In [1]:

```
#convert txt to csv
import pandas as pd
import matplotlib.pyplot as plt
```

In [2]:

```
dfg = pd.read_csv('wat-good-time-interval-10000.csv')
```

In [3]:

```
dfm = pd.read_csv('wat-mal-time-interval-10000.csv')
```

In [4]:

```
dfg.head()
```

Out[4]:

	time_intervals	r0	r1	r2	r3	r4	r5	r6	r7	r8	...	inport_north	inport_south	i
0	10000	613	194	105	48	385	110	105	70	264	...	695	711	
1	20000	629	266	202	89	337	122	129	50	175	...	544	700	
2	30000	672	266	172	86	316	108	80	65	200	...	553	586	
3	40000	697	290	196	109	341	115	72	84	236	...	614	639	
4	50000	558	243	152	79	249	102	91	67	165	...	397	436	

5 rows × 32 columns

In [5]:

```
dfm.head()
```

Out[5]:

	time_intervals	r0	r1	r2	r3	r4	r5	r6	r7	r8	...	inport_north	inport_south
0	10000	675	825	201	95	445	521	179	117	300	...	1479	1076
1	20000	707	860	384	171	419	406	182	76	207	...	1072	1085
2	30000	776	1015	467	235	375	437	205	169	232	...	1148	1033
3	40000	782	1027	409	217	418	465	190	142	287	...	1207	1015
4	50000	690	941	445	242	367	378	198	151	184	...	754	827

5 rows × 32 columns

In [6]:

```
df = dfg.append(dfm, ignore_index=True)
```

In [7]:

```
df.head()
```

Out[7]:

	time_intervals	r0	r1	r2	r3	r4	r5	r6	r7	r8	...	inport_north	inport_south	i
0	10000	613	194	105	48	385	110	105	70	264	...	695	711	
1	20000	629	266	202	89	337	122	129	50	175	...	544	700	
2	30000	672	266	172	86	316	108	80	65	200	...	553	586	
3	40000	697	290	196	109	341	115	72	84	236	...	614	639	
4	50000	558	243	152	79	249	102	91	67	165	...	397	436	

5 rows × 32 columns

In [8]:

```
df = df.sort_values('time_intervals')
```

In [9]:

```
df.head(50)
```

Out[9]:

	time_intervals	r0	r1	r2	r3	r4	r5	r6	r7	r8	...	inport_north	inport_sou
0	10000	613	194	105	48	385	110	105	70	264	...	695	7
315	10000	675	825	201	95	445	521	179	117	300	...	1479	10
316	20000	707	860	384	171	419	406	182	76	207	...	1072	10
1	20000	629	266	202	89	337	122	129	50	175	...	544	7(
2	30000	672	266	172	86	316	108	80	65	200	...	553	5
317	30000	776	1015	467	235	375	437	205	169	232	...	1148	10
3	40000	697	290	196	109	341	115	72	84	236	...	614	6
318	40000	782	1027	409	217	418	465	190	142	287	...	1207	10
4	50000	558	243	152	79	249	102	91	67	165	...	397	4
319	50000	690	941	445	242	367	378	198	151	184	...	754	8
320	60000	851	1082	532	258	511	441	221	137	295	...	1170	10
5	60000	767	350	298	164	411	125	161	115	237	...	612	6
321	70000	822	709	345	188	463	369	215	224	289	...	908	8
6	70000	762	326	242	139	388	150	139	163	226	...	578	6
322	80000	606	330	234	120	264	60	120	84	180	...	462	5
7	80000	555	301	252	126	227	31	120	78	185	...	459	5(
323	90000	534	300	210	120	210	60	114	102	132	...	384	4
8	90000	507	240	204	120	246	66	114	114	156	...	462	5(
324	100000	528	264	210	132	216	24	96	102	150	...	426	5
9	100000	505	216	180	96	253	30	102	102	174	...	480	4(
325	110000	738	325	247	132	371	126	115	54	221	...	558	5
10	110000	705	334	261	141	335	144	126	56	168	...	441	5
326	120000	704	350	258	156	341	163	132	126	179	...	474	5
11	120000	746	327	219	129	407	169	138	154	251	...	612	5
12	130000	493	317	276	132	180	48	60	42	162	...	330	4
327	130000	562	287	234	126	276	72	84	84	222	...	468	5(
13	140000	413	241	210	96	156	30	30	60	156	...	330	4
328	140000	427	294	258	126	121	36	36	54	121	...	284	4(
329	150000	393	204	180	126	173	18	36	54	167	...	340	3
14	150000	480	276	228	144	144	24	36	54	120	...	264	4
330	160000	224	138	96	60	42	12	6	18	24	...	54	1(
15	160000	60	42	24	12	18	12	0	0	0	...	12	
16	170000	84	48	48	36	36	12	24	18	24	...	54	
331	170000	84	48	42	30	36	24	24	12	6	...	36	

	time_intervals	r0	r1	r2	r3	r4	r5	r6	r7	r8	...	inport_north	inport_sou
17	180000	60	30	12	6	18	6	6	6	18	...	54	
332	180000	60	24	18	12	36	6	6	12	36	...	84	
333	190000	84	48	30	24	24	18	12	0	0	...	18	
18	190000	84	42	36	30	42	24	18	12	12	...	36	
334	200000	60	24	18	12	36	12	12	18	30	...	54	
19	200000	66	43	37	30	23	6	7	6	23	...	51	
20	210000	60	42	30	18	6	0	0	6	6	...	18	
335	210000	84	60	48	30	12	0	6	6	12	...	36	
336	220000	84	48	36	36	36	18	0	0	18	...	36	
21	220000	84	42	30	24	42	18	6	0	24	...	48	
22	230000	60	24	18	12	36	6	6	12	36	...	84	
337	230000	60	24	18	6	36	6	12	6	36	...	78	
23	240000	84	60	54	36	24	18	12	0	0	...	18	
338	240000	414	408	408	120	6	0	0	6	6	...	18	
24	250000	84	42	30	30	42	18	6	12	36	...	66	
339	250000	150	120	114	108	30	24	18	12	0	...	24	

50 rows × 32 columns

In [10]:

```
df['tot_packets']= df.iloc[:, 1:16].sum(axis=1)
```

In [11]:

```
df['tot_mean']= df.iloc[:, 1:16].mean(axis=1)
```

In [12]:

```
df
```

Out[12]:

	time_intervals	r0	r1	r2	r3	r4	r5	r6	r7	r8	...	inport_east	inport_west
0	10000	613	194	105	48	385	110	105	70	264	...	179	200
315	10000	675	825	201	95	445	521	179	117	300	...	351	393
316	20000	707	860	384	171	419	406	182	76	207	...	453	548
1	20000	629	266	202	89	337	122	129	50	175	...	232	327
2	30000	672	266	172	86	316	108	80	65	200	...	293	362
...	...	...	...	...	...	...	...	...	...	...	...	...	...
312	3130000	559	229	168	102	329	90	96	72	239	...	498	403
628	3140000	486	282	228	120	192	66	102	84	109	...	312	474
313	3140000	503	269	198	114	210	72	90	96	126	...	324	449
314	3150000	747	369	288	198	366	134	114	90	204	...	496	621
629	3150000	762	348	258	180	390	144	102	90	227	...	510	570

630 rows × 34 columns

In [13]:

```
df.to_csv('wat-time-interval-10000.csv',index=False)
```

In [14]:

```
df = pd.read_csv('wat-time-interval-10000.csv')
```

In [15]:

```
df.head(50)
```

Out[15]:

	time_intervals	r0	r1	r2	r3	r4	r5	r6	r7	r8	...	inport_east	inport_west
0	10000	613	194	105	48	385	110	105	70	264	...	179	200
1	10000	675	825	201	95	445	521	179	117	300	...	351	393
2	20000	707	860	384	171	419	406	182	76	207	...	453	548
3	20000	629	266	202	89	337	122	129	50	175	...	232	327
4	30000	672	266	172	86	316	108	80	65	200	...	293	362
5	30000	776	1015	467	235	375	437	205	169	232	...	723	778
6	40000	697	290	196	109	341	115	72	84	236	...	385	414
7	40000	782	1027	409	217	418	465	190	142	287	...	806	747
8	50000	558	243	152	79	249	102	91	67	165	...	350	378
9	50000	690	941	445	242	367	378	198	151	184	...	654	746
10	60000	851	1082	532	258	511	441	221	137	295	...	1024	929
11	60000	767	350	298	164	411	125	161	115	237	...	552	616
12	70000	822	709	345	188	463	369	215	224	289	...	827	809
13	70000	762	326	242	139	388	150	139	163	226	...	526	607
14	80000	606	330	234	120	264	60	120	84	180	...	450	552
15	80000	555	301	252	126	227	31	120	78	185	...	447	547
16	90000	534	300	210	120	210	60	114	102	132	...	402	510
17	90000	507	240	204	120	246	66	114	114	156	...	462	494
18	100000	528	264	210	132	216	24	96	102	150	...	426	510
19	100000	505	216	180	96	253	30	102	102	174	...	481	462
20	110000	738	325	247	132	371	126	115	54	221	...	522	536
21	110000	705	334	261	141	335	144	126	56	168	...	430	538
22	120000	704	350	258	156	341	163	132	126	179	...	444	590
23	120000	746	327	219	129	407	169	138	154	251	...	604	597
24	130000	493	317	276	132	180	48	60	42	162	...	312	480
25	130000	562	287	234	126	276	72	84	84	222	...	468	503
26	140000	413	241	210	96	156	30	30	60	156	...	330	408
27	140000	427	294	258	126	121	36	36	54	121	...	294	474
28	150000	393	204	180	126	173	18	36	54	167	...	330	372
29	150000	480	276	228	144	144	24	36	54	120	...	264	426
30	160000	224	138	96	60	42	12	6	18	24	...	54	168
31	160000	60	42	24	12	18	12	0	0	0	...	12	42
32	170000	84	48	48	36	36	12	24	18	24	...	54	96
33	170000	84	48	42	30	36	24	24	12	6	...	36	84

	time_intervals	r0	r1	r2	r3	r4	r5	r6	r7	r8	...	inport_east	inport_west
34	180000	60	30	12	6	18	6	6	6	18	...	54	42
35	180000	60	24	18	12	36	6	6	12	36	...	84	54
36	190000	84	48	30	24	24	18	12	0	0	...	18	60
37	190000	84	42	36	30	42	24	18	12	12	...	36	72
38	200000	60	24	18	12	36	12	12	18	30	...	54	54
39	200000	66	43	37	30	23	6	7	6	23	...	39	74
40	210000	60	42	30	18	6	0	0	6	6	...	18	54
41	210000	84	60	48	30	12	0	6	6	12	...	36	84
42	220000	84	48	36	36	36	18	0	0	18	...	36	66
43	220000	84	42	30	24	42	18	6	0	24	...	48	60
44	230000	60	24	18	12	36	6	6	12	36	...	84	54
45	230000	60	24	18	6	36	6	12	6	36	...	78	48
46	240000	84	60	54	36	24	18	12	0	0	...	18	84
47	240000	414	408	408	120	6	0	0	6	6	...	18	486
48	250000	84	42	30	30	42	18	6	12	36	...	66	66
49	250000	150	120	114	108	30	24	18	12	0	...	24	180

50 rows × 34 columns

In [16]:

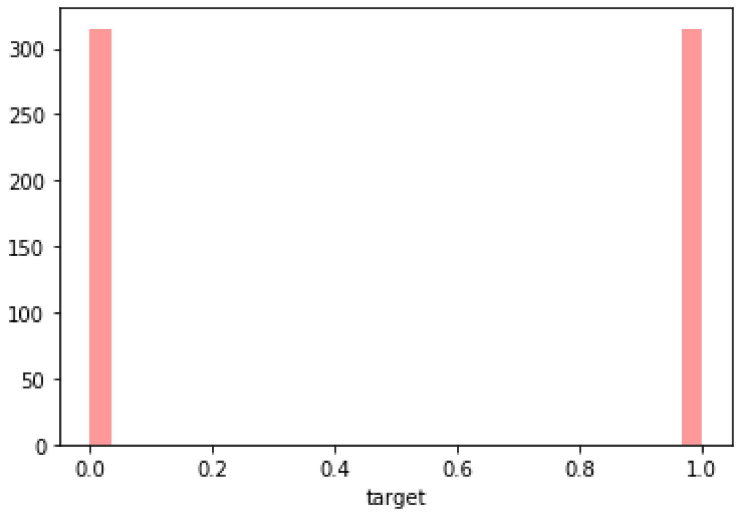
```
import seaborn as sns
```

In [17]:

```
sns.distplot(df['target'], kde = False, bins=30, color='red')
```

Out[17]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x1d25f0dd4c8>
```



In [18]:

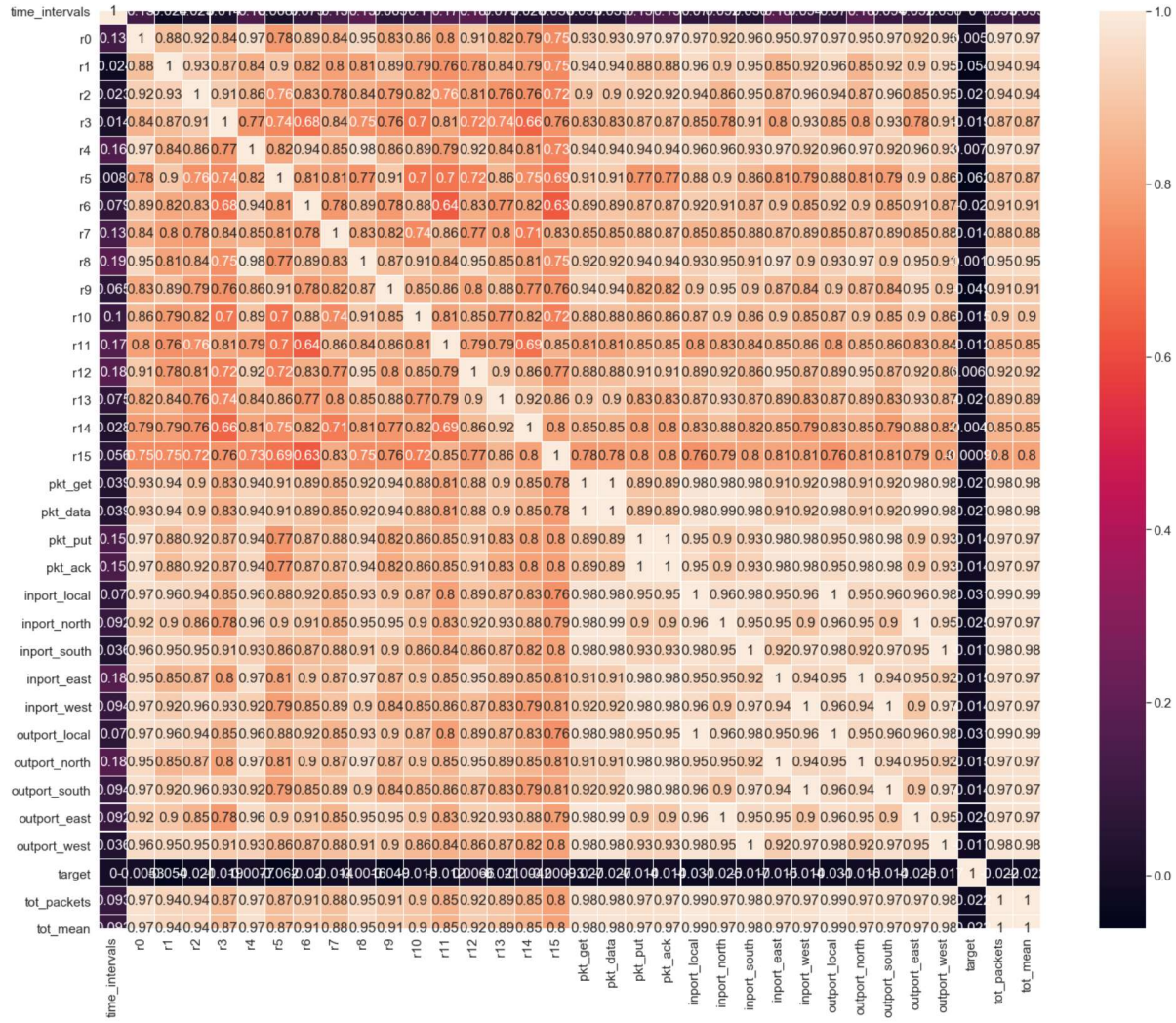
```
df.isnull().sum()
```

Out[18]:

```
time_intervals    0
r0                0
r1                0
r2                0
r3                0
r4                0
r5                0
r6                0
r7                0
r8                0
r9                0
r10               0
r11               0
r12               0
r13               0
r14               0
r15               0
pkt_get           0
pkt_data          0
pkt_put           0
pkt_ack           0
inport_local      0
inport_north      0
inport_south      0
inport_east       0
inport_west       0
outport_local     0
outport_north     0
outport_south     0
outport_east      0
outport_west      0
target            0
tot_packets       0
tot_mean          0
dtype: int64
```

In [19]:

```
plt.figure(figsize=(25,20))
plt.rcParams["axes.labelsize"] = 20
sns.set(font_scale=1.4)
sns.heatmap(df.corr(), annot = True ,linewidths=.1)
plt.show()
```



In [20]:

```
df_corr = df.corr()
df_corr
```

Out[20]:

	time_intervals	r0	r1	r2	r3	r4	r5	
time_intervals	1.000000	0.126189	-0.024202	0.023317	0.014263	0.156730	0.008746	0.(
r0	0.126189	1.000000	0.880315	0.921483	0.843099	0.967894	0.779053	0.8
r1	-0.024202	0.880315	1.000000	0.928026	0.874358	0.838893	0.902357	0.8
r2	0.023317	0.921483	0.928026	1.000000	0.914807	0.862259	0.758288	0.8
r3	0.014263	0.843099	0.874358	0.914807	1.000000	0.772269	0.739808	0.(
r4	0.156730	0.967894	0.838893	0.862259	0.772269	1.000000	0.819686	0.9
r5	0.008746	0.779053	0.902357	0.758288	0.739808	0.819686	1.000000	0.8
r6	0.078534	0.893604	0.820267	0.834735	0.683599	0.936351	0.807417	1.(
r7	0.134347	0.843027	0.800133	0.780864	0.837076	0.847388	0.811944	0.7
r8	0.188715	0.948662	0.806011	0.838658	0.754123	0.979600	0.765015	0.8
r9	0.065188	0.827457	0.886674	0.790391	0.764939	0.859911	0.908614	0.7
r10	0.102202	0.860886	0.787954	0.820909	0.698767	0.892640	0.695586	0.8
r11	0.172795	0.796771	0.763521	0.756715	0.814951	0.788356	0.696688	0.(
r12	0.179868	0.908541	0.776521	0.806334	0.721701	0.924290	0.718594	0.8
r13	0.074840	0.822733	0.843763	0.764902	0.738184	0.838230	0.855968	0.7
r14	0.028335	0.787450	0.791578	0.759947	0.658551	0.809367	0.751011	0.8
r15	0.056096	0.746831	0.745869	0.718016	0.763804	0.726475	0.691399	0.(
pkt_get	0.038868	0.928516	0.944195	0.898233	0.833638	0.937455	0.912105	0.8
pkt_data	0.038957	0.929048	0.944010	0.898550	0.833667	0.938177	0.911528	0.8
pkt_put	0.151557	0.970968	0.875951	0.924178	0.870777	0.943584	0.772211	0.
pkt_ack	0.151576	0.971068	0.875429	0.924264	0.870371	0.943806	0.770952	0.8
inport_local	0.070300	0.970680	0.956778	0.936481	0.853645	0.957091	0.883817	0.9
inport_north	0.092394	0.920258	0.901315	0.855046	0.781116	0.957884	0.901952	0.9
inport_south	0.036279	0.955375	0.949886	0.950114	0.911695	0.927164	0.862797	0.8
inport_east	0.176981	0.951722	0.851538	0.870375	0.803435	0.968424	0.807444	0.8
inport_west	0.093501	0.968819	0.916082	0.960831	0.930476	0.919094	0.791908	0.8
outport_local	0.070297	0.970715	0.956777	0.936627	0.853811	0.957128	0.883655	0.9
outport_north	0.177002	0.951749	0.851558	0.870393	0.803472	0.968449	0.807479	0.8
outport_south	0.093503	0.968830	0.916106	0.960823	0.930422	0.919087	0.791940	0.8
outport_east	0.092382	0.920094	0.901163	0.854758	0.780908	0.957746	0.901946	0.9
outport_west	0.036273	0.955349	0.949885	0.950103	0.911616	0.927126	0.862834	0.8
target	0.000000	-0.005309	-0.053992	-0.020834	-0.018737	-0.007652	-0.061772	-0.(
tot_packets	0.093126	0.974987	0.938291	0.935989	0.872597	0.967581	0.871561	0.9
tot_mean	0.093126	0.974987	0.938291	0.935989	0.872597	0.967581	0.871561	0.9

34 rows × 34 columns

In [21]:

```
df_corr['target']
```

Out[21]:

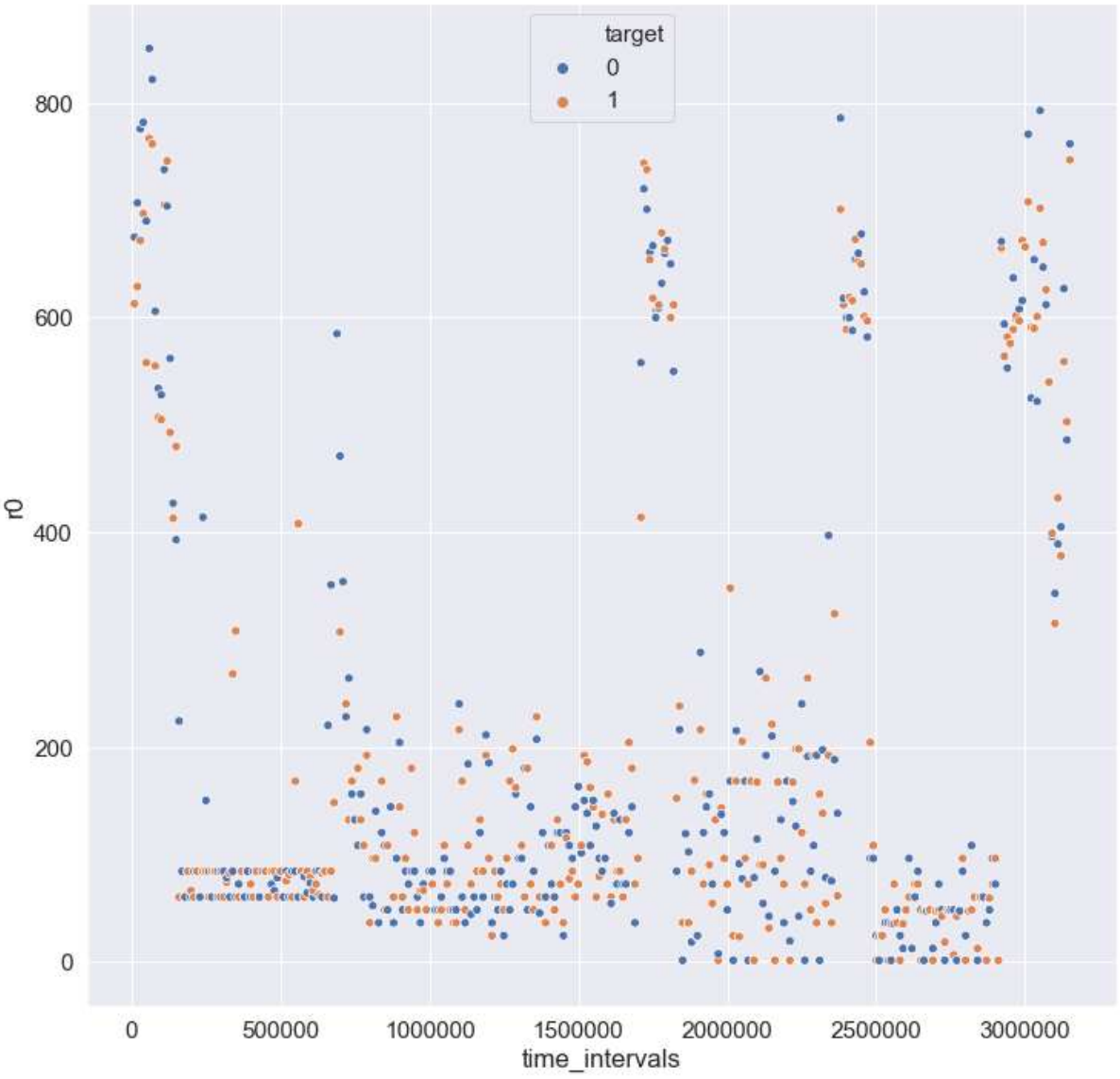
```
time_intervals    0.000000
r0               -0.005309
r1               -0.053992
r2               -0.020834
r3               -0.018737
r4               -0.007652
r5               -0.061772
r6               -0.019972
r7               -0.014347
r8               -0.001649
r9               -0.049409
r10              -0.015207
r11              -0.012263
r12               0.006575
r13              -0.021119
r14              -0.004152
r15              -0.000925
pkt_get          -0.026866
pkt_data         -0.026882
pkt_put          -0.014233
pkt_ack          -0.014278
inport_local     -0.030686
inport_north     -0.025127
inport_south     -0.017061
inport_east      -0.015180
inport_west      -0.014465
outport_local    -0.030690
outport_north    -0.015172
outport_south    -0.014466
outport_east     -0.025125
outport_west     -0.017060
target            1.000000
tot_packets      -0.022066
tot_mean         -0.022066
Name: target, dtype: float64
```

In [22]:

```
dff = pd.read_csv('wat-time-interval-10000.csv')
```

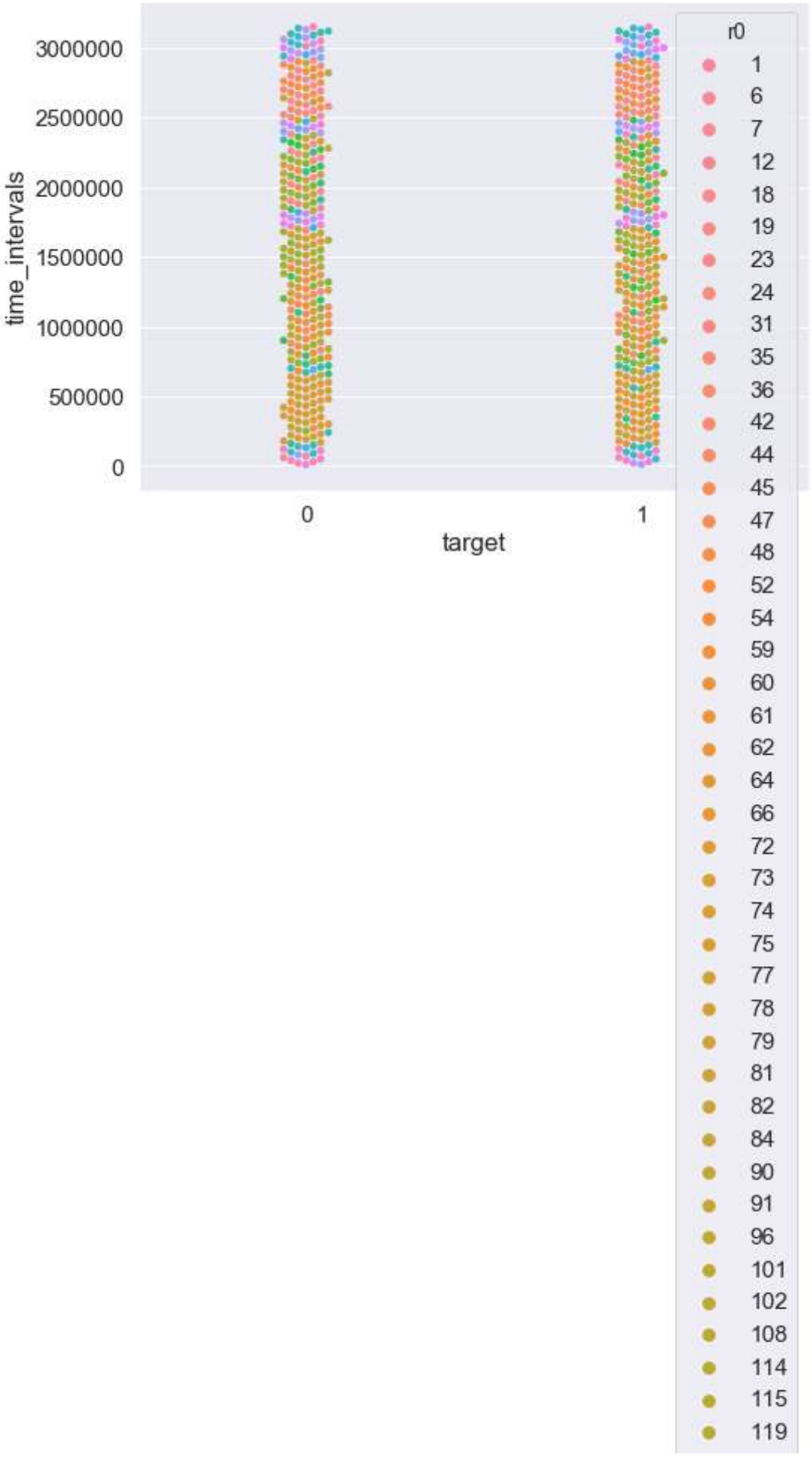
In [23]:

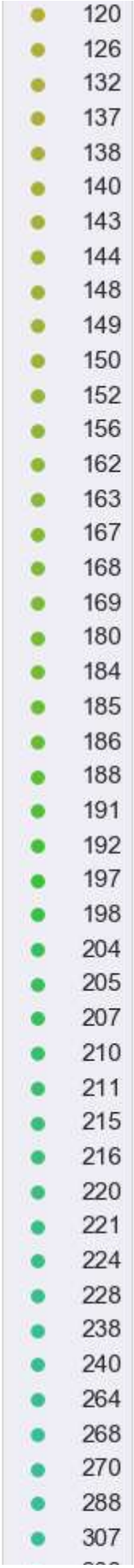
```
plt.figure(figsize=(12,12))
sns.scatterplot(x='time_intervals',y='r0',data=dff, hue='target')
plt.show()
```



In [24]:

