Report Assignment 1

ELG 5142 Ubiquitous Sensing and Smart City

Group Number: G_26

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Step one: Generating tasks

We need to create 2,000 legitimate tasks for 15,000 users with task properties

- Days: Distribution consistent in [1, 2, 3].

- Hours: 50% (9:00 AM-11:00 AM), 25% (12:00 PM-5:00 PM), 25% (6:00 PM-8:00 AM)

- Minutes: 50% in [20, 40, 60], 30% in [30, 50, 70], 20% in [10, 80, 100].

- Task value: Uniformly distributed in [1,10].

First, we identified the task properties:

```
num_usr=15000
days=3
```

```
day = random.randint(0,days-1)
task_value=random.randint(1,10)
minute=random.randint(0,59)
rh=random.randint(1,100)
```

Then, we applied the conditions of durations:

```
if(rh<=50):
    hour=random.randint(9,11)
elif( 50 < rh <= 75):
    hour=random.randint(12,17)
elif(rh > 75):
    hour=random.choice(list(range(18,24))+list(range(0,9)))


dur= random.randint(1,10)

if(dur<6):
    duration=random.choice([20,40,60])
elif(dur<9):
    duration=random.choice([30,50,70])
else:
    duration=random.choice([10,80,100])
```

After that, we create a folder in the input file called mobility and then create inside it a folder called differentradius then another folder inside it called 50, and we append another column for task value.

Finally, we create mytask_files and csv_files that contain our readings.

```python
# task txt file
mytask_file = open('./Inputs/Mobility/differentradius/50/'+str(run_num)+'/mytasks.txt', 'w')
mytask_file.write("/ID-Task/  -/Lat/  -/Long/ -/Day/  -/Hour/ -/Minute/   -/Duration/ -/Remaining time/ -/Resou
for i in range(0,len(tasks)):
    task_file.write("{}\t {}\t {}\t {}\t {}\t {}\t {}\t {}\t {}\t {}\t {}\t {}\t {}\t {}\n".format(tasks[i][0],

    task_file.close()

# task csv file
csvfile = open('./Inputs/Mobility/differentradius/50/'+str(run_num)+'/mytasks.csv','w')
with csvfile:
    titles = ['ID','Latitude','Longitude','Day','Hour','Minute','Duration','RemainingTime','Resources','Coverage
    writer = csv.DictWriter(csvfile, fieldnames=titles)
    writer.writeheader()
    for i in range(0,len(tasks)):
        # if(tasks[i][3]==0):
        #     continue
        writer.writerow({'ID':tasks[i][0],'Latitude':tasks[i][1],'Longitude':tasks[i][2],'Day':tasks[i][3],'Hou
```

Our Results:

.csv file

ID	Latitude	Longitude	Day	Hour	Minute	Duration	Remaining	Resources	Coverage	Ligitimacy	OnPeakHo	GridNumb	Task_value
1	42.13911	12.49167	2	11	44	70	70	10	100	TRUE	TRUE	44	2
2	42.1563	12.51112	0	9	3	50	50	10	100	TRUE	TRUE	76	7
3	42.1431	12.49389	2	16	6	70	70	8	100	TRUE	TRUE	44	2
4	42.14093	12.53469	1	21	5	60	60	9	100	TRUE	TRUE	49	10
5	42.1379	12.52687	0	11	52	40	40	8	100	TRUE	TRUE	38	1
6	42.1476	12.51803	0	10	18	20	20	8	100	TRUE	TRUE	57	10
7	42.15351	12.49869	2	10	34	20	20	7	100	TRUE	TRUE	65	3
8	42.15636	12.49716	2	9	48	40	40	7	100	TRUE	TRUE	75	6
9	42.14984	12.50055	2	12	31	20	20	8	100	TRUE	TRUE	55	6
10	42.15107	12.50622	0	16	26	50	50	10	100	TRUE	TRUE	66	10
11	42.14827	12.52736	0	11	15	70	70	10	100	TRUE	TRUE	58	7
12	42.12355	12.53833	1	7	30	100	100	9	100	TRUE	TRUE	20	5
13	42.14761	12.47353	0	11	19	60	60	9	100	TRUE	TRUE	52	5
14	42.15484	12.47546	2	7	52	20	20	10	100	TRUE	TRUE	62	3
15	42.15161	12.51155	0	17	34	30	30	8	100	TRUE	TRUE	66	10
16	42.15847	12.48596	1	14	29	30	30	7	100	TRUE	TRUE	73	3
17	42.14692	12.52189	1	5	33	10	10	7	100	TRUE	TRUE	58	2
18	42.15348	12.53704	0	11	8	70	70	8	100	TRUE	TRUE	70	8
19	42.15236	12.49324	2	12	34	20	20	9	100	TRUE	TRUE	64	9
20	42.13056	12.49579	0	9	55	50	50	7	100	TRUE	TRUE	25	5

