

Title: **Forests of paths**

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Brief Description:

Let  $\mathcal{A}$  denote the class of path forests, that is graphs such that each component is a path. We want to explore the typical numbers of components and their orders (numbers of vertices) in a path forest.

Let  $\mathcal{A}_n$  be the set of graphs in  $\mathcal{A}$  on vertices  $1, \dots, n$ ; and let  $R_n$  be a graph sampled uniformly at random from  $\mathcal{A}_n$ . Thus we are interested in the distributions of the number  $\kappa(R_n)$  of components of  $R_n$ , and of the numbers  $\kappa_i(R_n)$  of components of order  $i$ . Some of these distributions can be computed exactly for modest values of  $n$  (say  $n = 100$ ). We wish to learn from such computations, and compare results with asymptotic results and perhaps develop such results further.

It would be natural to warm up by considering the easier corresponding case with directed paths. The results should also be compared with the unlabelled case, which corresponds to partitions of the integer  $n$ , and perhaps to cycle decompositions of permutations.

Prerequisite courses: none, though graph theory and combinatorial optimisation would help.

theoretical/simulation/computational project

References:

O. Bernardi, M. Noy and D. Welsh, On the growth rate of minor-closed classes of graphs, manuscript, October 2007, arXiv:0710.2995.

Colin McDiarmid, Random graphs from minor-closed classes, 2008.