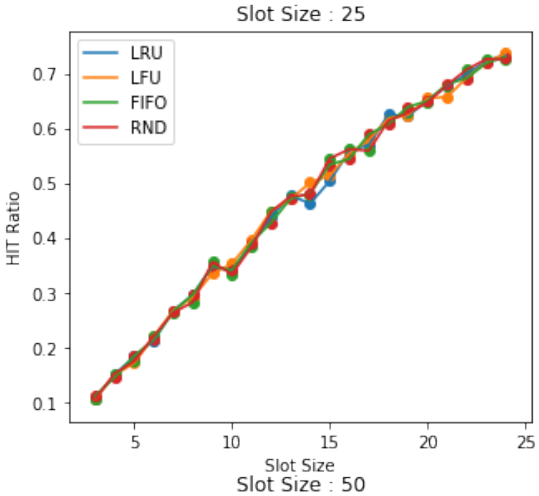

Slot Size : 100
LRU
LFU
FIFO
RND
HIT Ratio
Slot Size

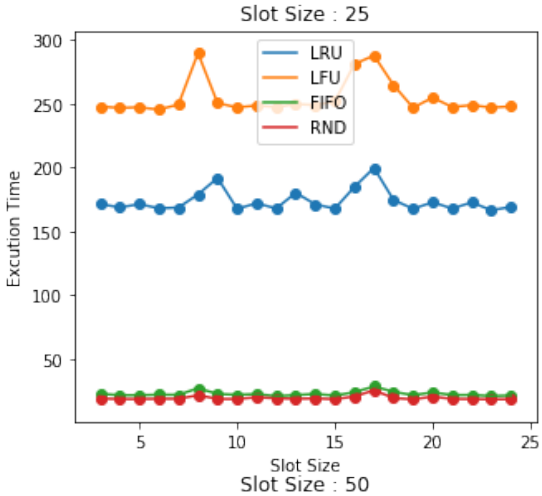

Slot Size : 100
LRU
LFU
FIFO
RND
Excution Time
Slot Size

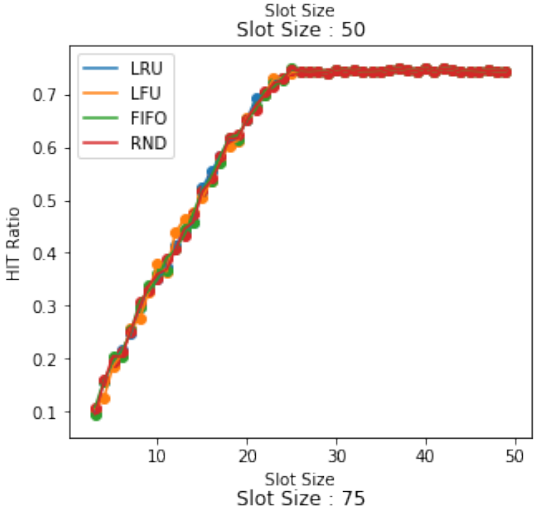
1.2.4 2.4 100

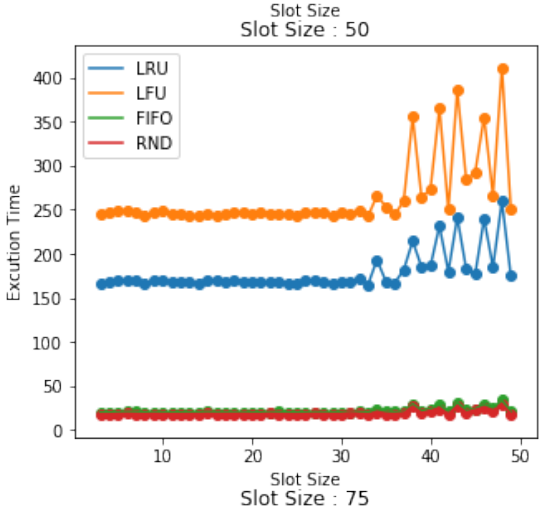
2.4.1 25 25,50,75,100

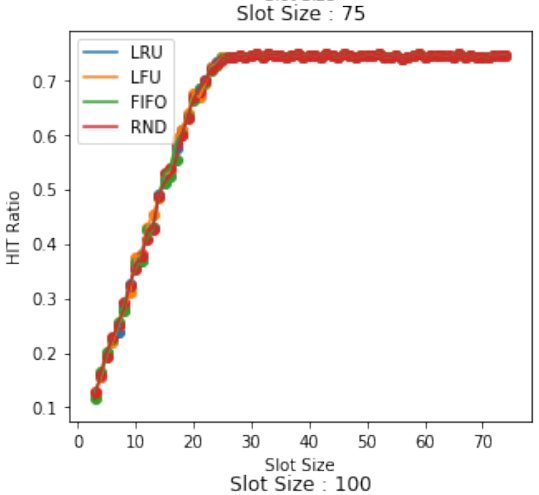
[32]:
```
visualize(input_size = 100, input_max_size = 25)
```