.txt file

/ID-Task/	-/Lat/	-/Long/	-/Day/	-/Hour/	-/Minute/	-/Duration/	-/Remaining time/	-/Resources/	-/Coverage/	-/Ligitimacy/	-/on peak hour/	-/grid_number	-/Task Value
1	42.139109926891095	12.491672040372578	2	11	44	70	70	10	100	True	True	44	2
2	42.156296585502695	12.511117641566655	0	9	3	50	50	10	100	True	True	76	7
3	42.14309530076537	12.49388978463099	2	16	6	70	70	8	100	True	True	44	2
4	42.14092661633357	12.534686255415128	1	21	5	60	60	9	100	True	True	49	10
5	42.13790236632472	12.526865567738412	0	11	52	40	40	8	100	True	True	38	1
6	42.147603489501435	12.518027176523205	0	10	18	20	20	8	100	True	True	57	10
7	42.15350599418839	12.498685586128216	2	10	34	20	20	7	100	True	True	65	3
8	42.156357289802536	12.497156037161748	2	9	48	40	40	7	100	True	True	75	6
9	42.14984192559077	12.500545262293278	2	12	31	20	20	8	100	True	True	55	6
10	42.1510734434269	12.5062244644796	0	16	26	50	50	10	100	True	True	66	10
11	42.148273567419544	12.527356894182915	0	11	15	70	70	10	100	True	True	58	7
12	42.12355210833318	12.538332917374804	1	7	30	100	100	9	100	True	True	20	5
13	42.14760956570716	12.473525879919778	0	11	19	60	60	9	100	True	True	52	5
14	42.154836758479675	12.475455347244578	2	7	52	20	20	10	100	True	True	62	3
15	42.15160602561719	12.511550648379854	0	17	34	30	30	8	100	True	True	66	10
16	42.15846935804963	12.485963402652706	1	14	29	30	30	7	100	True	True	73	3
17	42.14692170863859	12.521893306345493	1	5	33	10	10	7	100	True	True	58	2
18	42.15347912600719	12.537036064581082	0	11	8	70	70	8	100	True	True	70	8
19	42.152360549971995	12.493243315899555	2	12	34	20	20	9	100	True	True	64	9
20	42.13056458422722	12.495789734776379	0	9	55	50	50	7	100	True	True	25	5

Step two: Obtain user movement

We generated user movement events using a stochastic algorithm throught using Dirichlet distribution to select a stochastic path rather than the longest path.

```python
# stochastic model
weights=np.random.dirichlet(I)
idr = random.choices(I , weights=weights)[0]
```

