

Next generation phylogenetic inference
@Evolution2016:
Nearest neighbors of phylogenetic time-trees

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(joint work with Chris Whidden and Erick Matsen)

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- The discrete component of tree space is *the* bottleneck for tree search algorithms.

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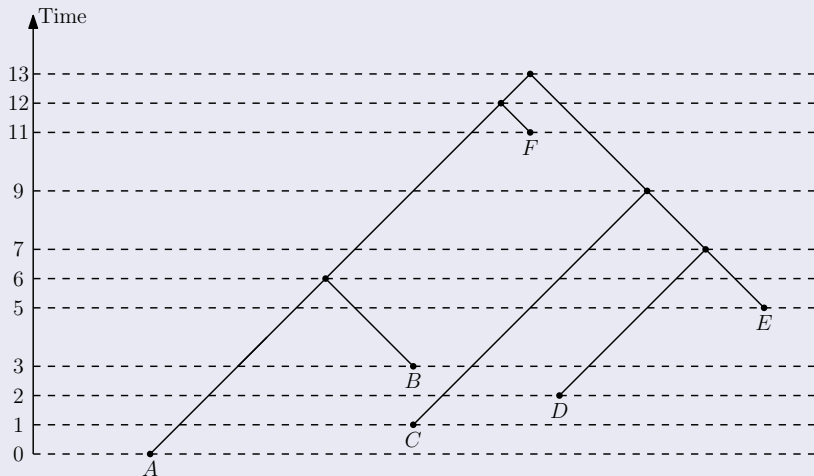
- General statistics is at least 5 years ahead of phylostatistics.
- The discrete component of tree space is *the* bottleneck for tree search algorithms.
- What's wrong with trees?

Same as above but with a mortarboard on

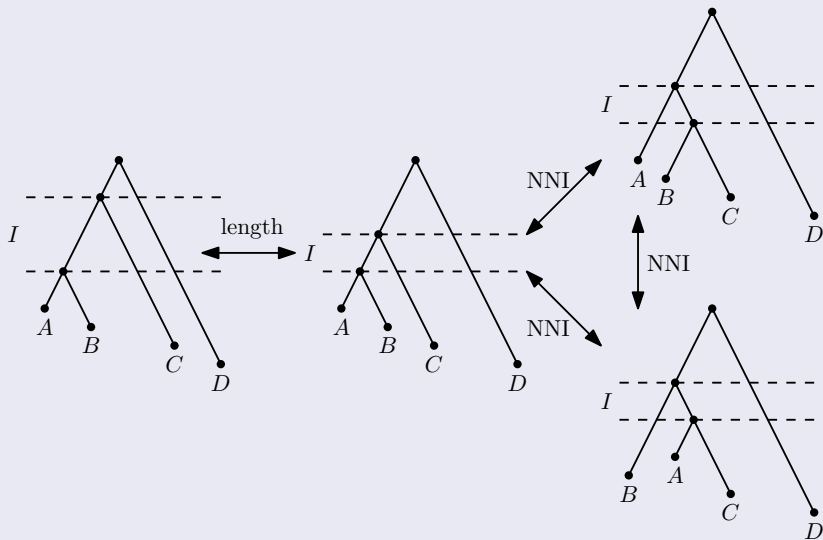
- MCMC algorithms
 - Improving efficiency = smart proposals
 - Point estimates AKA posterior summary
- Tree search methods in general
 - Semi-convergence
 - Valleys
 - Terraces

THESE ARE NOT THE TYPE OF TREES WE'RE GONNA
CONSIDER — ?

