

# Certainty-based Domain Selection Framework for TinyML Devices

Joanna Komorniczak, Tobiasz Puślecki, Paweł Ksieniewicz,  
Krzysztof Walkowiak

Supplementary material

## 1 MNIST

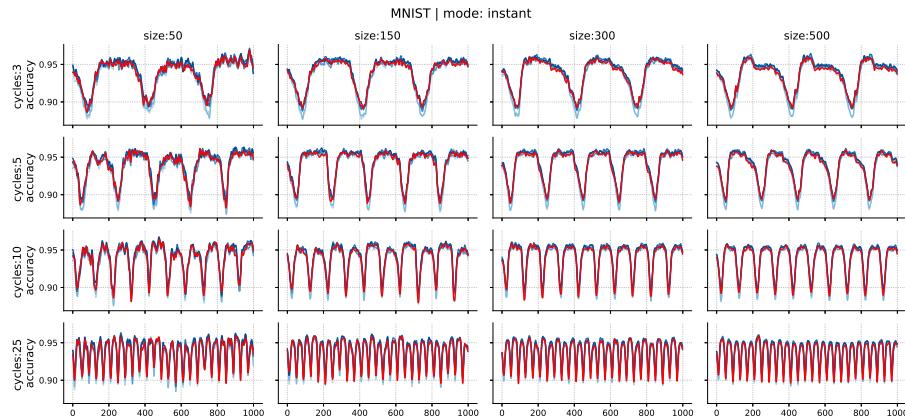


Figure 1: Accuracy of MNIST-based stream with instant difficulty change

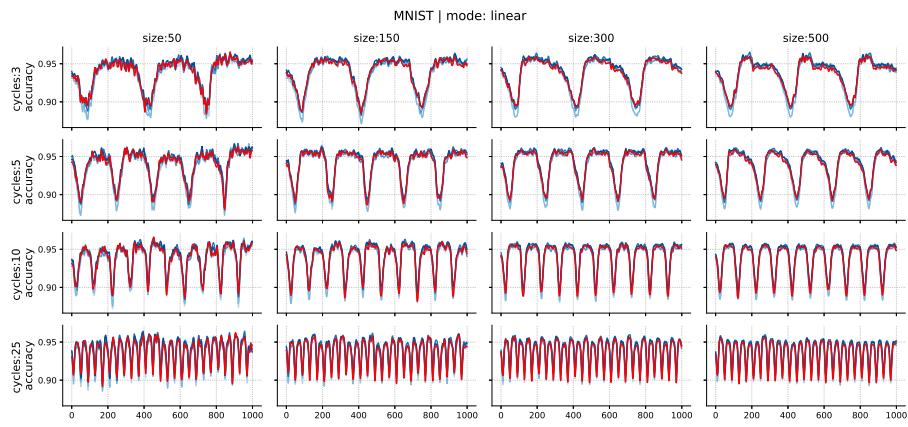


Figure 2: Accuracy of MNIST-based stream with linear difficulty change

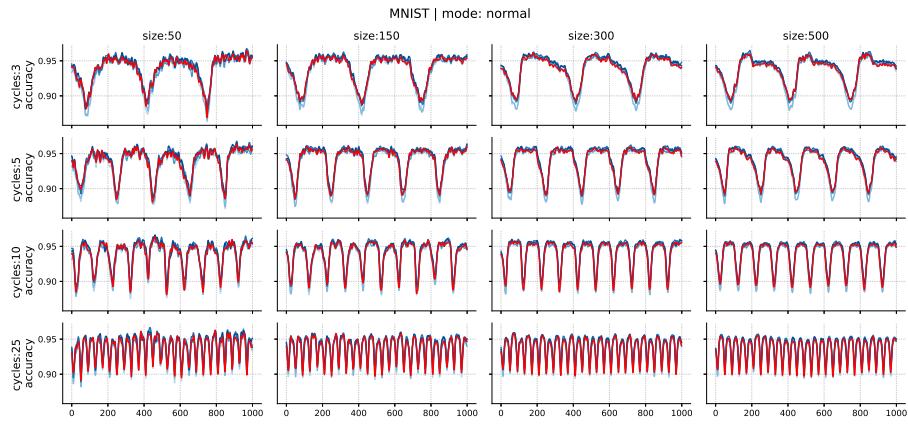


Figure 3: Accuracy of MNIST-based stream with normal difficulty change

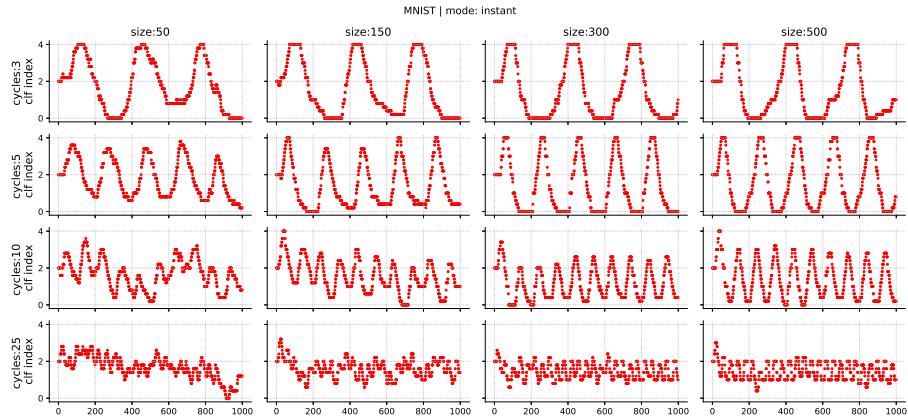


Figure 4: Selected architecture of MNIST-based stream with instant difficulty change

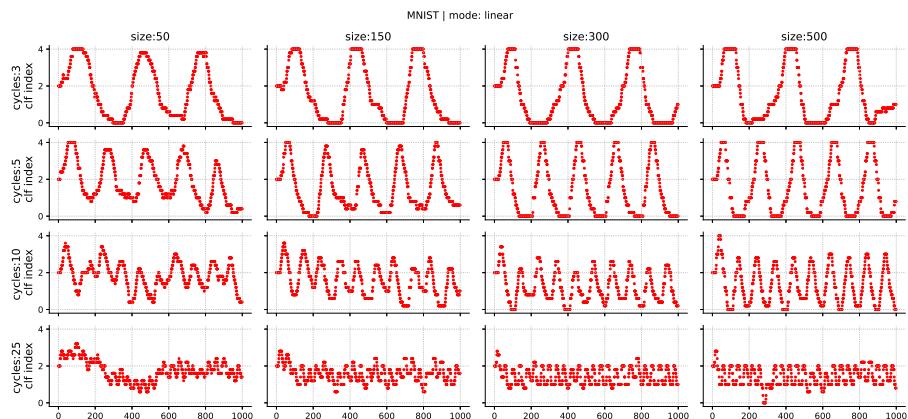


Figure 5: Selected architecture of MNIST-based stream with linear difficulty change

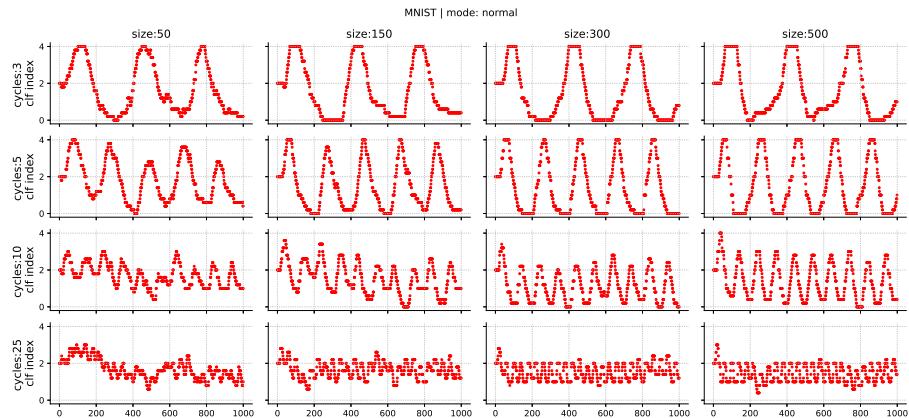


Figure 6: Selected architecture of MNIST-based stream with normal difficulty change

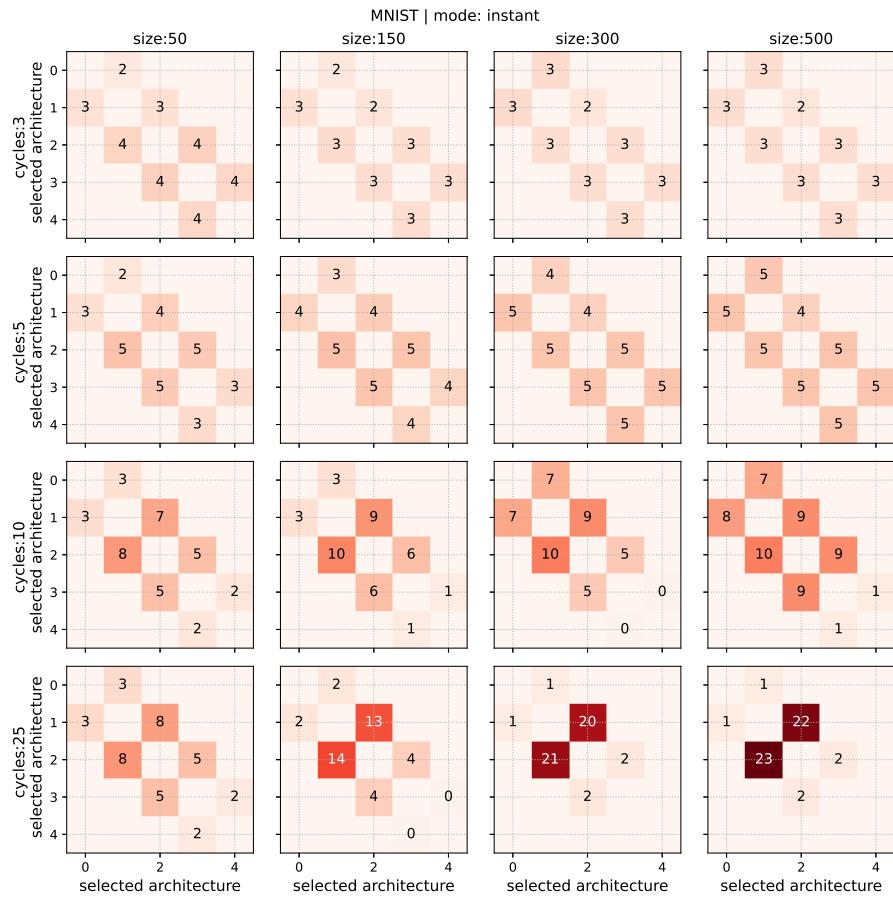


Figure 7: Number of architecture switches of MNIST-based stream with instant difficulty change

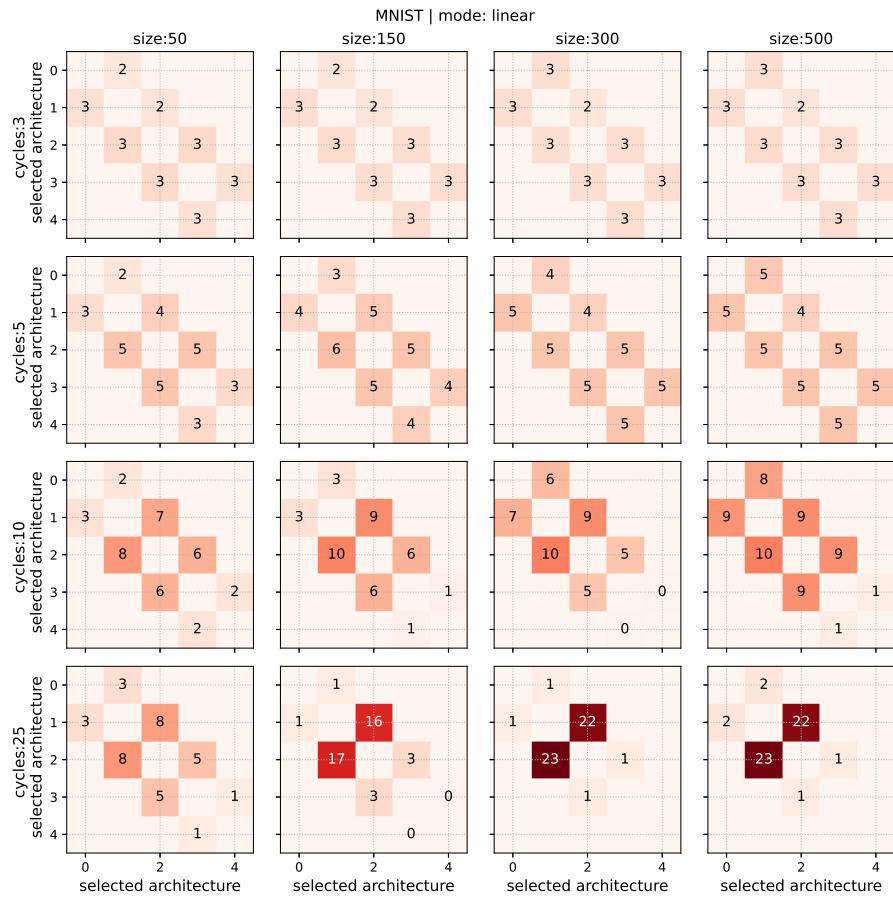


Figure 8: Number of architecture switches of MNIST-based stream with linear difficulty change

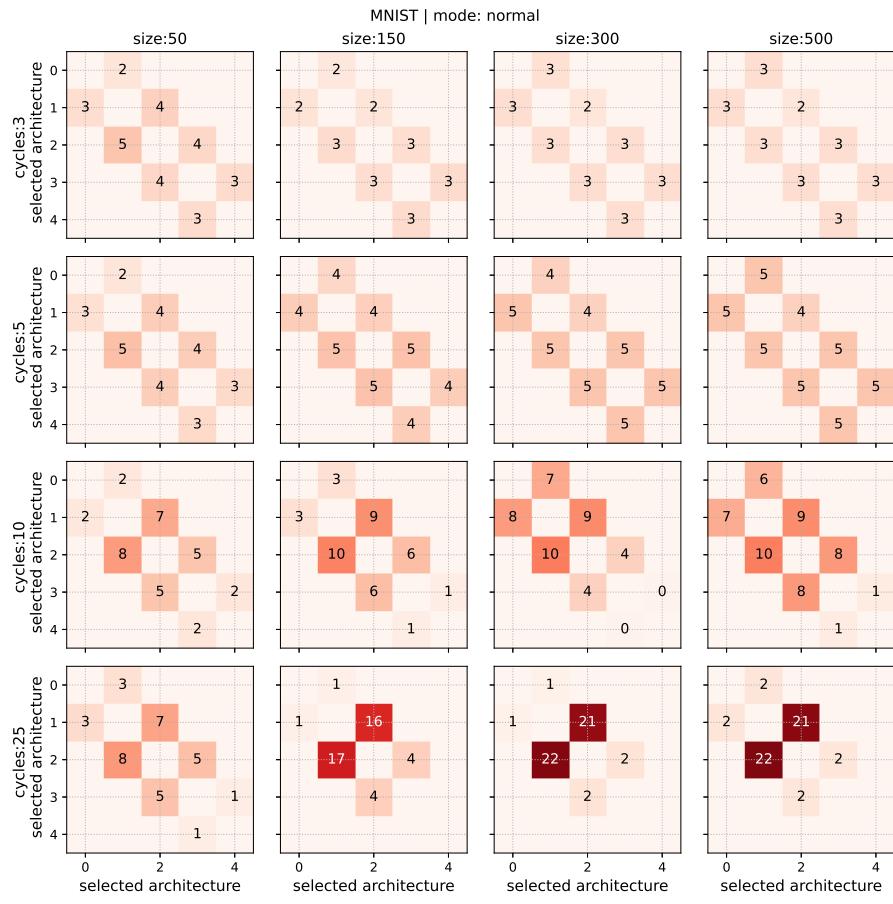


Figure 9: Number of architecture switches of MNIST-based stream with normal difficulty change

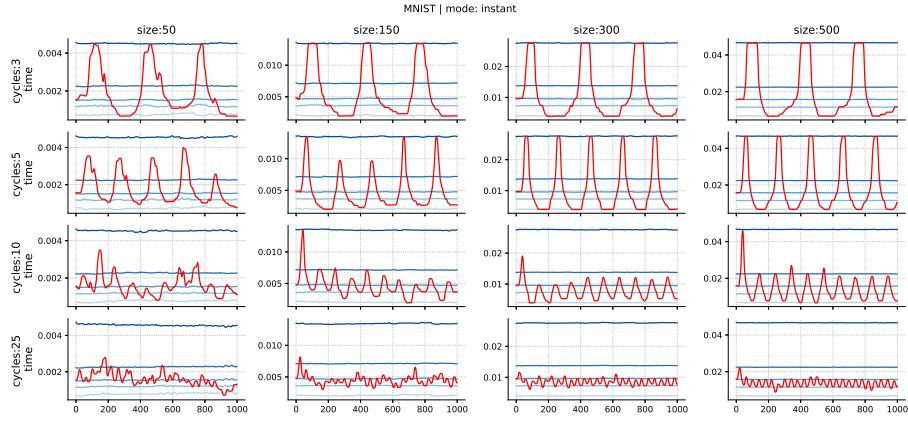


Figure 10: Time of processing measured during the desktop experiment of MNIST-based stream with instant difficulty change

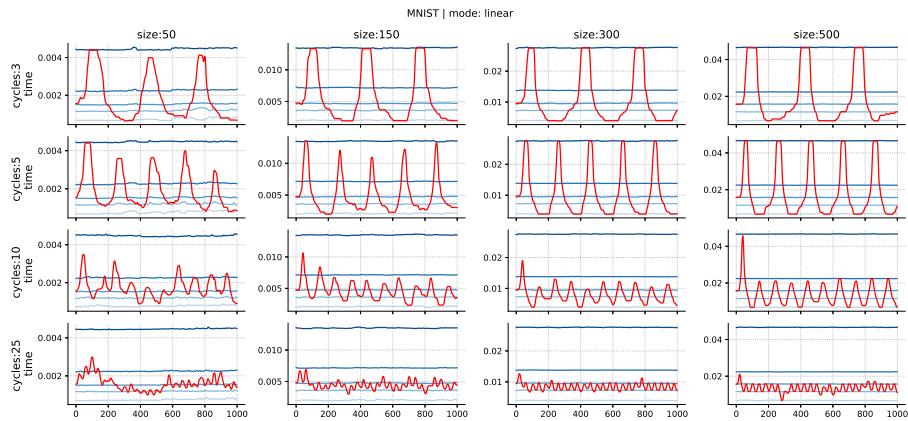


Figure 11: Time of processing measured during the desktop experiment of MNIST-based stream with linear difficulty change

