

Trial License -- for use to evaluate programs for possible purchase as an end-user only.

```
Trial>> gen_k_folds('data',5)
Trial>> nn1h_k_folds
Filename root of the folds (use single quotes): 'data'
Number of folds: k = 5
Number of neurons at the hidden layer (nonlinear units) = 140
(1) Generate w10 and w20, and save
(2) Copy existing w10 and w20
(3) Copy existing w1 and w2
Type of weight generation: 1
Fold = 1
Number of input-output patterns (training) = 48000
Number of input-output patterns (validation) = 12000
Maximum number of iterations = 500
Number of inputs = 784
Number of weights in the neural network = 111310
Initial CER (validation) = 0.889394542933
 2 1 34034.3025084
 3 2 28365.6507735
 4 3 19066.5429192
 5 4 18066.9912053
 6 5 15662.3499093
 7 6 14396.5904723
 8 7 13754.4726948
 9 8 12827.380782
10 9 12579.2401461
11 10 12076.3876492
12 11 11815.4956166
13 12 11540.5966479
14 13 11236.2077904
15 14 11088.3075875
16 15 10844.1700044
17 16 10663.5897851
18 17 10543.9346651
19 18 10365.07484
20 19 10249.2064926
21 20 10158.3556099
22 21 10010.9617166
23 22 9891.51272843
24 23 9815.85916422
25 24 9706.12973021
26 25 9581.38356576
27 26 9515.68312914
28 27 9445.06044863
29 28 9315.39108026
30 29 9220.38942526
31 30 9167.57487322
32 31 9072.88281924
33 32 8949.37042354
34 33 8892.78084476
35 34 8846.38247633
36 35 8750.71385994
37 36 8643.75026945
38 37 8592.91355174
39 38 8539.62100486
40 39 8418.29650527
41 40 8284.06961422
42 41 8217.18165555
43 42 8169.44584406
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46 45 7841.87665088
47 46 7806.75080857
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49 48 7598.69822752
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51 50 7482.52435732
52 51 7443.49628646
53 52 7323.00260348
54 53 7204.68412189
55 54 7164.17580632
56 55 7139.58724398
57 56 7061.23199134
58 57 6933.26423304
59 58 6895.32290898
60 59 6876.92332966
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62 61 6666.52550808
63 62 6626.76671832
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65 64 6543.26116756
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67 66 6357.3528175
68 67 6341.46273809
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70 69 6155.21687507
71 70 6129.29726009
72 71 6116.1056183
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75 74 5934.40757783
76 75 5912.83930715
77 76 5798.5132908
78 77 5737.8778882
79 78 5727.11817145
80 79 5684.41412255
81 80 5579.2181444
82 81 5560.36671079
83 82 5545.04703849
84 83 5451.35568013
85 84 5412.56989547
86 85 5404.91834586
87 86 5353.65162776
88 87 5286.12771678
89 88 5277.29809419
90 89 5252.98153365
91 90 5166.51330375
92 91 5151.39298123
93 92 5140.99051724
94 93 5065.96831109
95 94 5037.04385871
96 95 5030.08035238
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98 97 4932.82746705
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367 366 2014.33464774
368 367 2009.03662705
369 368 2008.70331945
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372 371 2000.20362263
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425 424 1854.00254979
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460 459 1769.33786641
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462 461 1766.2478214
463 462 1762.80125551
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465 464 1757.83291903
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470 469 1747.60155634
471 470 1745.5206516
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495 494 1695.89490474
496 495 1692.52326214
497 496 1692.31166855
498 497 1688.85573211
499 498 1688.36397712
500 499 1685.38651187
Final mean squared error (training) = 0.0838000226698 at iteration 500
Final CER (validation) = 0.0337635214368 at iteration 498
Fold = 2
Number of input-output patterns (training) = 48000
Number of input-output patterns (validation) = 12000
Maximum number of iterations = 500
Initial CER (validation) = 0.878805339804