(Discrete) Time-tree

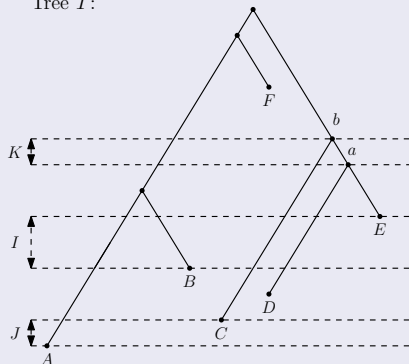


Discrete time-tree space

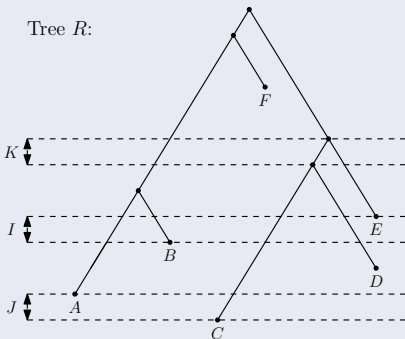


Trees at distance 3

Tree T :

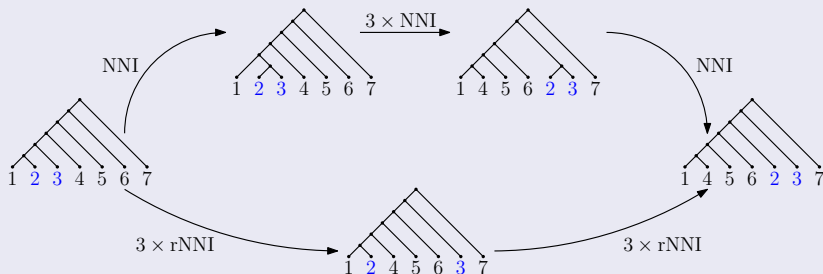


Tree R :



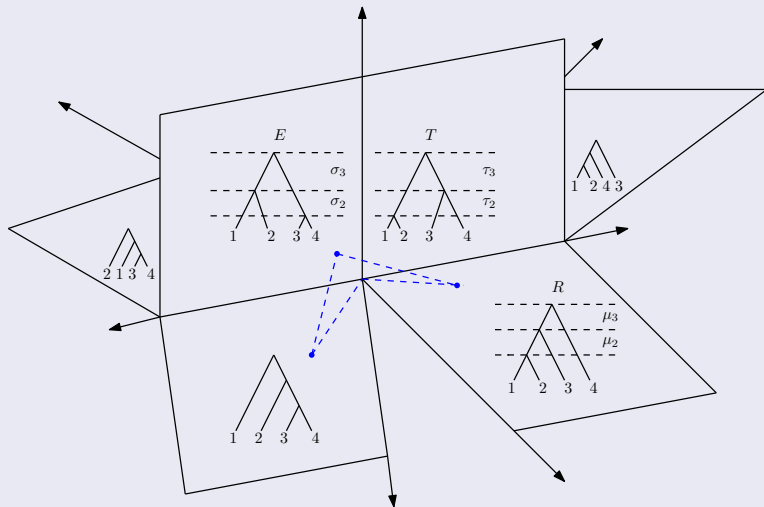
Looks promising!

G, Whidden, and Matsen, arXiv, to appear in June 2016



Promising indeed

G and Drummond, JTB 2016



Thank you for your attention!



Yann Ollivier

Ricci curvature of Markov chains on metric spaces

J. Functional Analysis, 256, 3, 810–864, 2009



Alex Gavryushkin and Alexei Drummond

The space of ultrametric phylogenetic trees

arXiv preprint arXiv:1410.3544, 2014



Chris Whidden and Frederick A. Matsen IV

Quantifying MCMC exploration of phylogenetic tree space

Systematic Biology, doi:10.1093/sysbio/syv006, 2015



Chris Whidden and Frederick A. Matsen IV

Ricci-Ollivier curvature of two random walks on rooted phylogenetic subtree-prune-regraft graph

To appear in the proceedings of the *Thirteenth Workshop on Analytic Algorithmics and Combinatorics*, 2015



Alex Gavryushkin, Chris Whidden, and Frederick A. Matsen IV

Random walks over discrete time-trees

To appear on the *arXiv*, 2015



<https://github.com/gavruskin/tauGeodesic>



<https://github.com/gavruskin/tTauCurvature>