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Permutation invariant random matrix theory and natural language data

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I give an introduction to the Linguistic Matrix Theory programme, where permutation invariant random matrix theory is developed for applications to matrix data arising in compositional distributional semantics. Techniques from distributional semantics produce ensembles of matrices and it is argued that the relevant semantic information has an invariance under permutations. The general 13-parameter permutation invariant Gaussian matrix models are described. Techniques from symmetric group representation theory and quantum field theory allow the computation of expectation values of permutation invariant matrix observables (PIMOs). This is used to give evidence for approximate Gaussianity in the ensembles of matrices in compositional distributional semantics. Statistical distributions of PIMOs are applied to natural language tasks involving synonyms, antonyms, hypernyms and hyponyms.

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