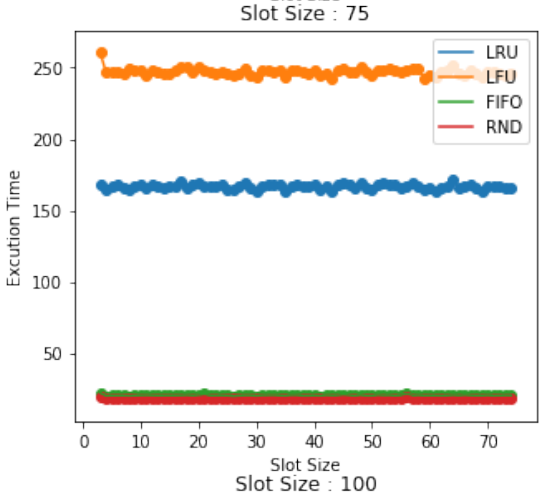

Slot Size : 25
LRU
LFU
FIFO
RND
HIT Ratio
Slot Size

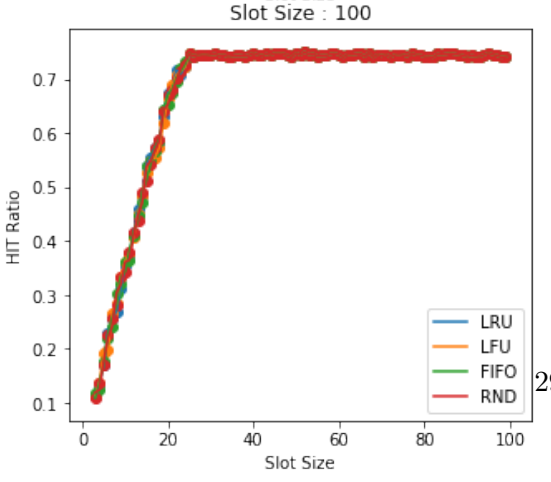

Slot Size : 25
LRU
LFU
FIFO
RND
Excution Time
Slot Size

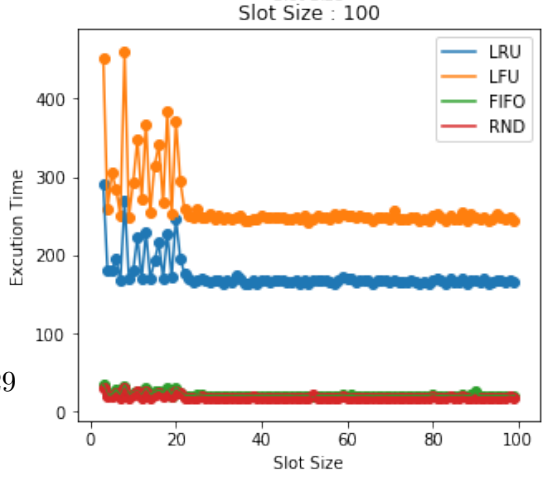

Slot Size : 50
LRU
LFU
FIFO
RND
HIT Ratio
Slot Size


Slot Size : 50
LRU
LFU
FIFO
RND
Excution Time
Slot Size


Slot Size : 75
LRU
LFU
FIFO
RND
HIT Ratio
Slot Size

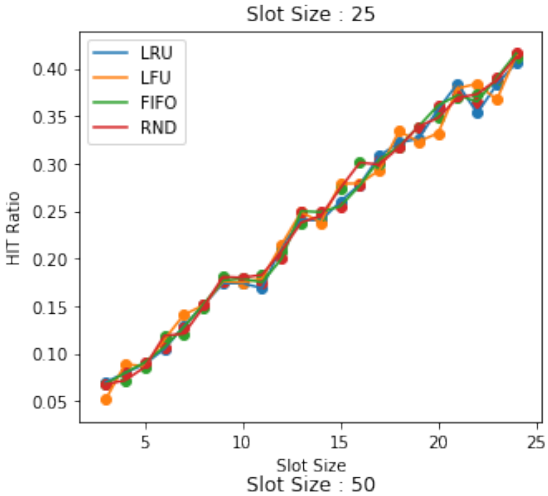

