

# On the enumeration of graphs with given degree sequence

Nick Wormald

## Abstract

In this talk I will give a brief description of methods and results on enumeration of graphs with given degree sequence, a topic of interest of some 60 years, with emphasis on asymptotic enumeration. Methods include generating functions, tailored combinatorial arguments, analytic methods, and the use of probability. I will also describe new work, joint with Pu Gao, which applies to certain heavy-tailed degree sequences in the sparse case (i.e. where the average degree is rather small).

An  $n$ -term degree sequence follows a power law if the number of copies of  $i$  in the sequence is approximately proportional to  $ni^{-\gamma}$  for some  $\gamma > 1$ . Naturally occurring networks occasionally have a power-law degree sequence, normally with  $2 < \gamma < 3$ . A special case of our new result gives the first enumeration applicable to such degree sequences, and applies whenever  $\gamma > 5/2$ . Another special case generalises a result of Janson.