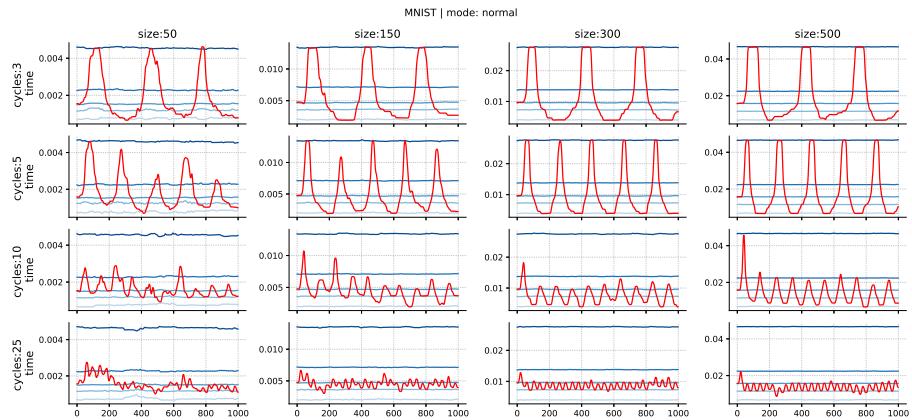


Figure 12: Time of processing measured during the desktop experiment of MNIST-based stream with normal difficulty change

stream	R acc	CDoS acc	CDos Latency (*1e3)	CDoS MACC(*1e9)	TTAG
instant cs50 c3	0.940	0.938 (-0.002)	1.545 (-2.637)	0.029 (-0.071)	180.281
instant cs50 c5	0.940	0.938 (-0.002)	1.394 (-2.788)	0.024 (-0.075)	196.680
instant cs50 c10	0.940	0.938 (-0.003)	1.120 (-3.062)	0.017 (-0.083)	210.163
instant cs50 c25	0.940	0.936 (-0.004)	1.140 (-3.042)	0.017 (-0.082)	152.951
instant cs150 c3	0.940	0.938 (-0.002)	4.512 (-8.035)	0.084 (-0.215)	224.077
instant cs150 c5	0.943	0.940 (-0.002)	3.472 (-9.075)	0.055 (-0.243)	241.693
instant cs150 c10	0.941	0.938 (-0.003)	3.106 (-9.441)	0.044 (-0.255)	215.492
instant cs150 c25	0.939	0.936 (-0.004)	3.141 (-9.406)	0.044 (-0.254)	170.423
instant cs300 c3	0.940	0.938 (-0.002)	8.578 (-16.516)	0.157 (-0.439)	187.806
instant cs300 c5	0.942	0.940 (-0.002)	7.862 (-17.232)	0.137 (-0.460)	225.327
instant cs300 c10	0.942	0.939 (-0.003)	5.407 (-19.687)	0.069 (-0.527)	200.847
instant cs300 c25	0.939	0.935 (-0.004)	5.945 (-19.149)	0.081 (-0.515)	162.393
instant cs500 c3	0.938	0.936 (-0.002)	15.184 (-26.639)	0.285 (-0.709)	175.249
instant cs500 c5	0.940	0.938 (-0.002)	14.144 (-27.679)	0.255 (-0.739)	214.620
instant cs500 c10	0.940	0.937 (-0.003)	9.842 (-31.981)	0.133 (-0.861)	213.547
instant cs500 c25	0.938	0.934 (-0.004)	9.884 (-31.939)	0.134 (-0.860)	152.603
linear cs50 c3	0.940	0.938 (-0.002)	1.497 (-2.685)	0.027 (-0.072)	203.507
linear cs50 c5	0.940	0.938 (-0.002)	1.470 (-2.713)	0.026 (-0.073)	189.081
linear cs50 c10	0.940	0.938 (-0.002)	1.241 (-2.941)	0.020 (-0.080)	258.983
linear cs50 c25	0.939	0.936 (-0.003)	1.164 (-3.018)	0.018 (-0.082)	183.636
linear cs150 c3	0.940	0.938 (-0.002)	4.481 (-8.066)	0.083 (-0.215)	220.977
linear cs150 c5	0.943	0.941 (-0.002)	3.639 (-8.908)	0.059 (-0.239)	255.219
linear cs150 c10	0.941	0.938 (-0.003)	3.074 (-9.473)	0.042 (-0.256)	234.464
linear cs150 c25	0.939	0.936 (-0.003)	3.120 (-9.427)	0.044 (-0.255)	174.711
linear cs300 c3	0.940	0.938 (-0.002)	8.467 (-16.627)	0.154 (-0.443)	200.468
linear cs300 c5	0.942	0.940 (-0.002)	7.963 (-17.131)	0.139 (-0.457)	234.060
linear cs300 c10	0.942	0.940 (-0.003)	5.441 (-19.653)	0.070 (-0.527)	221.728
linear cs300 c25	0.939	0.936 (-0.004)	5.901 (-19.193)	0.080 (-0.516)	163.837
linear cs500 c3	0.939	0.936 (-0.002)	15.007 (-26.816)	0.280 (-0.714)	193.112
linear cs500 c5	0.940	0.938 (-0.002)	14.264 (-27.559)	0.258 (-0.736)	199.600
linear cs500 c10	0.940	0.937 (-0.003)	9.567 (-32.256)	0.127 (-0.867)	211.779
linear cs500 c25	0.938	0.934 (-0.004)	9.821 (-32.002)	0.133 (-0.861)	152.490
normal cs50 c3	0.940	0.938 (-0.002)	1.515 (-2.667)	0.028 (-0.072)	197.426
normal cs50 c5	0.940	0.937 (-0.003)	1.362 (-2.820)	0.023 (-0.076)	188.023
normal cs50 c10	0.940	0.937 (-0.003)	1.158 (-3.024)	0.018 (-0.082)	207.315
normal cs50 c25	0.940	0.936 (-0.003)	1.116 (-3.067)	0.016 (-0.083)	166.036
normal cs150 c3	0.940	0.938 (-0.002)	4.498 (-8.048)	0.083 (-0.215)	221.754
normal cs150 c5	0.943	0.941 (-0.002)	3.727 (-8.820)	0.062 (-0.236)	247.973
normal cs150 c10	0.941	0.938 (-0.003)	3.069 (-9.478)	0.043 (-0.256)	228.711
normal cs150 c25	0.939	0.936 (-0.003)	3.171 (-9.376)	0.045 (-0.254)	185.673
normal cs300 c3	0.940	0.938 (-0.002)	8.496 (-16.598)	0.155 (-0.442)	189.809
normal cs300 c5	0.942	0.940 (-0.002)	7.811 (-17.283)	0.135 (-0.461)	222.045
normal cs300 c10	0.943	0.939 (-0.003)	5.312 (-19.781)	0.067 (-0.529)	198.701
normal cs300 c25	0.939	0.935 (-0.004)	6.120 (-18.974)	0.085 (-0.512)	156.508
normal cs500 c3	0.938	0.936 (-0.002)	15.110 (-26.713)	0.282 (-0.712)	197.701
normal cs500 c5	0.940	0.938 (-0.002)	14.253 (-27.570)	0.258 (-0.736)	204.746
normal cs500 c10	0.940	0.937 (-0.003)	9.832 (-31.991)	0.133 (-0.861)	222.464
normal cs500 c25	0.938	0.934 (-0.004)	9.846 (-31.977)	0.134 (-0.860)	158.669

Table 1: Results for all streams generated based on MNIST

## 2 SVHN

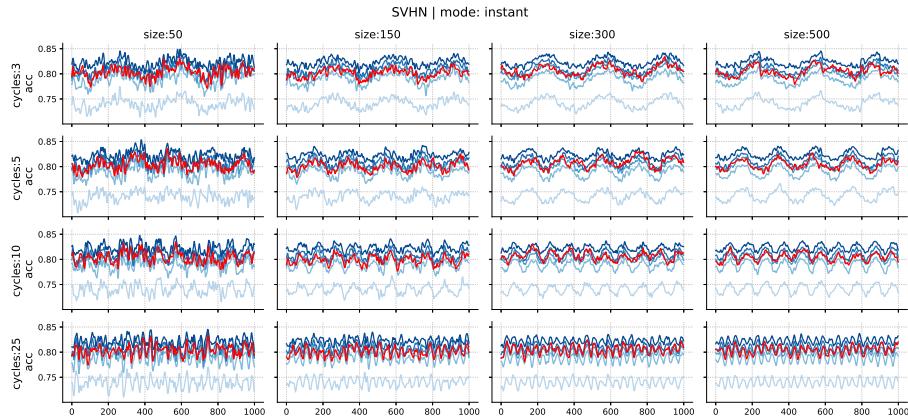


Figure 13: Accuracy of SVHN-based stream with instant difficulty change

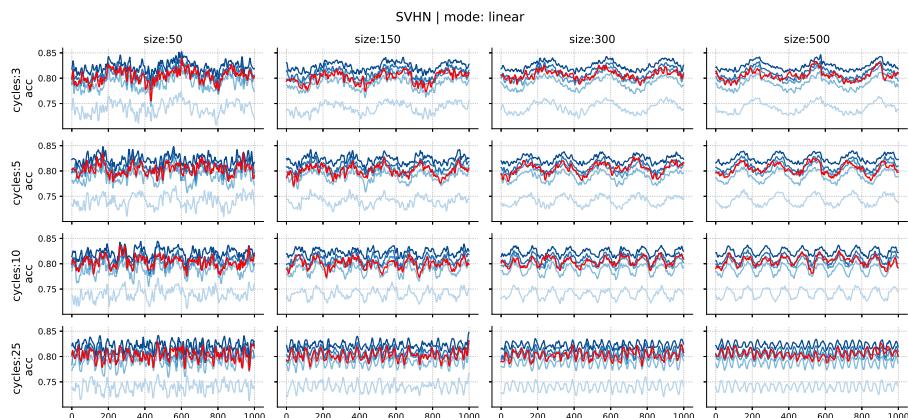


Figure 14: Accuracy of SVHN-based stream with linear difficulty change

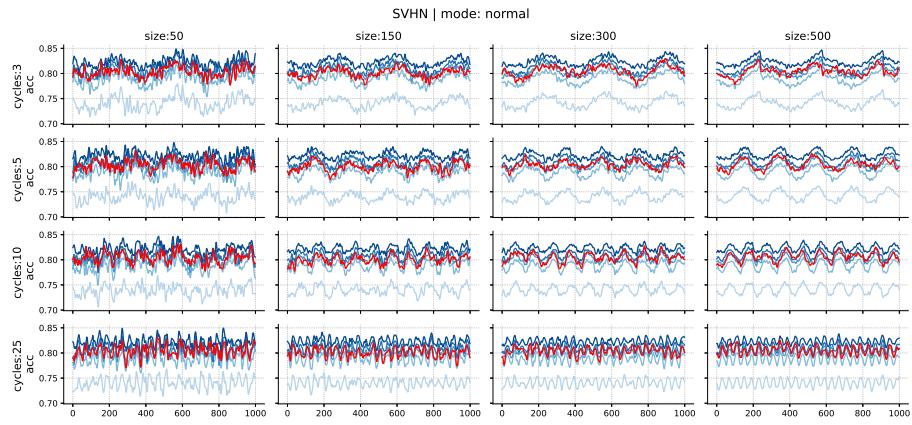


Figure 15: Accuracy of SVHN-based stream with normal difficulty change

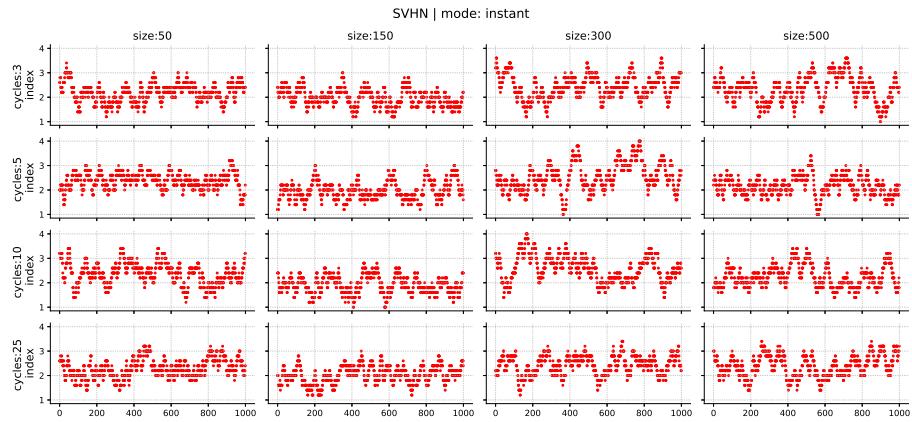


Figure 16: Selected architecture of SVHN-based stream with instant difficulty change

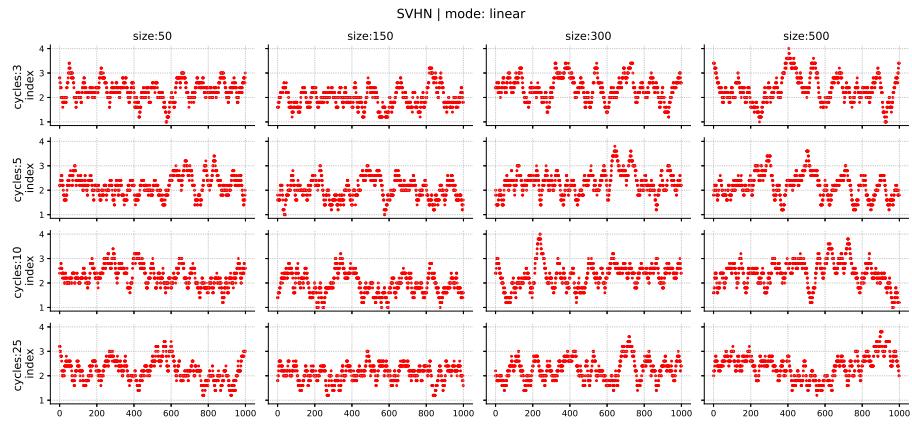


Figure 17: Selected architecture of SVHN-based stream with linear difficulty change

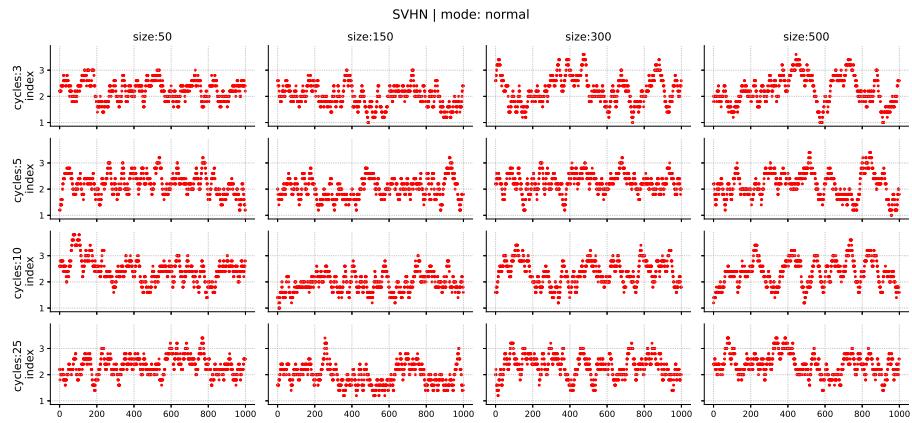


Figure 18: Selected architecture of SVHN-based stream with normal difficulty change

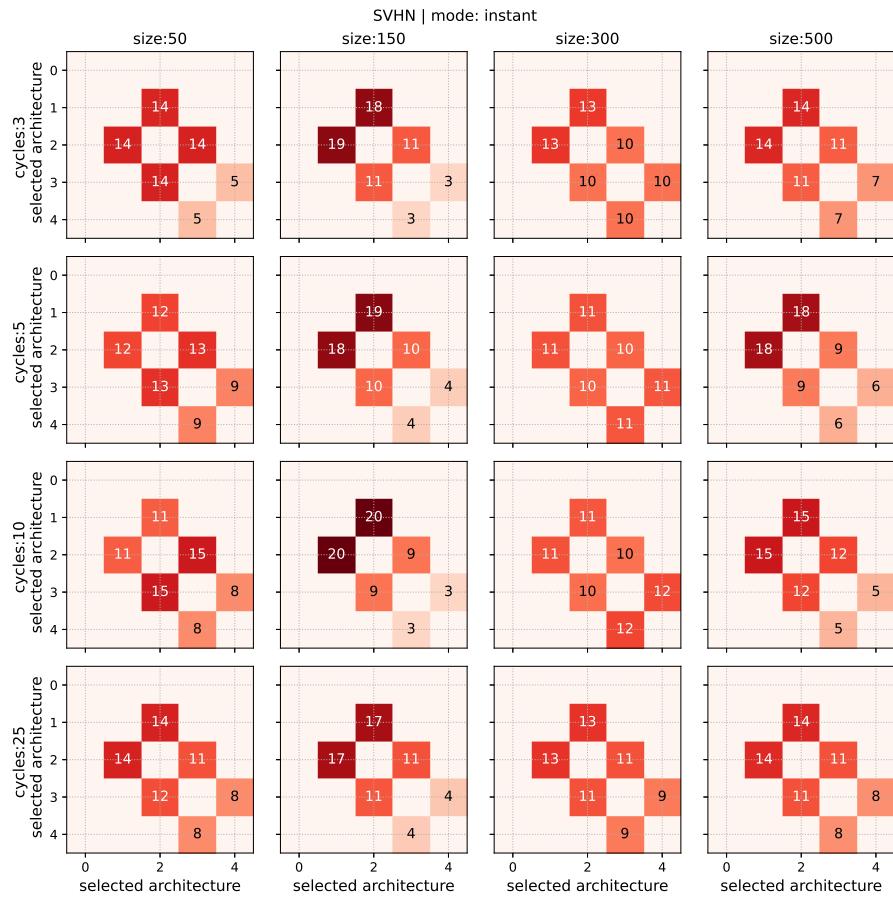


Figure 19: Number of architecture switches of SVHN-based stream with instant difficulty change

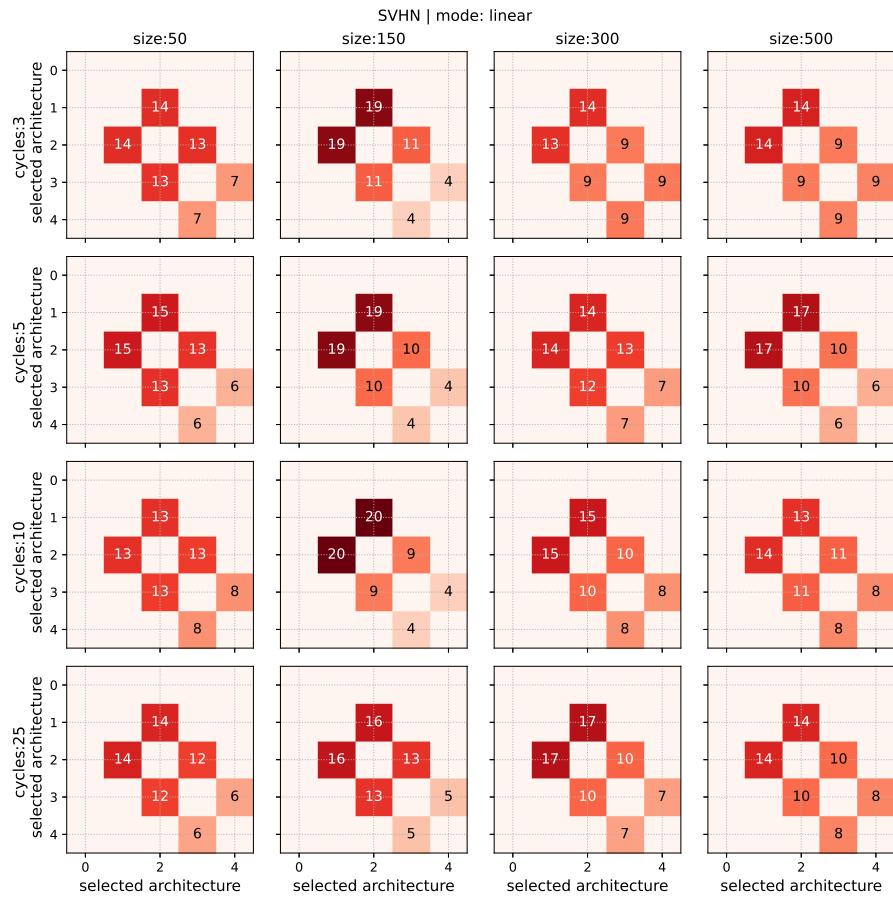


Figure 20: Number of architecture switches of SVHN-based stream with linear difficulty change

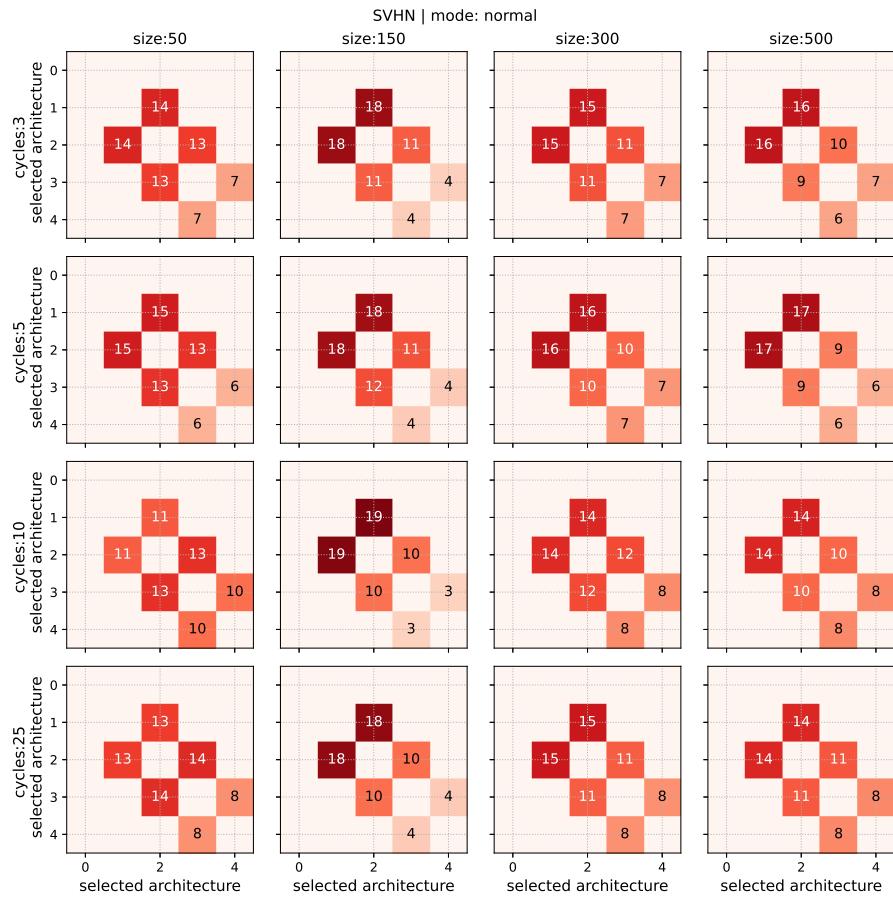


Figure 21: Number of architecture switches of SVHN-based stream with normal difficulty change

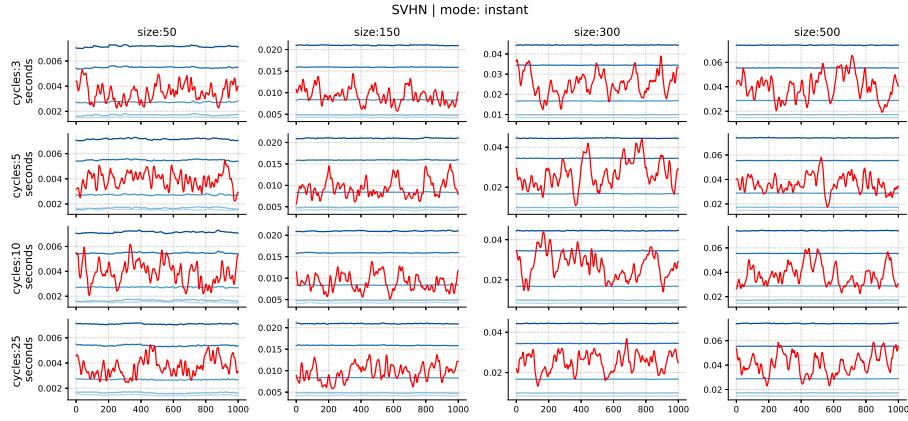


Figure 22: Time of processing measured during the desktop experiment of SVHN-based stream with instant difficulty change

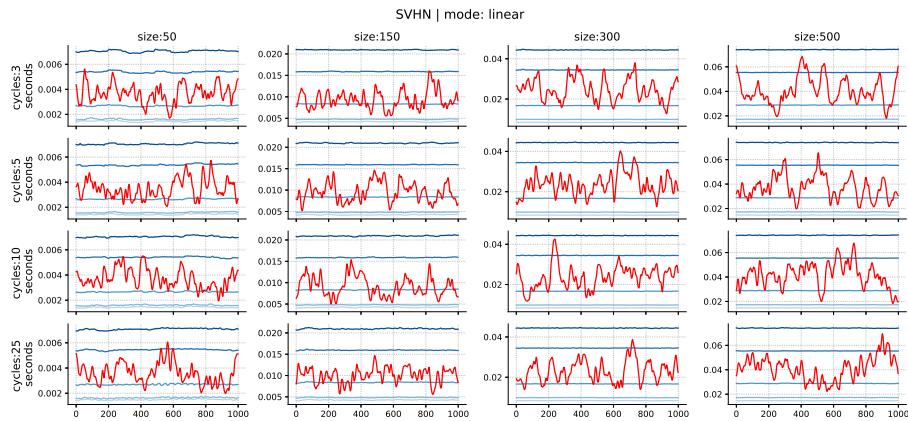


Figure 23: Time of processing measured during the desktop experiment of SVHN-based stream with linear difficulty change

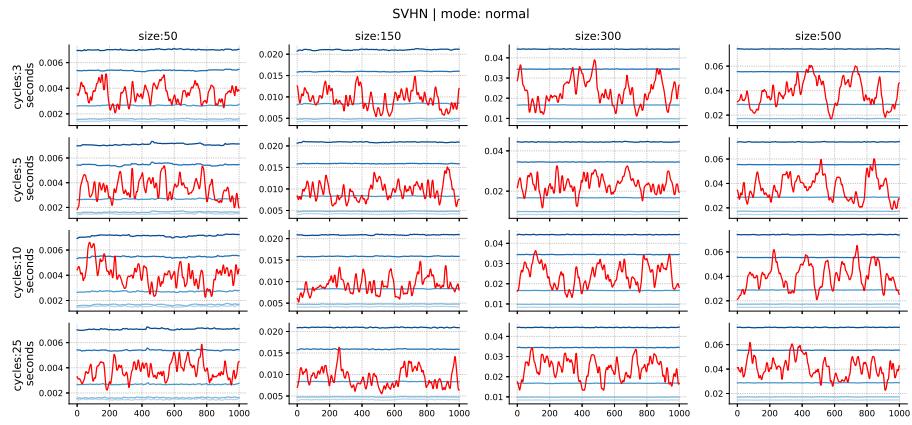


Figure 24: Time of processing measured during the desktop experiment of SVHN-based stream with normal difficulty change

stream	R acc	CDoS acc	CDos Latency(*1e3)	CDoS MACC(*1e9)	TTAG
instant cs50 c3	0.823	0.803 (-0.020)	3.231 (-4.093)	0.076 (-0.125)	14.144
instant cs50 c5	0.823	0.804 (-0.019)	3.661 (-3.663)	0.089 (-0.111)	12.021
instant cs50 c10	0.823	0.804 (-0.019)	3.641 (-3.683)	0.089 (-0.112)	12.131
instant cs50 c25	0.822	0.803 (-0.019)	3.507 (-3.817)	0.084 (-0.116)	13.320
instant cs150 c3	0.824	0.801 (-0.023)	8.640 (-13.331)	0.194 (-0.407)	14.905
instant cs150 c5	0.823	0.800 (-0.023)	8.683 (-13.288)	0.196 (-0.406)	14.856
instant cs150 c10	0.823	0.799 (-0.024)	8.307 (-13.664)	0.183 (-0.418)	14.771
instant cs150 c25	0.823	0.801 (-0.022)	8.980 (-12.991)	0.205 (-0.397)	14.566
instant cs300 c3	0.825	0.807 (-0.018)	23.199 (-20.743)	0.575 (-0.629)	11.406
instant cs300 c5	0.824	0.807 (-0.016)	24.531 (-19.412)	0.618 (-0.586)	10.769
instant cs300 c10	0.823	0.807 (-0.016)	25.020 (-18.922)	0.632 (-0.571)	10.429
instant cs300 c25	0.822	0.805 (-0.018)	23.007 (-20.935)	0.569 (-0.634)	11.748
instant cs500 c3	0.824	0.805 (-0.019)	36.474 (-36.764)	0.890 (-1.116)	12.102
instant cs500 c5	0.825	0.804 (-0.020)	32.798 (-40.440)	0.772 (-1.234)	13.785
instant cs500 c10	0.824	0.804 (-0.019)	34.290 (-38.947)	0.821 (-1.185)	13.353
instant cs500 c25	0.823	0.804 (-0.019)	37.349 (-35.889)	0.917 (-1.088)	11.662
linear cs50 c3	0.824	0.804 (-0.019)	3.490 (-3.833)	0.084 (-0.117)	12.971
linear cs50 c5	0.823	0.803 (-0.019)	3.296 (-4.028)	0.078 (-0.123)	14.201
linear cs50 c10	0.822	0.803 (-0.019)	3.519 (-3.805)	0.085 (-0.116)	13.038
linear cs50 c25	0.823	0.802 (-0.020)	3.360 (-3.963)	0.080 (-0.121)	13.216
linear cs150 c3	0.823	0.800 (-0.023)	8.690 (-13.282)	0.196 (-0.406)	14.568
linear cs150 c5	0.823	0.801 (-0.022)	8.898 (-13.074)	0.202 (-0.399)	14.543
linear cs150 c10	0.823	0.800 (-0.023)	8.492 (-13.479)	0.189 (-0.412)	14.943
linear cs150 c25	0.823	0.802 (-0.021)	9.377 (-12.594)	0.218 (-0.384)	14.260
linear cs300 c3	0.825	0.807 (-0.018)	22.755 (-21.187)	0.560 (-0.643)	11.782
linear cs300 c5	0.823	0.805 (-0.019)	21.638 (-22.305)	0.526 (-0.677)	12.517
linear cs300 c10	0.823	0.804 (-0.019)	21.705 (-22.238)	0.528 (-0.676)	12.555
linear cs300 c25	0.823	0.802 (-0.020)	20.938 (-23.005)	0.503 (-0.700)	12.487
linear cs500 c3	0.824	0.805 (-0.019)	36.955 (-36.283)	0.904 (-1.102)	11.949
linear cs500 c5	0.825	0.804 (-0.020)	33.569 (-39.669)	0.797 (-1.209)	13.197
linear cs500 c10	0.824	0.805 (-0.018)	37.794 (-35.444)	0.932 (-1.074)	11.684
linear cs500 c25	0.823	0.805 (-0.018)	37.719 (-35.518)	0.928 (-1.078)	11.926
normal cs50 c3	0.822	0.803 (-0.019)	3.399 (-3.925)	0.081 (-0.119)	13.601
normal cs50 c5	0.823	0.804 (-0.019)	3.313 (-4.010)	0.078 (-0.122)	14.349
normal cs50 c10	0.822	0.804 (-0.018)	3.820 (-3.504)	0.095 (-0.106)	11.503
normal cs50 c25	0.823	0.804 (-0.018)	3.574 (-3.749)	0.087 (-0.114)	13.056
normal cs150 c3	0.823	0.801 (-0.023)	8.671 (-13.301)	0.195 (-0.407)	14.922
normal cs150 c5	0.823	0.800 (-0.023)	8.894 (-13.078)	0.203 (-0.399)	14.096
normal cs150 c10	0.823	0.800 (-0.023)	8.551 (-13.421)	0.191 (-0.410)	14.877
normal cs150 c25	0.823	0.800 (-0.023)	8.674 (-13.297)	0.195 (-0.407)	14.731
normal cs300 c3	0.824	0.805 (-0.020)	21.048 (-22.895)	0.507 (-0.696)	12.563
normal cs300 c5	0.823	0.804 (-0.019)	21.111 (-22.832)	0.509 (-0.694)	12.738
normal cs300 c10	0.823	0.804 (-0.019)	22.105 (-21.837)	0.541 (-0.663)	12.087
normal cs300 c25	0.823	0.804 (-0.019)	21.738 (-22.204)	0.529 (-0.675)	12.154
normal cs500 c3	0.824	0.804 (-0.020)	34.619 (-38.618)	0.829 (-1.176)	12.876
normal cs500 c5	0.825	0.804 (-0.020)	33.074 (-40.163)	0.781 (-1.225)	13.477
normal cs500 c10	0.824	0.805 (-0.018)	36.878 (-36.359)	0.902 (-1.103)	12.198
normal cs500 c25	0.823	0.805 (-0.018)	37.391 (-35.847)	0.919 (-1.087)	12.086

Table 2: Results for all streams generated based on SVHN