Slot Size : 75
LRU
LFU
FIFO
RND
Excution Time
Slot Size

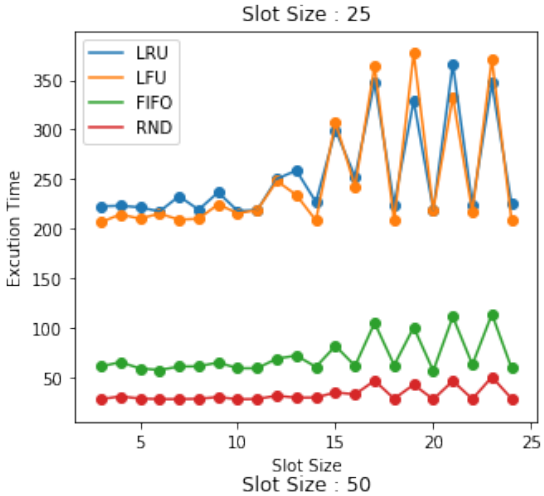

Slot Size : 100
LRU
LFU
FIFO
RND
HIT Ratio
Slot Size

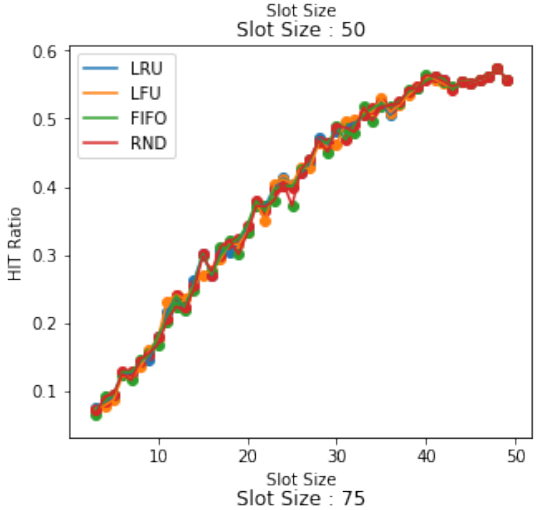

Slot Size : 100
LRU
LFU
FIFO
RND
Excution Time
Slot Size

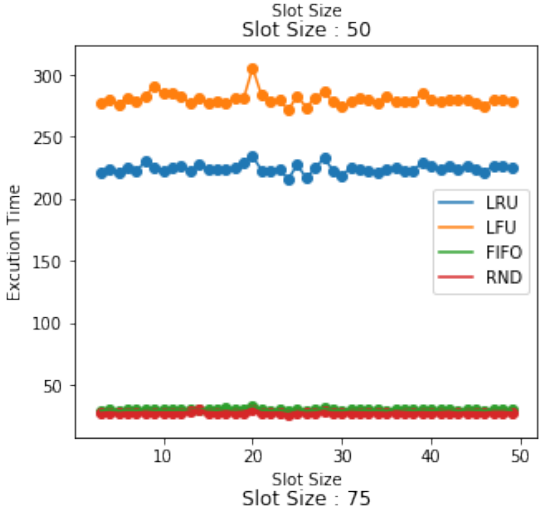
2.4.2 50 25,50,75,100

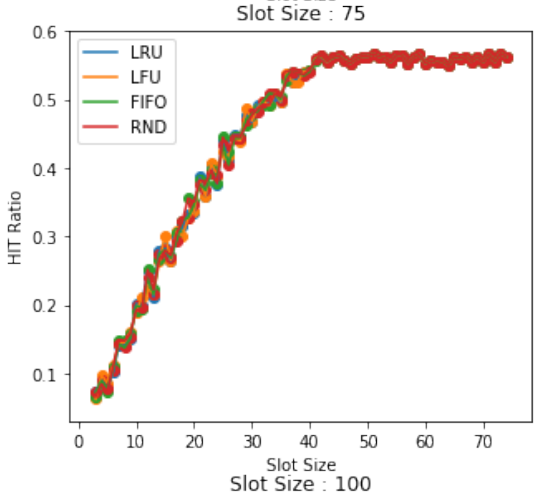
[33]:
```
visualize(input_size = 100, input_max_size = 50)
```

