Client frequencies:

```
client_ 0 freq:  [1357 1480 1603 1726 1850 1973 2096 2220 2343 2466]
client_ 1 freq:  [243 265 287 309 331 353 375 397 419 441]
client_ 2 freq:  [3135 3420 3705 3990 4275 4560 4845 5130 5415 5700]
client_ 3 freq:  [1970 2149 2328 2507 2686 2865 3045 3224 3403 3582]
```

<table>
<tr><th></th><th>Accuracy</th><th>Loss</th></tr>
<tr><td>Norm</td><td>

```
for i in range(len(pdfs)):
    for j in range(i+1,len(pdfs)):
        print(i," and ", j , stats.was
```

```
0  and  1 1.1316950932567083
0  and  2 16.789943005620493
0  and  3 9.708723438735062
1  and  2 17.892796430680484
1  and  3 10.80858591890214
2  and  3 7.084210511778343
```

```
shape, loc, scale = stats.gamma.fit(gl
pdf_global = stats.gamma.pdf(global_lo

for i in range(len(pdfs)):
    print(i," and global: " , stats.wa
```

```
0  and global:  1751631362.9410932
1  and global:  1751631362.5086415
2  and global:  1751631376.031605
3  and global:  1751631370.533872
```

</td><td>

```
for i in range(len(pdfs)):
    for j in range(i+1,len(pdfs)):
        print(i," and ", j , stats.wasserst
```

```
0  and  1 1.589712839613521
0  and  2 2.4618447346270234
0  and  3 1.2872063294604323
1  and  2 4.051557574240545
1  and  3 2.872169320055356
2  and  3 1.1793882541851883
```

```
shape, loc, scale = stats.gamma.fit(global_
pdf_global = stats.gamma.pdf(global_loss_li

for i in range(len(pdfs)):
    print(i," and global: " , stats.wassers
```

```
0  and global:  1751631362.639029
1  and global:  1751631363.1257498
2  and global:  1751631364.5361264
3  and global:  1751631363.6473703
```

</td></tr>
<tr><td>Gamma</td><td>

```
        print(i," and ", j , stats.wasserstein_(
```

```
0  and  1 54717527503560.66
0  and  2 2619302465.973565
0  and  3 32223122.089287713
1  and  2 54714908201097.61
1  and  3 54717495280441.984
2  and  3 2587079344.469823
```

```
shape, loc, scale = stats.gamma.fit(global_loss_
pdf_global = stats.gamma.pdf(global_loss_list, s

for i in range(len(pdfs)):
    print(i," and global: " , stats.wasserstein_
```

```
0  and global:  1751631312.3499918
1  and global:  54715775872251.2
2  and global:  867671153.9460524
3  and global:  1719408190.8830602
```

</td><td>

```
0  and  1 23293.67582116507
0  and  2 2642966087.701834
0  and  3 86836338.94386089
1  and  2 2642989381.0476484
1  and  3 86859632.27898744
2  and  3 2556129748.768661
```

```
shape, loc, scale = stats.gamma.fit(global_
pdf_global = stats.gamma.pdf(global_loss_li

for i in range(len(pdfs)):
    print(i," and global: " , stats.wassers
```

```
0  and global:  1751608069.7465165
1  and global:  1751631363.2008057
2  and global:  891358018.1219131
3  and global:  1664771762.0599706
```

</td></tr>
<tr><td>Lognorm</td><td>

```
for i in range(len(pdfs)):
    for j in range(i+1,len(pdfs)):
        print(i," and ", j , stats.wasserste
```

```
0  and  1 55254380325754.164
0  and  2 16.077900064004852
0  and  3 9.049841030666352
1  and  2 55254380325751.23
1  and  3 55254380325752.18
2  and  3 7.04678114945583
```

```
shape, loc, scale = stats.gamma.fit(global_l
pdf_global = stats.gamma.pdf(global_loss_lis

for i in range(len(pdfs)):
    print(i," and global: " , stats.wasserst
```

```
0  and global:  1751631363.2840414
1  and global:  55252628694393.89
2  and global:  1751631376.009677
3  and global:  1751631370.5441334
```

</td><td>

```
0  and  1 1.5962046520864261
0  and  2 1152032554.6114473
0  and  3 828319716.0062158
1  and  2 1152032555.8887386
1  and  3 828319717.1620903
2  and  3 323712838.75998193
```

```
shape, loc, scale = stats.gamma.fit(global_loss_
pdf_global = stats.gamma.pdf(global_loss_list, s

for i in range(len(pdfs)):
    print(i," and global: " , stats.wasserstein_
```

```
0  and global:  1751631362.6457176
1  and global:  1751631363.124102
2  and global:  599598829.1823409
3  and global:  923311661.1644437
```

</td></tr>
</table>

Beta	```for i in range(len(pdfs)):
	  for j in range(i+1,len(pdfs)):
	  print(i," and ", j , stats.wasserste```
	``0 and 1 472447182945.1053
	0 and 2 1633923312858.529
	0 and 3 30858645448885.793
	1 and 2 1161476130514.6243
	1 and 3 30386198265965.234
	2 and 3 29224722136028.8```
	``shape, loc, scale = stats.gamma.fit(global_l
	pdf_global = stats.gamma.pdf(global_loss_lis
	
	for i in range(len(pdfs)):
	  print(i," and global: " , stats.wasserst```
	``0 and global: 1751371635.8632
	1 and global: 470695811311.50385
	2 and global: 1632171941224.898
	3 and global: 30856894077252.176```
		``0 and 1 1326423760265.2085
		0 and 2 2797271921268.4023
		0 and 3 4987275998778.207
		1 and 2 1470848161004.5254
		1 and 3 3660852238514.3296
		2 and 3 2190004078257.9138```
		``shape, loc, scale = stats.gamma.fit(global_lo
		pdf_global = stats.gamma.pdf(global_loss_list
		
		for i in range(len(pdfs)):
		  print(i," and global: " , stats.wasserste```
		``0 and global: 17268452031.729095
		1 and global: 1343692212296.3552
		2 and global: 2814540373299.788
		3 and global: 5004544450809.597```

Burr	```0 and 1 472447182945.1053
	0 and 2 1633923312858.529
	0 and 3 30858645448885.793
	1 and 2 1161476130514.6243
	1 and 3 30386198265965.234
	2 and 3 29224722136028.8```
	``shape, loc, scale = stats.gamma.fit(global
	pdf_global = stats.gamma.pdf(global_loss_l
	
	for i in range(len(pdfs)):
	  print(i," and global: " , stats.wasser```
	``0 and global: 1751371635.8632
	1 and global: 470695811311.50385
	2 and global: 1632171941224.898
	3 and global: 30856894077252.176```
		``0 and 1 1326423760265.2085
		0 and 2 2797271921268.4023
		0 and 3 4987275998778.207
		1 and 2 1470848161004.5254
		1 and 3 3660852238514.3296
		2 and 3 2190004078257.9138```
		``shape, loc, scale = stats.gamma.fit(global_loss
		pdf_global = stats.gamma.pdf(global_loss_list,
		
		for i in range(len(pdfs)):
		  print(i," and global: " , stats.wasserstein```
		``0 and global: 17268452031.729095
		1 and global: 1343692212296.3552
		2 and global: 2814540373299.788
		3 and global: 5004544450809.597```

NON_IID DISTRIBUTIONS (4 clients : gender-income)

```
client_ 0 freq:  [1973 2096 2220 2343 2466 2589 2713 2836 2959 3083]
client_ 1 freq:  [353 375 397 419 441 463 485 507 529 551]
client_ 2 freq:  [4560 4845 5130 5415 5700 5985 6270 6555 6840 7125]
client_ 3 freq:  [2865 3045 3224 3403 3582 3761 3940 4119 4298 4477]
```