We created an empty list called: I[] to append the values in it, After that we brought random length which is greater than path and less than the longest path and then we got the weight for each path by using np.random.dirichlet ,then we choosed random path by using random.choices.

```python
speed = random.uniform(min_speed,max_speed)

mincamm=random.randint(20,40)
cut=mincamm*60*speed
cutadded=cut+maxlen

(length, path)= nx.single_source_dijkstra(G_old, origin_node, target=None, cutoff=cutadded, weight='length')
I=[]
idr=0

for l in length:
    if (length[l]>cut ) & (length[l]< cutadded):
        I.append(l)
# stochastic model
weights=np.random.dirichlet(I)
idr = random.choices(I , weights=weights)[0]

if idr==0:
    idr= max(length,key=length.get)
route=path[idr]
```

Output of uniform mobility model (Main) :

Editing the setup.txt file by using number of users = 15,000.

```
***************************
|Days of simulation| = 3

***************************
|Number of users| = 15000
```

Days= 3

We entered CityName= morlupo

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```
2998 49.6049363 6.1112415 0 0 23 31 16 151.09848666255436 91.66624349755925
2998 49.6048752 6.1112935 0 0 23 32 17 151.121666987323 7.759193143650632
2998 49.6046985 6.1123829 0 0 23 33 18 107.25957144478485 35.827781812473916
2998 49.6037927 6.1133717 0 0 23 34 19 151.40280139413943 112.76435257862715
2998 49.6033094 6.1141722 0 0 23 35 20 131.74797846404635 69.55340622045344
2998 49.6036057 6.1150314 0 0 23 36 21 64.48278048202405 44.06200808799272
2998 49.60311534758B8 6.115869288425135 0 0 23 37 23 137.3154149701412 111.30069076740821
2998 49.6029058 6.1161696 0 0 23 38 23 137.3154149701412 111.30069076740821
2998 49.6023523 6.1170078 0 0 23 39 24 132.45409004910948 7.989255172944484
2998 49.6015681 6.1183307 0 0 23 40 25 132.44755160820648 129.1989964413229
2999 49.635270415544475 6.07301712493415 0 0 23 13
2999 49.6354806 6.0740735 0 0 23 14 1 121.22090741874422 53.84462869667293
2999 49.6352156 6.0749277 0 0 23 15 2 115.59463281886394 68.20891125000992
2999 49.6345549 6.0770713 0 0 23 16 3 115.44898001203637 170.9638212105986
2999 49.6344454 6.0773642 0 0 23 17 4 119.99460302657997 24.355703138989814
2999 49.6340423 6.0782769 0 0 23 18 5 105.74872413132516 18.88618676086416
2999 49.6340043 6.0794257 0 0 23 19 6 83.58309448889884 18.70493041288826
2999 49.6341383 6.080688 0 0 23 20 7 79.13826297216224 20.12228091882904
2999 49.6342076 6.0824463 0 0 23 21 8 70.45701346393759 45.70665366749852
2999 49.6340243 6.0829549 0 0 23 22 9 168.47517919462837 16.76141446320464
2999 49.6331803 6.0834673 0 0 23 23 10 151.07820278069886 33.55104668779501