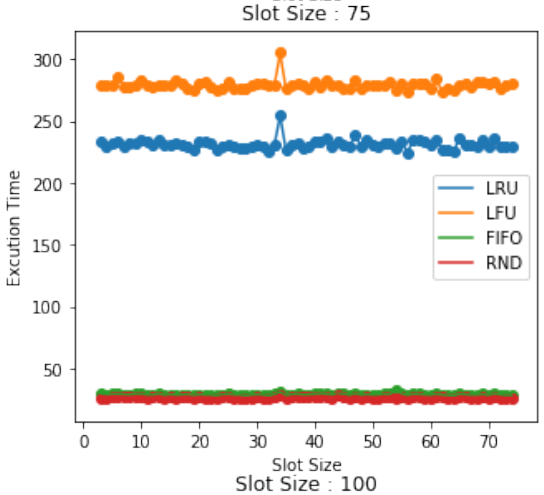

Slot Size : 25
LRU
LFU
FIFO
RND
HIT Ratio
Slot Size

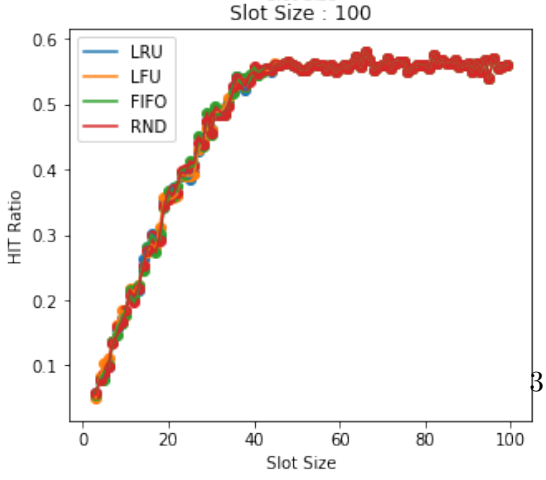

Slot Size : 25
LRU
LFU
FIFO
RND
Excution Time
Slot Size

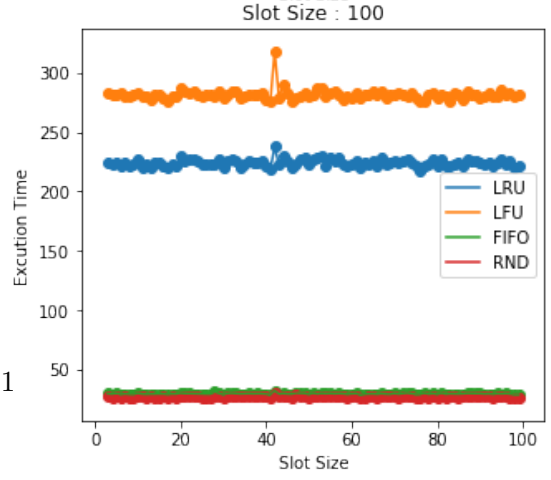

Slot Size : 50
LRU
LFU
FIFO
RND
HIT Ratio
Slot Size


Slot Size : 50
LRU
LFU
FIFO
RND
Excution Time
Slot Size


Slot Size : 75
LRU
LFU
FIFO
RND
HIT Ratio
Slot Size

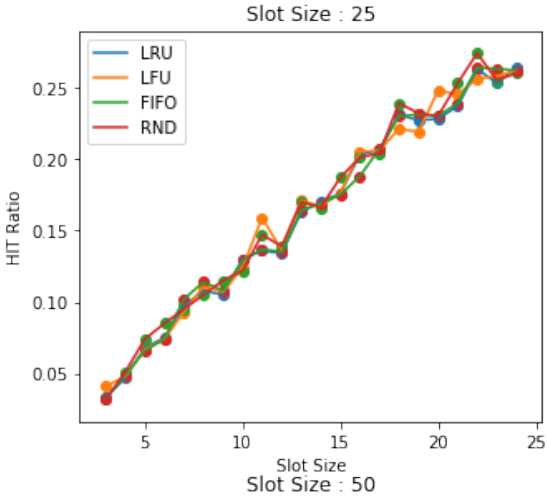