```
plt.figure(figsize=(8,6))
sns.swarmplot(x='target',y='time_intervals',data=dff, hue='r0')
plt.show()
```


time_intervals
3000000
2500000
2000000
1500000
1000000
500000
0
0
1
target
r0
1
6
7
12
18
19
23
24
31
35
36
42
44
45
47
48
52
54
59
60
61
62
64
66
72
73
74
75
77
78
79
81
82
84
90
91
96
101
102
108
114
115
119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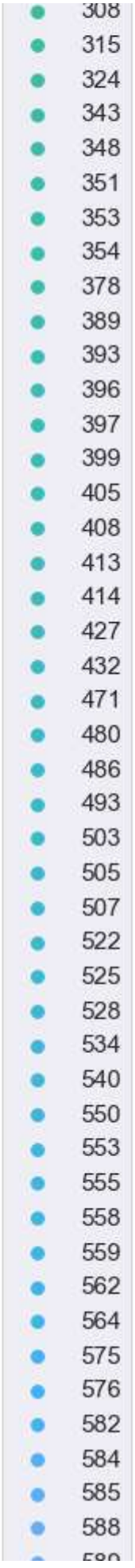
308
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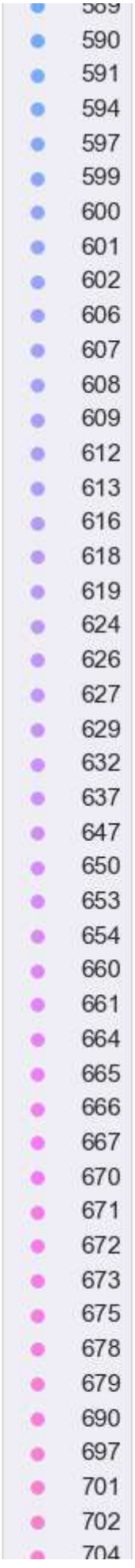
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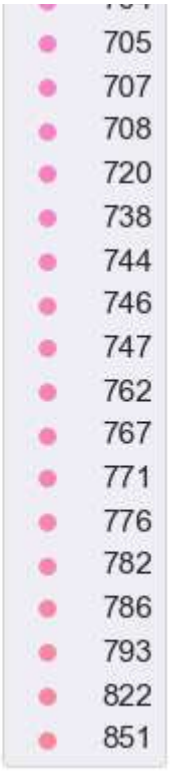
705
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744
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762
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782
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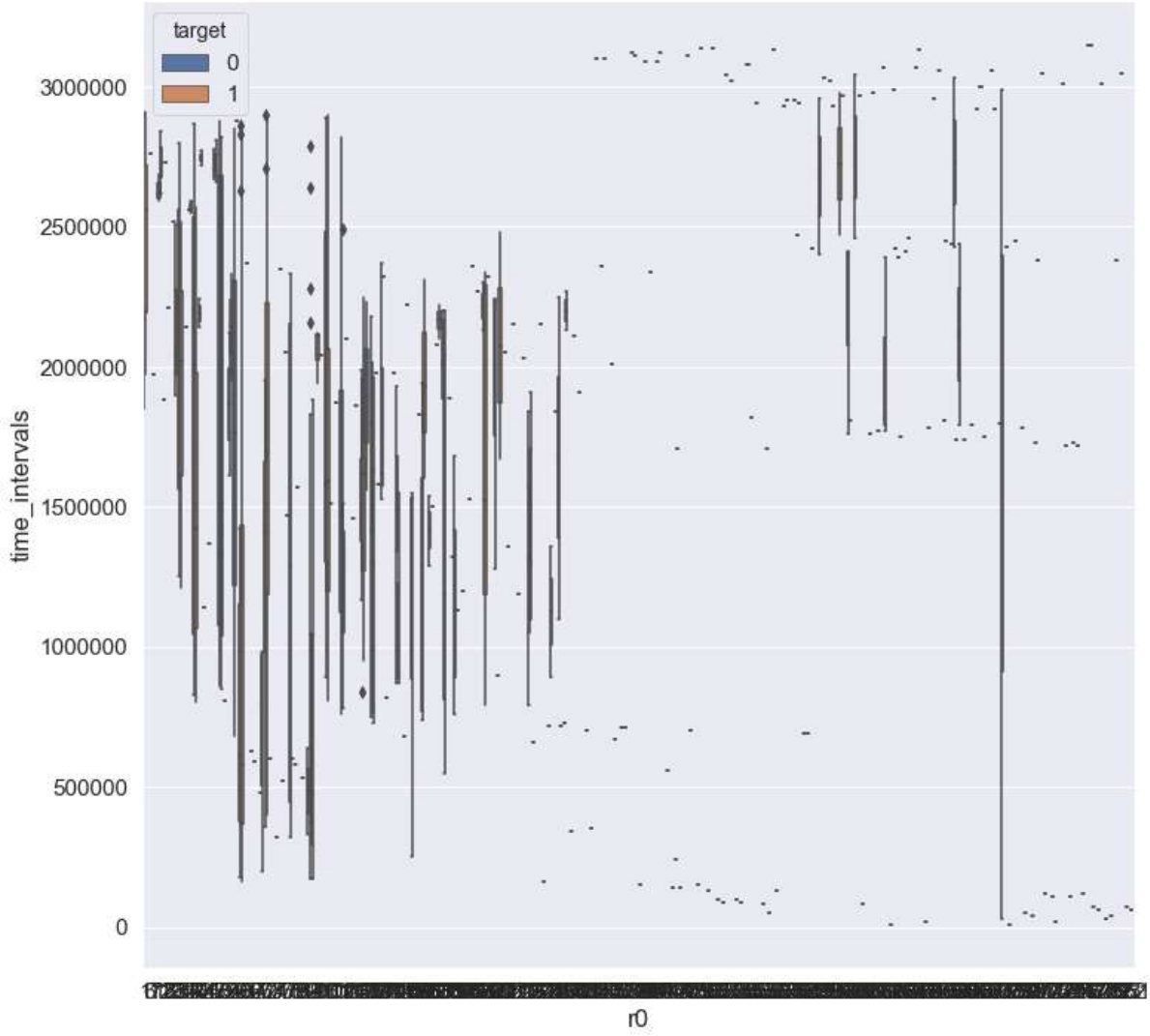
793
822
851

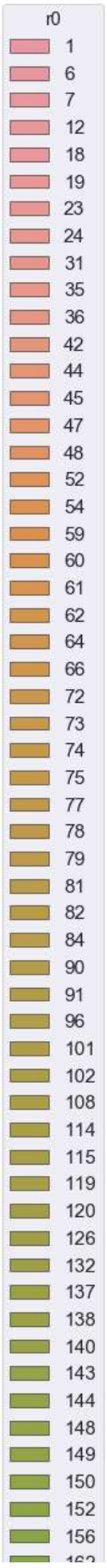
In [25]:

```
plt.figure(figsize=(12,12))
sns.boxplot(x='r0',y='time_intervals',data=dff, hue='target')
plt.show()
```


target
0
1
3000000
2500000
2000000
1500000
1000000
500000
0
time_intervals
r0

In [26]:

```
plt.figure(figsize=(12,12))
sns.boxplot(x='target',y='time_intervals',data=dff, hue='r0')
plt.show()
```


r0
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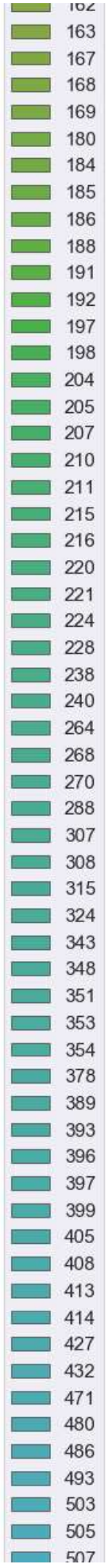
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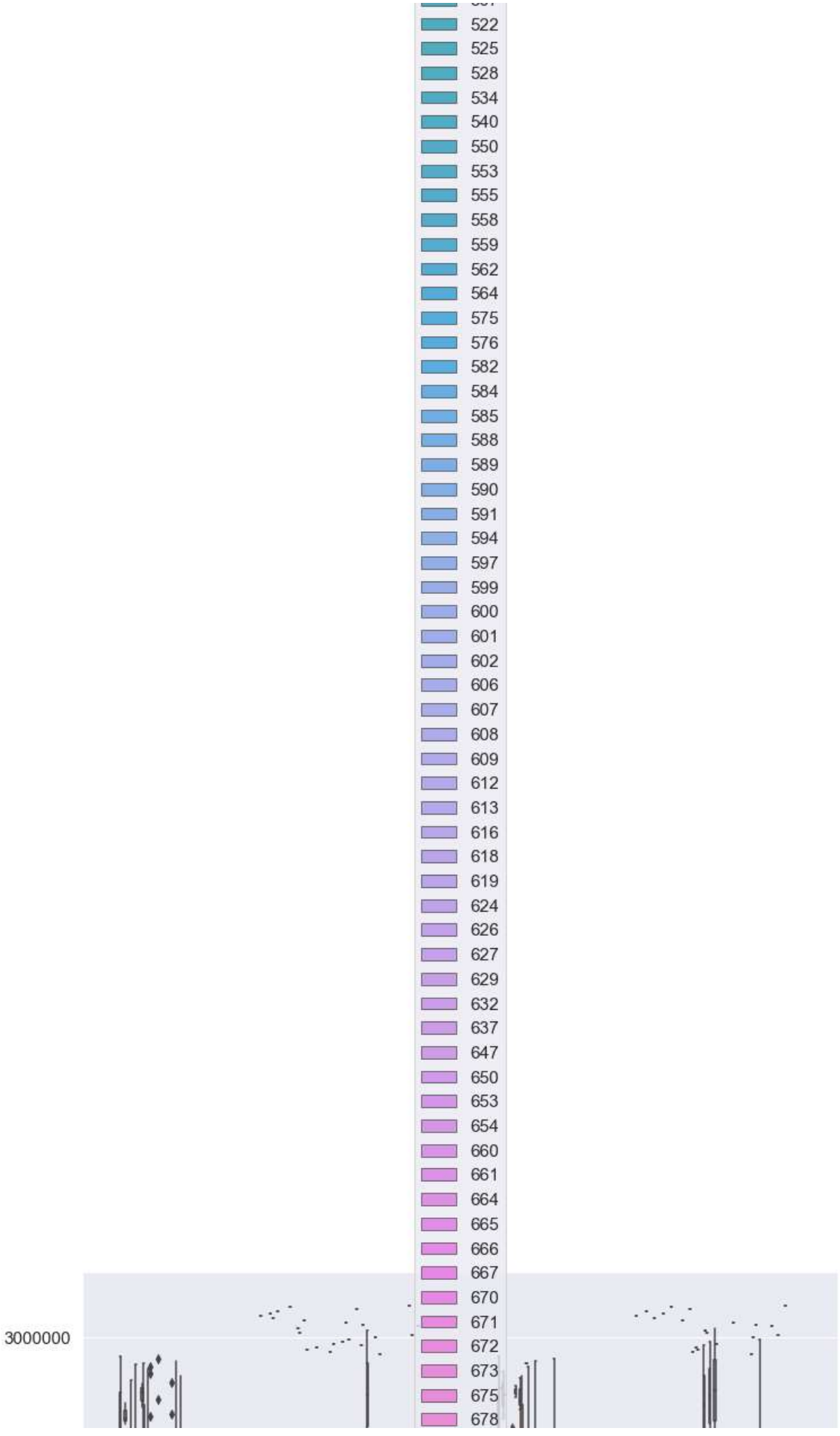
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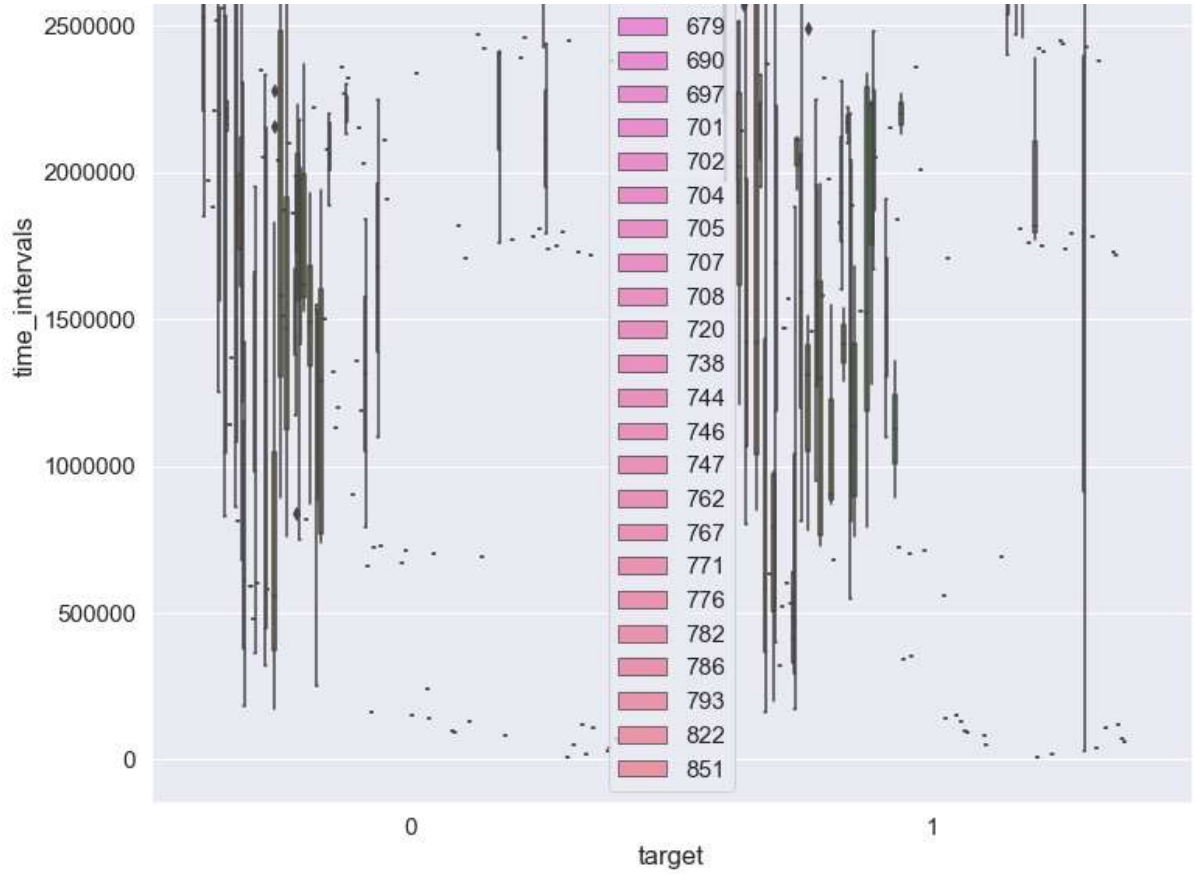
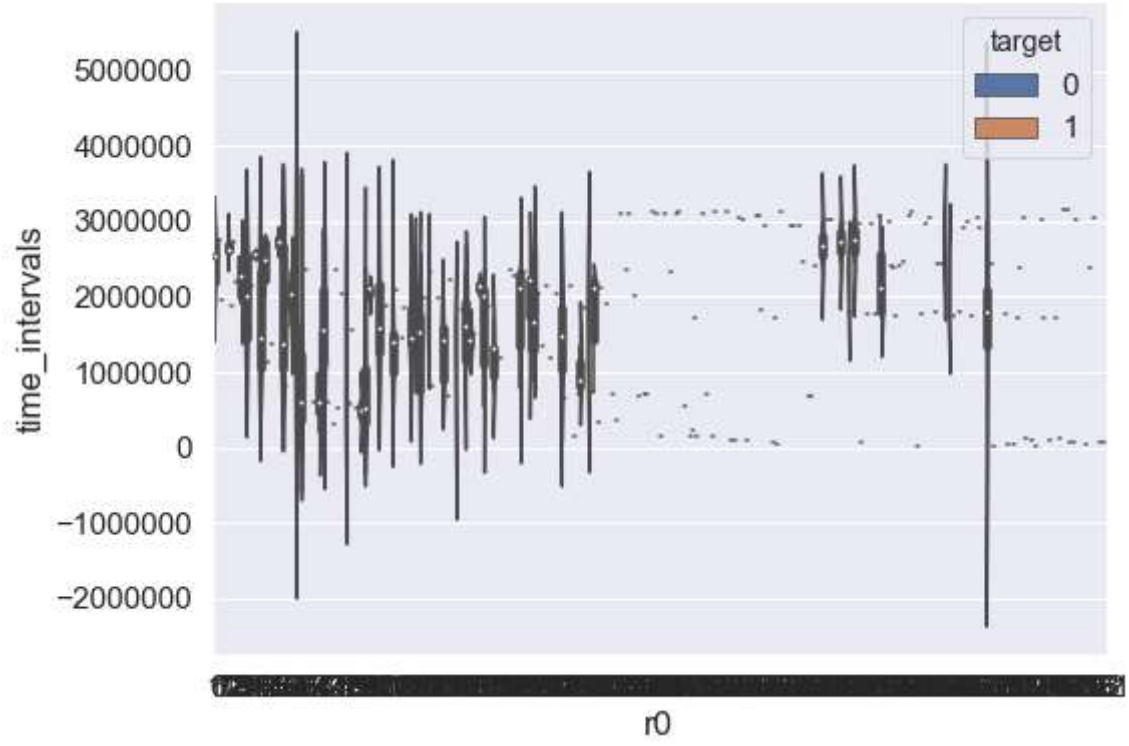


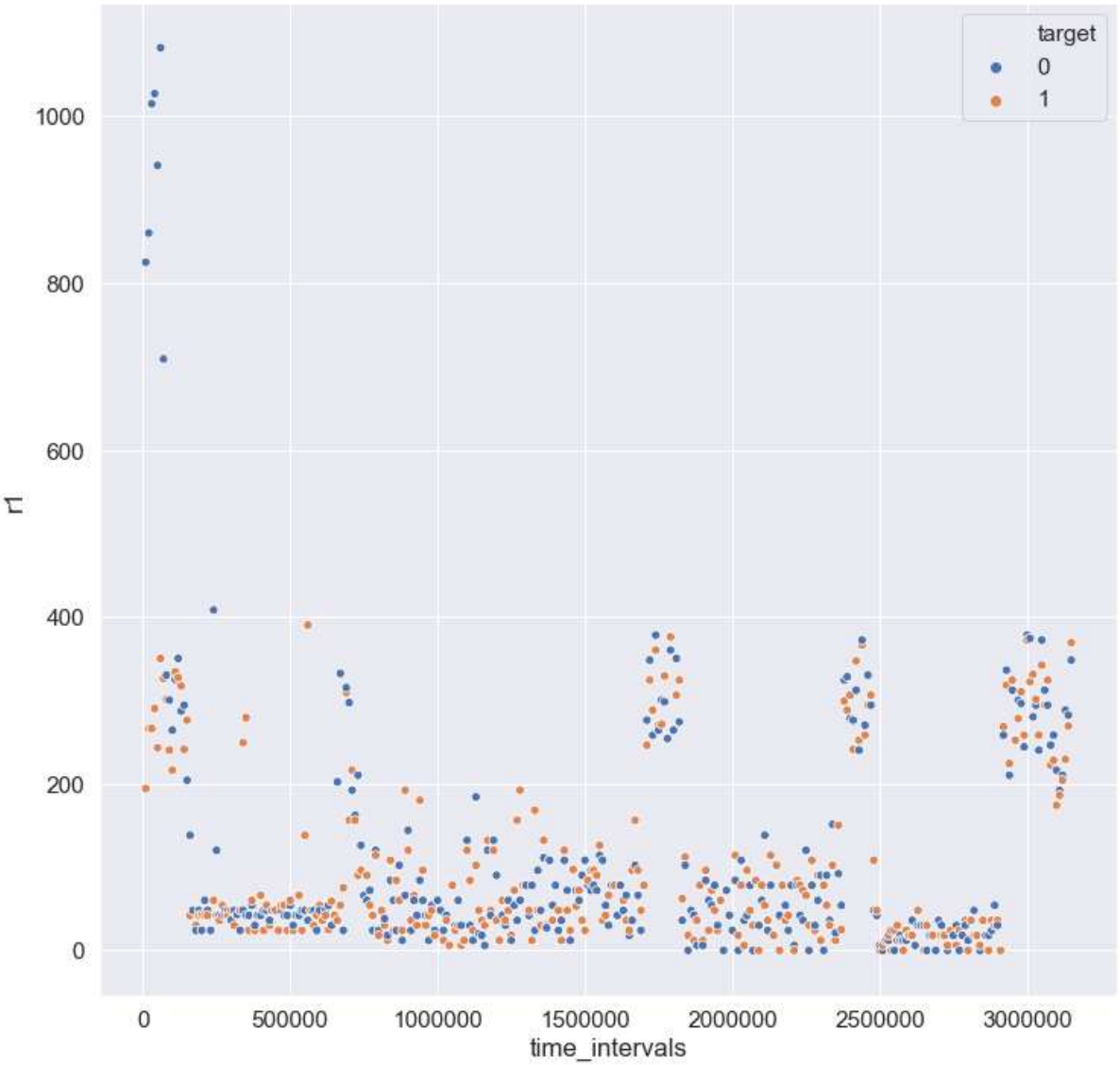
In [27]:

```
plt.figure(figsize=(8,6))
sns.violinplot(x='r0',y='time_intervals',data=dff, hue='target', split=True)
plt.show()
```



In [28]:

```
plt.figure(figsize=(12,12))
sns.scatterplot(x='time_intervals',y='r1',data=dff, hue='target')
plt.show()
```



In [29]:

```
plt.figure(figsize=(8,6))
sns.swarmplot(x='target',y='time_intervals',data=dff, hue='r1')
plt.show()
```


r1
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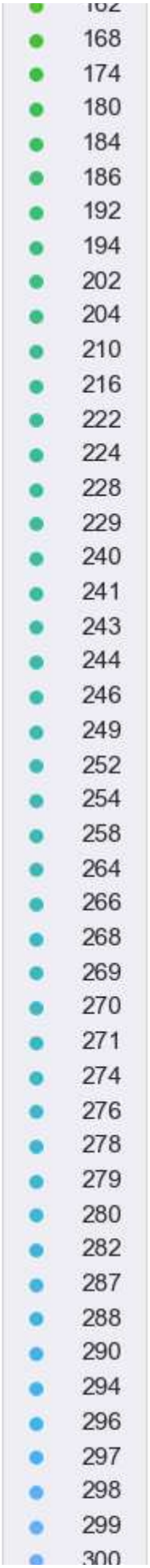
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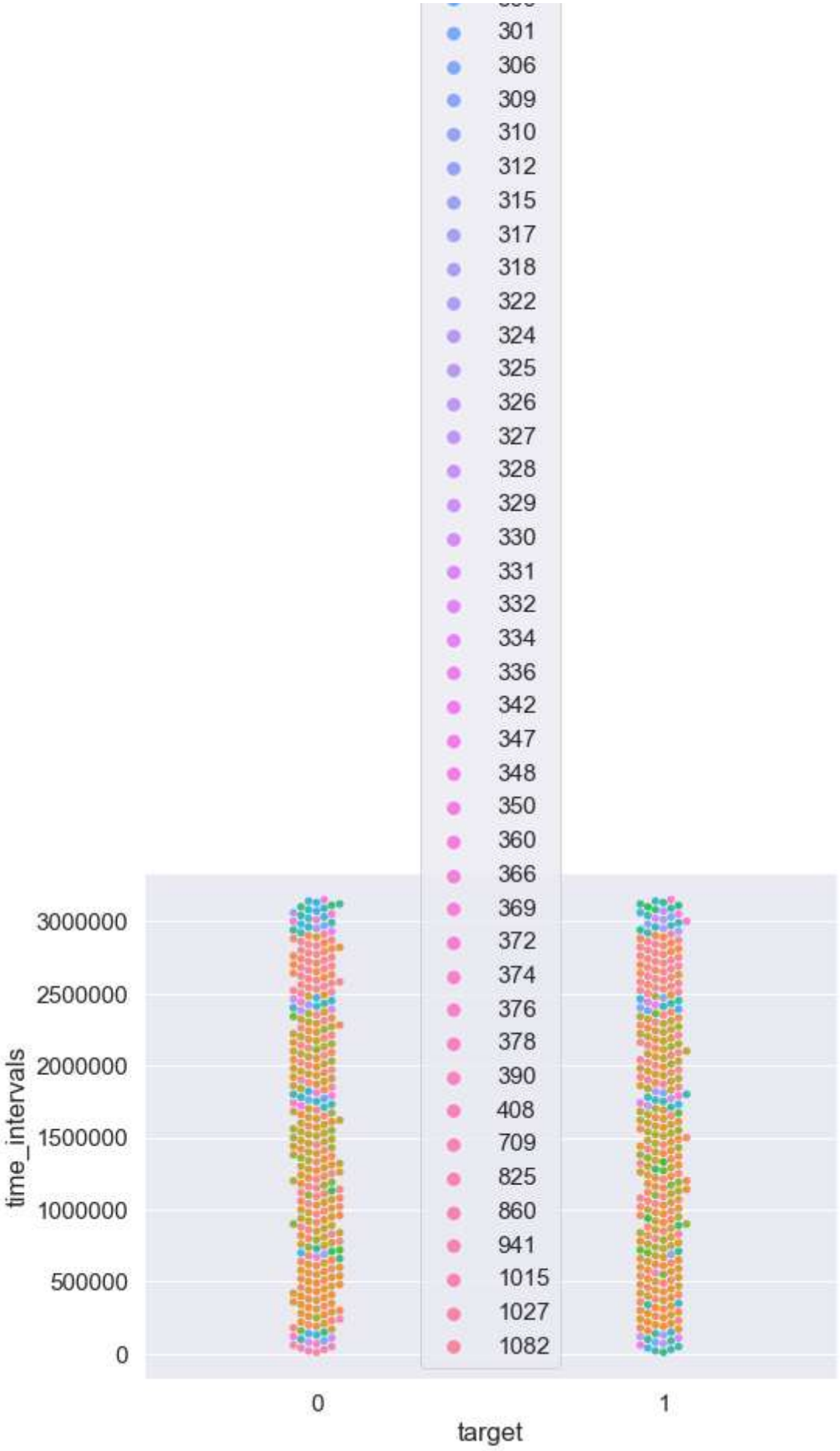
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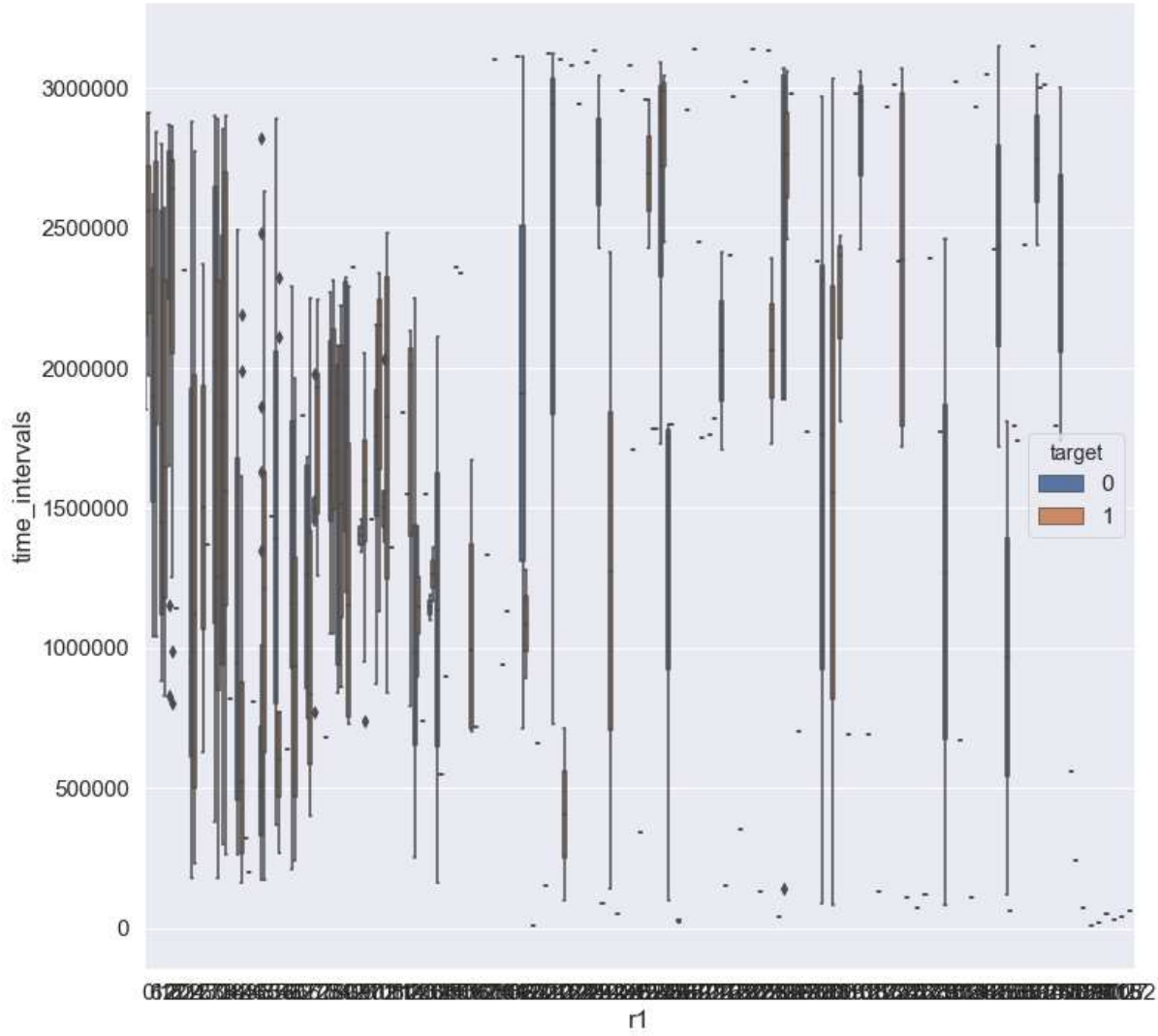
372
374
376
378
390
408
709
825
860
941
1015
1027
1082
3000000
2500000
2000000
1500000
1000000
500000
0
time_intervals
0
1
target

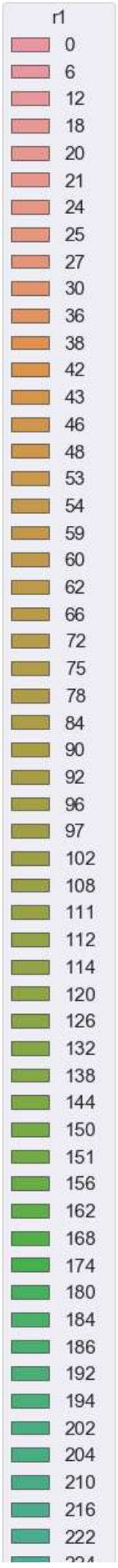
In [30]:

```
plt.figure(figsize=(12,12))
sns.boxplot(x='r1',y='time_intervals',data=dff, hue='target')
plt.show()
```



In [31]:

```
plt.figure(figsize=(12,12))
sns.boxplot(x='target',y='time_intervals',data=dff, hue='r1')
plt.show()
```


r1
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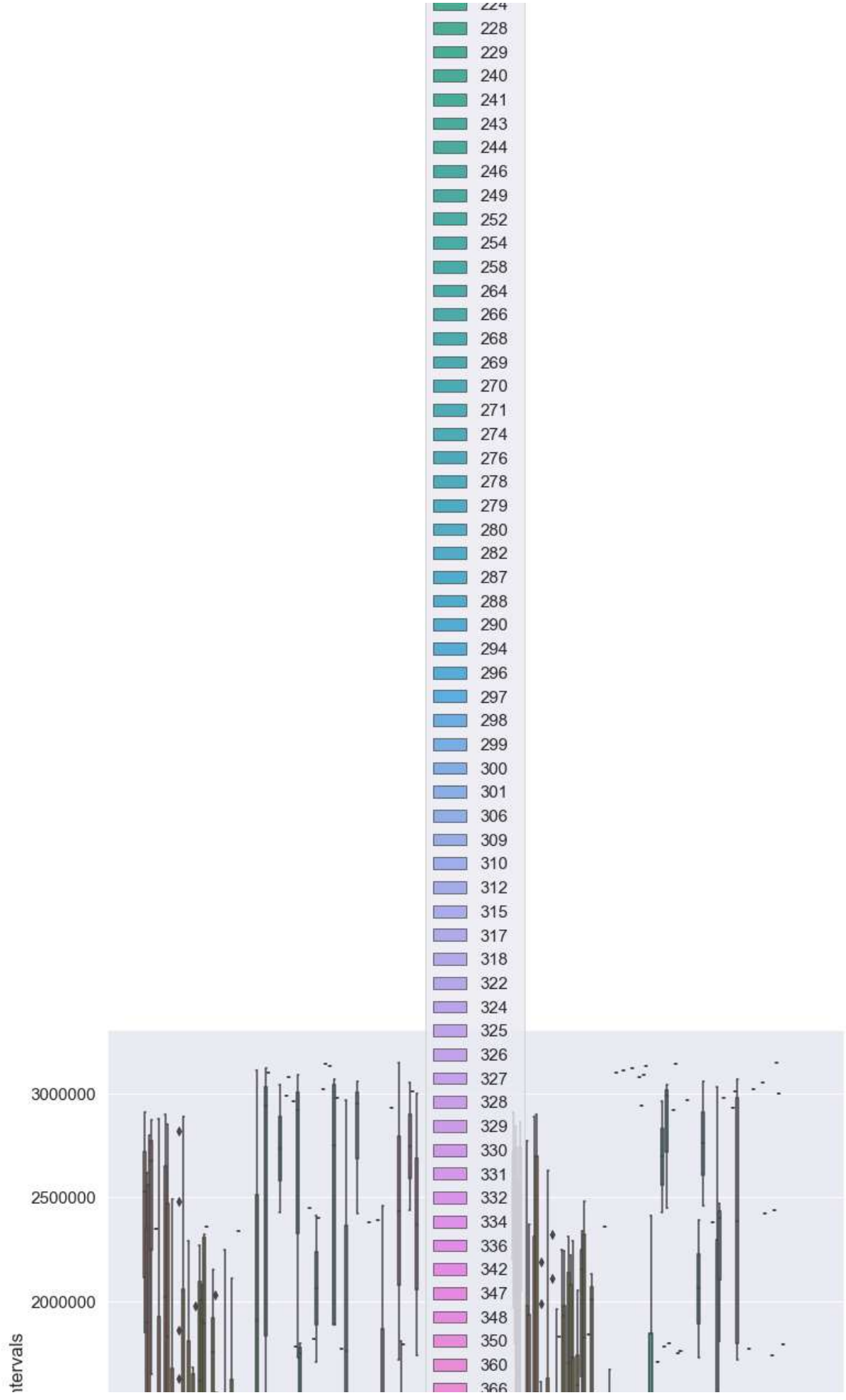
224
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360
366
3000000
2500000
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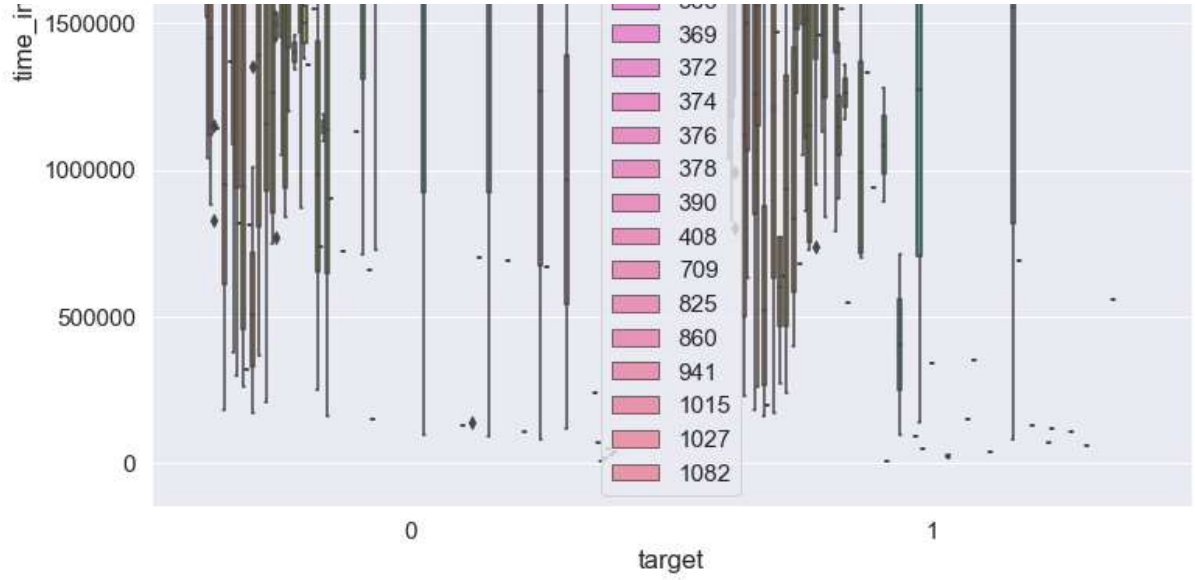
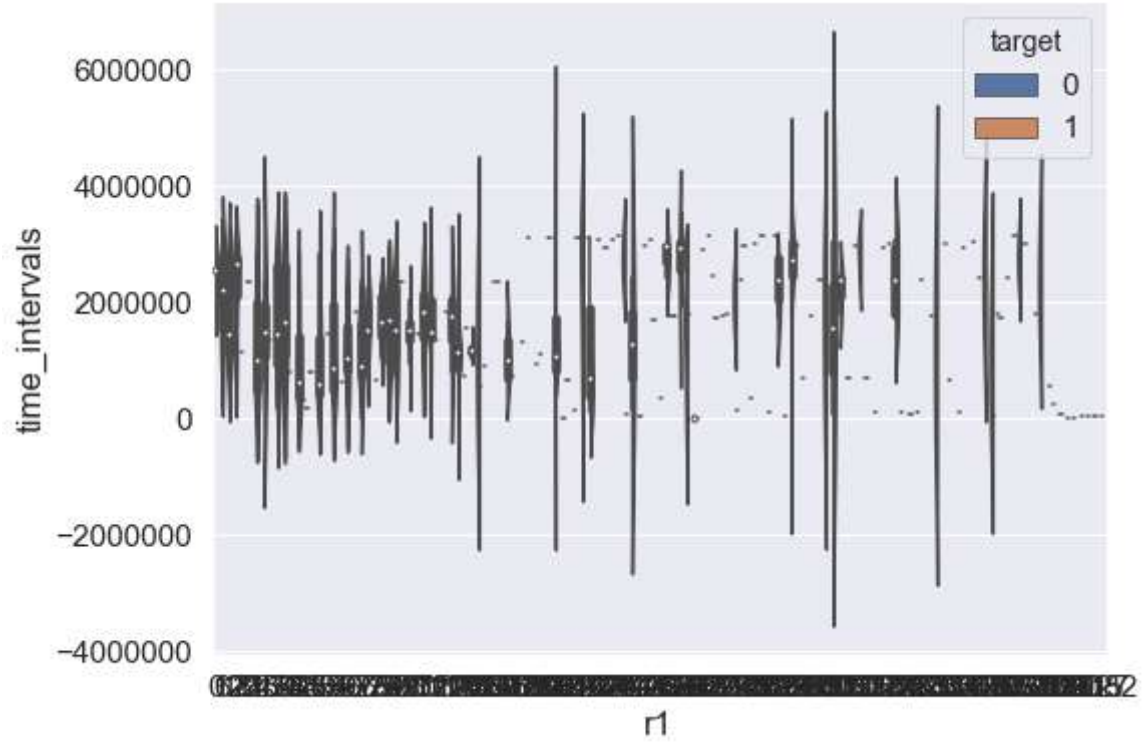
tervals



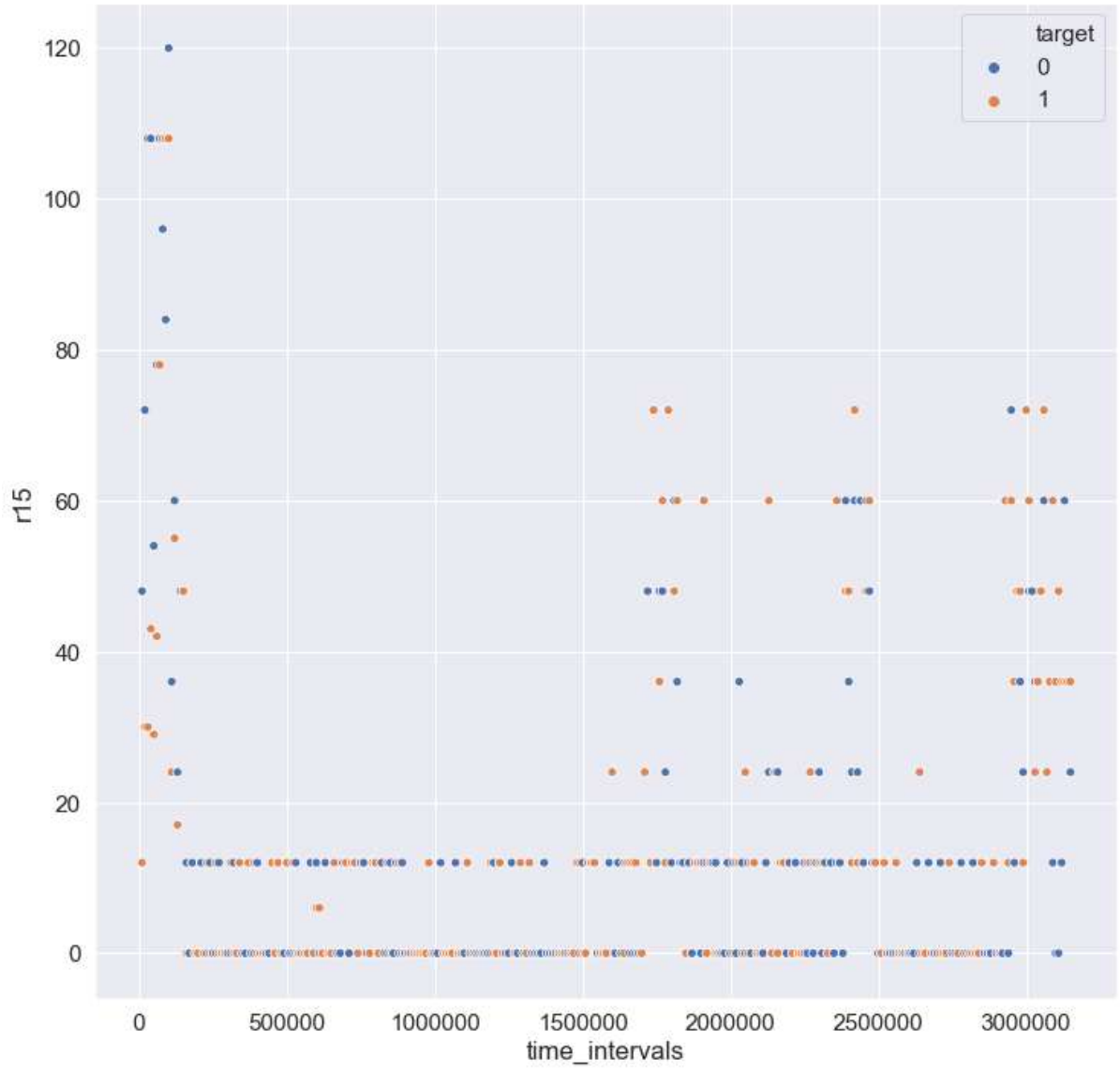
In [32]:

```
plt.figure(figsize=(8,6))
sns.violinplot(x='r1',y='time_intervals',data=dff, hue='target', split=True)
plt.show()
```



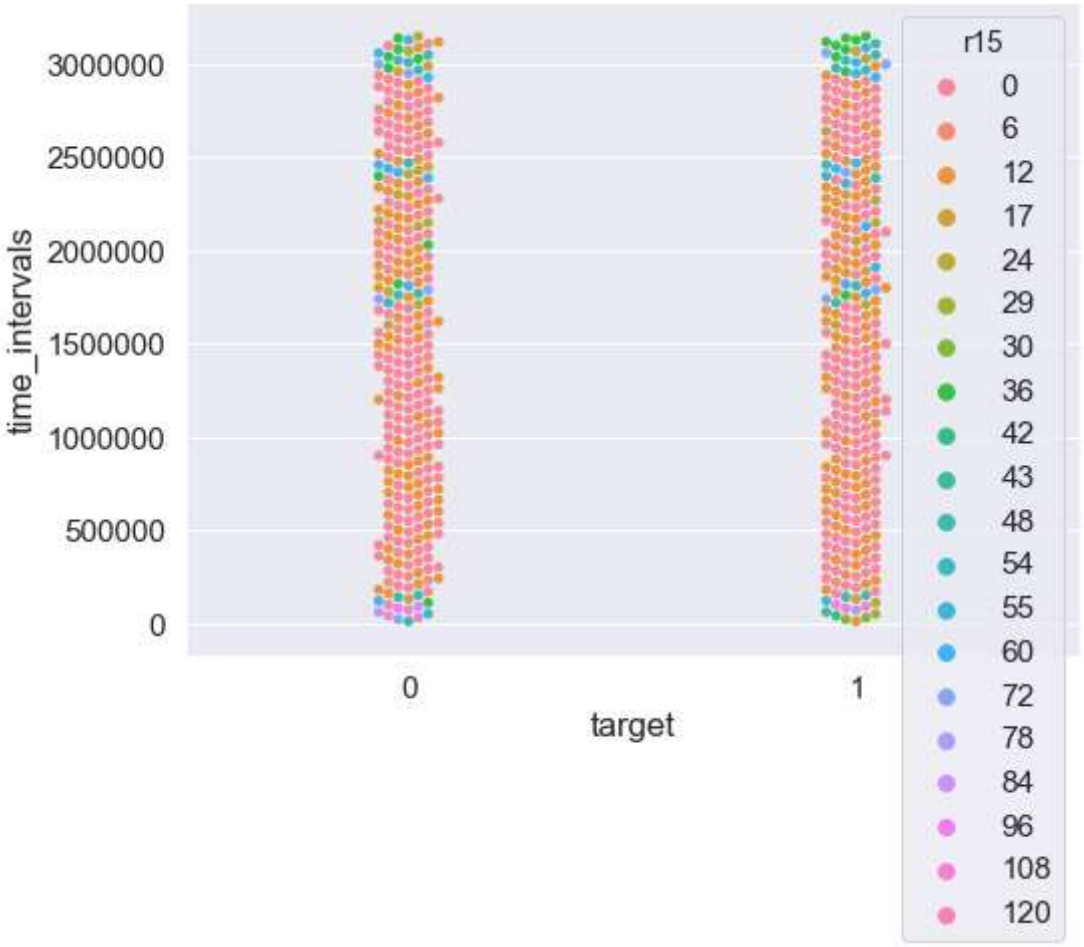
In [33]:

```
plt.figure(figsize=(12,12))
sns.scatterplot(x='time_intervals',y='r15',data=dff, hue='target')
plt.show()
```



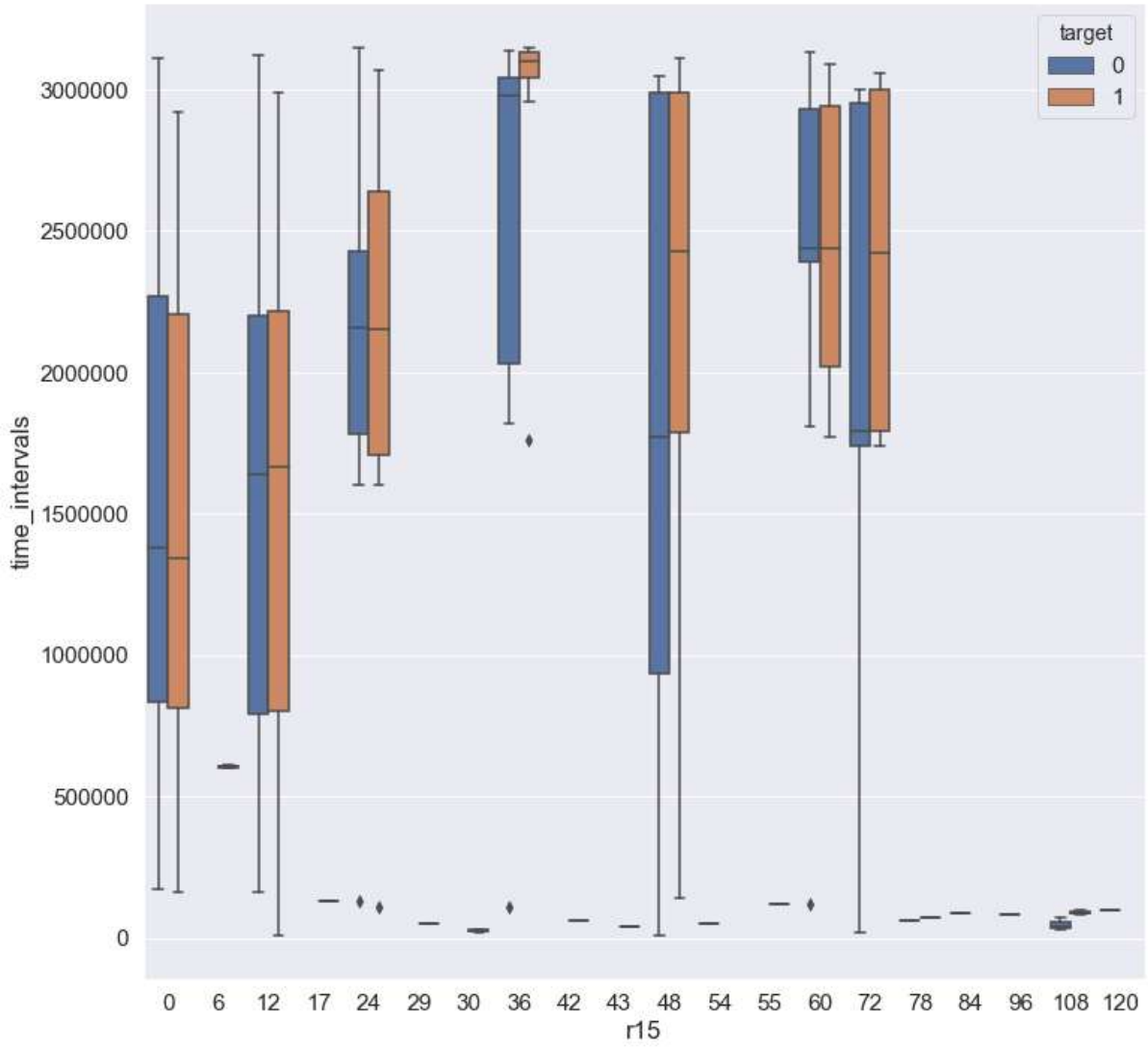
In [34]:

```
plt.figure(figsize=(8,6))
sns.swarmplot(x='target',y='time_intervals',data=dff, hue='r15')
plt.show()
```



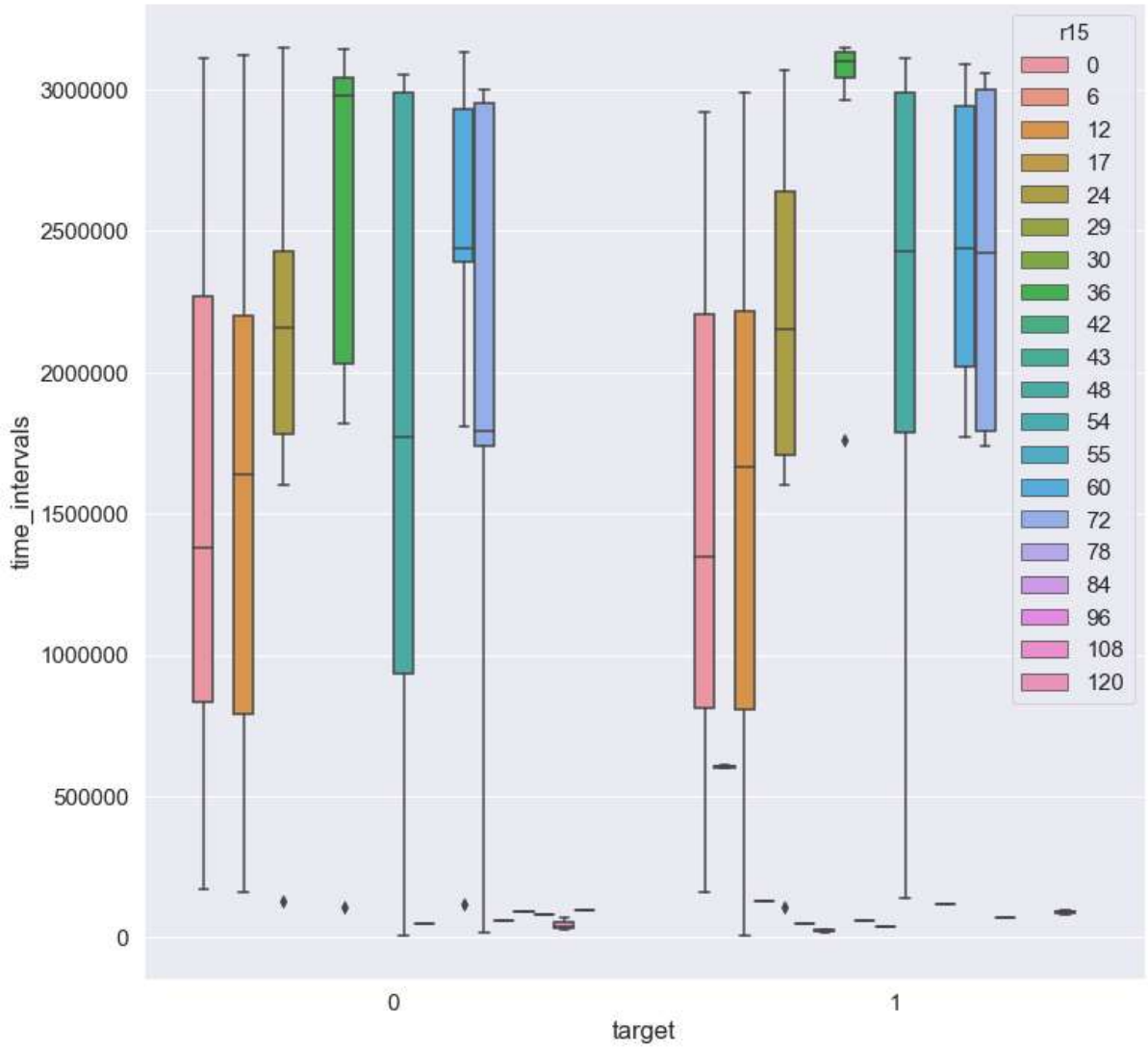
In [35]:

```
plt.figure(figsize=(12,12))
sns.boxplot(x='r15',y='time_intervals',data=dff, hue='target')
plt.show()
```



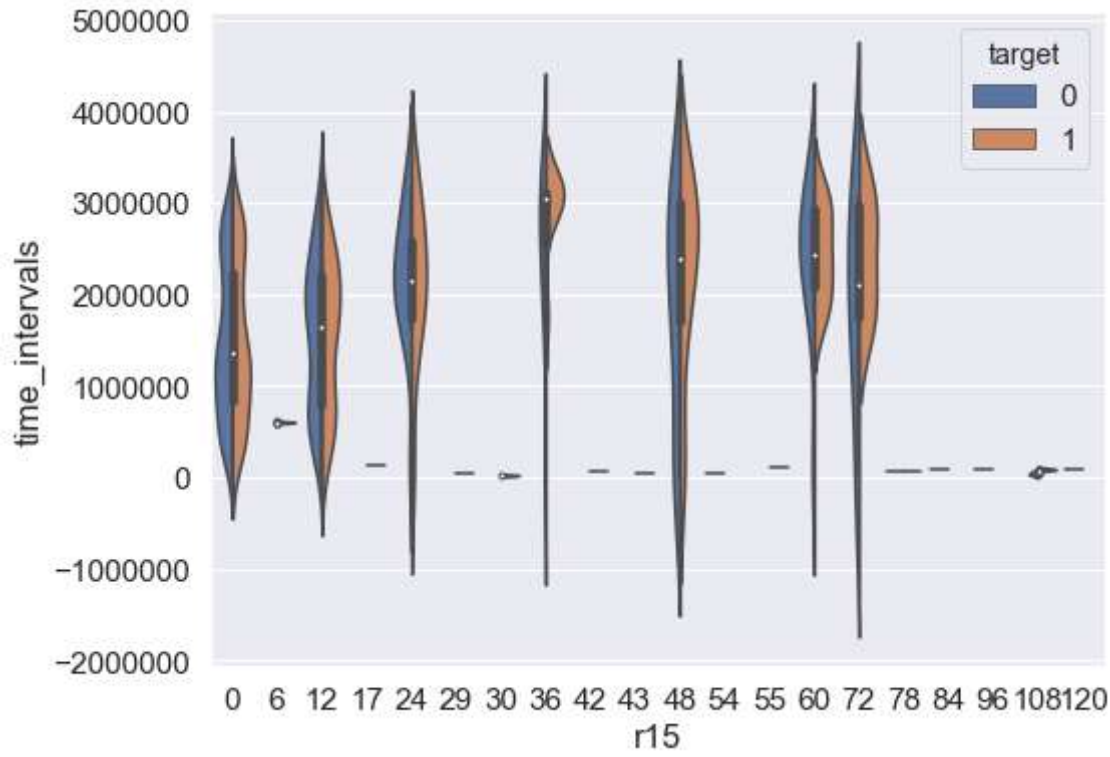
In [36]:

```
plt.figure(figsize=(12,12))
sns.boxplot(x='target',y='time_intervals',data=dff, hue='r15')
plt.show()
```



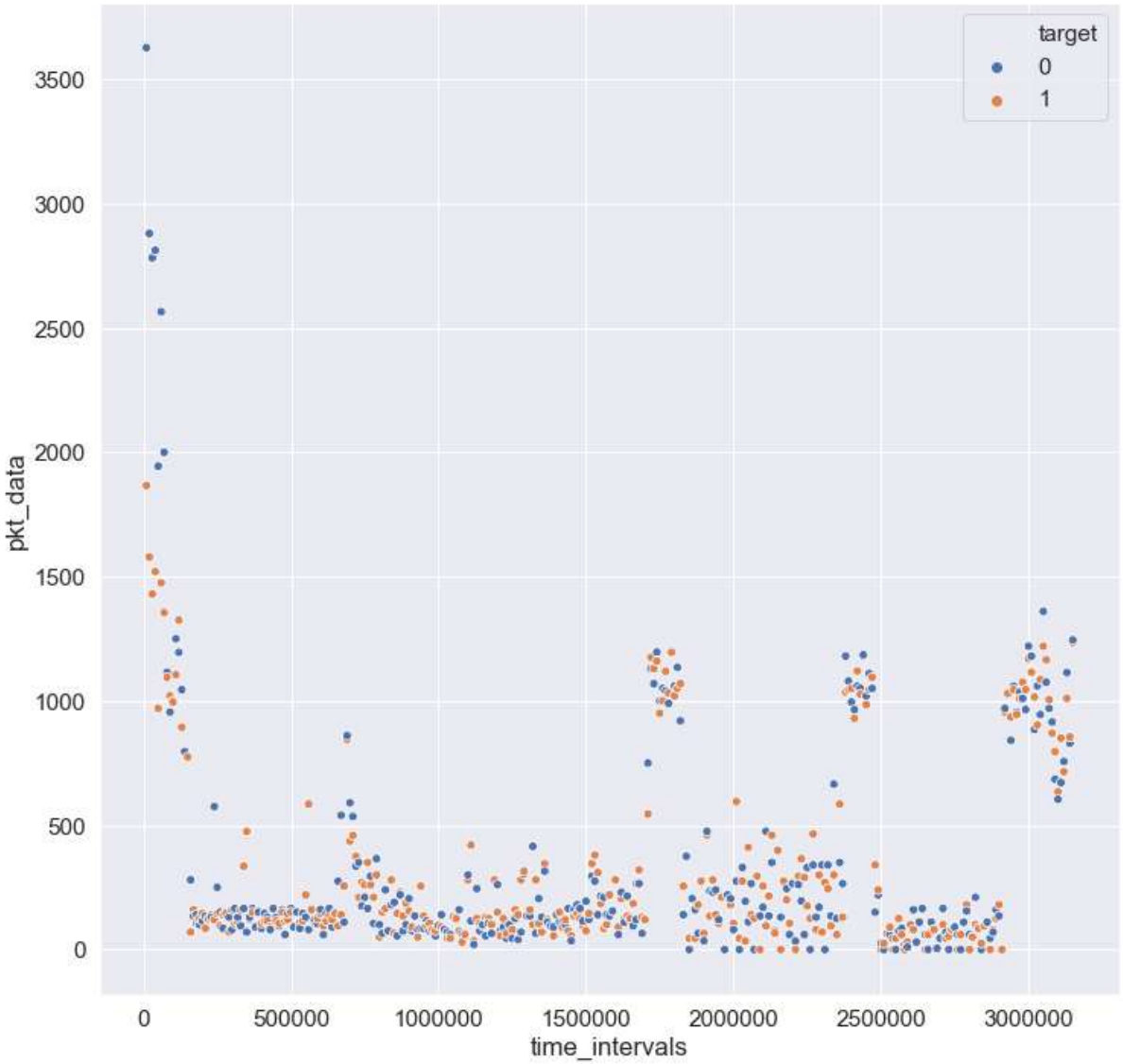
In [37]:

```
plt.figure(figsize=(8,6))
sns.violinplot(x='r15',y='time_intervals',data=dff, hue='target', split=True)
plt.show()
```



In [38]:

```
plt.figure(figsize=(12,12))
sns.scatterplot(x='time_intervals',y='pkt_data',data=dff, hue='target')
plt.show()
```



In [39]:

```
plt.figure(figsize=(8,6))
sns.swarmplot(x='target',y='time_intervals',data=dff, hue='pkt_data')
plt.show()
```


pkt_data
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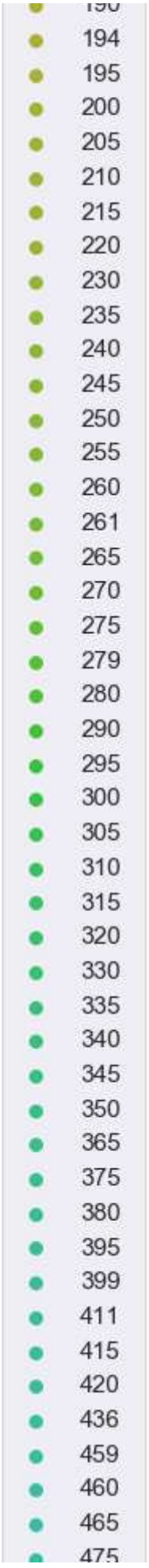
194
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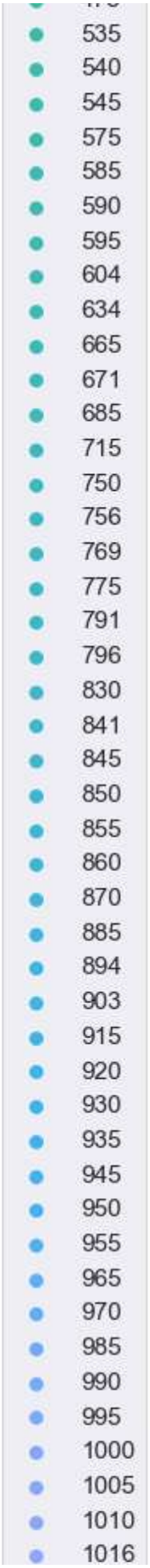
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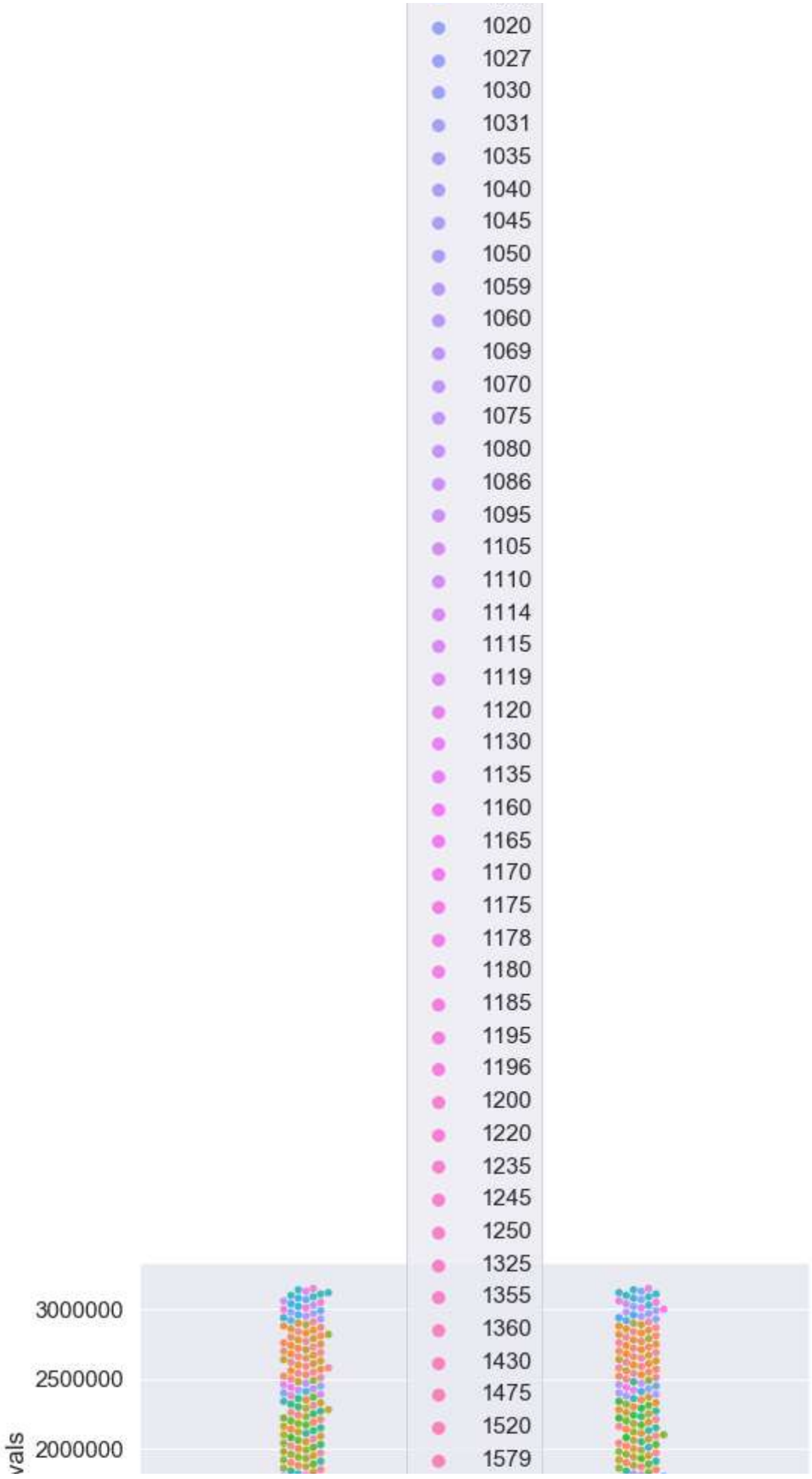
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1200
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1579
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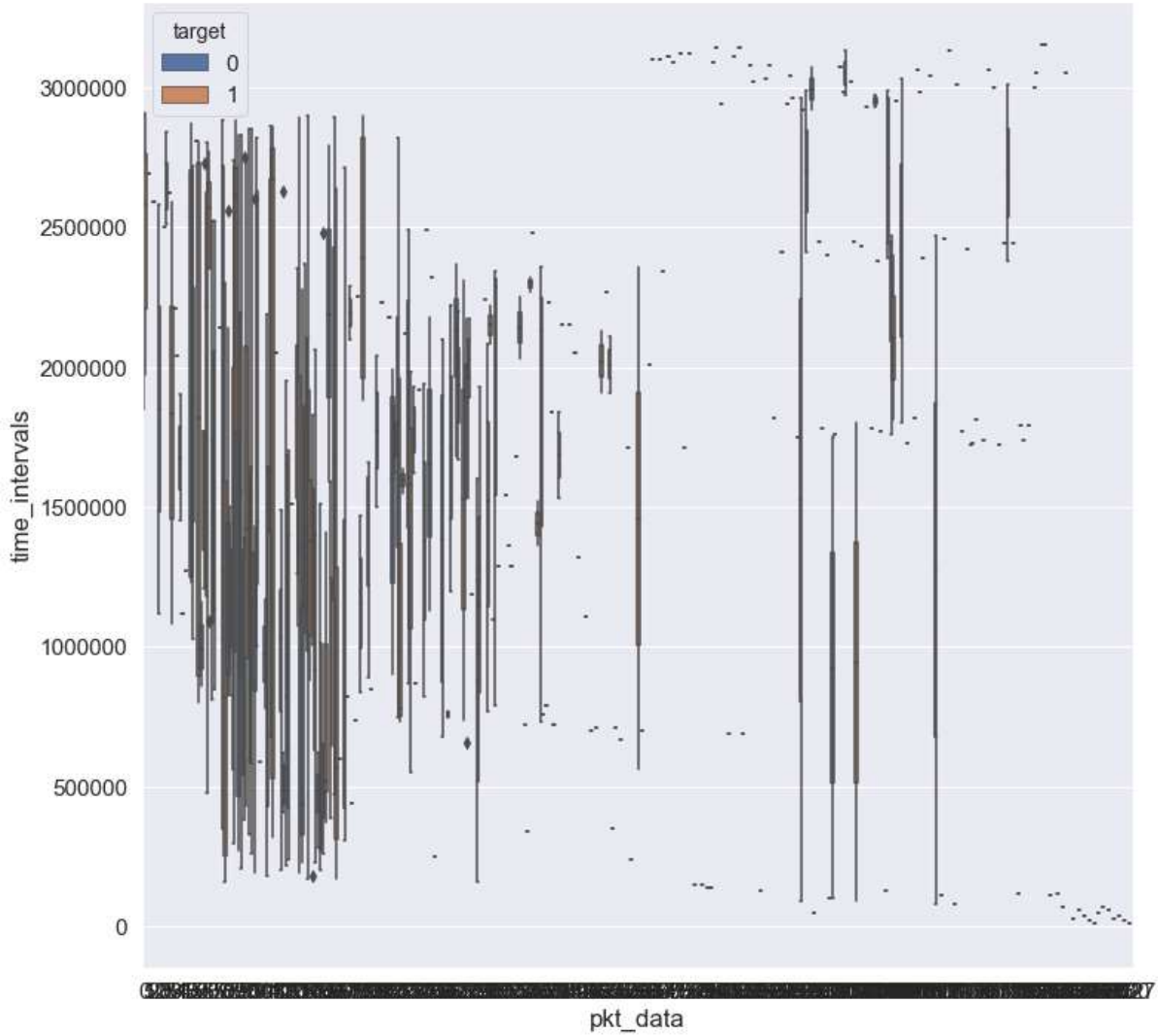
2500000
2000000
vals

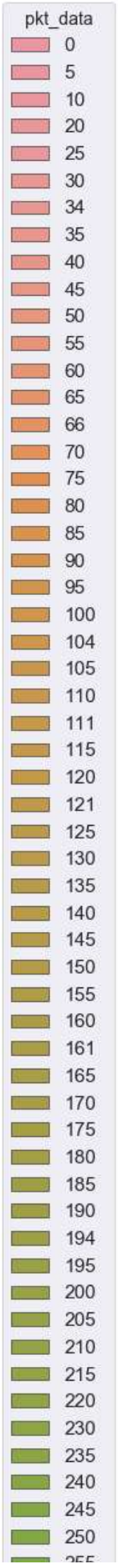
In [40]:

```
plt.figure(figsize=(12,12))
sns.boxplot(x='pkt_data',y='time_intervals',data=dff, hue='target')
plt.show()
```



In [41]:

```
plt.figure(figsize=(12,12))
sns.boxplot(x='target',y='time_intervals',data=dff, hue='pkt_data')
plt.show()
```


pkt_data
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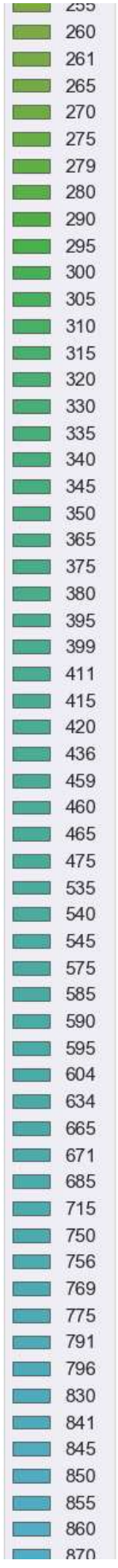
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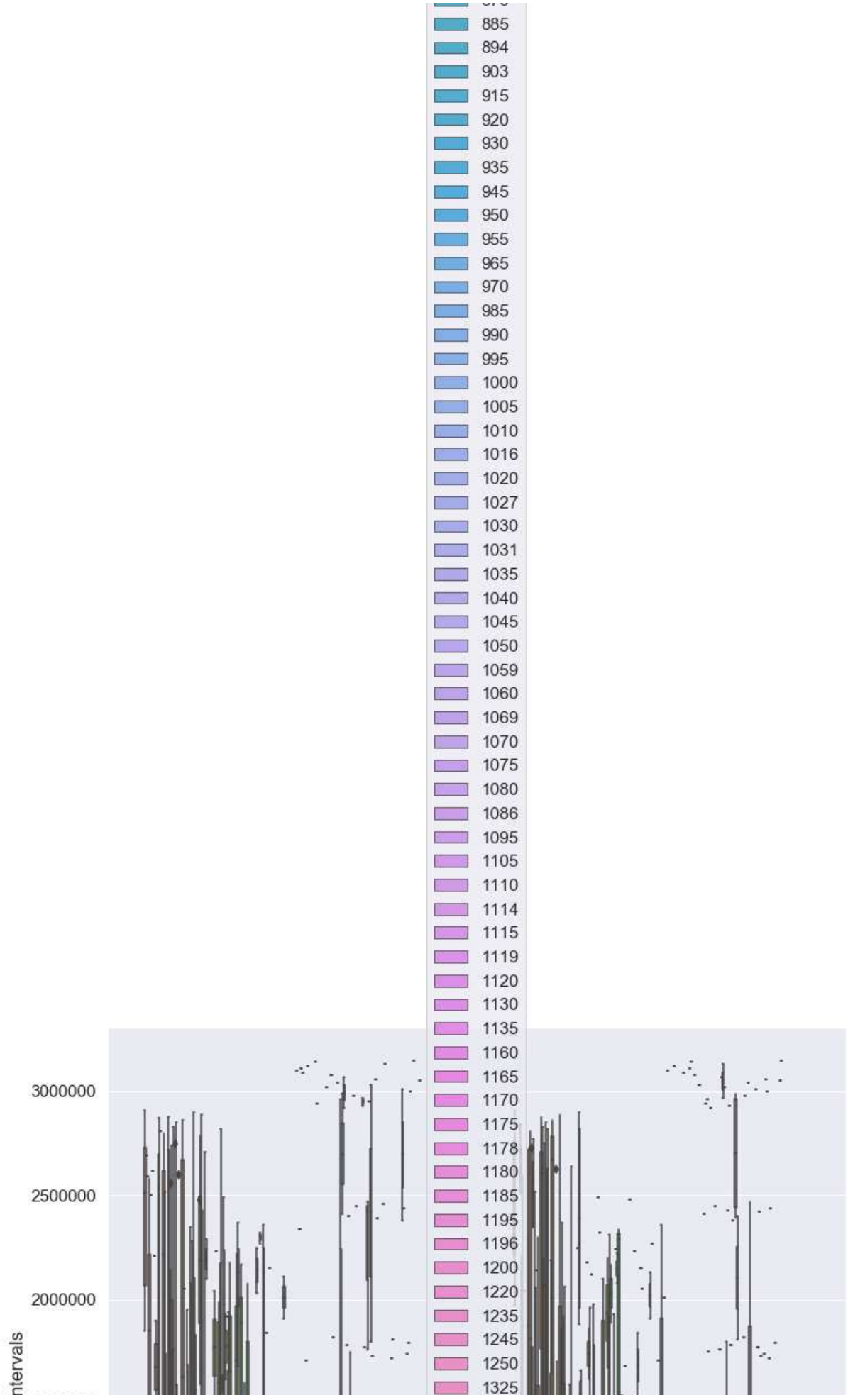
885
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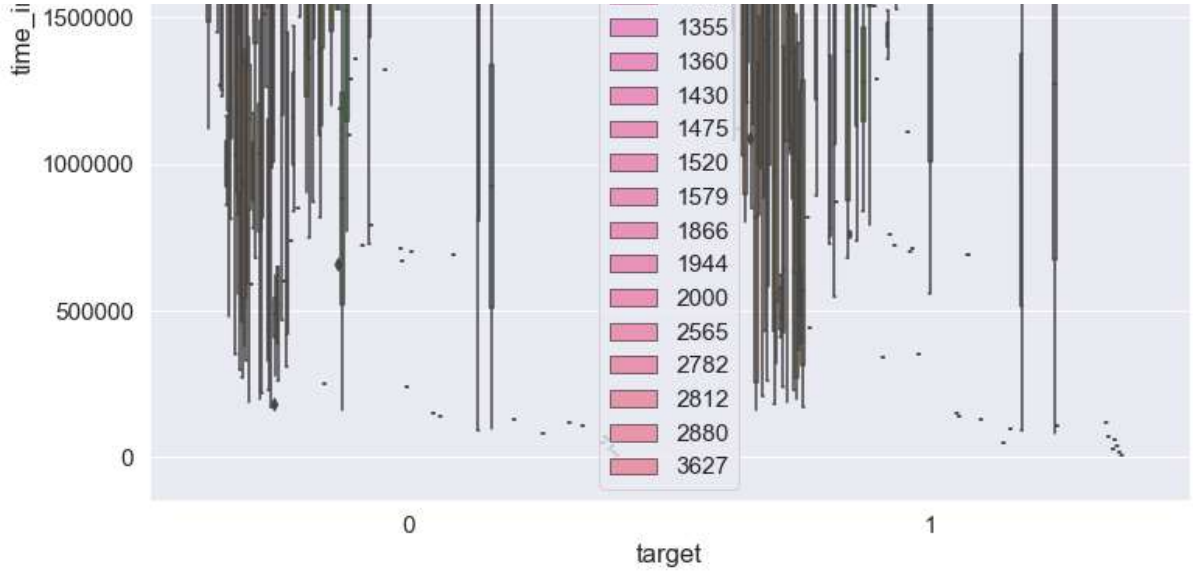
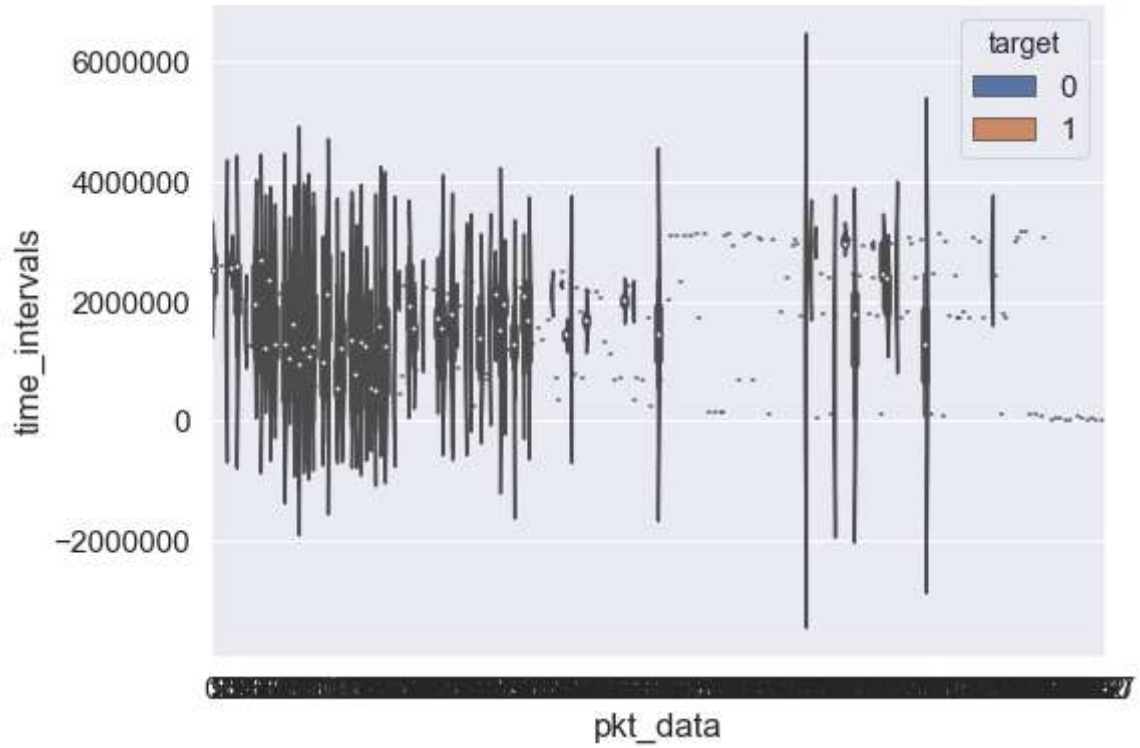
ntervals



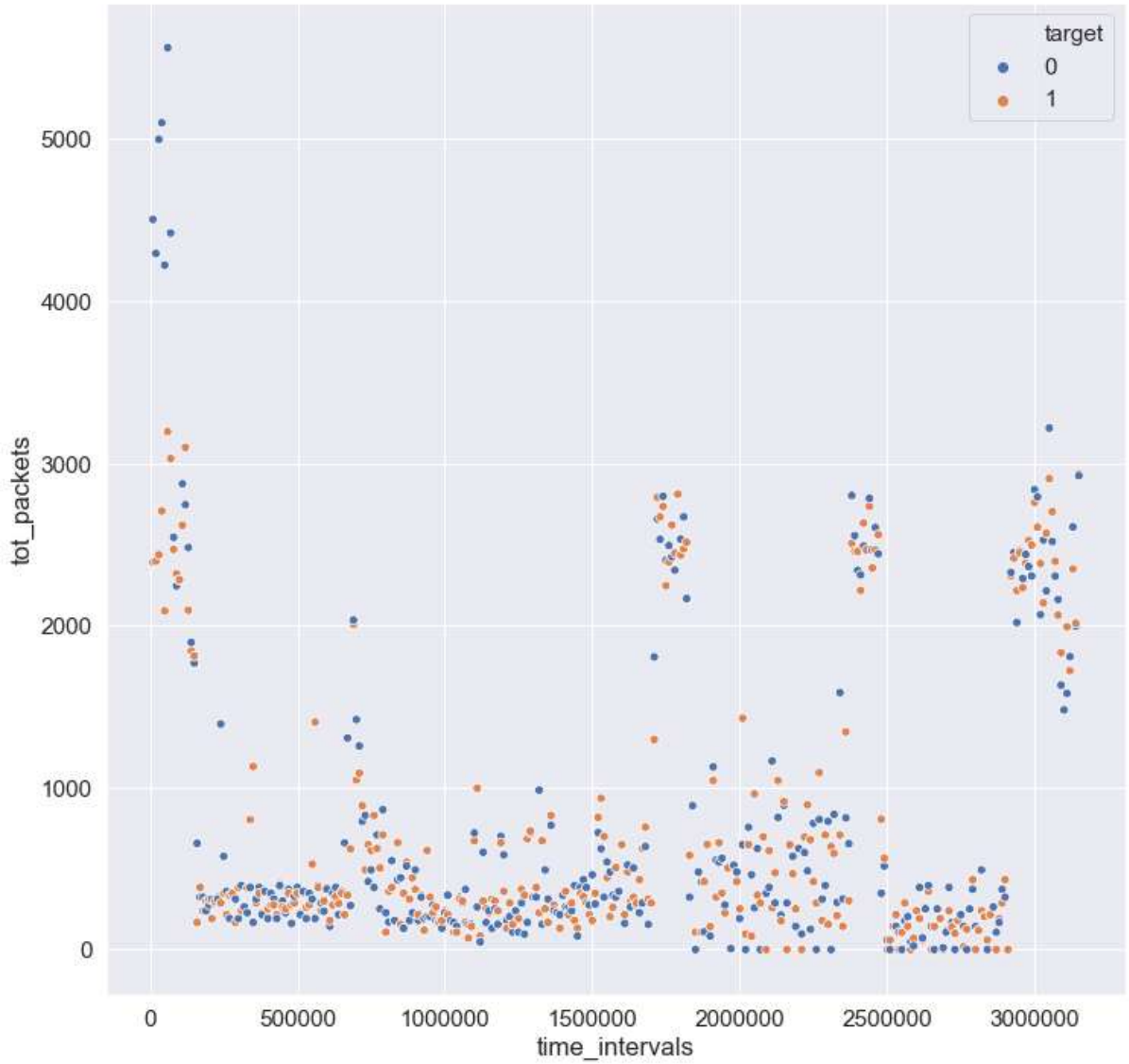
In [42]:

```
plt.figure(figsize=(8,6))
sns.violinplot(x='pkt_data',y='time_intervals',data=dff, hue='target', split=True)
plt.show()
```



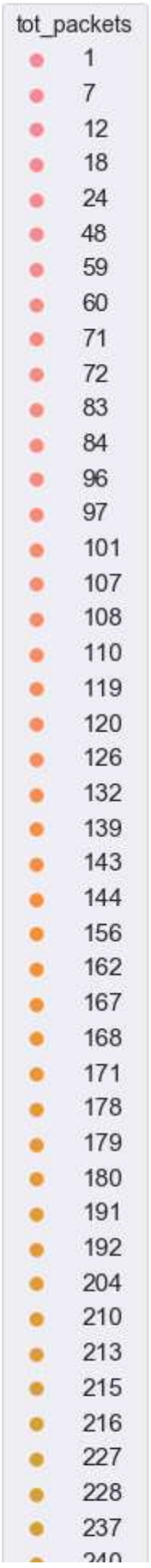
In [43]:

```
plt.figure(figsize=(12,12))
sns.scatterplot(x='time_intervals',y='tot_packets',data=dff, hue='target')
plt.show()
```



In [44]:

```
plt.figure(figsize=(8,6))
sns.swarmplot(x='target',y='time_intervals',data=dff, hue='tot_packets')
plt.show()
```


tot_packets
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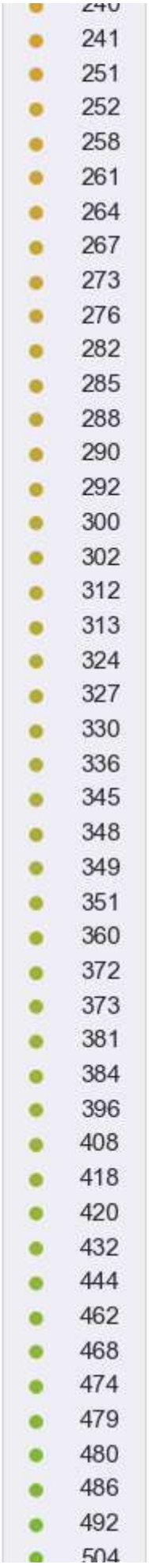
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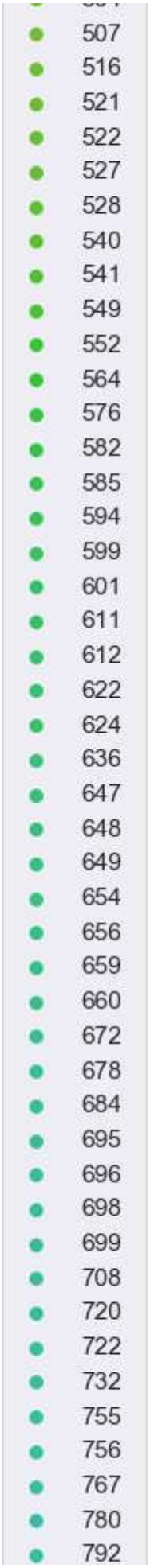
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- 1896
- 1992


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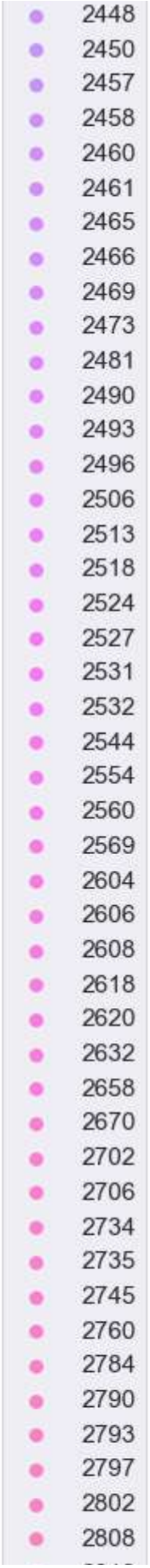
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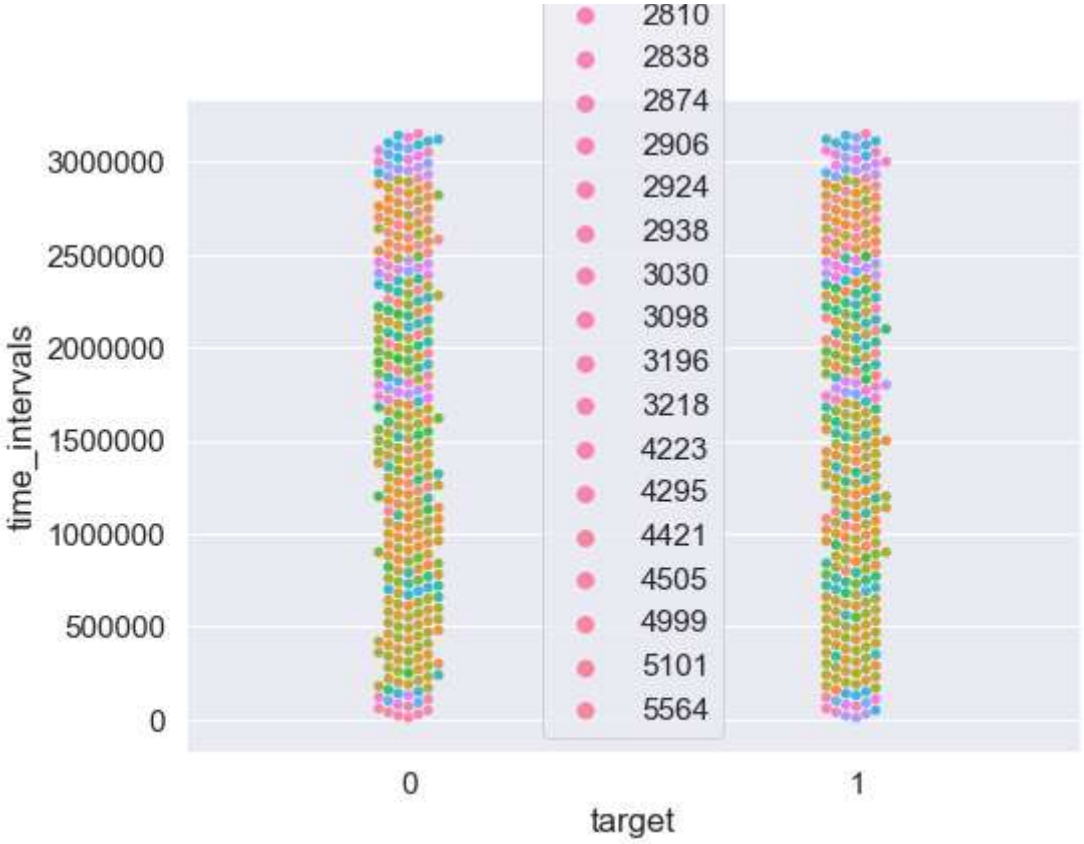
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3000000
2500000
2000000
1500000
1000000
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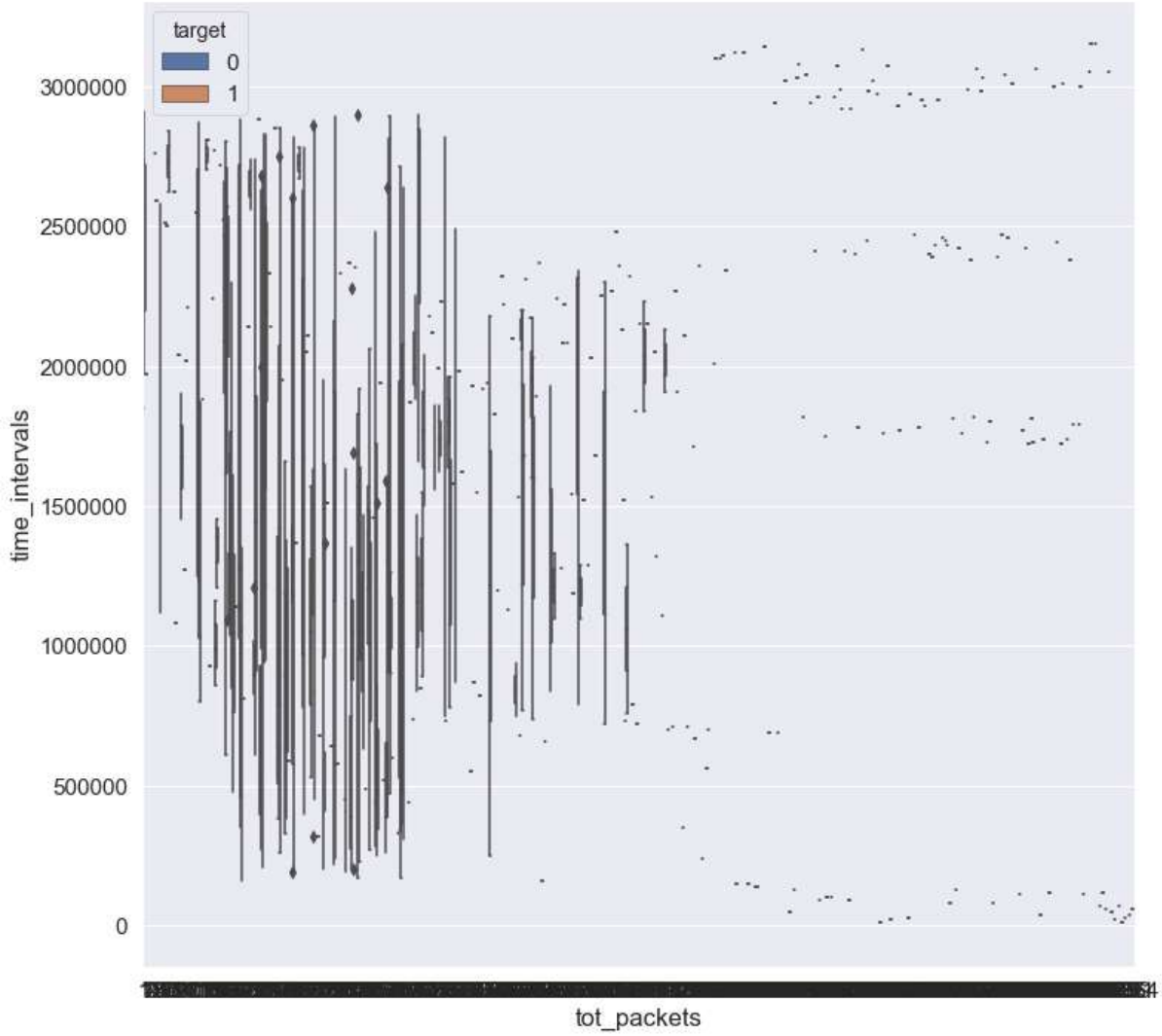
time_intervals
0
1
target

In [45]:

```
plt.figure(figsize=(12,12))
sns.boxplot(x='tot_packets',y='time_intervals',data=dff, hue='target')
plt.show()
```


target
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3000000
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1500000
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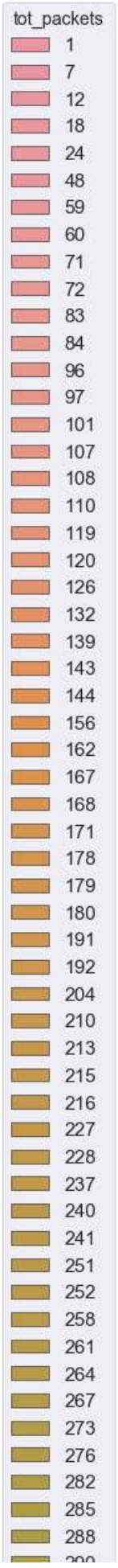
500000
0
time_intervals
tot_packets

In [46]:

```
plt.figure(figsize=(12,12))
sns.boxplot(x='target',y='time_intervals',data=dff, hue='tot_packets')
plt.show()
```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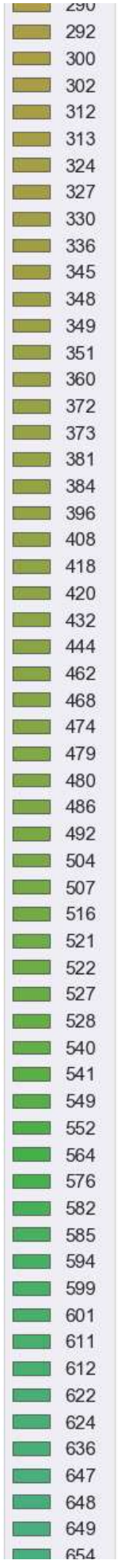
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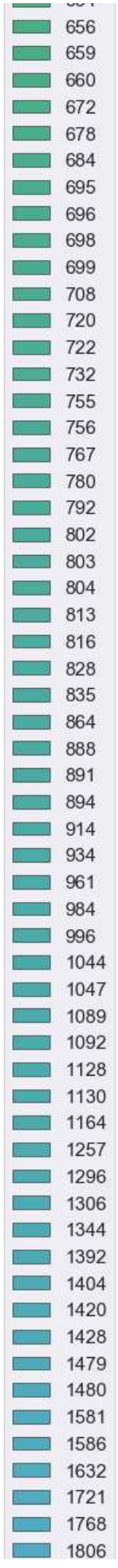
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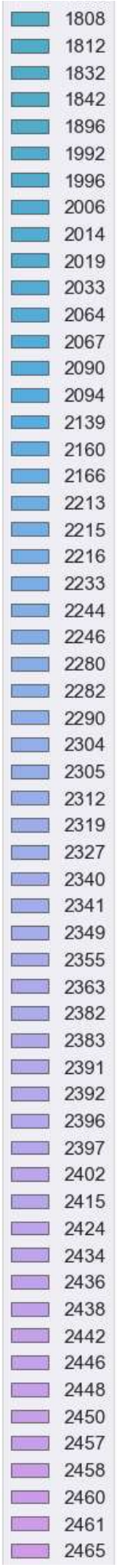
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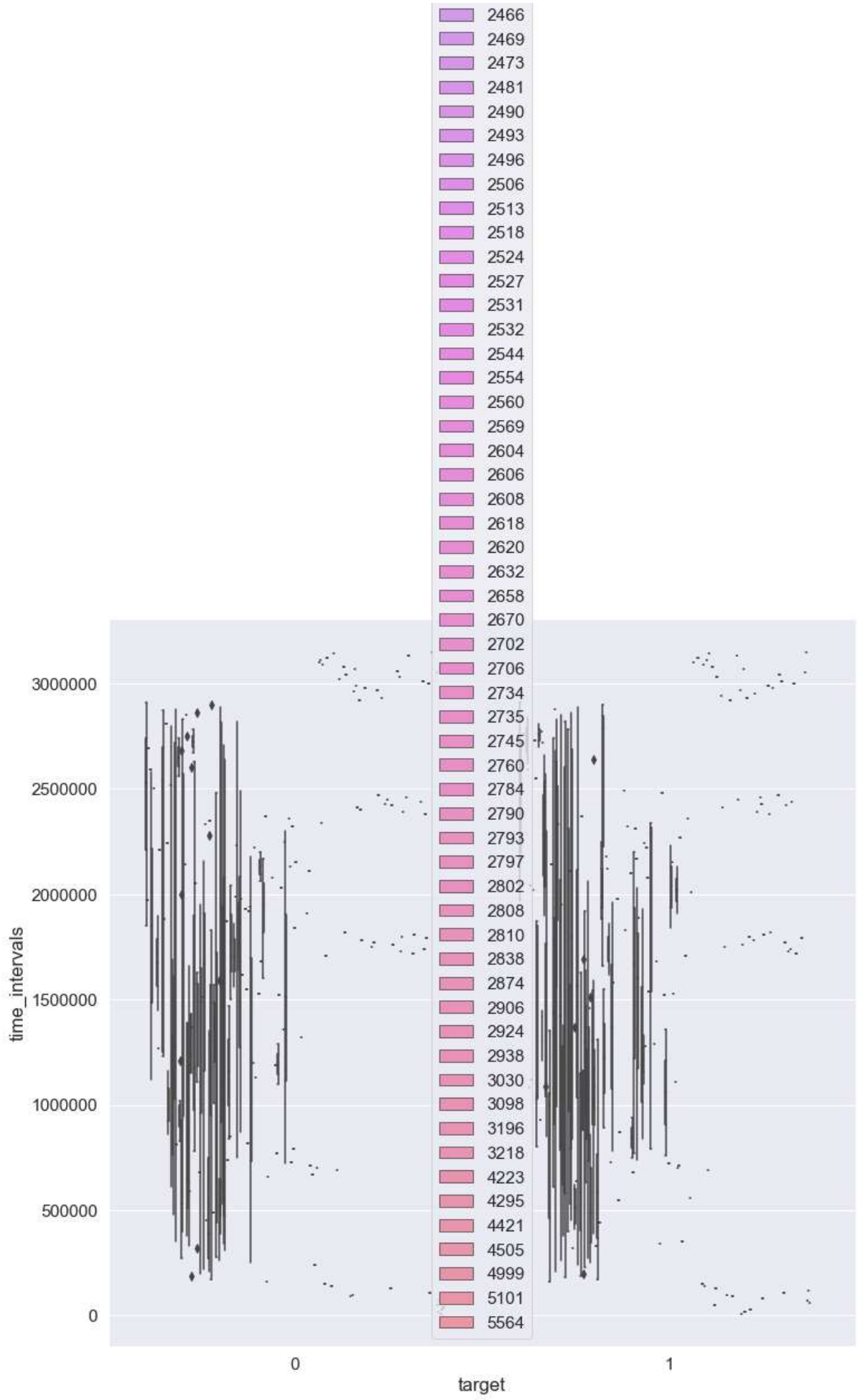
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target