2999 49.6325966 6.084154 0 0 23 24 11 129.2823566635709 32.94697206603069
2999 49.631829 6.0842378 0 0 23 25 12 179.57098732163195 21.161020498035633
2999 49.6314689 6.0855168 0 0 23 26 13 90.14393947280814 39.77760617433167
2999 49.6313877 6.086493 0 0 23 27 14 85.81196649903222 32.1280354020168
2999 49.6311754 6.0875373 0 0 23 28 15 107.42504682090618 78.82980051993023
2999 49.6306217 6.0884953 0 0 23 29 16 128.69243261135182 63.1443385016843
2999 49.6300541 6.089388 0 0 23 30 17 124.39116706414069 21.4186201364849
2999 49.6295496 6.0904615 0 0 23 31 18 123.43415382715034 38.949914887896725
2999 49.6287254 6.0909348 0 0 23 32 19 159.5964866139343 97.78165161588322|
2999 49.6280844689148 6.092599826114582 0 0 23 33 21 120.66518757741528 140.96962277353308
2999 49.6278428 6.093232 0 0 23 34 21 120.66518757741528 140.96962277353308
3000 49.6358085650159 6.117265737845595 0 0 23 0
3000 49.6363995 6.117083 0 0 23 1 1 11.14584134735236 30.62252695775456
3000 49.6367669 6.1172585 0 0 23 2 2 17.190025693121697 42.763327903149396
3000 49.637436 6.1174836 0 0 23 3 3 13.58709489395983 26.883327463356572
3000 49.6378611 6.117287 0 0 23 4 4 315.739682571269 13.041792774217956
3000 49.6369549 6.1167955 0 0 23 5 5 196.11495154144467 80.76545052303783
3000 49.636572 6.1165558 0 0 23 6 6 202.06894863848208 45.942864320652376
3000 49.6362072 6.1162486 0 0 23 7 7 208.6071864072501 46.20450033807379
3000 49.6353549 6.116106 0 0 23 8 8 183.2764438894326 54.307465202225124
3000 49.6351796 6.1161142 0 0 23 9 9 175.95859892878252 11.035401777598496
3000 49.6346401 6.1163838 0 0 23 10 10 158.7892883743425 39.67097151409887
3000 49.6341897 6.11668 0 0 23 11 11 156.77625953287668 31.121161038026656
3000 49.6335572 6.1171269 0 0 23 12 12 147.8198726193658 21.243911025540292
3000 49.6331259 6.1175015 0 0 23 13 13 148.2990549310058 17.186197742054866
3000 49.6325512 6.1179467 0 0 23 14 14 155.26486047312892 26.248230624772766
3000 49.6321393 6.1181881 0 0 23 15 15 159.21374211754676 48.9898105694511
3000 49.6315835 6.1185244 0 0 23 16 16 158.5994577678939 66.37881065943243
3000 49.6310189 6.1185729 0 0 23 17 17 186.45992085221638 29.7670649042794
3000 49.6304602 6.1192079 0 0 23 18 18 139.83525008944707 31.88049981480638
3000 49.6302066 6.1195293 0 0 23 19 19 140.617859962814 36.483131949932705
3000 49.6296623 6.1203285 0 0 23 20 20 116.27384912591634 38.85979877664472
3000 49.6294067 6.1208905 0 0 23 21 21 125.07455023806153 49.459264563786334
3000 49.6289728 6.1209769 0 0 23 22 22 183.6309185670135 6.028213053186513
3000 49.6285693 6.121666 0 0 23 23 23 132.8612791680274 21.381558572018314
```

2) UserMovementsListEvents_1.txt