Slot Size : 75
LRU
LFU
FIFO
RND
Excution Time
Slot Size

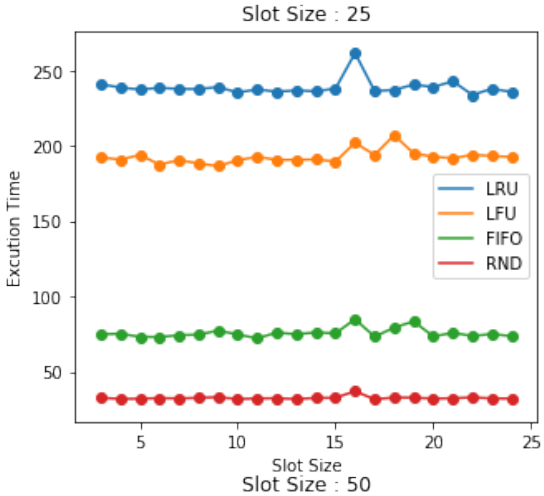

Slot Size : 100
LRU
LFU
FIFO
RND
HIT Ratio
Slot Size

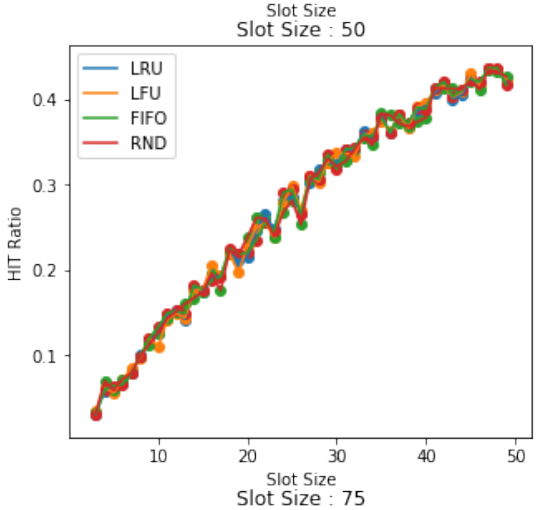

Slot Size : 100
LRU
LFU
FIFO
RND
Excution Time
Slot Size

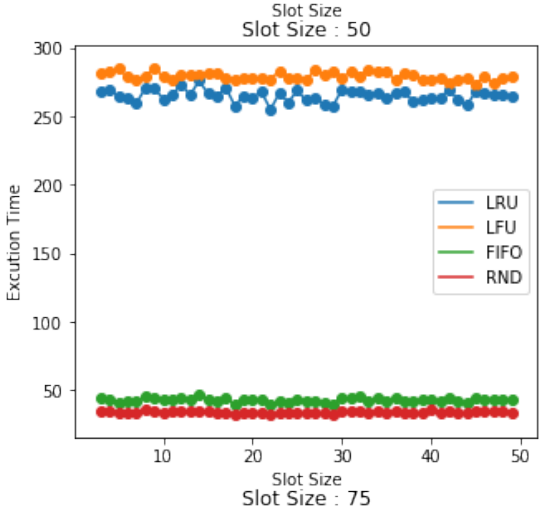
2.4.3 75 25,50,75,100

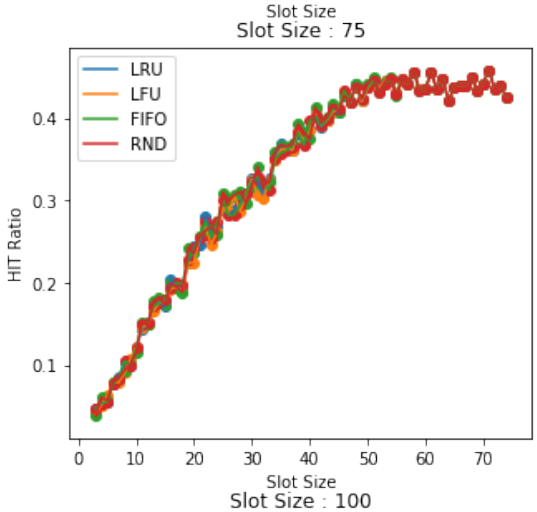
[34]:
```
visualize(input_size = 100, input_max_size = 75)
```

