

**S4 Table. Performance comparison of different methods on negative binomial model.**

Method	$L_1$	ACC	AUPR	$L_1$	ACC	AUPR	$L_1$	ACC	AUPR
Random Graph									
MPLasso	0.071 (0.009)	<b>0.956 (0.006)</b>	<b>0.737 (0.027)</b>	0.064 (0.009)	<b>0.971 (0.008)</b>	<b>0.855 (0.047)</b>	0.052 (0.008)	<b>0.987 (0.006)</b>	<b>0.957 (0.024)</b>
CCLasso	0.077 (0.008)	0.943 (0.007)	0.556 (0.037)	0.071 (0.004)	0.949 (0.007)	0.681 (0.052)	0.058 (0.004)	0.961 (0.009)	0.804 (0.051)
SparCC	0.083 (0.004)	0.943 (0.007)	0.539 (0.032)	0.071 (0.004)	0.948 (0.008)	0.656 (0.050)	0.063 (0.006)	0.959 (0.010)	0.783 (0.051)
REBACCA	<b>0.070 (0.008)</b>	0.949 (0.007)	0.658 (0.039)	<b>0.061 (0.007)</b>	0.959 (0.008)	0.761 (0.049)	<b>0.050 (0.008)</b>	0.969 (0.009)	0.858 (0.047)
SPIEC (mb)	-	0.943 (0.007)	0.627 (0.035)	-	0.950 (0.008)	0.684 (0.034)	-	0.966 (0.013)	0.783 (0.056)
SPIEC (gl)	0.074 (0.009)	0.943 (0.007)	0.654 (0.024)	0.074 (0.008)	0.950 (0.007)	0.700 (0.030)	0.072 (0.011)	0.960 (0.013)	0.768 (0.063)
CCREPE	0.092 (0.005)	0.942 (0.007)	0.561 (0.036)	0.093 (0.007)	0.951 (0.007)	0.703 (0.047)	0.094 (0.008)	0.965 (0.009)	0.839 (0.046)
Hub Graph									
MPLasso	<b>0.088 (0.001)</b>	<b>0.971 (0.003)</b>	<b>0.756 (0.027)</b>	0.086 (0.001)	<b>0.978 (0.003)</b>	<b>0.830 (0.035)</b>	0.083 (0.001)	0.988 (0.003)	0.940 (0.019)
CCLasso	0.102 (0.010)	0.963 (0.001)	0.537 (0.046)	0.100 (0.003)	0.963 (0.001)	0.603 (0.050)	0.085 (0.003)	0.968 (0.004)	0.753 (0.048)
SparCC	0.112 (0.002)	0.963 (0.001)	0.514 (0.030)	0.101 (0.002)	0.963 (0.001)	0.577 (0.036)	0.057 (0.000)	<b>0.995 (0.001)</b>	<b>0.967 (0.010)</b>
REBACCA	0.089 (0.002)	0.965 (0.003)	0.629 (0.047)	<b>0.077 (0.004)</b>	0.975 (0.006)	0.779 (0.077)	<b>0.061 (0.004)</b>	0.991 (0.004)	0.956 (0.029)
SPIEC (mb)	-	0.961 (0.003)	0.650 (0.077)	-	0.962 (0.003)	0.643 (0.067)	-	0.968 (0.004)	0.708 (0.035)
SPIEC (gl)	0.089 (0.000)	0.963 (0.001)	0.682 (0.027)	0.089 (0.000)	0.963 (0.001)	0.683 (0.022)	0.089 (0.000)	0.968 (0.004)	0.731 (0.034)
CCREPE	0.094 (0.006)	0.963 (0.001)	0.518 (0.026)	0.096 (0.006)	0.963 (0.001)	0.613 (0.038)	0.103 (0.005)	0.969 (0.003)	0.758 (0.031)
Cluster Graph									
MPLasso	0.060 (0.005)	<b>0.911 (0.011)</b>	<b>0.686 (0.029)</b>	0.051 (0.003)	<b>0.927 (0.010)</b>	<b>0.750 (0.029)</b>	0.043 (0.003)	<b>0.946 (0.009)</b>	<b>0.844 (0.028)</b>
CCLasso	0.080 (0.009)	0.890 (0.008)	0.476 (0.028)	0.071 (0.004)	0.896 (0.010)	0.560 (0.031)	0.059 (0.003)	0.905 (0.009)	0.642 (0.024)
SparCC	0.088 (0.004)	0.890 (0.009)	0.466 (0.029)	0.074 (0.003)	0.895 (0.010)	0.544 (0.033)	0.066 (0.004)	0.903 (0.008)	0.623 (0.020)
REBACCA	<b>0.056 (0.004)</b>	0.897 (0.010)	0.578 (0.029)	<b>0.042 (0.003)</b>	0.904 (0.009)	0.627 (0.027)	<b>0.031 (0.002)</b>	0.912 (0.009)	0.683 (0.025)
