Hamiltonicity of the Preferential Attachment model

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The preferential attachment model is perhaps the best-known model of complex real-world networks. In this model, vertices are added to the graph one by one, and each time a new vertex is created it establishes a connection with m random vertices selected with probabilities proportional to their current degrees. We prove that if $m \geq 1{,}260$, then asymptotically almost surely there exists a perfect matching; and if $m \geq 29{,}500$, then asymptotically almost surely there exists a Hamiltonian cycle. One difficulty in the analysis comes from the fact that vertices establish connections only with vertices that are "older" (i.e., are created earlier in the process). In view of that, we consider a simpler setting—sometimes called the uniform attachment model—in which vertices are added one by one and each vertex connects to m older vertices selected uniformly at random. In this talk, we will outline the proof of the statements for the uniform attachment model; to get the result for the preferential attachment model involves quite technical work.