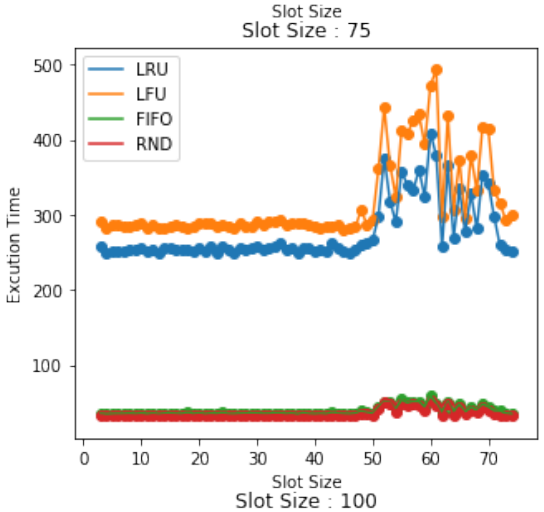

Slot Size : 25
LRU
LFU
FIFO
RND
HIT Ratio
Slot Size

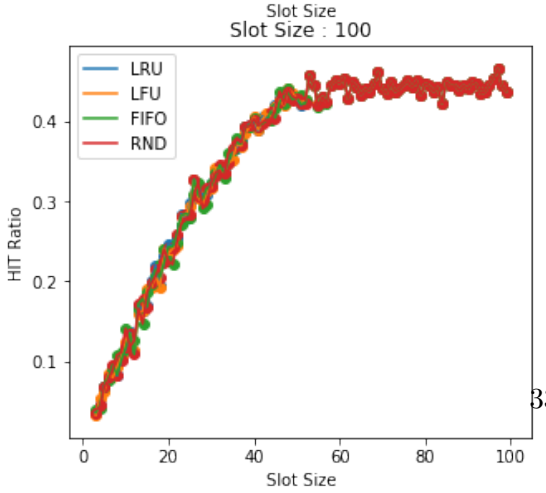

Slot Size : 25
LRU
LFU
FIFO
RND
Excution Time
Slot Size

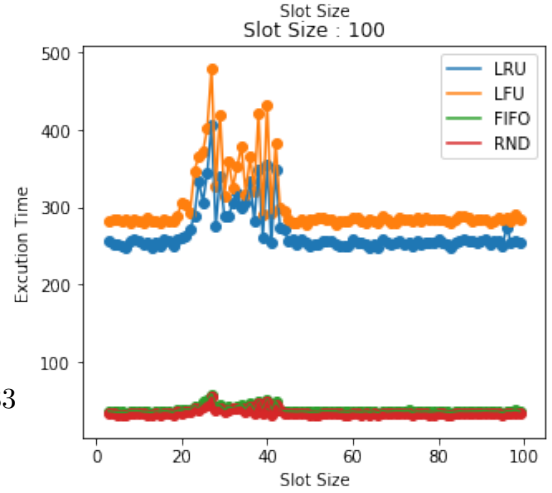

Slot Size : 50
LRU
LFU
FIFO
RND
HIT Ratio
Slot Size


Slot Size : 50
LRU
LFU
FIFO
RND
Excution Time
Slot Size


Slot Size : 75
LRU
LFU
FIFO
RND
HIT Ratio
Slot Size

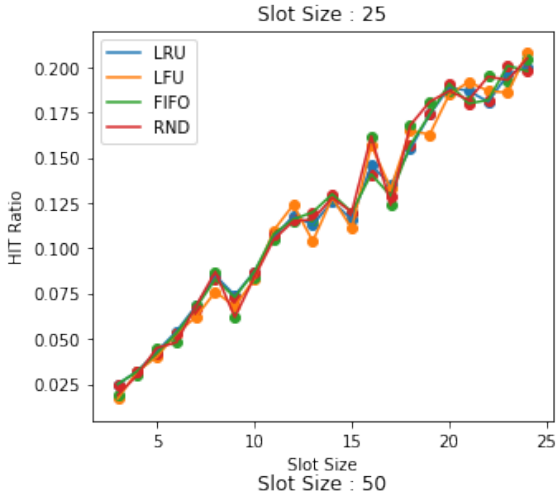

Slot Size : 75
LRU
LFU
FIFO
RND