SPIEC (mb)	-	0.891 (0.010)	0.589 (0.034)	-	0.896 (0.010)	0.607 (0.024)	-	0.902 (0.012)	0.640 (0.030)
SPIEC (gl)	0.065 (0.006)	0.891 (0.009)	0.614 (0.021)	0.064 (0.005)	0.896 (0.009)	0.620 (0.019)	0.065 (0.006)	0.902 (0.011)	0.648 (0.024)
CCREPE	0.125 (0.012)	0.889 (0.009)	0.483 (0.028)	0.127 (0.011)	0.898 (0.009)	0.583 (0.026)	0.130 (0.011)	0.911 (0.009)	0.673 (0.023)
Band(4) Graph									
MPLasso	<b>0.093 (0.002)</b>	<b>0.870 (0.008)</b>	<b>0.656 (0.021)</b>	0.087 (0.005)	<b>0.886 (0.007)</b>	<b>0.692 (0.019)</b>	0.067 (0.005)	<b>0.909 (0.005)</b>	<b>0.762 (0.012)</b>
CCLasso	0.093 (0.006)	0.850 (0.002)	0.426 (0.037)	0.079 (0.003)	0.855 (0.004)	0.499 (0.020)	0.064 (0.003)	0.866 (0.006)	0.577 (0.019)
SparCC	0.094 (0.003)	0.850 (0.002)	0.416 (0.023)	0.082 (0.002)	0.855 (0.003)	0.485 (0.021)	0.076 (0.002)	0.863 (0.005)	0.557 (0.019)
REBACCA	<b>0.093 (0.001)</b>	0.854 (0.003)	0.523 (0.021)	<b>0.079 (0.001)</b>	0.864 (0.005)	0.572 (0.025)	<b>0.063 (0.002)</b>	0.880 (0.005)	0.643 (0.017)
SPIEC (mb)	-	0.849 (0.002)	0.608 (0.040)	-	0.855 (0.005)	0.612 (0.024)	-	0.858 (0.007)	0.633 (0.021)
SPIEC (gl)	0.096 (0.000)	0.849 (0.002)	0.619 (0.027)	0.096 (0.000)	0.855 (0.005)	0.623 (0.018)	0.096 (0.000)	0.855 (0.007)	0.638 (0.012)
CCREPE	0.167 (0.004)	0.849 (0.001)	0.431 (0.021)	0.171 (0.004)	0.857 (0.004)	0.519 (0.020)	0.177 (0.003)	0.875 (0.006)	0.615 (0.018)
Scale-free Graph									
MPLasso	<b>0.067 (0.008)</b>	<b>0.970 (0.003)</b>	<b>0.751 (0.034)</b>	0.065 (0.009)	<b>0.976 (0.004)</b>	<b>0.818 (0.036)</b>	0.057 (0.008)	<b>0.985 (0.004)</b>	<b>0.915 (0.034)</b>
CCLasso	0.074 (0.009)	0.961 (0.001)	0.574 (0.053)	0.070 (0.007)	0.964 (0.002)	0.649 (0.049)	0.060 (0.007)	0.971 (0.004)	0.769 (0.047)
SparCC	0.082 (0.006)	0.961 (0.001)	0.539 (0.039)	0.070 (0.006)	0.964 (0.002)	0.624 (0.044)	0.061 (0.005)	0.969 (0.004)	0.748 (0.052)
REBACCA	0.070 (0.009)	0.966 (0.003)	0.662 (0.046)	<b>0.063 (0.010)</b>	0.972 (0.003)	0.749 (0.041)	<b>0.054 (0.009)</b>	0.977 (0.005)	0.826 (0.048)
SPIEC (mb)	-	0.960 (0.002)	0.646 (0.055)	-	0.965 (0.003)	0.681 (0.047)	-	0.973 (0.005)	0.761 (0.041)
SPIEC (gl)	0.069 (0.008)	0.962 (0.002)	0.678 (0.023)	0.069 (0.008)	0.966 (0.003)	0.718 (0.031)	0.068 (0.008)	0.972 (0.004)	0.775 (0.037)
CCREPE	0.073 (0.004)	0.961 (0.001)	0.555 (0.040)	0.072 (0.004)	0.964 (0.002)	0.668 (0.047)	0.075 (0.004)	0.973 (0.004)	0.803 (0.045)

We consider five different graph structures and three sets of parameters, namely,  $(p = 50, n = 50)$ ,  $(p = 50, n = 100)$ , and  $(p = 50, n = 200)$ . For each experiment, we average over 100 simulation runs with standard deviations in round brackets. Bold number shows best result.