

# Asymptotic enumeration of 0-1 matrices: the dense case

**Brendan McKay**

*Department of Computer Science,  
Australian National University, Australia  
(bdm@cs.anu.edu.au)*

## Abstract

Given two vectors of positive integers with the same sum, how many different zero-one matrices are there with row sums given by the first vector and column sums given by the second vector? This is a fundamental question with many applications. Exact expressions seem unlikely to exist, so we seek highly accurate asymptotic expressions. (Here the input is a sequence of row sums and a sequence of column sums, such that the matrix sum tends to infinity.)

Different methods are used for asymptotic enumeration depending on whether the matrices are sparse (small matrix sum) or dense (fairly large matrix sum). This talk will discuss the dense case, where we have used the tools of complex analysis. In brief, the value is expressed as a coefficient in a multivariable generation function then extracted using a saddle point method. As well as the general problem noted above, we consider the case of symmetric 0-1 matrices, including recent investigation of different options for the weighting of entries on the diagonal. We also consider extra constraints regarding the values of specified entries, leading to a theory of subgraphs of random graphs with specified degrees.