Distribution	frequency	accuracy	Loss
Gamma	0 and 1 0.0034349427373413384 0 and 2 0.00042332799344532235 0 and 3 0.00023232772854376901 1 and 2 0.003858270730786661 1 and 3 0.003667270465885108 2 and 3 0.00019100026490155328 0 and global: 0.0005951170688163395 1 and global: 0.004030059806157678 2 and global: 0.00017178907537101712 3 and global: 0.00036278934027257045	0 and 1 96611745126.51799 0 and 2 26331468952.791576 0 and 3 10325938315.564121 1 and 2 70280276178.07014 1 and 3 86285806815.72081 2 and 3 16005530637.711647 0 and global: 71717033119.61592 1 and global: 24894712009.077194 2 and global: 45385564169.90277 3 and global: 61391094807.61442	0 and 1 3571334.6290192525 0 and 2 3527876.6556697614 0 and 3 3375884237.1164727 1 and 2 43488.81355166581 1 and 3 3379455571.689611 2 and 3 3379412087.511244 0 and global: 100025094.95119059 1 and global: 103596429.5762785 2 and global: 103552956.95220673 3 and global: 3275859142.165282
Norm	0 and 1 0.003434916180979071 0 and 2 0.00042333433612756695 0 and 3 0.00023233377600585708 1 and 2 0.0038582505171066376 1 and 3 0.003667249956984929 2 and 3 0.00019100056012170982 0 and global: 0.0005951218430858042 1 and global: 0.004030038024064876 2 and global: 0.00017178750695823704 3 and global: 0.00036278806707994697	0 and 1 1.8533511277924637 0 and 2 12.550186731287384 0 and 3 8.844801561217773 1 and 2 14.389581675430298 1 and 3 10.680811536495323 2 and 3 3.7087701389349754 0 and global: 45.57258011544753 1 and global: 47.41197505959046 2 and global: 33.02239338416016 3 and global: 36.73116352309513	0 and 1 1.9439247483985005 0 and 2 2.2940469778074366 0 and 3 1.3069255004588132 1 and 2 4.237971726205937 1 and 3 3.2498012081393775 2 and 3 0.9881705180665596 0 and global: 4.964483702557023 1 and global: 6.908408450955523 2 and global: 2.7417408911300143 3 and global: 3.658607242816146

Lognorm	0 and 1 5660592.193859114 0 and 2 58726.068773617095 0 and 3 58834.618926491945 1 and 2 5719318.262632731 1 and 3 5719426.812785607 2 and 3 108.55021695542531 0 and global: 59708.31306807256 1 and global: 5720300.506927187 2 and global: 982.244294455473 3 and global: 873.6941415806158	0 and 1 3463538508071.1514 0 and 2 11.92890537244354 0 and 3 8.301989770435537 1 and 2 3463538508076.3716 1 and 3 3463538508074.5317 2 and 3 3.637997000153498 0 and global: 45.35031292556467 1 and global: 3463538508096.0435 2 and global: 33.440059079099576 3 and global: 37.078056079253074	0 and 1 1.9443768895059936 0 and 2 42.594144025410536 0 and 3 198758847484.76242 1 and 2 44.479917786526045 1 and 3 198758847485.8803 2 and 3 198758847476.48886 0 and global: 6.273941466842511 1 and global: 8.218318356348504 2 and global: 36.908357975239106 3 and global: 198758847483.9256
Beta	0 and 1 0.0037600727311337865 0 and 2 0.0010872173535729818 0 and 3 0.0007812811823525462 1 and 2 0.004730229869492611 1 and 3 0.004424293698272176 2 and 3 0.0003059361712204356 0 and global: 0.0013583023787272718 1 and global: 0.0050013148946469015 2 and global: 0.00027108502515429 3 and global: 0.0005770211963747256	0 and 1 854113097152899.4 0 and 2 23350576942951.473 0 and 3 28716477394886.68 1 and 2 830762520209948.1 1 and 3 825396619758256.6 2 and 3 5365900451935.387 0 and global: 142560324721048.28 1 and global: 711552772431869.8 2 and global: 119209747778098.02 3 and global: 113843847326399.7	0 and 1 1668988051430.631 0 and 2 33993429924.851116 0 and 3 5102665534436.631 1 and 2 1702981481355.2244 1 and 3 3433677483008.0156 2 and 3 5136658964360.713 0 and global: 36162306096.86395 1 and global: 1705150357527.4949 2 and global: 2168876172.2707167 3 and global: 5138827840527.401
Burr	0 and 1 0.0033262394877202617 0 and 2 0.00040832023076190096 0 and 3 0.00022358570628453592 1 and 2 0.003734559718482163 1 and 3 0.003549825194004798 2 and 3 0.00018473452447736509 0 and global: 0.0005744299617219128 1 and global: 0.0039006694494421747 2 and global: 0.00016610973096001176 3 and global: 0.0003508442554373769	0 and 1 802754617320.8098 0 and 2 40.223243866821676 0 and 3 45.69219771091308 1 and 2 802754617348.5286 1 and 3 802754617351.9719 2 and 3 7.6786916197144635 0 and global: 43.05023143195532 1 and global: 802754617350.6935 2 and global: 3.4811377511131445 3 and global: 5.862382991576778	0 and 1 0.972495068914641 0 and 2 29.11436567242299 0 and 3 24.301778376477447 1 and 2 29.84226937755347 1 and 3 24.928362496047953 2 and 3 4.9139068815055165 0 and global: 4.580701327257708 1 and global: 5.459503317743751 2 and global: 25.287826120400084 3 and global: 20.688757770350925

Single-Batch Distributions

client_ 0
loss: [0.04675943 0.22334448 0.3253662 0.3327828 0.32753864 0.30964363 0.30064547 0.2881389 0.30844659 0.29107651]
freq: [7895 7895 7895 7895 7895 7895 7895 7895 7895 7895]
acc [0.99366689 0.91247624 0.87321091 0.86865103 0.87473083 0.8781507 0.88081062 0.88777709 0.87941736 0.88448387]
client_ 1
loss: [0.44730943 1.00544584 1.24900603 1.09015918 1.2009567 1.20884359 1.11642206 1.12442636 1.07541847 1.10691833]
freq: [1435 1435 1435 1435 1435 1435 1435 1435 1435 1435]
acc [0.89128917 0.49756098 0.37770036 0.50522649 0.44808361 0.43135887 0.47804877 0.47456446 0.50662023 0.48989546]
client_ 2
loss: [0.03972216 0.02067855 0.01909248 0.02059607 0.02184644 0.02210405 0.0240159 0.02484704 0.02478325 0.02511534]
freq: [18259 18259 18259 18259 18259 18259 18259 18259 18259 18259]
acc [0.99611151 0.99989045 1.   1.   1.   0.99994522 0.99994522 0.99989045 0.99989045 0.99994522]
client_ 3
loss: [0.10719391 0.02389912 0.0262641 0.02447494 0.02615622 0.02859946 0.0283988 0.02978892 0.03104771 0.03117665]
freq: [11484 11484 11484 11484 11484 11484 11484 11484 11484 11484]
acc [0.98885405 0.99965167 0.99982584 0.99991292 0.99991292 0.99991292 0.99982584 0.99982584 0.99973875 0.99973875]

Distribution	Accuracy	Loss
Gamma	0 and 1 5052963785.6386385 0 and 2 110213288418.12776 0 and 3 107785490295.07877 1 and 2 105160324655.85822 1 and 3 102732526518.81839 2 and 3 2427798137.039818 0 and global: 2170527.9642331777 1 and global: 5050793767.680869 2 and global: 110211118394.07294 3 and global: 107783320275.70663	0 and 1 9.308714649162779 0 and 2 11341.601002166437 0 and 3 4854633.798060776 1 and 2 11337.843632987884 1 and 3 4854630.040691596 2 and 3 4843350.173976158 0 and global: 6.269837293033752 1 and global: 13.414506742209406 2 and global: 11335.51733712475 3 and global: 4854628.48416662
Norm	0 and 1 6.675711374677921 0 and 2 286.15857542033956 0 and 3 94.18641588484508 1 and 2 292.8342867950175 1 and 3 100.86212725952299 2 and 3 191.97215953549448 0 and global: 1091.4961367516255 1 and global: 1098.1718481263035 2 and global: 805.337561331286 3 and global: 997.3097208667805	0 and 1 2.4057410423621155 0 and 2 54.555577640223106 0 and 3 10.220130044593963 1 and 2 56.96131868258523 1 and 3 12.62587108695608 2 and 3 44.33544759562915 0 and global: 6.002736887598183 1 and global: 8.408477929960299 2 and global: 49.369079300209755 3 and global: 5.281169731086335

Lognorm	0 and 1 20.848571350665924 0 and 2 68.43472489365098 0 and 3 78.13086556288947 1 and 2 89.2832962443169 1 and 3 98.97943691355539 2 and 3 84.68423389603093 0 and global: 1078.2990797532764 1 and global: 1099.1476511039423 2 and global: 1015.7192759065204 3 and global: 1000.1682141903868	0 and 1 2.396580615537854 0 and 2 88.29790770059965 0 and 3 79.39303651314505 1 and 2 90.69448831613751 1 and 3 81.7896171286829 2 and 3 32.77755483496762 0 and global: 6.029857038491165 1 and global: 8.426437654029018 2 and global: 82.74258355514098 3 and global: 74.39622381424006
Beta	0 and 1 1521748664975.6758 0 and 2 210969340692530.25 0 and 3 30110798953388.42 1 and 2 212491089357505.84 1 and 3 31632547618362.84 2 and 3 180858541739143.1 0 and global: 308744075720725.44 1 and global: 310265824385701.06 2 and global: 385995910701328.75 3 and global: 325709730121620.6	0 and 1 2314866766485.9023 0 and 2 10624594890126.223 0 and 3 4839861950005.761 1 and 2 12939461656612.125 1 and 3 7154728716486.841 2 and 3 5784732940125.554 0 and global: 4391291160872.917 1 and global: 2076424394391.9973 2 and global: 15015886050987.99 3 and global: 9231153110878.678
Burr	0 and 1 12.557451473326129 0 and 2 73.81034375812625 0 and 3 58.98077024145226 1 and 2 86.36779523145239 1 and 3 71.5382217147784 2 and 3 14.82957351667399 0 and global: 37.68286544026416 1 and global: 50.24031691359029 2 and global: 36.12747831786209 3 and global: 30.816360768026254	0 and 1 5.9800054838741215 0 and 2 85.11174054509708 0 and 3 14009025718706.021 1 and 2 91.09174602897119 1 and 3 14009025718712.0 2 and 3 14009025718739.184 0 and global: 2.2096049476649746 1 and global: 7.564232292959562 2 and global: 83.77601115000714 3 and global: 14009025718705.12

NON_IID DISTRIBUTIONS (8 clients : gender-race(white/black)-income)

```
client_ 0  freq:  [154 173 193 212 231 250 270 289 308 327]
client_ 1  freq:  [12 13 15 16 17 19 20 22 23 24]
client_ 2  freq:  [1148 1291 1435 1578 1722 1865 2009 2152 2295 2439]
client_ 3  freq:  [214 241 268 294 321 348 375 401 428 455]
client_ 4  freq:  [ 900 1013 1125 1238 1350 1463 1575 1688 1800 1913]
client_ 5  freq:  [42 47 52 57 62 68 73 78 83 88]
client_ 6  freq:  [1921 2168 2415 2661 2908 3154 3401 3647 3894 4140]
client_ 7  freq:  [1504 1529 1553 1577 1602 1626 1650 1675 1699 1724]
```

Distribution	frequency	accuracy	Loss
Gamma	0 and 1 0.061555536385285624 0 and 2 0.0041382116829178405 0 and 3 0.0013400631914867798 0 and 4 0.003961905318923298 0 and 5 0.013010983461184001 0 and 6 0.004406344593409131 0 and 7 0.00100519614650254 1 and 2 0.06569374806820347 1 and 3 0.0628955995767724 1 and 4 0.06551744170420892 1 and 5 0.048544552924101626 1 and 6 0.06596188097869476 1 and 7 0.06256073253178818 2 and 3 0.0027981484914310598 2 and 4 0.00017630636399454234 2 and 5 0.01714919514410184 2 and 6 0.0002681329104912907 2 and 7 0.0031330155364153 3 and 4 0.002621842127436518 3 and 5 0.014351046652670783 3 and 6 0.00306628140192235 3 and 7 0.00033486704498423994 4 and 5 0.016972888780107297 4 and 6 0.0004444392744858331 4 and 7 0.002956709172420758 5 and 6 0.017417328054593128 5 and 7 0.014016179607686542 6 and 7 0.003401148446906591 0 and global: 0.004620694721391866 1 and global: 0.0661762311066775 2 and global: 0.00048248303847402575 3 and global: 0.0032806315299050855 4 and global: 0.000658789402468568 5 and global: 0.017631678182575862 6 and global: 0.00021435012798273496 7 and global: 0.003615498574889326	0 and 1 3.5001817549856585e+23 0 and 2 7869143271.861214 0 and 3 357034.07862304547 0 and 4 518126.9362475103 0 and 5 165104.89760287738 0 and 6 19103681246.857594 0 and 7 392016643.4018573 1 and 2 3.50018175498558e+23 1 and 3 3.5001817549856585e+23 1 and 4 3.5001817549856585e+23 1 and 5 3.5001817549856585e+23 1 and 6 3.500181754985467e+23 1 and 7 3.500181754985655e+23 2 and 3 7868786239.209446 2 and 4 7868625147.615849 2 and 5 7869231109.581604 2 and 6 11234537976.059536 2 and 7 7477126628.530401 3 and 4 161100.1784975285 3 and 5 444871.7990126755 3 and 6 19103324215.268982 3 and 7 391659611.30970186 4 and 5 605962.197813923 4 and 6 19103163122.99236 4 and 7 391498519.3510584 5 and 6 19103769084.577984 5 and 7 392104481.1222469 6 and 7 18711664603.959282 0 and global: 41259533824.28781 1 and global: 3.5001817549852465e+23 2 and global: 33390390564.280167 3 and global: 41259176803.48961 4 and global: 41259015707.19073 5 and global: 41259621663.250084 6 and global: 22155852588.220627 7 and global: 40867517192.17992	0 and 1 0.22051657214227194 0 and 2 14774694.28399596 0 and 3 4717296587.966944 0 and 4 1661033.0837199779 0 and 5 0.1598046861121252 0 and 6 31.63787434757529 0 and 7 4686093.701512583 1 and 2 14774694.504512532 1 and 3 4717296588.187131 1 and 4 1661033.0432750282 1 and 5 0.06072497058341592 1 and 6 31.858060977126417 1 and 7 4686093.921699212 2 and 3 4702521897.798205 2 and 4 13113661.556582669 2 and 5 14774694.443800645 2 and 6 14774665.688301405 2 and 7 10088608.07593358 3 and 4 4715635555.235035 3 and 5 4717296588.126406 3 and 6 4717296562.071834 3 and 7 4712610502.249417 4 and 5 1661033.0135691038 4 and 6 1661030.5133884917 4 and 7 3025060.9600235075 5 and 6 31.797336006543002 5 and 7 4686093.860974241 6 and 7 4686063.665686254 0 and global: 7654705523.434952 1 and global: 7654705523.655138 2 and global: 7639930862.044109 3 and global: 2937408981.9449573 4 and global: 7653044490.611863 5 and global: 7654705523.594413 6 and global: 7654705517.384555 7 and global: 7650019469.851103

Norm	0 and 1 0.06155314818732709 0 and 2 0.0041382495420010145 0 and 3 0.0013401049330001278 0 and 4 0.003961938678467752 0 and 5 0.013011209351361921 0 and 6 0.004406379243408383 0 and 7 0.001005243975558933 1 and 2 0.06569139772932811 1 and 3 0.06289325312032723 1 and 4 0.06551508686579485 1 and 5 0.048541938835965165 1 and 6 0.06595952743073548 1 and 7 0.06255839216288603 2 and 3 0.0027981446090008864 2 and 4 0.00017631086353326104 2 and 5 0.017149458893362935 2 and 6 0.0002681297014073686 2 and 7 0.0031330055664420815 3 and 4 0.002621833745467625 3 and 5 0.014351314284362048 3 and 6 0.0030662743104082546 3 and 7 0.000334860957441195 4 and 5 0.01697314802982967 4 and 6 0.00044444056494062964 4 and 7 0.0029566947029088203 5 and 6 0.017417588594770304 5 and 7 0.014016453326920853 6 and 7 0.0034011352678494497 0 and global: 0.0046207285698786765 1 and global: 0.06617387675720578 2 and global: 0.0004824790278776623 3 and global: 0.003280623636878548 4 and global: 0.0006587898914109234 5 and global: 0.017631937921240598 6 and global: 0.0002143493264702938 7 and global: 0.003615484594319744	0 and 1 0.8325300686638157 0 and 2 10.459736423104237 0 and 3 1.698031063319809 0 and 4 0.6592378845059876 0 and 5 0.42290213571143564 0 and 6 18.528715177097837 0 and 7 13.219825443615902 1 and 2 9.627206354440421 1 and 3 0.8655009946559932 1 and 4 0.32002245930806605 1 and 5 0.4096279329523801 1 and 6 17.696185108434015 1 and 7 12.387295374952084 2 and 3 8.761705359784427 2 and 4 9.800498538598248 2 and 5 10.036834287392804 2 and 6 8.068978753993596 2 and 7 2.7600890205116646 3 and 4 1.0479685475623837 3 and 5 1.275128927608373 3 and 6 16.830684113778027 3 and 7 11.521794380296091 4 and 5 0.41552401074085465 4 and 6 17.86947729259185 4 and 7 12.560587559109912 5 and 6 18.105813041386398 5 and 7 12.796923307904466 6 and 7 5.308889733481931 0 and global: 116.55554794469576 1 and global: 115.72301787603195 2 and global: 106.09581152159153 3 and global: 114.85751688137596 4 and global: 115.89631006018978 5 and global: 116.13264580898432 6 and global: 98.02683276759791 7 and global: 103.33572250107987	0 and 1 0.2263963719578554 0 and 2 2.4129205474004163 0 and 3 1.2704907536330314 0 and 4 1.4787686693468602 0 and 5 0.16566362160853892 0 and 6 3.7632501494387287 0 and 7 2.9819330218239486 1 and 2 2.6393169193582717 1 and 3 1.496887125590887 1 and 4 1.7051650413047155 1 and 5 0.060732750349316474 1 and 6 3.9896465213965846 1 and 7 3.208329393781804 2 and 3 1.1424297937673844 2 and 4 0.9375641506137123 2 and 5 2.578584169008955 2 and 6 1.3503296020383129 2 and 7 0.569012474423533 3 and 4 0.3000020347142675 3 and 5 1.4361543752415704 3 and 6 2.492759395805697 3 and 7 1.7114422681909174 4 and 5 1.6444322909553992 4 and 6 2.2844814800918685 4 and 7 1.5031643524770888 5 and 6 3.9289137710472675 5 and 7 3.1475966434324874 6 and 7 0.7813171276147799 0 and global: 14.191481446599221 1 and global: 14.417877818557077 2 and global: 11.778560899198805 3 and global: 12.92099069296619 4 and global: 12.71271277725236 5 and global: 14.357145068207759 6 and global: 10.428231297160492 7 and global: 11.20954842477527
Lognorm	0 and 1 3057067514.6183133 0 and 2 6644.163376197016 0 and 3 1643282.336807157 0 and 4 26728.73118429474 0 and 5 172235.6442783698 0 and 6 94975.05676701889 0 and 7 2661220.4334895806 1 and 2 3057060870.462868 1 and 3 3055424232.288583 1 and 4 3057040785.895042 1 and 5 3056895278.9762454 1 and 6 3056972539.5695715 1 and 7 3054406294.191746 2 and 3 1636638.1742856344 2 and 4 20084.567826467424 2 and 5 165591.48662285908 2 and 6 88330.89339082188 2 and 7 2654576.2711217343 3 and 4 1616553.606459167	0 and 1 6.109867828617498e+18 0 and 2 79709480807.47874 0 and 3 79709480814.391 0 and 4 79709480810.03777 0 and 5 1.6971964477274035e+17 0 and 6 79709480801.30351 0 and 7 79709480805.46625 1 and 2 6.10986790832698e+18 1 and 3 6.10986790832698e+18 1 and 4 6.10986790832698e+18 1 and 5 5.940148183844758e+18 1 and 6 6.10986790832698e+18 1 and 7 6.10986790832698e+18 2 and 3 8.798886019579744 2 and 4 9.620161192220916 2 and 5 1.6971972448222112e+17 2 and 6 8.064896234963543 2 and 7 2.608621289287474 3 and 4 6.763128366138591	0 and 1 0.22680003033273918 0 and 2 127642629847.09103 0 and 3 283325675686.15894 0 and 4 1.4824814062622755 0 and 5 0.16340965376444838 0 and 6 8451664.432559114 0 and 7 356762726052.7163 1 and 2 127642629847.27338 1 and 3 283325675686.31433 1 and 4 1.7092814365950144 1 and 5 0.06339136742791164 1 and 6 8451664.628246019 1 and 7 356762726052.90234 2 and 3 155683045839.19888 2 and 4 127642629846.15292 2 and 5 127642629847.21269 2 and 6 127634178217.18904 2 and 7 229120096205.629 3 and 4 283325675685.34314

	3 and 5 1471046.6937597056 3 and 6 1548307.2809887175 3 and 7 1017938.0968360996 4 and 5 145506.91879639166 4 and 6 68246.32558272415 4 and 7 2634491.7032952667 5 and 6 77260.59332594191 5 and 7 2488984.7904421296 6 and 7 2566245.377824817 0 and global: 331320.9079630696 1 and global: 3056736193.7184424 2 and global: 324676.74458687264 3 and global: 1311961.4298593567 4 and global: 304592.1767787749 5 and global: 159085.26491561832 6 and global: 236345.85119605073 7 and global: 2329899.526695457	3 and 5 1.6971972448222112e+17 3 and 6 16.863782254543285 3 and 7 11.407507308867217 4 and 5 1.6971972448222112e+17 4 and 6 14.00588899954047 4 and 7 11.04412293698373 5 and 6 1.6971972448222112e+17 5 and 7 1.6971972448222112e+17 6 and 7 5.456274945676069 0 and global: 79709480793.47607 1 and global: 6.10986790832698e+18 2 and global: 25.754946932579383 3 and global: 34.55383295215913 4 and global: 30.170699859880774 5 and global: 1.697197244822211e+17 6 and global: 17.690050697615845 7 and global: 23.14632564329191	3 and 5 283325675686.25916 3 and 6 283317224035.2745 3 and 7 73437050377.60309 4 and 5 1.645891060026724 4 and 6 8451663.329942504 4 and 7 356762726051.67145 5 and 6 8451664.564855643 5 and 7 356762726052.8389 6 and 7 356754274409.2717 0 and global: 14.149724143550477 1 and global: 14.376524173883215 2 and global: 127642629847.19232 3 and global: 283325675683.603 4 and global: 12.667242737288205 5 and global: 14.313133797314926 6 and global: 8451658.94373009 7 and global: 356762726049.0028
Beta	0 and 1 2.220652626228219 0 and 2 0.004581367677561024 0 and 3 0.0015114701017898443 0 and 4 0.1363751875820617 0 and 5 0.4612214831003908 0 and 6 1.582322789238371 0 and 7 0.0016017589952226825 1 and 2 2.22523399390578 1 and 3 2.222164096330009 1 and 4 2.0921404591245185 1 and 5 1.7594311431278284 1 and 6 0.6479308183370217 1 and 7 2.2222543852234415 2 and 3 0.003069897575771181 2 and 4 0.13309353478126132 2 and 5 0.4658028507779518 2 and 6 1.577923770185364 2 and 7 0.0037003509509938998 3 and 4 0.13509929088577144 3 and 5 0.46273295320218066 3 and 6 1.5808919225642308 3 and 7 0.0006908274096867855 4 and 5 0.33270931599669057 4 and 6 1.4459476016563093 4 and 7 0.13574246307004081 5 and 6 1.1500988775360375 5 and 7 0.4628232420956135 6 and 7 1.581569714172193 0 and global: 0.005978573520716108 1 and global: 2.226631199748935 2 and global: 0.0013972058431550838 3 and global: 0.0044671034189262635 4 and global: 0.13449074062441638 5 and global: 0.4672000566211069 6 and global: 1.5787003814119134 7 and global: 0.004376814525493426	0 and 1 7.307236233053098e+28 0 and 2 37600461648677.42 0 and 3 48198812766773.0 0 and 4 48968916937776.31 0 and 5 48844505240609.46 0 and 6 48978053403745.07 0 and 7 44051455739019.99 1 and 2 7.307236233053103e+28 1 and 3 7.3072362330531045e+28 1 and 4 7.307236233053104e+28 1 and 5 7.307236233053104e+28 1 and 6 7.307236233053104e+28 1 and 7 7.307236233053102e+28 2 and 3 10598351118113.635 2 and 4 11368455289108.766 2 and 5 11244043591950.123 2 and 6 11377591755067.637 2 and 7 6450994090353.064 3 and 4 770104171003.5665 3 and 5 645692473836.4873 3 and 6 779240636972.3181 3 and 7 4147357027763.732 4 and 5 124411697167.80614 4 and 6 9136465968.751783 4 and 7 4917461198761.089 5 and 6 133548163136.5579 5 and 7 4793049501600.219 6 and 7 4926597664725.075 0 and global: 238239896020545.4 1 and global: 7.307236233053075e+28 2 and global: 275840357669204.75 3 and global: 286438708787318.3 4 and global: 287208812958313.2 5 and global: 287084401261154.9 6 and global: 287217949424196.9 7 and global: 282291351759554.6	0 and 1 353086513869.58966 0 and 2 625704185007.5367 0 and 3 601345396248.4308 0 and 4 612308990252.4236 0 and 5 170051563451.07916 0 and 6 9619369512165.635 0 and 7 626150273442.9197 1 and 2 272617671156.7146 1 and 3 248258882397.76105 1 and 4 259222476400.81454 1 and 5 183034950419.6448 1 and 6 9972456026023.438 1 and 7 273063759591.8211 2 and 3 24358788759.46 2 and 4 13395194756.100967 2 and 5 455652621559.27655 2 and 6 10245073697172.484 2 and 7 446088435.6647787 3 and 4 10963594005.57126 3 and 5 431293832800.351 3 and 6 10220714908413.885 3 and 7 24804877195.124775 4 and 5 442257426803.36224 4 and 6 10231678502416.443 4 and 7 13841283191.108635 5 and 6 9789421075613.766 5 and 7 456098709994.3831 6 and 7 10245519785607.215 0 and global: 625549346868.8162 1 and global: 272462833009.92758 2 and global: 154838164.6307743 3 and global: 24203950621.944965 4 and global: 13240356616.392603 5 and global: 455497783417.7913 6 and global: 10244918859015.127 7 and global: 600926599.3623089

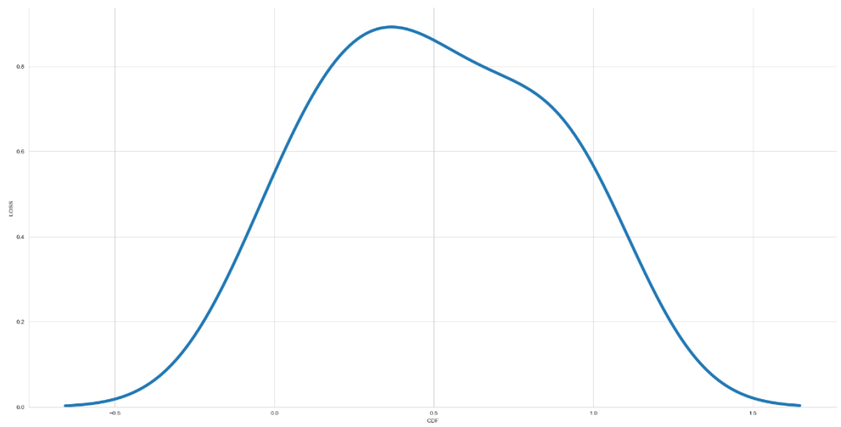
Burr	0 and 1 0.0687238736146832 0 and 2 0.0038440424886690577 0 and 3 0.001160969409141201 0 and 4 0.00367676196969297 0 and 5 0.012969043801782994 0 and 6 0.0041010915149884775 0 and 7 0.0007704665972037736 1 and 2 0.07256791610335224 1 and 3 0.06988484302382439 1 and 4 0.07240063558437616 1 and 5 0.0557548298129002 1 and 6 0.07282496512967165 1 and 7 0.06949434021188697 2 and 3 0.002683073079527857 2 and 4 0.00016728051897608721 2 and 5 0.016813086290452046 2 and 6 0.00025704902631942 2 and 7 0.0030735758914652842 3 and 4 0.0025157925605517697 3 and 5 0.014130013210924193 3 and 6 0.002940122105847277 3 and 7 0.0003958053079826416 4 and 5 0.01664580577147596 4 and 6 0.0004243295452955072 4 and 7 0.002906295372489197 5 and 6 0.017070135316771467 5 and 7 0.013739510398986767 6 and 7 0.0033306249177847045 0 and global: 0.004305008337911491 1 and global: 0.07302888195259467 2 and global: 0.00046096584924243286 3 and global: 0.00314403892877029 4 and global: 0.0006282463682185201 5 and global: 0.01727405213969448 6 and global: 0.0002039168229230128 7 and global: 0.0035345417407077174	0 and 1 9.632467572128582e+27 0 and 2 41444361615586.05 0 and 3 41444361615596.75 0 and 4 41444361615607.33 0 and 5 4.481935523269599e+19 0 and 6 41444361615584.23 0 and 7 41444361615585.336 1 and 2 9.632467572128622e+27 1 and 3 9.632467572128622e+27 1 and 4 9.632467572128622e+27 1 and 5 9.632467527309225e+27 1 and 6 9.632467572128622e+27 1 and 7 9.632467572128622e+27 2 and 3 17.405240826672046 2 and 4 30.113678715951945 2 and 5 4.481939667705761e+19 2 and 6 6.109357347514156 2 and 7 2.644867905478688 3 and 4 12.724712292977225 3 and 5 4.481939667705761e+19 3 and 6 23.5145981741862 3 and 7 20.050108732150733 4 and 5 4.481939667705761e+19 4 and 6 36.20399101750616 4 and 7 32.74869276729836 5 and 6 4.481939667705761e+19 5 and 7 4.481939667705761e+19 6 and 7 3.4644894420354695 0 and global: 41444361615583.23 1 and global: 9.632467572128622e+27 2 and global: 18.88400310048125 3 and global: 36.2892439271533 4 and global: 48.97863677047325 5 and global: 4.481939667705761e+19 6 and global: 12.774645752967094 7 and global: 16.239135195002564	0 and 1 nan 0 and 2 nan 0 and 3 nan 0 and 4 nan 0 and 5 nan 0 and 6 nan 0 and 7 nan 1 and 2 nan 1 and 3 nan 1 and 4 nan 1 and 5 nan 1 and 6 nan 1 and 7 nan 2 and 3 782038.2021019952 2 and 4 57506.06774511564 2 and 5 57507.474677920385 2 and 6 57493.267578002036 2 and 7 29269.100591399332 3 and 4 839533.6420631084 3 and 5 839534.5676024959 3 and 6 839506.9687639928 3 and 7 811282.6256697116 4 and 5 1.6507194556933353 4 and 6 58.50867120462314 4 and 7 28317.212255846658 5 and 6 60.01442353468633 5 and 7 28318.542849606303 6 and 7 28259.755804628818 0 and global: nan 1 and global: nan 2 and global: 57498.250617960235 3 and global: 839530.5720602596 4 and global: 16.234427795312904 5 and global: 17.88514725100624 6 and global: 47.140566428665224 7 and global: 28306.207042509108

<u>Non-IID distribution for a 10-client system using repaired (sensitive attributes dropped) data for training/ server side repairing</u>

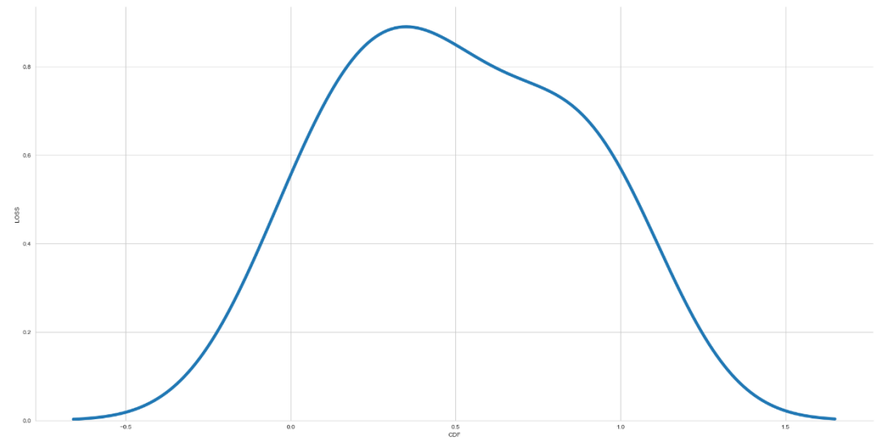
sensitive attributes : {'age', 'race_Amer-Indian-Eskimo', 'race_Asian-Pac-Islander', 'race_Black', 'race_Other', 'race_White', 'gender_Female', 'gender_Male'}

CDFs for losses for individual clients:

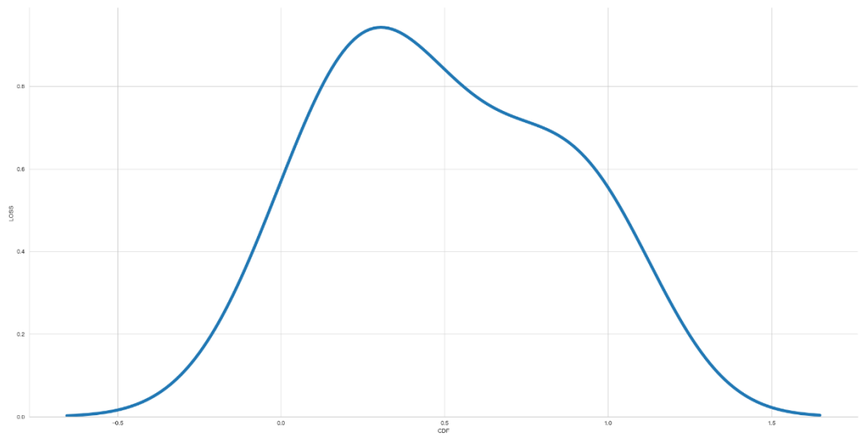
client_ 0



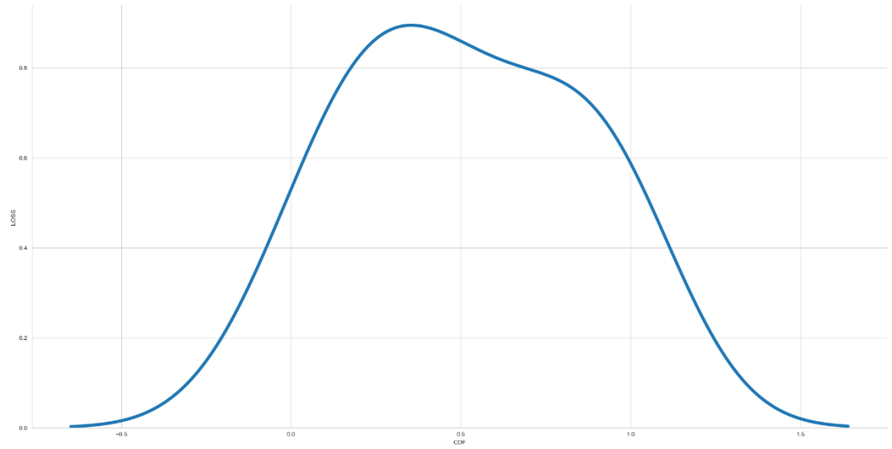
client_ 1



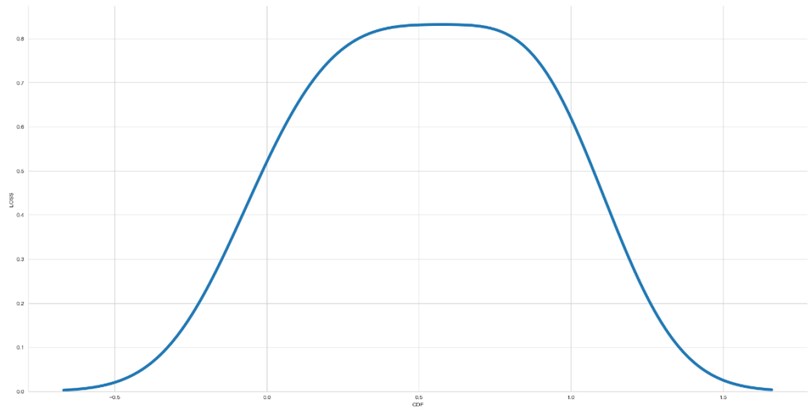
client_ 2



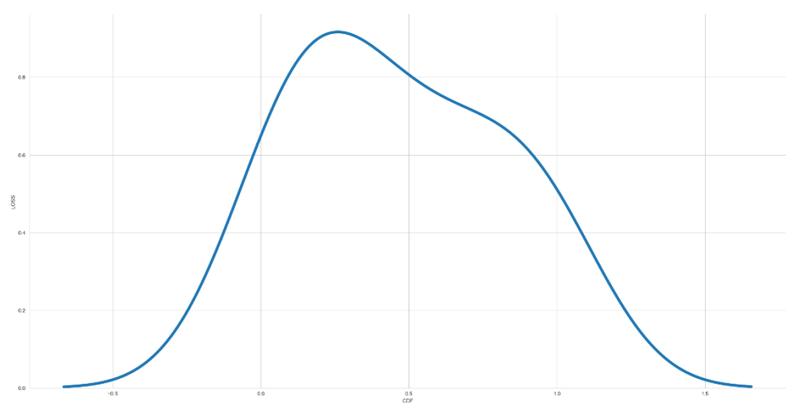
client_ 3



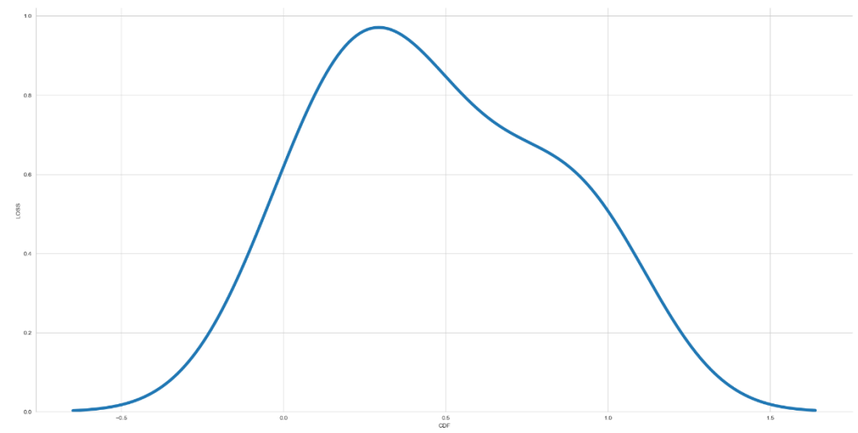
client_ 4



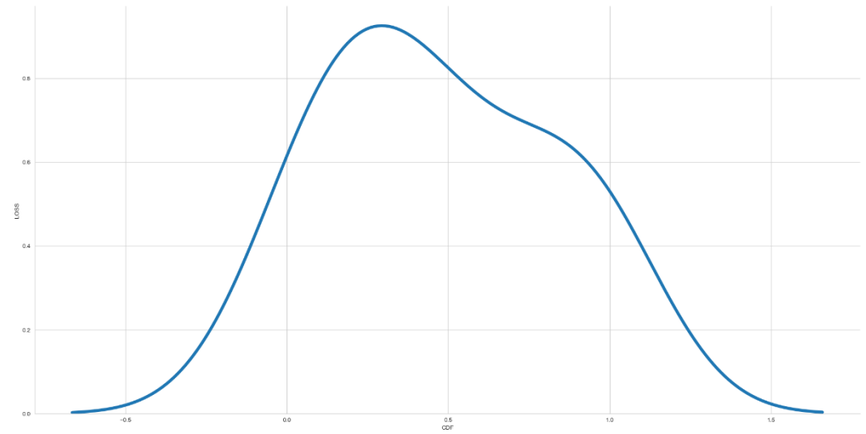
client_ 5



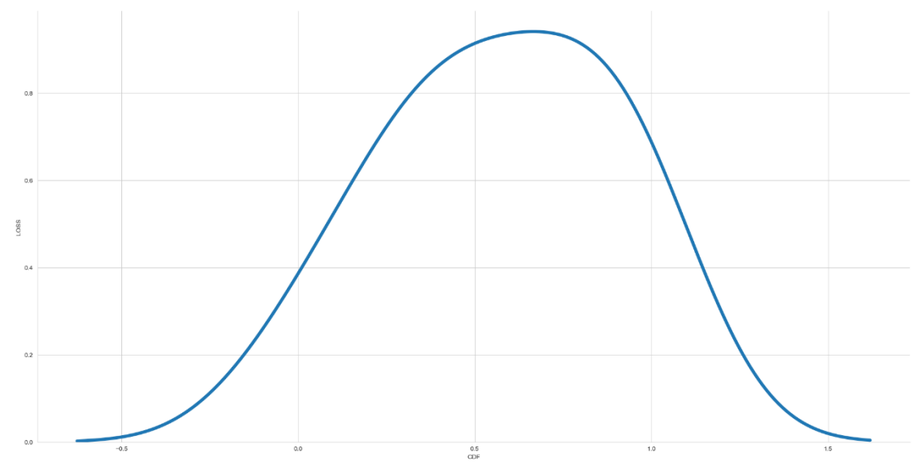
client_ 6



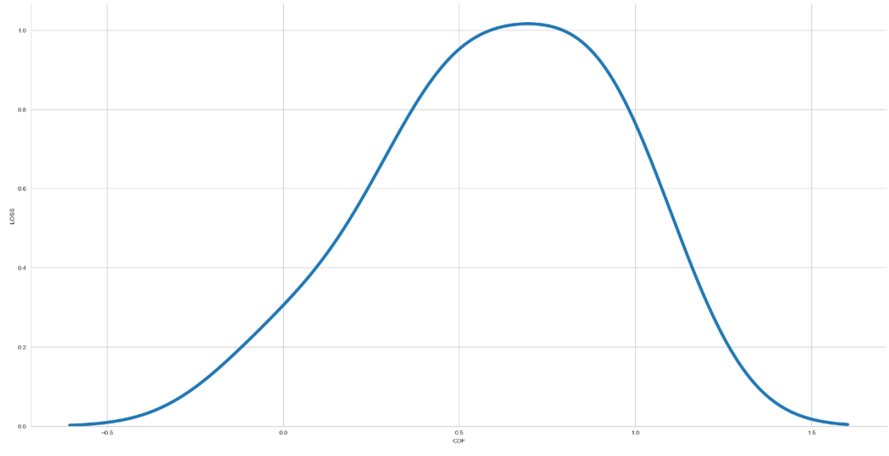
client_ 7



client_ 8



client_ 9



Statistics:

client_ 0
loss: [0.61086375 0.48895925 0.42192078 0.38538462 0.36777058 0.35811067 0.35217971 0.34762534 0.34223405 0.34042257]
freq: [34 63 89 99 135 136 155 198 253 310]
acc [0.68465227 0.80593437 0.82598567 0.83244336 0.83575219 0.83884007 0.84030771 0.84148592 0.84315759 0.84329736]
client_ 1
loss: [0.60810548 0.49124789 0.42425817 0.38594407 0.36823279 0.35871762 0.35395196 0.34909132 0.34512201 0.34348699]
freq: [38 72 80 100 154 175 210 265 301 304]
acc [0.6895178 0.80177778 0.82569444 0.83469224 0.83653253 0.83756828 0.83787876 0.83998203 0.84094632 0.84125489]
client_ 2
loss: [0.62629861 0.5121786 0.42389324 0.38565096 0.36983481 0.3597762 0.35359699 0.35081801 0.35046026 0.34585956]
freq: [26 28 61 119 128 167 202 222 248 308]
acc [0.64890963 0.78917378 0.81968504 0.83105296 0.83345747 0.83466476 0.83621299 0.83674204 0.83647132 0.83981413]
client_ 3
loss: [0.5920248 0.47583362 0.42313868 0.3866969 0.37091368 0.36190581 0.35488188 0.35127825 0.34916413 0.34639987]
freq: [49 102 104 119 124 138 185 201 215 265]
acc [0.70891088 0.80850899 0.8235566 0.83092368 0.83423078 0.83580887 0.83733851 0.83866507 0.83899999 0.83986813]
client_ 4
loss: [0.65826589 0.5169788 0.42765966 0.38794741 0.36735302 0.35774747 0.35061172 0.34742814 0.34490946 0.34517193]
freq: [11 26 53 78 123 172 209 224 249 315]
acc [0.6068182 0.78535825 0.82666665 0.83210254 0.83792883 0.84053552 0.84220952 0.84236926 0.84271133 0.84184933]
client_ 5
loss: [0.61959428 0.48596308 0.40170121 0.37713358 0.3615804 0.35094073 0.34597063 0.34304726 0.34170884 0.34019074]
freq: [31 74 155 190 254 301 345 408 456 501]
acc [0.66692913 0.80526882 0.82871795 0.83496648 0.83968699 0.84224683 0.84266943 0.84290451 0.84317309 0.84325564]
client_ 6
loss: [0.63035935 0.5015859 0.4151603 0.3802737 0.36296323 0.35536006 0.35027575 0.3468076 0.34330562 0.34104306]
freq: [23 48 91 135 164 209 225 248 287 306]
acc [0.6536842 0.79149997 0.83095866 0.83722717 0.84047621 0.84233409 0.84359521 0.84452999 0.84544194 0.84531045]
client_ 7
loss: [0.67178184 0.51838964 0.42784214 0.38460797 0.36651531 0.358017 0.35256788 0.34676394 0.34442586 0.34205738]
freq: [2 27 40 91 124 172 187 232 261 263]
acc [0.60666668 0.79030305 0.82404041 0.83298153 0.83513516 0.8371706 0.83821654 0.83956194 0.84028029 0.84116048]
client_ 8
loss: [0.58725697 0.49155888 0.41370627 0.38253722 0.36716944 0.35897282 0.35035193 0.34639585 0.34351107 0.34077337]
freq: [51 64 112 133 145 158 187 200 215 222]
acc [0.71806854 0.80588973 0.82985073 0.83530468 0.83838552 0.83816719 0.84089172 0.84224343 0.84337038 0.84474343]
client_ 9
loss: [0.58318889 0.45914096 0.40776464 0.37675032 0.36124367 0.35230872 0.34864539 0.3455101 0.34278136 0.34076509]
freq: [50 120 150 182 203 236 270 287 310 311]
acc [0.72603172 0.8139165 0.82998937 0.8375383 0.84057969 0.84284753 0.84299177 0.84381586 0.84391373 0.84510106]

Wasserstein distances using cdfs obtained by Gauss Distribution

```
FREQUENCY

0  and  1 0.060296525645336316
0  and  2 0.05905889378110912
0  and  3 0.06010973946227704
0  and  4 0.06992996869099012
0  and  5 0.046182048403765136
0  and  6 0.05193517557023589
0  and  7 0.06888461062958612
0  and  8 0.04853586469820127
0  and  9 0.04854032281454009
1  and  2 0.04800968023567024
1  and  3 0.06807515627193718
1  and  4 0.04009617256871384
1  and  5 0.028330873449552908
1  and  6 0.043004796816411985
1  and  7 0.027801567806504713
1  and  8 0.056813273523276586
1  and  9 0.0511193136268366
2  and  3 0.05141160226681113
2  and  4 0.02630102254374446
2  and  5 0.03326238326480497
2  and  6 0.029126543911198524
2  and  7 0.038381603994583416
2  and  8 0.0405598284248768
2  and  9 0.044781170697600514
3  and  4 0.057326507832012326
3  and  5 0.05410309845371015
3  and  6 0.06240157647590677
3  and  7 0.07086640829733468
3  and  8 0.05945147861368833
3  and  9 0.053241565948238666
4  and  5 0.033576330865139184
4  and  6 0.03322765547496947
4  and  7 0.031436071675332876
4  and  8 0.051646212766509415
4  and  9 0.042787990980283214
5  and  6 0.02419990111279453
5  and  7 0.02683451778912996
5  and  8 0.03360722030603758
5  and  9 0.03413198266481823
6  and  7 0.027490398927198987
6  and  8 0.0353251529902119
6  and  9 0.029541226404968975
7  and  8 0.05243720087541905
7  and  9 0.04174431968159501
8  and  9 0.024286348545042784
0  and global:  0.04866562419872061
1  and global:  0.02751780963852191
2  and global:  0.02677920412647137
3  and global:  0.04900749868526779
4  and global:  0.025705076625181462
5  and global:  0.012138943097059245
6  and global:  0.025810322939319924
7  and global:  0.022131667334606964
8  and global:  0.040736587535703486
9  and global:  0.04016497848099118
```

```
LOSS
0  and  1 0.005099843692771721
0  and  2 0.029168742143768994
0  and  3 0.01673728178886089
0  and  4 0.02468398014305861
0  and  5 0.0373746450075483
0  and  6 0.036140018151634576
0  and  7 0.028665053938597328
0  and  8 0.07094406306916093
0  and  9 0.10712069218830675
1  and  2 0.026740294977832302
1  and  3 0.015227284812385774
1  and  4 0.026523474195558186
1  and  5 0.03557801152980067
1  and  6 0.034300524047937896
1  and  7 0.02623660678314112
1  and  8 0.07113419365352858
1  and  9 0.10731082277267437
2  and  3 0.027768096354225554
2  and  4 0.05070825878873159
2  and  5 0.028147621025904422
2  and  6 0.028575521799454447
2  and  7 0.02199452844068725
2  and  8 0.07755981645834968
2  and  9 0.11373644557749547
3  and  4 0.02679364615132102
3  and  5 0.04539567289068987
3  and  6 0.043453999386061204
3  and  7 0.036993995049395115
3  and  8 0.06053231823163545
3  and  9 0.09670894735078124
4  and  5 0.0620061554099333
4  and  6 0.06082399824349608
4  and  7 0.051765534090727
4  and  8 0.047076671088834524
4  and  9 0.08325320670748433
5  and  6 0.017362768264246622
5  and  7 0.017653783084014957
5  and  8 0.10570743706643954
5  and  9 0.14188406618558533
6  and  7 0.015268655832304056
6  and  8 0.10398631761769665
6  and  9 0.1401629467368425
7  and  8 0.09496837310117004
7  and  9 0.13114290834689338
8  and  9 0.03655223405200688
0  and global:  0.07096748921780578
1  and global:  0.0711576198021734
2  and global:  0.07915580924772436
3  and global:  0.06055574438028027
4  and global:  0.04808974564009074
5  and global:  0.10573086321508438
6  and global:  0.10400974376634148
7  and global:  0.09499489561765642
8  and global:  0.012243842958882761
9  and global:  0.036153202970500974
```

```
ACCURACY
0  and  1 0.16922599600770416
0  and  2 0.015600465325442597
0  and  3 0.3326675944011425
0  and  4 0.13311156524333806
0  and  5 0.002088637781454481
0  and  6 0.0029715160910101387
0  and  7 0.08490192281680213
0  and  8 0.377265077145193
0  and  9 0.05880820171523992
1  and  2 0.15362553068226154
1  and  3 0.1634415983934384
1  and  4 0.03611443077190012
1  and  5 0.16763187651343472
1  and  6 0.16917606708037777
1  and  7 0.08432407319486346
1  and  8 0.2080390811374888
1  and  9 0.22803419771725916
2  and  3 0.31706712907569995
2  and  4 0.11751109991968871
2  and  5 0.01400634583117321
2  and  6 0.015550536398116257
2  and  7 0.0693014574931528
2  and  8 0.3616646118197504
2  and  9 0.07440866703888924
3  and  4 0.19955602916533852
3  and  5 0.3310734749068731
3  and  6 0.33261766547381616
3  and  7 0.24776567158830184
3  and  8 0.04463201943717401
3  and  9 0.39147579611069744
4  and  5 0.1315174457439552
4  and  6 0.13306163630933018
4  and  7 0.04820964242653591
4  and  8 0.24415351190938892
4  and  9 0.19191976695857796
5  and  6 0.0022254298877297804
5  and  7 0.0833078033185713
5  and  8 0.37567095765092356
5  and  9 0.06040232121462274
6  and  7 0.08485199388551434
6  and  8 0.37721514821786667
6  and  9 0.05885813064924775
7  and  8 0.29236315433235227
7  and  9 0.14371012453204202
8  and  9 0.4360732788547479

0  and global:  0.045806577796085095
1  and global:  0.12341941821161903
2  and global:  0.030206112470642497
3  and global:  0.2868610166050574
4  and global:  0.08730518263439262
5  and global:  0.04421245830181571
6  and global:  0.04575664886875875
7  and global:  0.039095540207856716
8  and global:  0.33145849934910787
9  and global:  0.1046147795056401
```