Excution Time
Slot Size

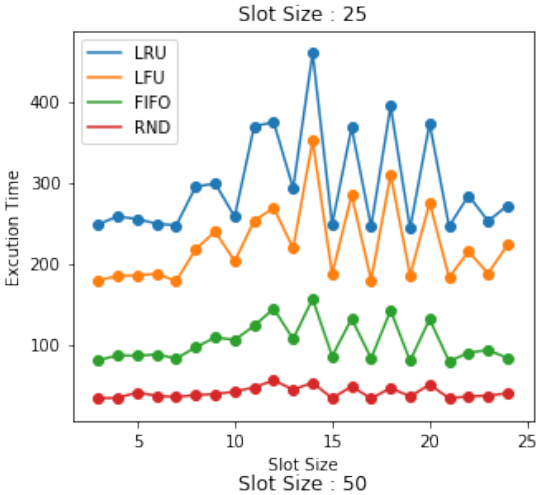

Slot Size : 100
LRU
LFU
FIFO
RND
HIT Ratio
Slot Size

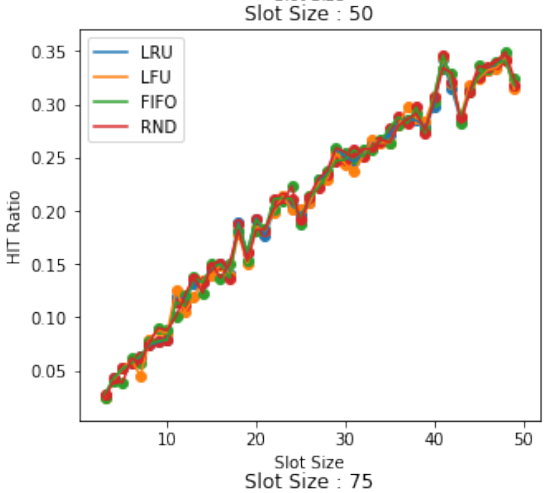

Slot Size : 100
LRU
LFU
FIFO
RND
Excution Time
Slot Size

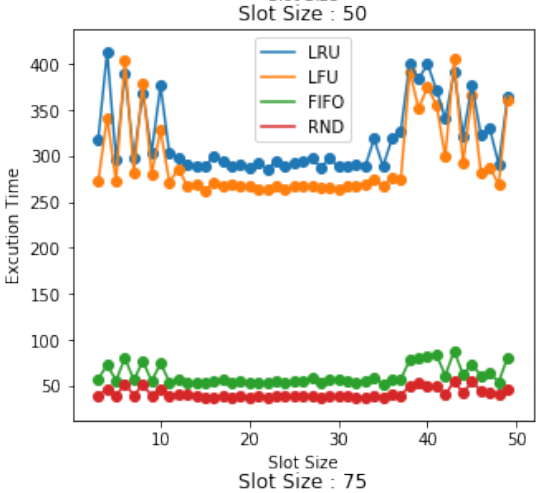
2.4.4 100 25,50,75,100

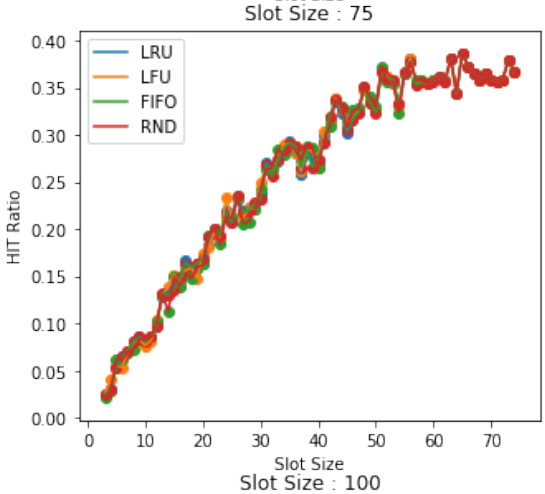
[35]:
```
visualize(input_size = 100, input_max_size = 100)
```

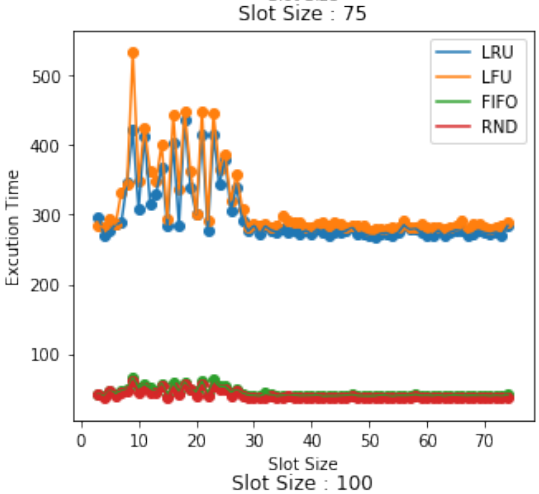

Slot Size : 25
LRU
LFU
FIFO
RND
HIT Ratio
Slot Size

