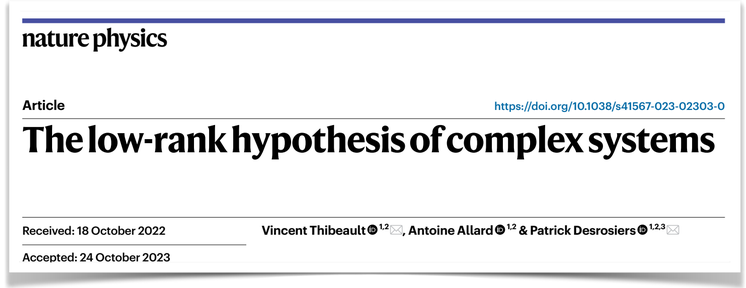
Main takeaways

- The rapid decrease of the singular values of adjacency matrices (i.e. low effective rank) offers a *justification* for low-dimensional mathematical models beyond mathematical and/or conceptual convenience.
- A large proportion of real networks can be considered as having a low effective rank.
- The higher-order interactions observed in some systems could be a byproduct of a low-dimensional representation used to analyze them.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The low-rank hypothesis of complex systems

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Challenges and open questions

- Could we measure the effective dimension independently?
- Could we design a random graph model based on observed singular values (singular vectors)?
- Are some of the higher-order interactions inferred from time series artefacts of coarse-grained observations?
- Could we designed more interpretable observables, perhaps nonlinear ones?

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Outline

1. Are simple models enough to study complex systems/networks?

2. **“Simple” ways to encode structural complexity**

   (a) latent metric space

   (b) stub types