Comparison of steady states

Using the pair wise interactions the transition rates p, q can be measured and the steady state probabilities inferred and compared to the actual probabilities of each state. This is done numerically by computing the singular eigenvector of the matrix A [1]:

$$A = \begin{bmatrix} p_1 q_1 & p_1(1-q_1) & (1-p_1)q_1 & (1-p_1)(1-q_1) \\ p_2 q_2 & p_2(1-q_2) & (1-p_2)q_2 & (1-p_2)(1-q_2) \\ p_3 q_3 & p_3(1-q_3) & (1-p_3)q_3 & (1-p_3)(1-q_3) \\ p_4 q_4 & p_4(1-q_4) & (1-p_4)q_4 & (1-p_4)(1-q_4) \end{bmatrix}$$

Figure 1 shows a regression line fitted to every pairwise interaction with a reported SSError value (pairwise interactions with missing states were omitted). This serves to validate the approach: a part from some edge cases the relationship is consistent.

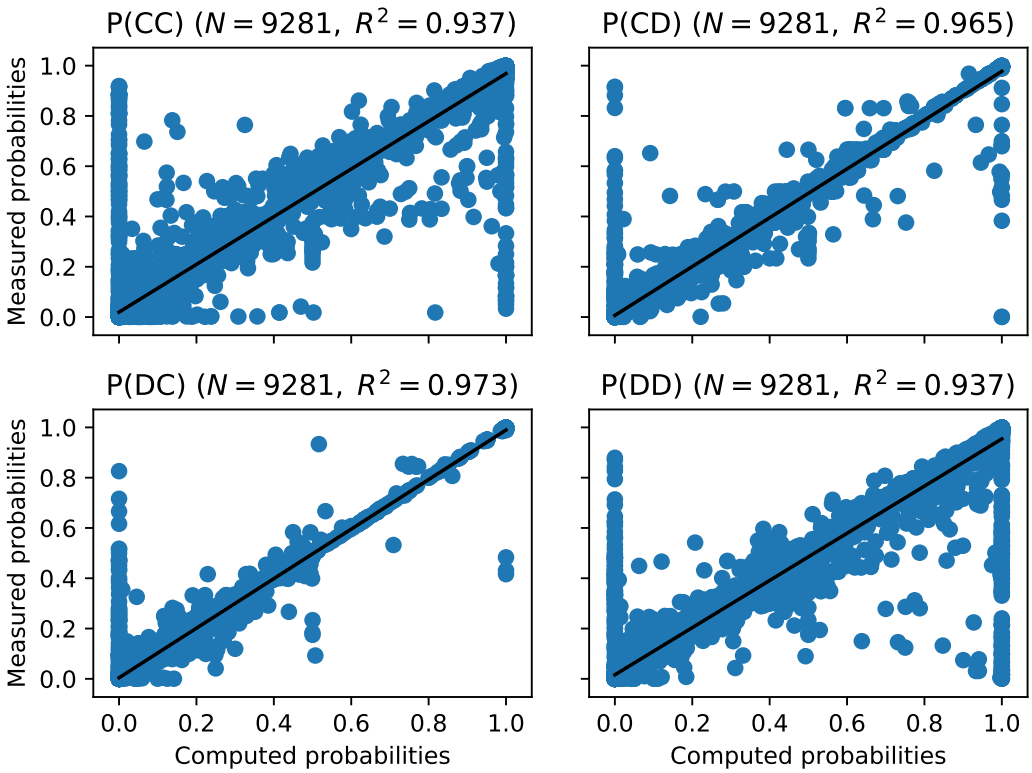

Figure 1: The relationship between the steady state probabilities inferred from the measured transitions and the actual steady state probabilities. A linear regression line is included validating the approach.

References

[1] William J. Stewart. *Probability, Markov Chains, Queues, and Simulation.* Princeton Univers. Press, July 11, 2009. 760 pp. ISBN: 0691140626. URL: `https://www.ebook.de/de/product/8052317/william_j_stewart_probability_markov_chains_queues_and_simulation.html`.