```
8999 49.63058295089383 6.092851558122607 0 1 23 30 17 122.33560097711654 79.16328635301856
8999 49.6305058 6.0930418 0 1 23 31 17 122.33560097711654 79.16328635301856
8999 49.6299844 6.0941663 0 1 23 32 18 124.56347434573036 71.40261663518122
8999 49.629592 6.0948918 0 1 23 33 19 129.862591127697 68.07525860342186
8999 49.6292226176084714 6.095560110155684 0 1 23 34 21 130.12068062287 98.20082730698043
8999 49.6290229 6.0959344 0 1 23 35 21 130.12068062287 98.20082730698043
8999 49.6287958 6.0964504 0 1 23 36 22 124.19469842513581 44.93224899178307
8999 49.6282128 6.0971181 0 1 23 37 23 139.3602613982672 21.27697681810524
8999 49.6277803 6.0979632 0 1 23 38 24 123.53617407424315 35.94682216246829
8999 49.6275854931405 6.099210528353417 0 1 23 39 26 99.06097856852728 88.4655608593297
8999 49.6275496 6.0995604 0 1 23 40 26 99.06097856852728 88.4655608593297
8999 49.6275768 6.1001706 0 1 23 41 27 86.0631299404892 44.054848373452415
8999 49.6273412 6.1003305 0 1 23 42 28 194.389993342656 11.158851384311133
8999 49.62734078767412 6.1017314544895696 0 1 23 43 30 92.70676685058334 92.9902128228947
8999 49.6273281 6.1021481 0 1 23 44 30 92.70676685058334 92.9902128228947
8999 49.6273259 6.1030811 0 1 23 45 31 89.76198457580358 45.55041208059055
8999 49.6273601 6.1040126 0 1 23 46 32 82.86902453193409 26.3353010416276
8999 49.6275166 6.1045408 0 1 23 47 33 39.056725745282904 17.39832636053091
8999 49.6278744 6.1052057 0 1 23 48 34 54.54934890844277 21.644445730473624
8999 49.6280724 6.1060816 0 1 23 49 35 74.8580109088175 33.62966246183659
9000 49.59708637076178 6.148674445179484 0 1 23 23
9000 49.596782745415624 6.146249563584578 0 1 23 24 2 259.08902308062136 93.10712339122189
9000 49.5967736 6.146173 0 1 23 25 2 259.08902308062136 93.10712339122189
9000 49.596577 6.1445993 0 1 23 26 3 259.08922158023523 109.84989470655059
9000 49.5971005 6.1441995 0 1 23 27 4 342.9242708874132 33.45447039200212
9000 49.5977994 6.1438873 0 1 23 28 5 343.90228672021794 11.098922436441182
9000 49.5974879 6.1416991 0 1 23 29 6 258.3251236650228 106.65242663596763
9000 49.597853 6.1415804 0 1 23 30 7 348.10236326679336 35.27282509581903
9000 49.5979215 6.1400839 0 1 23 31 8 271.2916699057448 93.75910939745087
9000 49.5981769 6.1396768 0 1 23 32 9 300.84730952797025 7.546620465435846
9000 49.598502 6.138752 0 1 23 33 10 348.40125301977514 35.20044007558783
9000 49.5986822 6.1376476 0 1 23 34 11 253.33258520544473 5.815134259913166
9000 49.5994957 6.137316 0 1 23 35 12 347.6212851482591 11.464018501163547
9000 49.6002817 6.1370509 0 1 23 36 13 347.6719957763423 75.47384762446657
9000 49.6005891 6.1357516 0 1 23 37 14 273.3060489207446 55.72831158985994
9000 49.6008274 6.1347463 0 1 23 38 15 289.319265328626 21.44364251162568
9000 49.6009588 6.1338999 0 1 23 39 16 290.0965491561926 33.97972399424745
9000 49.6012108 6.1330278 0 1 23 40 17 245.16115146863336 10.561753487650513
9000 49.6025025 6.1318037 0 1 23 41 18 330.748174578189 112.89295913938591
9000 49.6030478 6.131358 0 1 23 42 19 332.0895751144954 68.61618848515478
9000 49.603217 6.1311541 0 1 23 43 20 280.26155130473 5.368680524189566
9000 49.603754 6.1297901 0 1 23 44 21 292.21859386119957 49.72550822709667
9000 49.6041008 6.1293238 0 1 23 45 22 323.05117237506846 12.647452044005322
9000 49.6047834 6.12869 0 1 23 46 23 306.5685427778846 5.356916301672329
9000 49.6054765 6.1280372 0 1 23 47 24 329.0266915954703 5.096538620626006
9000 49.6068094 6.1267564 0 1 23 48 25 328.15054192522797 88.60939820830158
9000 49.6069052 6.1266646 0 1 23 49 26 328.16094542538224 12.53902644217481
9000 49.6075244 6.127469 0 1 23 50 27 37.689008419518075 18.421388270028917
9000 49.60850285920758 6.126755605699695 0 1 23 51 29 330.50501979811736 152.81738543176766
9000 49.6090123 6.1263092 0 1 23 52 29 330.50501979811736 152.81738543176766
9000 49.6095931 6.1260467 0 1 23 53 30 49.29067337888131 3.71705860755677
9000 49.6104211 6.1259939 0 1 23 54 31 354.9180498470485 83.21197578932478
9000 49.6114603 6.1258426 0 1 23 55 32 354.04754134473325 47.59248708377317
9000 49.6121557 6.1257306 0 1 23 56 33 354.0422292315014 77.7449896931306
9000 49.6123815 6.124968 0 1 23 57 34 275.69834246993776 49.6133694322529
9000 49.6124984 6.1234915 0 1 23 58 35 274.45127047491525 40.404591271767664
```

3) UserMovementsListEvents_ 2.txt