DI comparison with repaired and non-repaired data:

Using repaired training data:

Frequencies:

```
client_ 0
freq:  [165 192 251 305 366 386 424 451 516 563]

client_ 1
freq:  [248 320 382 432 438 491 538 592 625 633]

client_ 2
freq:  [210 267 270 303 311 315 347 388 455 464]

client_ 3
freq:  [102 144 187 226 273 296 311 314 330 379]

client_ 4
freq:  [223 236 267 270 312 350 393 410 418 425]

client_ 5
freq:  [170 173 192 248 271 334 335 374 392 423]

client_ 6
freq:  [136 157 218 243 255 269 298 332 345 395]

client_ 7
freq:  [196 244 255 262 322 323 357 391 400 448]

client_ 8
freq:  [257 262 268 289 310 381 410 443 511 520]

client_ 9
freq:  [160 180 196 217 246 270 311 340 353 404]

global_freq:  [1867, 2175, 2486, 2795, 3104, 3415, 3724, 4035, 4345, 4654]
```

DI:

```
client_ 0
DI:  [0.28288973 0.21026823 0.1790106  0.17074166 0.16554893 0.16293253
 0.15948756 0.16003669 0.16002906 0.15838304]

client_ 1
DI:  [0.26464698 0.19399469 0.17936393 0.17506776 0.16837184 0.16608063
 0.16473668 0.16275456 0.16165476 0.15980471]

client_ 2
DI:  [0.25935925 0.19076275 0.17871263 0.17362835 0.1668667  0.1639574
 0.1614788  0.16145767 0.15893146 0.15882102]

client_ 3
DI:  [0.34850499 0.2196805  0.18563895 0.17451298 0.17030738 0.16697165
 0.16516621 0.16210353 0.16316819 0.16034564]
```

```
client_ 4
DI:  [0.26715572 0.19800939 0.18153955 0.17335944 0.16834552 0.16554442
 0.16356696 0.16223794 0.16079351 0.15871194]

client_ 5
DI:  [0.26766294 0.21116768 0.17728303 0.1717007  0.16391933 0.15949069
 0.15803984 0.15815511 0.15948292 0.15816049]

client_ 6
DI:  [0.31327134 0.20891978 0.17912972 0.17327628 0.16464021 0.16207862
 0.15915406 0.15848565 0.15659587 0.15838076]

client_ 7
DI:  [0.26379888 0.19478318 0.17964208 0.17200668 0.16624253 0.16358636
 0.16347236 0.15992686 0.1595946  0.16157298]

client_ 8
DI:  [0.24139095 0.19943477 0.17743795 0.17342031 0.16631842 0.16335852
 0.1633647  0.16111759 0.16176952 0.16002603]

client_ 9
DI:  [0.30202056 0.21264085 0.18170005 0.17569069 0.16958671 0.1630639
 0.16455638 0.16200472 0.1613329  0.15925871]

global_DI:  [0.2709412913830132, 0.20048795059997424, 0.18037817973311088, 0.173277885059641, 0.16655299948164728, 0.163143035418459, 0.16335852272983517, 0.161461167
43259317, 0.15991861443420607, 0.15915067830358973]
```

Using non-repaired training data:

Frequencies:

```
client_ 0
freq:  [ 29  74 118 149 153 189 257 267 308 355]

client_ 1
freq:  [ 28  71 116 117 154 206 274 311 324 358]

client_ 2
freq:  [ 33  78 103 135 197 216 218 252 261 283]

client_ 3
freq:  [  3   8  12  24  53  74 140 161 203 234]

client_ 4
freq:  [  2  26  82 136 145 155 159 186 199 251]

client_ 5
freq:  [  4  44  84 133 146 168 184 226 281 283]

client_ 6
freq:  [ 62  82  96 122 158 178 226 257 281 296]

client_ 7
freq:  [ 46  67 118 157 200 236 261 290 328 359]

client_ 8
freq:  [ 54  85 103 135 178 216 227 265 308 364]
```

client_ 9
freq: [54 90 103 138 171 225 228 270 302 323]

global_freq: [315, 625, 935, 1246, 1555, 1863, 2174, 2485, 2795, 3106]

DI:
client_ 0
DI: [0.44191841 0.17971129 0.15242817 0.13340962 0.12794631 0.12430922
 0.1236793 0.1214093 0.12150065 0.12220011]

client_ 1
DI: [0.43073767 0.19002924 0.14982966 0.13507994 0.13127082 0.12709818
 0.12044582 0.12071648 0.12047838 0.11949734]

client_ 2
DI: [0.36793093 0.18323042 0.15092603 0.1369037 0.12837683 0.12247492
 0.12065914 0.12144424 0.12166888 0.12027246]

client_ 3
DI: [1.50639386 0.26953687 0.18009166 0.14473906 0.13549024 0.12949971
 0.1283181 0.12676956 0.12464751 0.1237177]

client_ 4
DI: [1.5650387 0.2350837 0.15544102 0.1367278 0.13228707 0.12609832
 0.12187121 0.12216374 0.12250967 0.12136153]

client_ 5
DI: [1.50359026 0.20454197 0.15094316 0.13327437 0.12785947 0.12463822
 0.12559576 0.12356096 0.12250967 0.12136153]

client_ 6
DI: [0.24616109 0.18809003 0.15642322 0.14321044 0.1304053 0.13072084
 0.12924097 0.12700327 0.1259679 0.12373031]

client_ 7
DI: [0.27889908 0.18591534 0.14266103 0.13319071 0.13016345 0.12285938
 0.12454555 0.12360023 0.12321918 0.12097768]

client_ 8
DI: [0.24786423 0.16987197 0.14797473 0.13363889 0.12657201 0.12643618
 0.12600825 0.12481528 0.12324326 0.12070744]

client_ 9
DI: [0.26841758 0.17669171 0.15512265 0.13555919 0.13014123 0.12373188
 0.12369219 0.12285938 0.1212711 0.12269225]

global_DI: [0.28214031995939176, 0.186501205986982, 0.15044426661760857, 0.1351911483754244, 0.12911714087339698, 0.1259591143043552, 0.12478187687202712, 0.12329660
54319864, 0.12400930257321172, 0.12115851400831043]