CARLA SAVAGE, North Carolina State University

Partitions and compositions defined by digraphs

We consider the enumeration of nonnegative integer sequences $a_1, a_2, \ldots, a_n$ satisfying a system C inequalities of the form $a_i \geq a_j + b_{i,j}$. In this case, C can be modeled by a directed graph with vertices $1, \ldots, n$ and with an edge from i to j of weight $b_{i,j}$ for each constraint $a_i \geq a_j + b_{i,j}$ in C. Many familiar systems can be modeled in this way, including ordinary partitions and compositions, plane partitions, monotone triangles, plane partition diamonds, and solid partitions.

We develop special tools tailored to computing the generating function of sequences defined by a digraph and show how to apply these tools strategically to solve some nontrivial enumeration problems in the theory of partitions and compositions. The focus is on *deriving a recurrence* for the generating function when the digraph has a recursive structure. Part of this process can be (and has been) automated.

This is joint work with Will Davis, Sunyoung Lee, and Erwin D'Souza.