**Supplementary Material**

Aligning functional network constraint to evolutionary outcomes

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Containing: **Supplementary Tables 1-4**

**Supplementary Table 1.** Results for linear multiple regression whole mode. Test of significance between sum of squares (SS) of whole model vs. SS of residual. Factors were: average shortest path length, neighborhood connectivity, betweenness centrality, and CAI expression level. Significant effects are given in italics.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Dependent Variables** | **Multiple R** | **Multiple R²** | **Adjusted R²** | **SS Model** | **df Model** | **MS Model** | **SS Residual** | **Df Residual** | **MS Residual** | **F** | **p** |
| *γ* | *0.152* | *0.023* | *0.016* | *4767.874* | *15* | *317.858* | *202278.371* | *2178* | *92.873* | *3.422* | *=8.5e-5* |
| *ω* | *0.427* | *0.182* | *0.176* | *1.561* | *15* | *0.104* | *7.018* | *2178* | *0.003* | *32.294* | *<0.0001* |

**Supplementary Table 2.** Linear regression multivariate Wilks tests of significance for predictors and their interactions, effect sizes, and powers. Abbreviations are: ASPL - average shortest path length, NC- neighborhood connectivity, BC- betweenness centrality, CAI: gene expression level. Effect df = 2; error df = 2177. Significant predictors are given in italics.

|  |  |  |  |
| --- | --- | --- | --- |
| **Predictor variables and interaction terms** | **F** | **P =** | **Observed power (alpha=0.05)** |
| *Intercept* | *8.157* | *2.95e-3* | *0.960* |
| *{2} ASPL* | *11.643* | *9.34.e-5* | *0.994* |
| *ASPL\*CAI* | *9.317* | *9.35e-4* | *0.978* |
| *{4} CAI* | *6.891* | *0.001* | *0.924* |
| *{1} NC* | *5.282* | *0.005* | *0.837* |
| *NC\*ASPL* | *3.853* | *0.021* | *0.700* |
| {3} BC | 0.127 | 0.881 | 0.070 |
| NC\*BC | 1.194 | 0.303 | 0.262 |
| ASPL\*BC | 0.123 | 0.884 | 0.069 |
| NC\*CAI | 4.799 | 0.008 | 0.798 |
| BC\*CAI | 0.167 | 0.846 | 0.076 |
| NC\*ASPL\*BC | 1.227 | 0.294 | 0.269 |
| NC\*ASPL\*CAI | 3.549 | 0.029 | 0.661 |
| NC\*BC\*CAI | 1.183 | 0.306 | 0.260 |
| ASPL\*BC\*CAI | 0.160 | 0.852 | 0.075 |
| 1\*2\*3\*4 | 1.216 | 0.297 | 0.267 |

**Supplementary Table 3.** Generalized linear model (Normal distribution, log link function) model building results for **ω** as dependent variable. Given are degrees of freedom df, Akaike Information Criterion AIC, delta AIC, Likelihood ratio Chi square test, and resulting error probability. Abbreviations are: ASPL - average shortest path length, NC- neighborhood connectivity, BC- betweenness centrality, CAI: gene expression level. Significant models are given in italics. The full (global) model is highlighted in red. The model with only CAI as predictor is highlighted in gray.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Model No.**  | **Var. 1** | **Var. 2** | **Var. 3** | **Var. 4** | **df** | **AIC** | **dAIC** | **L.ratio Chi2** | **p** |
| *1* | *CAI* | *ASPL* | *NC* |  | *3* | *-6447.116* | *--* | *519.516* | *<1e-8* |
| *2* | *CAI* | *ASPL* | *BC* | *NC* | *4* | *-6446.727* | *0.389* | *521.126* | *<1e-8* |
| *3* | *CAI* | *BC* | *NC* |  | *3* | *-6427.143* | *19.584* | *499.541* | *<1e-8* |
| *4* | *CAI* | *NC* |  |  | *2* | *-6424.137* | *3.006* | *494.536* | *<1e-8* |
| *5* | *CAI* | *ASPL* | *BC* |  | *3* | *-6390.305* | *33.832* | *462.704* | *<1e-8* |
| *6* | *CAI* | *BC* |  |  | *2* | *-6389.946* | *0.358* | *460.345* | *<1e-8* |
| *7* | *CAI* | *ASPL* |  |  | *2* | *-6381.948* | *7.998* | *452.347* | *<1e-8* |
| *8* | *CAI* |  |  |  | *1* | *-6379.731* | *4.218* | *448.130* | *<1e-8* |
| *9* | *ASPL* | *BC* | *NC* |  | *3* | *-6065.065* | *173.203* | *137.463* | *<1e-8* |
| *10* | *ASPL* | *NC* |  |  | *2* | *-6064.246* | *2.819* | *134.645* | *<1e-8* |
| *11* | *BC* | *NC* |  |  | *2* | *-6016.366* | *47.880* | *86.764* | *<1e-8* |
| *12* | *NC* |  |  |  | *1* | *-6008.095* | *8.271* | *76.494* | *<1e-8* |
| *13* | *ASPL* | *BC* |  |  | *2* | *-5967.606* | *40.479* | *38.005* | *=5.58e-8* |
| *14* | *BC* |  |  |  | *1* | *-5957.836* | *9.770* | *26.235* | *=3.02e-6* |
| *15* | *ASPL* |  |  |  | *1* | *-5950.705* | *7.131* | *19.104* | *=1.24e-4* |

**Supplementary Table 4.** Generalized linear model (Normal distribution, log link function) model building results for **γ** as dependent variable. Given are degrees of freedom df, Akaike Information Criterion AIC, delta AIC, Likelihood ratio Chi square test, and resulting error probability. Abbreviations are: ASPL - average shortest path length, NC- neighborhood connectivity, BC- betweenness centrality, CAI: gene expression level. Significant models are given in italics.The full (global) model is highlighted in red. The model with only CAI as predictor is highlighted in gray.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Var. 1** | **Var. 2** | **Var. 3** | **Var. 4** | **df** | **AIC** | **dAIC** | **L.ratio Chi2** | **p** |
| *1* | *CAI* | *ASPL* | *BC* | *NC* | *4* | *16175.287* | *--* | *39.607* | *5.21e-7* |
| *2* | *CAI* | *ASPL* | *NC* |  | *3* | *16176.924* | *1.637* | *35.969* | *7.6e-7* |
| *3* | *CAI* | *BC* | *NC* |  | *3* | *16177.088* | *0.164* | *35.806* | *8.23e-7* |
| *4* | *CAI* | *NC* |  |  | *2* | *16177.386* | *0.298* | *33.508* | *5.29e-7* |
| *5* | *CAI* |  |  |  | *1* | *16189.137* | *11.751* | *19.757* | *8.79e-5* |
| *6* | *CAI* | *BC* |  |  | *2* | *16190.230* | *1.093* | *20.664* | *3.25e-4* |
| *7* | *CAI* | *ASPL* |  |  | *2* | *16191.136* | *0.906* | *19.757* | *5.12e-4* |
| *8* | *CAI* | *ASPL* | *BC* |  | *3* | *16192.222* | *1.085* | *20.672* | *0.000123* |
| *9* | *BC* | *NC* |  |  | *2* | *16198.187* | *5.965* | *12.707* | *0.00174* |
| *10* | *ASPL* | *BC* | *NC* |  | *3* | *16199.130* | *0.943* | *13.764* | *0.00324* |
| *11* | *NC* |  |  |  | *1* | *16200.573* | *1.443* | *8.320* | *0.00392* |
| *12* | *ASPL* | *NC* |  |  | *2* | *16202.332* | *1.759* | *8.562* | *0.0138* |
| 13 | BC |   |   |   | 1 | 16206.448 | 4.116 | 2.446 | 0.118 |
| 14 | ASPL | BC |   |   | 2 | 16208.332 | 0.128 | 2.562 | 0.278 |
| 15 | ASPL |   |   |   | 1 | 16208.584 | 0.252 | 0.310 | 0.578 |