 2 1 32437.6705359
 3 2 25576.0710229
 4 3 18948.9476613
 5 4 18115.4511721
 6 5 15730.6319005
 7 6 14284.1553323
 8 7 13847.5446075
 9 8 12978.7529219
10 9 12658.0427304
11 10 12261.9831864
12 11 11860.1364327
13 12 11687.9467212
14 13 11463.4077824
15 14 11234.0805667
16 15 11082.3769087
17 16 10916.3929981
18 17 10739.1367596
19 18 10611.2404542
20 19 10493.0591522
21 20 10376.3208202
22 21 10276.9191752
23 22 10182.1812439
24 23 10090.4917967
25 24 9990.79109262
26 25 9887.58060011
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88 87 5654.48780303
89 88 5594.6510222
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266 265 2992.07800437
267 266 2977.03140397
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273 272 2941.53193722
274 273 2937.44307567
275 274 2936.26161901
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279 278 2909.72576685
280 279 2906.51553574
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292 291 2839.7825522
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341 340 2570.10413505
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343 342 2559.18476059
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390 389 2340.5864525
391 390 2339.97807038
392 391 2331.26969736
393 392 2329.78014222
394 393 2326.30485597
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397 396 2311.61792255
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404 403 2286.02493469
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420 419 2230.4992401
421 420 2223.1733817
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444 443 2147.74743457
445 444 2140.68825085
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451 450 2124.07902011
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454 453 2112.7649554
455 454 2108.14425238
456 455 2107.33241887
457 456 2100.36484112
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459 458 2094.17192821
460 459 2092.58005624
461 460 2090.42269548
462 461 2085.31952152
463 462 2084.79724771
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465 464 2078.42484202
466 465 2074.07608255
467 466 2072.24813729
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468 467 2070.68538654
469 468 2066.25082466
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475 474 2052.04141954
476 475 2046.97225805
477 476 2046.57371232
478 477 2040.91445558
479 478 2040.33147822
480 479 2036.0094252
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483 482 2026.95498458
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485 484 2020.65673188
486 485 2020.07492604
487 486 2015.76030777
488 487 2013.08853919
489 488 2011.6908344
490 489 2006.08352021
491 490 2005.65971528
492 491 1999.73971021
493 492 1999.18902125
494 493 1994.84075928
495 494 1992.63109225
496 495 1991.12923506
497 496 1986.5888006
498 497 1986.20925869
499 498 1981.48403112
500 499 1981.12649849
Final mean squared error (training) = 0.0908553451577 at iteration 500
Final CER (validation) = 0.0382722230418 at iteration 498
Fold = 3
Number of input-output patterns (training) = 48000
Number of input-output patterns (validation) = 12000
Maximum number of iterations = 500
Initial CER (validation) = 0.943195733726
 2 1 32671.7518123
 3 2 27575.3649704
 4 3 19150.0456083
 5 4 17924.9721201
 6 5 15695.1747747
 7 6 14416.8631368
 8 7 14019.9234573
 9 8 13199.9214035
10 9 12711.1332257
11 10 12432.8433845
12 11 12024.5216983
13 12 11727.7694207
14 13 11546.3977717
15 14 11298.3939432
16 15 11085.7788588
17 16 10952.714151
18 17 10793.0394135
19 18 10602.9413857
20 19 10475.9792278
21 20 10385.2106441
22 21 10264.7660672
23 22 10135.6853718
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29 28 9568.45472808
30 29 9451.51974094
31 30 9352.42935648
32 31 9296.35023261
33 32 9239.62040338
34 33 9131.94931562
35 34 9008.35968233
36 35 8931.65524371
37 36 8878.52357292
38 37 8808.08907818
39 38 8690.22837053
40 39 8578.84113293
41 40 8508.55839828
42 41 8454.37732147
43 42 8370.01366969
44 43 8228.47387453
45 44 8107.75078098
46 45 8048.81044678
47 46 8004.96416654
48 47 7919.6982168
49 48 7771.48573395
50 49 7683.86063757
51 50 7644.27302592
52 51 7598.7687343
53 52 7469.36441917
54 53 7300.80648348
55 54 7232.01093562
56 55 7200.7716416
57 56 7144.30588152
58 57 6993.05321569
59 58 6894.89040332
60 59 6863.43295535
61 60 6834.67325132
62 61 6740.45431365
63 62 6615.95846491
64 63 6578.49962121
65 64 6561.19833985
66 65 6510.86525949
67 66 6374.95776701
68 67 6310.66363259
69 68 6292.57800551
70 69 6259.36417557
71 70 6149.79983154
72 71 6083.09278988
73 72 6066.50097418
74 73 6041.8340385
75 74 5955.17922329
76 75 5891.89830589
77 76 5875.789857
78 77 5850.85424999
79 78 5754.52314252
80 79 5681.52671911
81 80 5665.72004944
82 81 5645.55526718
83 82 5561.88175796
84 83 5503.16145506
85 84 5490.2603399
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91 90 5219.26422148
92 91 5185.35418872
93 92 5176.9645646
94 93 5143.14785502
95 94 5066.82229999
96 95 5048.12758375
97 96 5038.77356283
98 97 4990.33367141
99 98 4936.34047045
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103 102 4813.23316811
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195 194 3202.57755745
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197 196 3173.27758176
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199 198 3149.97493952
200 199 3139.94801498
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209 208 3063.96322721
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270 269 2560.90691319
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393 392 2017.94506158
394 393 2012.19473475
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471 470 1818.89649456
472 471 1818.11903799
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492 491 1778.44843785
493 492 1774.74636155
494 493 1774.43237587
495 494 1770.46656454
496 495 1770.12776012
497 496 1766.4500932
498 497 1765.64033146
499 498 1763.25293065
500 499 1761.2701407
Final mean squared error (training) = 0.0856657783847 at iteration 500
Final CER (validation) = 0.0339148547654 at iteration 496
Fold = 4
Number of input-output patterns (training) = 48000
Number of input-output patterns (validation) = 12000
Maximum number of iterations = 500
Initial CER (validation) = 0.884541823822
 2 1 31214.2206125
 3 2 26893.41085
 4 3 18292.5905927
 5 4 17347.9534457
 6 5 14538.0930286
 7 6 14119.6240028
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 9 8 12428.6271166
10 9 12241.2423596
11 10 11809.8165976
12 11 11613.2104109
13 12 11392.3775731
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19 18 10374.3393091
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21 20 10165.8543069
22 21 10038.8369354
23 22 9953.85602564
24 23 9894.60337424
25 24 9791.0711141
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Final mean squared error (training) = 0.0822794507336 at iteration 500
Final CER (validation) = 0.0321861395271 at iteration 496
Fold = 5
Number of input-output patterns (training) = 48000
Number of input-output patterns (validation) = 12000
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301 300 2506.09694116
302 301 2501.63252919
303 302 2489.67629726
304 303 2488.55947104
305 304 2484.86598562
306 305 2474.3489241
307 306 2473.35222119
308 307 2469.67158895
309 308 2459.80366076
310 309 2458.91586944
311 310 2454.91510481
312 311 2445.92242957
313 312 2445.17652597
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314 313 2440.64384806
315 314 2433.67776074
316 315 2433.0451578
317 316 2426.48044685
318 317 2420.62036572
319 318 2419.94143537
320 319 2411.85068569
321 320 2408.55817206
322 321 2407.72927663
323 322 2399.30569871
324 323 2397.74529234
325 324 2396.23016919
326 325 2387.72552917
327 326 2386.93329107
328 327 2383.83544262
329 328 2377.15552618
330 329 2376.6221831
331 330 2370.48078311
332 331 2366.17454553
333 332 2365.50166903
334 333 2357.47934673