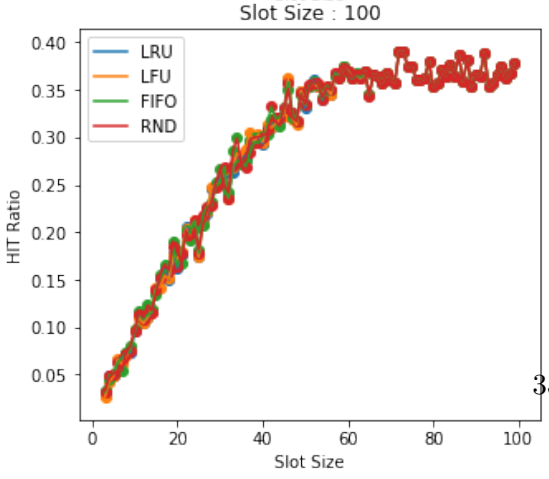

Slot Size : 25
LRU
LFU
FIFO
RND
Excution Time
Slot Size

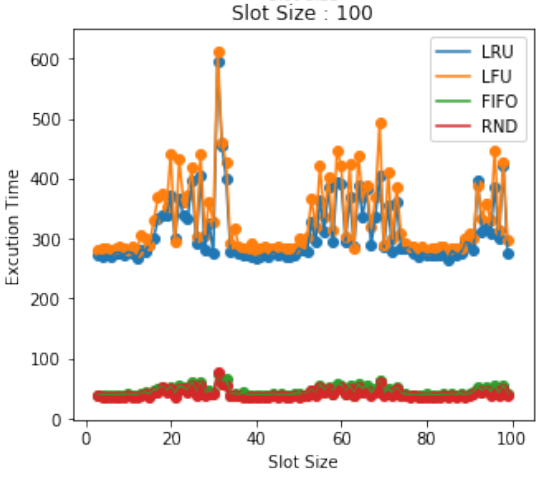

Slot Size : 50
LRU
LFU
FIFO
RND
HIT Ratio
Slot Size


Slot Size : 50
LRU
LFU
FIFO
RND
Excution Time
Slot Size


Slot Size : 75
LRU
LFU
FIFO
RND
HIT Ratio
Slot Size


Slot Size : 75
LRU
LFU
FIFO
RND
Excution Time
Slot Size


Slot Size : 100
LRU
LFU
FIFO
RND
HIT Ratio
Slot Size


Slot Size : 100
LRU
LFU
FIFO
RND
Excution Time
Slot Size

[ ]: