Structural Variant Detection Notes

# March 10, 2022

# Reproducing Andrew’s Code: Haploid data

MethodCompare.m is the script Andrew used to run his code (uses 2 SPIRAL scripts, 1 for each noise type)

compare\_methods\_haploid.m is the script I am working with (uses 1 SPIRAL script with 2 noisetype cases)

Data:

* 1 parent, 1 child (haploid)
* novel,

|  |  |
| --- | --- |
| MethodCompare.m |  |
| Andrew’s data:  Chart, line chart  Description automatically generated  iter\_p = 10, iter\_nb = 10 | Reproduced data:  Chart  Description automatically generated  iter\_p = 10, iter\_nb = 10 |
| compare\_methods\_haploid.m |  |
|  |  |
| Andrew’s data:  Chart, line chart  Description automatically generated  iter\_p = 62, iter\_nb = 164 | Reproduced data:  Chart, line chart  Description automatically generated  iter\_p = 5, iter\_nb = 108 |

Jocelyn’s code

Using Andrews data

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= Beginning NEBULA Reconstruction @ 16: 9 03/09/2022 =

= Noisetype: poisson Penalty: Canonical =

= Tau Vals: 1.00e+00 , 1.00e+01 Maxiter: 5 =

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Iter: 1, ||dx||%: 1.2112e+02, Alph: 2.5353e+30, Alph Acc: 1.2677e+30, Time: 1.477095e-02, Obj: 3.5334e+01, dObj%: 1.9610e+01, Err: 8.4764e-01

Iter: 2, ||dx||%: 6.0802e-01, Alph: 4.4038e+03, Alph Acc: 2.2019e+03, Time: 1.730832e-02, Obj: 3.5311e+01, dObj%: 6.4970e-02, Err: 8.4820e-01

Iter: 3, ||dx||%: 2.2140e+00, Alph: 1.2079e+03, Alph Acc: 6.0393e+02, Time: 1.864249e-02, Obj: 3.5248e+01, dObj%: 1.7872e-01, Err: 8.5036e-01

Iter: 4, ||dx||%: 1.9701e+00, Alph: 1.3382e+03, Alph Acc: 6.6912e+02, Time: 1.966430e-02, Obj: 3.5229e+01, dObj%: 5.4156e-02, Err: 8.5242e-01

Iter: 5, ||dx||%: 1.8103e+00, Alph: 1.4357e+03, Alph Acc: 7.1787e+02, Time: 2.340214e-02, Obj: 3.5245e+01, dObj%: 4.6441e-02, Err: 8.5441e-01

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= Completed NEBULA Reconstruction @ 16: 9 03/09/2022 =

= Noisetype: poisson Penalty: Canonical =

= Tau: 1.00e+00 , 1.00e+01 Iter: 5 =

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= Beginning NEBULA Reconstruction @ 16: 9 03/09/2022 =

= Noisetype: negative binomial Penalty: Canonical =

= Tau Vals: 1.00e+00 , 1.00e+01 Maxiter: 5 =

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Iter: 1, ||dx||%: 1.2112e+02, Alph: 2.5353e+30, Alph Acc: 1.2677e+30, Time: 5.333866e-03, Obj: 1.1130e+02, dObj%: 7.4907e+00, Err: 8.4764e-01

Iter: 2, ||dx||%: 5.2240e+01, Alph: 3.4405e+01, Alph Acc: 1.7203e+01, Time: 1.405224e-02, Obj: 1.0926e+02, dObj%: 1.8326e+00, Err: 8.9814e-01

Iter: 3, ||dx||%: 9.9571e+00, Alph: 1.1732e+02, Alph Acc: 5.8660e+01, Time: 1.456793e-02, Obj: 1.1259e+02, dObj%: 3.0461e+00, Err: 8.9819e-01

Iter: 4, ||dx||%: 6.3058e+00, Alph: 6.6654e+01, Alph Acc: 3.3327e+01, Time: 1.483367e-02, Obj: 1.1403e+02, dObj%: 1.2824e+00, Err: 8.9685e-01

Iter: 5, ||dx||%: 5.8157e+00, Alph: 4.6059e+01, Alph Acc: 2.3030e+01, Time: 1.609614e-02, Obj: 1.1572e+02, dObj%: 1.4759e+00, Err: 8.9718e-01

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= Completed NEBULA Reconstruction @ 16: 9 03/09/2022 =

= Noisetype: negative binomial Penalty: Canonical =

= Tau: 1.00e+00 , 1.00e+01 Iter: 5 =

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Jocelyn’s code – putting back Andrew’s code

Using Andrews data

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= Beginning NEBULA Reconstruction @ 16:19 03/09/2022 =

= Noisetype: poisson Penalty: Canonical =

= Tau Vals: 1.00e+00 , 1.00e+01 Maxiter: 5 =

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Iter: 1, ||dx||%: 1.2112e+02, Alph: 2.5353e+30, Alph Acc: 1.2677e+30, Time: 1.838916e-02, Obj: 1.3139e+01, dObj%: 5.5525e+01, Err: 8.4764e-01

Iter: 2, ||dx||%: 1.9864e+01, Alph: 1.3762e+02, Alph Acc: 6.8810e+01, Time: 1.997442e-02, Obj: 1.4583e+01, dObj%: 1.0992e+01, Err: 8.5616e-01

Iter: 3, ||dx||%: 1.2703e+01, Alph: 1.4442e+02, Alph Acc: 7.2210e+01, Time: 2.081163e-02, Obj: 1.6862e+01, dObj%: 1.5633e+01, Err: 8.6559e-01

Iter: 4, ||dx||%: 1.8416e+01, Alph: 9.0297e+01, Alph Acc: 4.5148e+01, Time: 2.148836e-02, Obj: 2.8648e+01, dObj%: 6.9894e+01, Err: 8.7612e-01

Iter: 5, ||dx||%: 2.1402e-01, Alph: 5.7139e+05, Alph Acc: 2.8570e+05, Time: 2.782810e-02, Obj: 2.6070e+01, dObj%: 8.9988e+00, Err: 8.7613e-01

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= Completed NEBULA Reconstruction @ 16:19 03/09/2022 =

= Noisetype: poisson Penalty: Canonical =

= Tau: 1.00e+00 , 1.00e+01 Iter: 5 =

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= Beginning NEBULA Reconstruction @ 16:19 03/09/2022 =

= Noisetype: negative binomial Penalty: Canonical =

= Tau Vals: 1.00e+00 , 1.00e+01 Maxiter: 5 =

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Iter: 1, ||dx||%: 1.2112e+02, Alph: 2.5353e+30, Alph Acc: 1.2677e+30, Time: 6.959384e-03, Obj: 8.9104e+01, dObj%: 2.5939e+01, Err: 8.4764e-01

Iter: 2, ||dx||%: 2.3285e+01, Alph: 1.3762e+02, Alph Acc: 6.8810e+01, Time: 1.471888e-02, Obj: 8.8605e+01, dObj%: 5.6034e-01, Err: 8.5659e-01

Iter: 3, ||dx||%: 1.8291e+01, Alph: 1.6070e+02, Alph Acc: 8.0348e+01, Time: 1.751277e-02, Obj: 8.8491e+01, dObj%: 1.2854e-01, Err: 8.6970e-01

Iter: 4, ||dx||%: 2.6698e+01, Alph: 1.0064e+02, Alph Acc: 5.0322e+01, Time: 1.794011e-02, Obj: 9.1088e+01, dObj%: 2.9347e+00, Err: 8.8431e-01

Iter: 5, ||dx||%: 6.1830e+00, Alph: 5.3468e+02, Alph Acc: 2.6734e+02, Time: 1.882329e-02, Obj: 9.0474e+01, dObj%: 6.7414e-01, Err: 8.8835e-01

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= Completed NEBULA Reconstruction @ 16:19 03/09/2022 =

= Noisetype: negative binomial Penalty: Canonical =

= Tau: 1.00e+00 , 1.00e+01 Iter: 5 =

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Andrew’s code

Using Andrews data

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= Beginning SPIRAL Reconstruction @ 16:18 03/09/2022 =

= Noisetype: Poisson Penalty: Canonical =

= Tau Vals: 1.00000e+00, 1.00000e+01 Maxiter: 5 =

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Iter: 1, ||dx||%: 1.0408e+02, Alph: 1.2800e+02, Alph Acc: 6.4000e+01, Time: 3.751398e-03, Obj: 2.4732e+00, dObj%: 9.1628e+01, Err: 7.2672e-01

Iter: 2, ||dx||%: 2.8009e+01, Alph: 1.6103e+02, Alph Acc: 8.0514e+01, Time: 7.277527e-03, Obj: 9.5496e+00, dObj%: 2.8613e+02, Err: 7.1929e-01

Iter: 3, ||dx||%: 3.0679e+01, Alph: 5.7150e+01, Alph Acc: 2.8575e+01, Time: 1.034783e-02, Obj: -7.4693e+00, dObj%: 1.7822e+02, Err: 7.1883e-01

Iter: 4, ||dx||%: 1.6669e+00, Alph: 7.8927e+02, Alph Acc: 3.9463e+02, Time: 1.072595e-02, Obj: -7.8884e+00, dObj%: 5.6106e+00, Err: 7.1781e-01

Iter: 5, ||dx||%: 1.4281e+00, Alph: 4.1071e+02, Alph Acc: 2.0535e+02, Time: 1.093751e-02, Obj: -8.1585e+00, dObj%: 3.4240e+00, Err: 7.1736e-01

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= Completed SPIRAL Reconstruction @ 16:18 03/09/2022 =

= Noisetype: Poisson Penalty: Canonical =

= Tau: 1.00000e+00 Iter: 5 =

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= Beginning SPIRAL Reconstruction @ 16:18 03/09/2022 =

= Noisetype: Negative Binomial Penalty: Canonical =

= Tau Vals: 1.00000e+00, 1.00000e+01 Maxiter: 5 =

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Iter: 1, ||dx||%: 1.0499e+02, Alph: 1.2800e+02, Alph Acc: 6.4000e+01, Time: 9.769748e-03, Obj: 8.3462e+01, dObj%: 3.0629e+01, Err: 7.2838e-01

Iter: 2, ||dx||%: 2.8045e+01, Alph: 1.2175e+02, Alph Acc: 6.0877e+01, Time: 1.406550e-02, Obj: 8.4617e+01, dObj%: 1.3836e+00, Err: 7.2311e-01

Iter: 3, ||dx||%: 4.2879e+01, Alph: 4.0545e+01, Alph Acc: 2.0273e+01, Time: 1.595697e-02, Obj: 6.5531e+01, dObj%: 2.2556e+01, Err: 7.5853e-01

Iter: 4, ||dx||%: 2.1253e+00, Alph: 4.1691e+02, Alph Acc: 2.0846e+02, Time: 1.669565e-02, Obj: 6.5173e+01, dObj%: 5.4601e-01, Err: 7.5812e-01

Iter: 5, ||dx||%: 3.9432e+00, Alph: 1.5634e+02, Alph Acc: 7.8171e+01, Time: 2.055550e-02, Obj: 6.4569e+01, dObj%: 9.2760e-01, Err: 7.5918e-01

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= Completed SPIRAL Reconstruction @ 16:18 03/09/2022 =

= Noisetype: Negative Binomial Penalty: Canonical

= Tau: 1.00000e+00 Iter: 5 =

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# April 5, 2022

# Results of reproducing Andrew’s code:

Chart, line chart

Description automatically generated Chart, line chart

Description automatically generated

Both algorithms took 42 iterations for Poisson and 81 iterations for Negative Binomial

Jocelyn Poisson:

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= Beginning NEBULA Reconstruction @ 10:18 04/05/2022 =

= Noisetype: poisson Penalty: Canonical =

= Reg Vals: 1.000 , 10.000 Maxiter: 1000 =

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Iter: 10, ||dx||%: 1.9392e+00, Alph: 9.9178e+02, Alph Acc: 4.9589e+02, Time: 2.966106e-02, Obj: -1.0810e+01, dObj%: 7.5098e+00, Err: 7.4306e-01

Iter: 20, ||dx||%: 1.4605e+00, Alph: 8.2498e+03, Alph Acc: 4.1249e+03, Time: 3.280388e-02, Obj: -1.1914e+01, dObj%: 4.4573e+01, Err: 7.9861e-01

Iter: 30, ||dx||%: 1.2961e-02, Alph: 9.9455e+01, Alph Acc: 4.9728e+01, Time: 3.435693e-02, Obj: -1.3519e+01, dObj%: 5.2871e-05, Err: 7.9111e-01

Iter: 40, ||dx||%: 3.0103e-05, Alph: 2.7902e+01, Alph Acc: 1.3951e+01, Time: 3.543938e-02, Obj: -1.3519e+01, dObj%: 1.0551e-11, Err: 7.9112e-01

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= Completed NEBULA Reconstruction @ 10:18 04/05/2022 =

= Noisetype: poisson Penalty: Canonical =

= Reg Vals: 1.00 , 10.00 Iter: 42 =

Andrew Poisson:

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= Beginning SPIRAL Reconstruction @ 10:21 04/05/2022 =

= Noisetype: Poisson Penalty: Canonical =

= Tau Vals: 1.00000e+00, 1.00000e+01 Maxiter: 1000 =

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Iter: 10, ||dx||%: 1.9392e+00, Alph: 9.9178e+02, Alph Acc: 4.9589e+02, Time: 1.418222e-02, Obj: -1.0810e+01, dObj%: 7.5098e+00, Err: 7.4306e-01

Iter: 20, ||dx||%: 1.4605e+00, Alph: 8.2498e+03, Alph Acc: 4.1249e+03, Time: 1.572119e-02, Obj: -1.1914e+01, dObj%: 4.4573e+01, Err: 7.9861e-01

Iter: 30, ||dx||%: 1.2961e-02, Alph: 9.9455e+01, Alph Acc: 4.9728e+01, Time: 1.693811e-02, Obj: -1.3519e+01, dObj%: 5.2871e-05, Err: 7.9111e-01

Iter: 40, ||dx||%: 3.0103e-05, Alph: 2.7902e+01, Alph Acc: 1.3951e+01, Time: 1.772477e-02, Obj: -1.3519e+01, dObj%: 1.0551e-11, Err: 7.9112e-01

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= Completed SPIRAL Reconstruction @ 10:21 04/05/2022 =

= Noisetype: Poisson Penalty: Canonical =

= Tau: 1.00000e+00 Iter: 42 =

Jocelyn Negative Binomial:

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= Beginning NEBULA Reconstruction @ 10:18 04/05/2022 =

= Noisetype: negative binomial Penalty: Canonical =

= Reg Vals: 1.000 , 10.000 Maxiter: 1000 =

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Iter: 10, ||dx||%: 9.4017e-01, Alph: 6.4944e+02, Alph Acc: 3.2472e+02, Time: 7.517335e-03, Obj: 6.2833e+01, dObj%: 2.0714e-01, Err: 7.7779e-01

Iter: 20, ||dx||%: 2.4021e-01, Alph: 9.1516e+01, Alph Acc: 4.5758e+01, Time: 1.108256e-02, Obj: 6.2593e+01, dObj%: 1.4354e-03, Err: 7.8034e-01

Iter: 30, ||dx||%: 3.5520e-02, Alph: 2.1658e+01, Alph Acc: 1.0829e+01, Time: 1.236755e-02, Obj: 6.2593e+01, dObj%: 4.9595e-06, Err: 7.8100e-01

Iter: 40, ||dx||%: 3.0774e-03, Alph: 3.4652e+01, Alph Acc: 1.7326e+01, Time: 1.313173e-02, Obj: 6.2593e+01, dObj%: 1.4475e-07, Err: 7.8102e-01

Iter: 50, ||dx||%: 3.4784e-04, Alph: 1.0613e+02, Alph Acc: 5.3067e+01, Time: 1.376389e-02, Obj: 6.2593e+01, dObj%: 3.8837e-09, Err: 7.8103e-01

Iter: 60, ||dx||%: 1.2549e-04, Alph: 2.0547e+01, Alph Acc: 1.0274e+01, Time: 1.450892e-02, Obj: 6.2593e+01, dObj%: 3.5804e-11, Err: 7.8103e-01

Iter: 70, ||dx||%: 1.0694e-05, Alph: 3.8332e+01, Alph Acc: 1.9166e+01, Time: 1.522926e-02, Obj: 6.2593e+01, dObj%: 1.9525e-12, Err: 7.8103e-01

Iter: 80, ||dx||%: 1.6121e-06, Alph: 1.0599e+02, Alph Acc: 5.2993e+01, Time: 1.598451e-02, Obj: 6.2593e+01, dObj%: 9.0815e-14, Err: 7.8103e-01

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= Completed NEBULA Reconstruction @ 10:18 04/05/2022 =

= Noisetype: negative binomial Penalty: Canonical =

= Reg Vals: 1.00 , 10.00 Iter: 81 =

Andrew Negative Binomial:

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= Beginning SPIRAL Reconstruction @ 10:12 04/05/2022 =

= Noisetype: Negative Binomial Penalty: Canonical =

= Tau Vals: 1.00000e+00, 1.00000e+01 Maxiter: 1000 =

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Iter: 10, ||dx||%: 9.4017e-01, Alph: 6.4944e+02, Alph Acc: 3.2472e+02, Time: 2.145323e-02, Obj: 6.2833e+01, dObj%: 2.0714e-01, Err: 7.7779e-01

Iter: 20, ||dx||%: 2.4021e-01, Alph: 9.1516e+01, Alph Acc: 4.5758e+01, Time: 2.292737e-02, Obj: 6.2593e+01, dObj%: 1.4354e-03, Err: 7.8034e-01

Iter: 30, ||dx||%: 3.5520e-02, Alph: 2.1658e+01, Alph Acc: 1.0829e+01, Time: 2.379029e-02, Obj: 6.2593e+01, dObj%: 4.9595e-06, Err: 7.8100e-01

Iter: 40, ||dx||%: 3.0774e-03, Alph: 3.4652e+01, Alph Acc: 1.7326e+01, Time: 2.505771e-02, Obj: 6.2593e+01, dObj%: 1.4475e-07, Err: 7.8102e-01

Iter: 50, ||dx||%: 3.4784e-04, Alph: 1.0613e+02, Alph Acc: 5.3067e+01, Time: 2.659698e-02, Obj: 6.2593e+01, dObj%: 3.8837e-09, Err: 7.8103e-01

Iter: 60, ||dx||%: 1.2549e-04, Alph: 2.0547e+01, Alph Acc: 1.0274e+01, Time: 2.998027e-02, Obj: 6.2593e+01, dObj%: 3.5804e-11, Err: 7.8103e-01

Iter: 70, ||dx||%: 1.0694e-05, Alph: 3.8332e+01, Alph Acc: 1.9166e+01, Time: 3.107390e-02, Obj: 6.2593e+01, dObj%: 1.9525e-12, Err: 7.8103e-01

Iter: 80, ||dx||%: 1.6121e-06, Alph: 1.0599e+02, Alph Acc: 5.2993e+01, Time: 3.184161e-02, Obj: 6.2593e+01, dObj%: 9.0815e-14, Err: 7.8103e-01

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= Completed SPIRAL Reconstruction @ 10:12 04/05/2022 =

= Noisetype: Negative Binomial Penalty: Canonical =

= Tau: 1.00000e+00 Iter: 81 =

## The issue:

The order of the vectors in the defining script was different.

# April 14, 2022

## Grid search results

The following table shows a grid search between and . The first two columns are their corresponding values and the 3rd-last column represent various AUCs for NEBULA and SPIRAL.

* denotes NEBULA, denotes SPIRAL AUCs
* = total reconstruction
* = parent reconstruction
* = child reconstruction

|  |
| --- |
| Tau Gamma N\_t S\_t N\_p S\_p N\_c S\_c  1.0e+03 \*  0.000010000000000 0.002000000000000 0.000976155361894 0.000972476935183 0.000958930123704 0.000949620528251 0.000967409045226 0.000957583919598  0.000100000000000 0.002000000000000 0.000976156790964 0.000972480921537 0.000958930123704 0.000949620528251 0.000967497487437 0.000957583919598  0.001000000000000 0.002000000000000 0.000985630924718 0.000985951487730 0.000958771313942 0.000958771313942 0.000967410050251 0.000967410050251  0.010000000000000 0.002000000000000 0.000985445296020 0.000985567744772 0.000958771313942 0.000958771313942 0.000967410050251 0.000967410050251  0.100000000000000 0.002000000000000 0.000981722041633 0.000974753143165 0.000957153126045 0.000956929120695 0.000975923618090 0.000975923618090  1.000000000000000 0.002000000000000 0.000983237608194 0.000983241519333 0.000954114008693 0.000954114008693 0.000974316582915 0.000974326633166  0.000010000000000 0.010000000000000 0.000976156941393 0.000972478439467 0.000958931795386 0.000949618856570 0.000967409045226 0.000957583919598  0.000100000000000 0.010000000000000 0.000976178076589 0.000972494760953 0.000958928452023 0.000949620528251 0.000967410050251 0.000957575879397  0.001000000000000 0.010000000000000 0.000985640251282 0.000985957354439 0.000958771313942 0.000958771313942 0.000967410050251 0.000967410050251  0.010000000000000 0.010000000000000 0.000981567025123 0.000981522423089 0.000963615847543 0.000946643263123 0.000978414070352 0.000978422110553  0.100000000000000 0.010000000000000 0.000986052049144 0.000986051372216 0.000957133065864 0.000957133065864 0.000975990954774 0.000975995979899  1.000000000000000 0.010000000000000 0.000986433310032 0.000986435190388 0.000957046138415 0.000957046138415 0.000975990954774 0.000975990954774  0.000010000000000 0.020000000000000 0.000976157843963 0.000972480996751 0.000958931795386 0.000949618856570 0.000967409045226 0.000957583919598  0.000100000000000 0.020000000000000 0.000985956602297 0.000972520484217 0.000958771313942 0.000949617184888 0.000967410050251 0.000957579899497  0.001000000000000 0.020000000000000 0.000985640251282 0.000985961115150 0.000958771313942 0.000958771313942 0.000967410050251 0.000967410050251  0.010000000000000 0.020000000000000 0.000985747055476 0.000981530245368 0.000946912403878 0.000946643263123 0.000978410050251 0.000978422110553  0.100000000000000 0.020000000000000 0.000986456024727 0.000986061826993 0.000957039451688 0.000957126379137 0.000975995979899 0.000975990954774  1.000000000000000 0.020000000000000 0.000986450158018 0.000986058066281 0.000957039451688 0.000957126379137 0.000975991959799 0.000975989949749  0.000010000000000 0.100000000000000 0.000976179280016 0.000972495287453 0.000958930123704 0.000949622199933 0.000967409045226 0.000957575879397  0.000100000000000 0.100000000000000 0.000985965176718 0.000985957655296 0.000958771313942 0.000958771313942 0.000967410050251 0.000967410050251  0.001000000000000 0.100000000000000 0.000977571194397 0.000987678707110 0.000963650952859 0.000947114677365 0.000978422110553 0.000978400000000  0.010000000000000 0.100000000000000 0.000986083563903 0.000986078599764 0.000957126379137 0.000957126379137 0.000975989949749 0.000975995979899  0.100000000000000 0.100000000000000 0.000986060172280 0.000986061826993 0.000957126379137 0.000957126379137 0.000975990954774 0.000975989949749  1.000000000000000 0.100000000000000 0.000986448879376 0.000986450082803 0.000957039451688 0.000957039451688 0.000975995979899 0.000975989949749  0.000010000000000 0.200000000000000 0.000985956602297 0.000972524620999 0.000958771313942 0.000949618856570 0.000967410050251 0.000957579899497  0.000100000000000 0.200000000000000 0.000988486808704 0.000985961265579 0.000993351721832 0.000958771313942 0.000976055276382 0.000967410050251  0.001000000000000 0.200000000000000 0.000986914380192 0.000987244495410 0.000946763624206 0.000948209628887 0.000978402010050 0.000978729648241  0.010000000000000 0.200000000000000 0.000986480619777 0.000986086045972 0.000957039451688 0.000957126379137 0.000975990954774 0.000975990954774 |