335 334 2355.72336914
336 335 2354.26508723
337 336 2346.27347013
338 337 2345.59243227
339 338 2341.97820937
340 339 2336.03501671
341 340 2335.56701521
342 341 2329.30741677
343 342 2326.62223472
344 343 2325.73992727
345 344 2317.74136555
346 345 2316.79890497
347 346 2314.18365029
348 347 2307.88962783
349 348 2307.44052165
350 349 2301.74958901
351 350 2298.96776268
352 351 2298.18752021
353 352 2291.3732076
354 353 2290.69694494
355 354 2288.16567224
356 355 2283.5098092
357 356 2283.10686314
358 357 2277.01146826
359 358 2275.3467998
360 359 2274.12080944
361 360 2267.62622416
362 361 2267.16385533
363 362 2262.40152831
364 363 2258.82774204
365 364 2258.13949327
366 365 2251.29602777
367 366 2250.62903668
368 367 2247.67303724
369 368 2243.32448987
370 369 2242.85096553
371 370 2236.29621395
372 371 2235.27005504
373 372 2233.13878257
374 373 2227.77108954
375 374 2227.37806244
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376 375 2221.14716302
377 376 2219.59206032
378 377 2217.83540064
379 378 2211.71035729
380 379 2211.30804641
381 380 2205.31012361
382 381 2203.61287718
383 382 2202.00302619
384 383 2195.4915261
385 384 2195.08021895
386 385 2189.11567626
387 386 2187.36462496
388 387 2185.8900716
389 388 2179.52286518
390 389 2179.10246942
391 390 2172.78233064
392 391 2171.14680033
393 392 2169.46600305
394 393 2163.81957987
395 394 2163.41974648
396 395 2157.04681074
397 396 2155.80676745
398 397 2153.49361883
399 398 2148.51596952
400 399 2148.07224547
401 400 2141.50414944
402 401 2140.72044824
403 402 2137.21031087
404 403 2133.14913591
405 404 2132.52712485
406 405 2126.22167337
407 406 2125.77564089
408 407 2121.28560085
409 408 2119.01209674
410 409 2117.93359722
411 410 2112.85472516
412 411 2112.54169559
413 412 2107.55772505
414 413 2106.6161105
415 414 2104.27325239
416 415 2100.04654801
417 416 2099.54281901
418 417 2093.48485677
419 418 2093.01386034
420 419 2088.29576599
421 420 2085.87103919
422 421 2084.57892215
423 422 2079.12821209
424 423 2078.78044303
425 424 2073.23338475
426 425 2072.4713078
427 426 2069.2475552
428 427 2065.94029757
429 428 2065.23053419
430 429 2059.75987642
431 430 2059.42093741
432 431 2054.28450123
433 432 2053.17634303
434 433 2050.98430871
435 434 2047.09424901
436 435 2046.55180464
437 436 2041.00778591
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438 437 2040.64251601
439 438 2035.72186528
440 439 2034.36933011
441 440 2032.30490622
442 441 2027.97785951
443 442 2027.45862074
444 443 2021.64605783
445 444 2021.24962539
446 445 2015.97181462
447 446 2014.41660945
448 447 2012.04775881
449 448 2007.37466298
450 449 2006.80312806
451 450 2001.12218226
452 451 2000.78665259
453 452 1996.11533757
454 453 1995.03838781
455 454 1992.70143374
456 455 1989.25517871
457 456 1988.6436537
458 457 1983.87089698
459 458 1983.57548799
460 459 1978.60970882
461 460 1977.83793752
462 461 1974.33633219
463 462 1971.31531054
464 463 1970.23644094
465 464 1964.66967247
466 465 1964.27151501
467 466 1957.84863718
468 467 1957.22579229
469 468 1952.16313555
470 469 1949.74876432
471 470 1947.88190695
472 471 1942.92599774
473 472 1942.47178576
474 473 1937.44725675
475 474 1937.12711699
476 475 1932.58437134
477 476 1931.50378069
478 477 1928.83422136
479 478 1925.28848121
480 479 1924.54849208
481 480 1919.51211056
482 481 1919.20687204
483 482 1914.22071534
484 483 1913.62527587
485 484 1909.82407172
486 485 1907.62046791
487 486 1906.16542858
488 487 1901.72583151
489 488 1901.29697125
490 489 1896.34996795
491 490 1896.03593564
492 491 1891.57403725
493 492 1890.67182473
494 493 1887.99020047
495 494 1885.2813416
496 495 1884.40024155
497 496 1880.12056211
498 497 1879.80808755
499 498 1875.19084858
```

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500 499 1874.82165345  
Final mean squared error (training) = 0.0883841438799 at iteration 500  
Final CER (validation) = 0.0379088917363 at iteration 493  
Trial>>
```