```
14998 49.607951 6.1344523 0 2 23 53 39 229.27059426851196 40.848941446634846
14999 49.620378206284464 6.114776138034361 0 2 23 15
14999 49.6203594 6.1148059 0 2 23 16 1 134.20427887419515 47.2707912122325
14999 49.6197446 6.1159445 0 2 23 17 2 129.1171227900984 18.347116577470743
14999 49.6189297 6.1155866 0 2 23 18 3 212.5860049814317 76.76631900352884
14999 49.6186299 6.1161353 0 2 23 19 4 130.1444892358524 48.722876360943154
14999 49.6180235 6.1172417 0 2 23 20 5 130.3548303827045 39.77126148023806
14999 49.6174756 6.1176681 0 2 23 21 6 133.45473654601687 42.843025741698376
14999 49.6167576 6.1174719 0 2 23 22 7 221.0456444032763 41.07578702211506
14999 49.6162349 6.1179443 0 2 23 23 8 132.73661472266542 25.905024931696406
14999 49.6156445 6.1189307 0 2 23 24 9 131.2736423174739 33.358965390652166
14999 49.6152118 6.1189108 0 2 23 25 10 132.66344970998938 31.273408646589846
14999 49.6146174 6.1193429 0 2 23 26 11 209.15423200711362 13.369052802737658
14999 49.6137591 6.119574 0 2 23 27 12 153.00584935329448 38.11110763664412
14999 49.612432845606854 6.11898261835709 0 2 23 28 14 211.70986735176174 106.32980300021254
14999 49.6122983 6.1188525 0 2 23 29 14 211.70986735176174 106.32980300021254
14999 49.61156 6.1182045 0 2 23 30 15 199.8480463946791 16.361426970160718
14999 49.6108171 6.1184263 0 2 23 31 16 160.32246881179867 2.5027688073736445
14999 49.6100517 6.1189368 0 2 23 32 17 161.33801575662847 12.722410563923146
14999 49.6088461 6.1195006 0 2 23 33 18 168.27755184130365 74.72485999449614
14999 49.6084319 6.119638 0 2 23 34 19 167.87033627450933 31.857026763684573
14999 49.6077509 6.1198308 0 2 23 35 20 174.22030539172852 6.582798489633327
14999 49.606602 6.1197536 0 2 23 36 21 183.36537474343294 67.14418754482747
14999 49.6058102 6.1196536 0 2 23 37 22 185.72144045316307 58.83730151695046
14999 49.6052687 6.1188368 0 2 23 38 23 224.48733635412168 67.94127671156564
14999 49.6047365 6.1187007 0 2 23 39 24 192.08743387671052 22.367924092292935
14999 49.6036829 6.1183831 0 2 23 40 25 191.05387542726817 119.36966954635449
14999 49.6031729 6.1182011 0 2 23 41 26 196.87832000523522 20.625255189684395
14999 49.6024499 6.1170033 0 2 23 42 27 225.55747988757633 56.423762124500584
15000 49.609868792252854 6.11383293558492 0 2 23 33
15000 49.6102233 6.1148278 0 2 23 34 1 93.34778696115836 35.034133003650005
15000 49.6107593 6.115383 0 2 23 35 2 2.3229328592557295 54.21877142061882
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15000 49.6116351 6.1164267 0 2 23 37 4 6.608832559160533 83.4504588464709
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Output of Crowdsensim2 model (after updating the main file) :

- UserMovementsListEvents_0.tx t

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