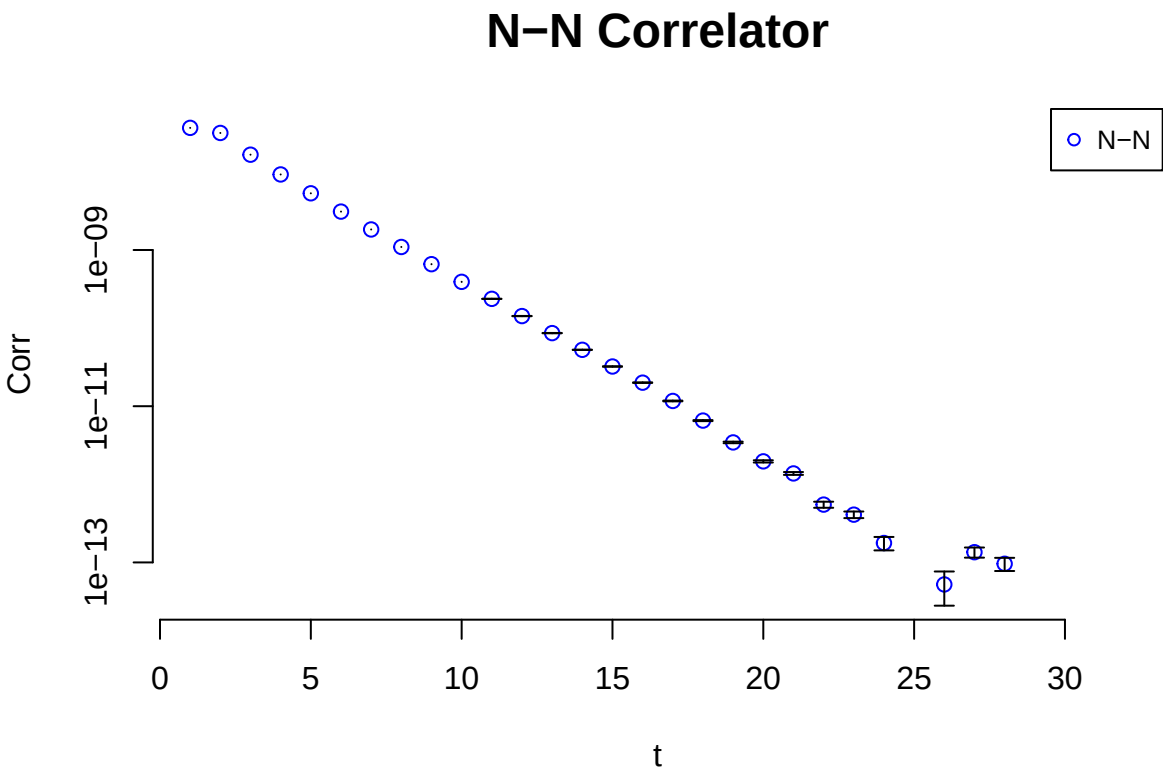
NJN-Korrelatoren

Timo Beilschmidt

November 15, 2019

NN-Correlator

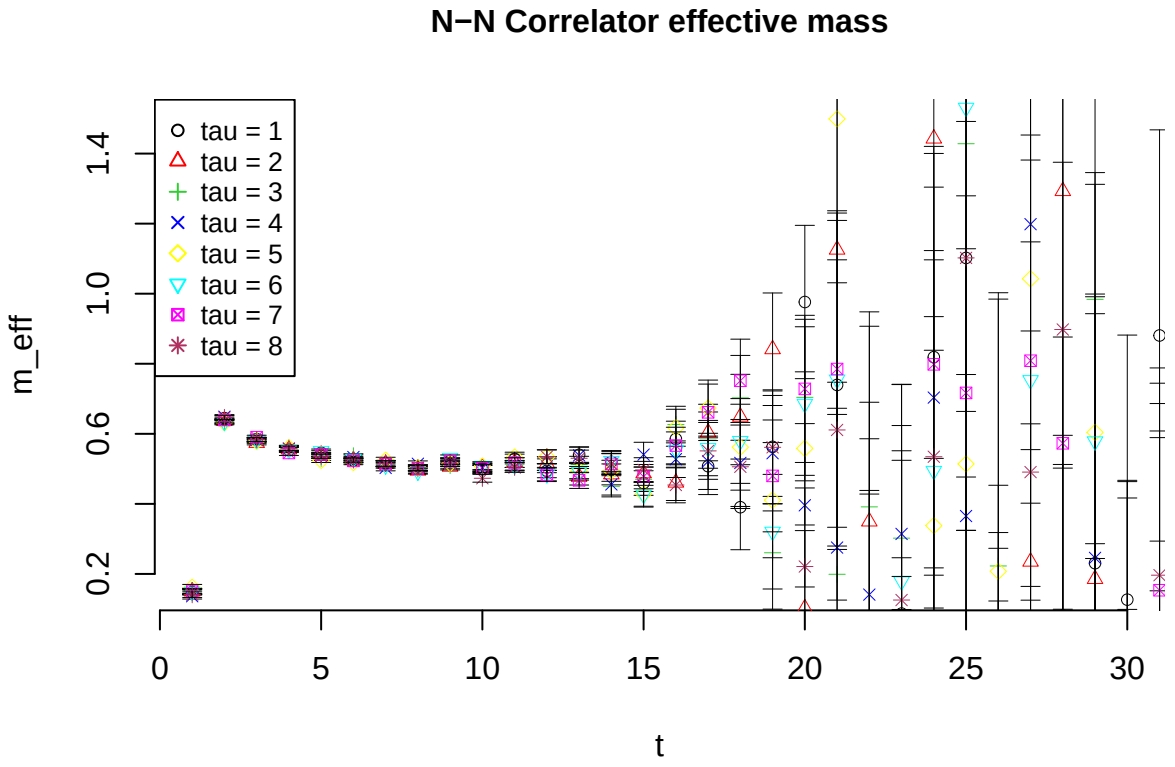
```
## [1] "N-N, T=64, n_src=16, n_conf=52, Gi = Gi_Cg5, Gf = Gf_Cg5"
## [1] "Symmetrized:"
##  [1]  3.659473e-08  3.149733e-08  1.660153e-08  9.268001e-09  5.316160e-09
##  [6]  3.101836e-09  1.831759e-09  1.092908e-09  6.583152e-10  3.909847e-10
## [11]  2.369275e-10  1.425725e-10  8.624975e-11  5.272966e-11  3.223009e-11
## [16]  2.002283e-11  1.167318e-11  6.543200e-12  3.439132e-12  1.966912e-12
## [21]  1.378407e-12  5.498324e-13  4.088967e-13  1.771753e-13 -1.892277e-14
## [26]  5.223083e-14  1.351647e-13  9.605017e-14 -1.377050e-14 -6.748304e-14
## [31] -7.954334e-14 -8.761381e-14 -4.839580e-14 -5.226023e-14 -9.212550e-14
## [36] -1.329026e-14  4.382036e-14 -1.137539e-13 -1.194977e-13 -4.793475e-14
## [41] -6.502525e-14 -1.700127e-13  1.841084e-13  3.144864e-13  4.419252e-13
## [46]  4.730956e-13  3.230008e-14  8.966850e-13  9.333902e-13  1.226868e-12
## [51]  1.482529e-12  2.868467e-12  4.655678e-12  8.402386e-12  1.545104e-11
## [56]  3.099444e-11  6.509481e-11  1.302679e-10  2.704009e-10  5.785913e-10
## [61]  1.275388e-09  2.959821e-09  7.371161e-09 -1.046501e-08
```



Effective Mass

We calculate the effective mass following https://arxiv.org/abs/1612.06963.

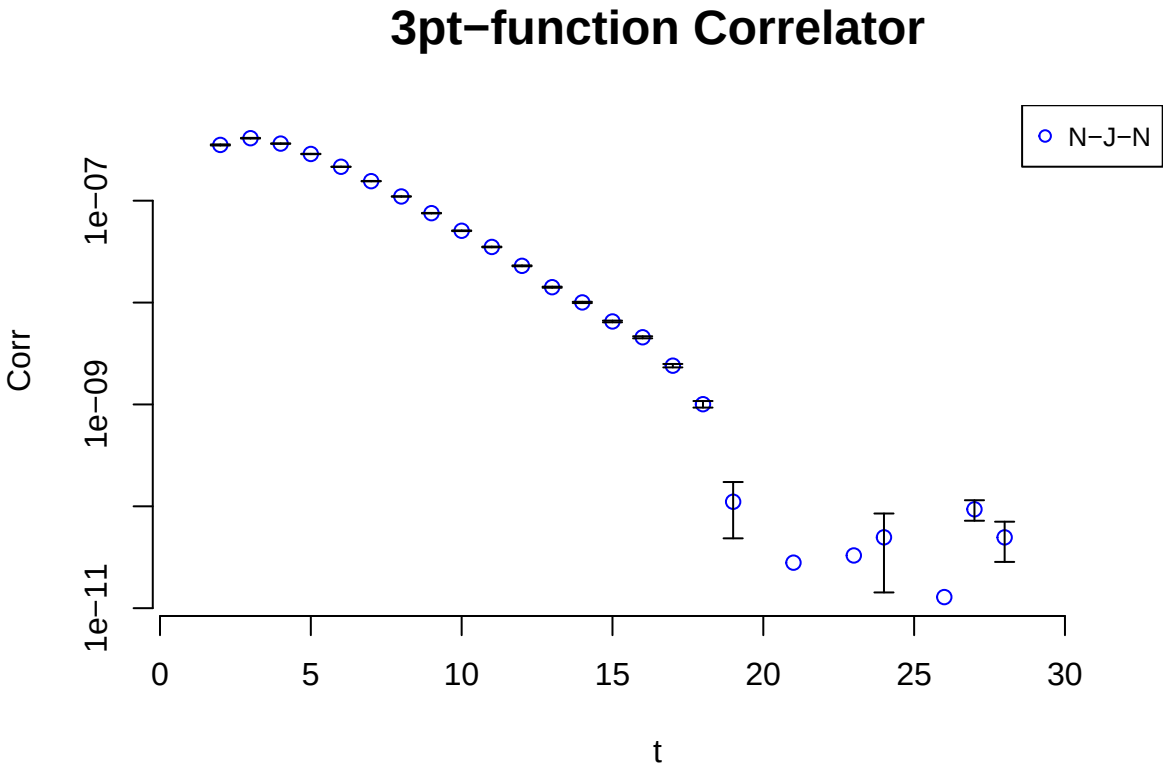
$m^{eff}(t,\tau) = \frac{1}{\tau} ln\left(\frac{C(t)}{C(t+\tau)}\right) \rightarrow_{t\rightarrow\infty} \frac{1}{\tau} ln(e^{E_0 \tau}) = E_0$



NJN-Correlator

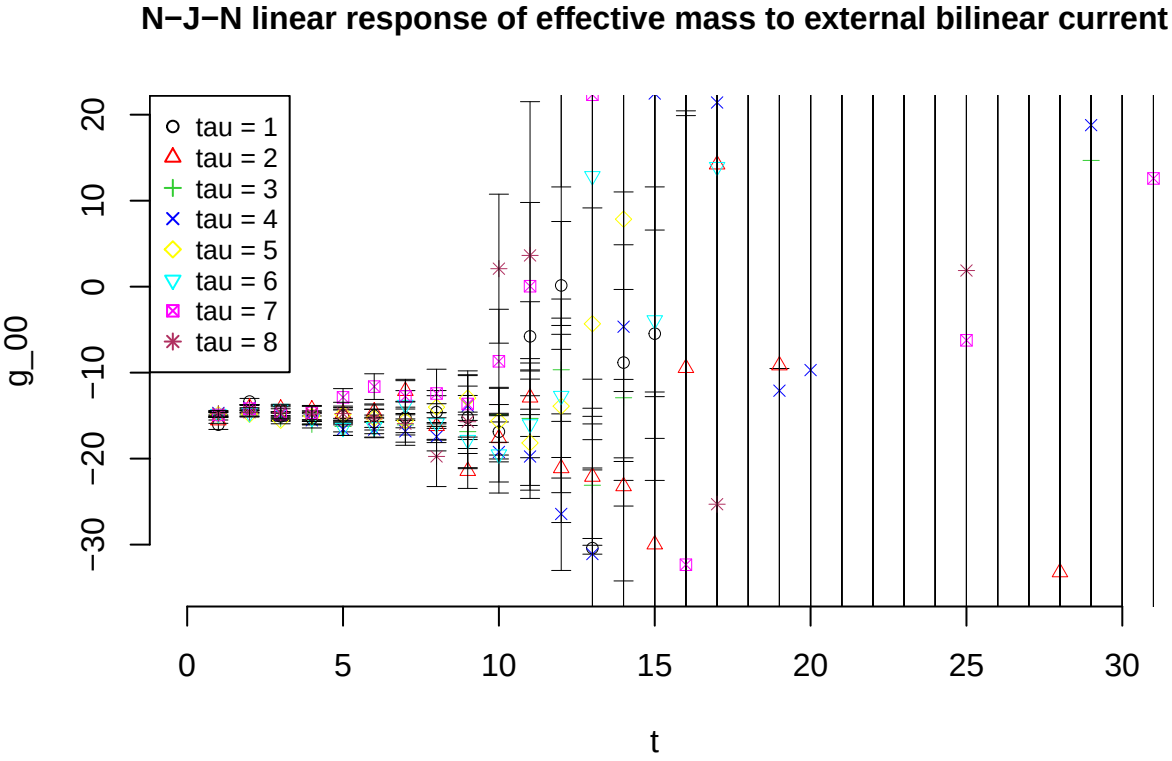
First the 3pt-function correlator:

```
## [1] "N-J-N, T=64, n_src=16, n_conf=52, Gi = Gi_Cg5, Gf = Gf_Cg5"
## [1] "Symmetrized:"
##  [1] -1.878429e-07  3.527035e-07  4.105506e-07  3.634870e-07  2.875087e-07
##  [6]  2.152937e-07  1.555487e-07  1.100326e-07  7.542379e-08  5.068947e-08
## [11]  3.514744e-08  2.293536e-08  1.415576e-08  1.003578e-08  6.525015e-09
## [16]  4.562794e-09  2.402439e-09  1.005561e-09  1.108351e-10 -3.512737e-11
## [21]  2.797372e-11 -2.930776e-10  3.292029e-11  4.961927e-11 -5.054414e-11
## [26]  1.285237e-11  9.344241e-11  4.954832e-11 -2.731457e-11 -6.977694e-11
## [31] -1.114514e-10 -1.367227e-10 -9.908533e-11 -1.173011e-10 -1.574097e-10
## [36] -4.459261e-11  3.899846e-11 -1.630353e-10 -1.652079e-10 -6.671210e-11
## [41] -6.780158e-11 -1.524821e-10  2.969911e-10  3.853345e-10  4.140481e-10
## [46]  4.073492e-10  1.069840e-10  7.835085e-10  4.305285e-10  5.941536e-10
## [51]  3.654188e-10  7.466623e-10  8.873875e-10  2.209112e-09  2.990080e-09
## [56]  5.460322e-09  1.097093e-08  1.836923e-08  3.199812e-08  5.958482e-08
## [61]  1.080306e-07  1.975960e-07  3.818178e-07  5.637172e-07
```



Ratio-Plot

$$\left.\frac{\partial m_\lambda^{eff}(t,\tau)}{\partial\lambda}\right|_{\lambda=0} = \frac{1}{\tau}\left(\frac{\partial_\lambda C_\lambda(t)}{C(t)} - \frac{\partial_\lambda C_\lambda(t+\tau)}{C(t+\tau)}\right)_{\lambda=0}$$




```
## [1] "tau = 1"
##  [1]   -16.056576   -13.358650   -15.089688   -15.346603   -15.088188
##  [6]   -15.025688   -15.214502   -14.582470   -15.218748   -16.874764
## [11]    -5.780408     0.141904   -30.410069    -8.829371    -5.467203
## [16]    72.554325    74.250295   257.219322   201.816875  -463.632078
## [21]  2572.314932 -2703.342701  -593.038493  -239.040762   231.221802
## [26] -1465.329591  1713.675808  2959.224367  -431.693537 -2946.212189
## [31]  -658.962272  -303.175429   316.492952   -59.245807  -118.228866
## [36] -1845.019902  2063.232904   166.823864 -1087.801410  1604.811702
## [41]  -231.847449 -1048.023195   243.350970  1098.138457   -91.166132
## [46]   618.687494  -633.860354   416.475439    98.500576  1027.542209
## [51]  -731.095177    19.736188  -138.216913    40.109305   -17.092518
## [56]    14.854835    44.503824    21.880236    19.923981    20.363897
## [61]    18.001724    15.119542   107.073724           NA
## [1] "tau = 2"
##  [1]   -15.553879   -14.072614   -14.186314   -14.291932   -14.780259
##  [6]   -14.529106   -12.133155   -16.211363   -21.435518   -17.618946
## [11]   -12.895486   -21.114824   -22.110608   -23.213416   -29.978957
## [16]    -9.461799    14.209576    41.706934    -9.157596   -87.162728
## [21]  -179.659419  -141.731833   -44.997005   -92.461442   -90.475208
## [26]   -83.120884  -102.347354   -33.220733   170.098184  -599.028683
## [31] -4843.068493  -382.057780  4339.420672   504.326141  2377.508169
## [36]   630.399067   871.156291 -1613.384567 -2915.130327  1481.414833
## [41]  -301.082432  -321.845389   395.589022   412.401644  -309.059252
## [46]    29.225738   541.478195   151.659161    40.430885    63.931093
```

```
## [51]    54.213838    34.762027    39.113184    49.748800    13.436000
## [56]    21.899615    20.657584    20.724088    17.426476    16.613729
## [61]    15.554026    61.274529           NA
## [1] "tau = 3"
##  [1]   -14.795830   -14.498205   -15.318769   -16.012603   -16.254587
##  [6]   -15.802222   -16.073093   -16.253201   -16.863188   -14.962111
## [11]   -15.322694    -9.664639   -23.097214   -12.922705    27.487565
## [16]    65.937016   212.382933   439.117575   391.530850   179.610981
## [21] -1011.329522  -697.655118  -667.911281   352.287125  -657.078616
## [26]  -134.878987  -105.086694   389.200801    14.681714  -166.404472
## [31]   -98.117119     2.478085  -358.059793  1242.309619   -19.927445
## [36]  -238.782943  -881.521555   113.946957   680.412962   -98.916991
## [41]    15.421020   126.249414   132.137894    41.233709     6.636497
## [46]   111.043963   112.766137   236.509220    66.630028   150.708686
## [51]   -38.618379    46.828469   -10.507986    53.573893    25.097404
## [56]    31.234346    29.072714    17.981283    16.228809    16.065619
## [61]    45.638364           NA
## [1] "tau = 4"
##  [1]  -14.689684  -14.101185  -14.861884  -15.545364  -16.586031
##  [6]  -16.622839  -16.821176  -17.452448  -13.856118  -19.226127
## [11]  -19.755414  -26.436842  -31.095085   -4.658673   22.464025
## [16]   24.106528   21.418393  183.307782  -12.099401   -9.703311
## [21] -163.943294  -96.415003 -146.944464   45.334932   62.128138
## [26] -243.934347  -78.637638 -172.534447   18.784325   34.482287
## [31]  132.699256  -36.039394 -133.145163 -193.237456  245.885615
## [36]   81.128753   85.220126  178.357697  473.436324  307.890748
## [41] -488.889332  292.677791 -597.004196 -485.240361  527.386408
## [46] -233.098472  -69.401997  261.109675   85.533704   56.260285
## [51]   33.231793   19.031800   27.172131   45.431408   26.982186
## [56]    9.660724   13.003155   17.668081   14.480847   38.357149
## [61]          NA
## [1] "tau = 5"
##  [1]  -14.890694  -14.854606  -15.544802  -15.048970  -14.844311
##  [6]  -15.305520  -15.604964  -14.020734  -12.950837  -15.647129
## [11]  -18.176712  -13.901829   -4.318902    7.847296   42.697691
## [16]   32.540540   50.068591  -54.841894 -120.653047 -184.618557
## [21] -132.892802 -137.800121   49.467113 -198.867781  -86.864850
## [26] -185.862181 -592.053885  -73.592972  238.473118 -221.040598
## [31] -144.797701  554.020367  -76.267520  -83.500258  302.949829
## [36]  387.447843  174.590353  -50.361380   -3.645275   -7.982934
## [41]  -65.538610 -142.825844   86.282415   78.226614   90.765234
## [46]   57.324963   57.567235   97.474533   61.886589   62.543857
## [51]   56.985037   43.826026   29.617557   31.671566   21.625783
## [56]   24.427927   25.655036   20.542711   34.725623          NA
## [1] "tau = 6"
##  [1]    -14.787221    -14.686631    -14.205881    -15.260224    -16.416988
##  [6]    -16.344193    -13.738389    -15.876547    -17.822272    -19.506665
## [11]    -15.997455    -12.699789     12.857113     33.611018     -3.904951
## [16]     74.157157     13.925343    -46.198763 -15404.067783    -55.506721
## [21]   -103.279241   -139.909666   -101.683332   -131.583188  15176.654879
## [26]   -168.470474   -213.753266   -153.006304   -126.210802    -51.408254
## [31]    -81.695349    -50.251636     13.804417   -127.008238     51.351562
## [36]   -105.598986    154.952235    153.158180    289.395408    285.020293
## [41]   -376.363925    291.617357    245.177375    132.316457    233.383829
```

```
## [46]    116.685252    575.958507     59.779731   -101.228300    -42.693549
## [51]   -209.543968    -40.135497    -16.861602      5.662128     10.331602
## [56]     18.896603     21.119391     34.297977            NA
## [1] "tau = 7"
##  [1]  -14.92383502  -14.18559540  -14.80294667  -14.68591240  -12.87581553
##  [6]  -11.62388294  -12.76465069  -12.42710923  -13.64683598   -8.68042793
## [11]    0.05236747   31.27921712   22.32247602   29.74602243   87.24956971
## [16]  -32.34007912  -80.54020108 -181.25591575 -136.00805661 -138.13694093
## [21] -137.28187394 -194.11042575  148.26951691  -74.98958441   -6.24004105
## [26] -197.53427178  756.90853021 -231.29532223 -241.90727108 -243.72418672
## [31]   12.58605784   15.28577505   59.72775681 -834.37517712  114.22647294
## [36]  214.22976823   13.08726591   47.54613733   76.20502611  160.24226153
## [41]  117.97185267  179.37700134   72.82813596   97.35099183   76.67295474
## [46]   92.08876042   76.96067025   70.94255619   43.62890373   65.86045165
## [51]   25.93777122   28.79698576    9.68780619   14.39034151   16.57054025
## [56]   19.17975699   30.46006249            NA
## [1] "tau = 8"
##  [1]   -14.773723   -14.610876   -14.665820   -14.783752   -14.757857
##  [6]   -15.374473   -15.930440   -19.748567   -15.707208     2.091131
## [11]     3.630497    30.476977    45.654273    79.678897 -2620.310598
## [16]  2297.022111   -25.303704  -150.591412   -62.505438 -1114.141406
## [21]  -259.529089  -242.549446  2449.708860 -2304.853335     1.877252
## [26]    89.591274  -425.013906   988.297857    88.983149   118.777559
## [31]    86.337074   -96.649870  -205.039349   102.093577   184.862409
## [36]   -45.162255    15.727025   -28.672792    85.099813    14.177703
## [41]   203.275321   -91.341377   258.892029   115.212836   104.220584
## [46]    64.647279     2.054148    96.784400    31.170686    45.489268
## [51]    42.512069    31.856350    15.416019    23.676719    17.279461
## [56]    32.042773           NA
```