

# Constructing orthogonal polynomials from finite moment measurements

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## Abstract

Let  $G$  be a finite union of disjoint and bounded Jordan domains in the complex plane, let  $B$  be a compact subset of  $G$  and consider the set  $G^*$  obtained from  $G$  by removing  $B$ , i.e.,  $G^* := G \setminus B$ . (We call  $G$  an archipelago and  $G^*$  an archipelago with lakes). Also, let  $\{p_n\}_{n=0}^{\infty}$  and  $\{p_n^*\}_{n=0}^{\infty}$  denote the two sequences of Bergman polynomials of  $G$  and  $G^*$ , respectively. These are the sequences of orthonormal polynomials defined by the area measure on  $G$  and  $G^*$ .

The purpose of the talk is twofold: (a) To report on an efficient and stable algorithm for the actual computation of the two sequences of polynomials, based on area complex moments. (b) To report on some recent developments, regarding the asymptotics of  $\{p_n\}_{n=0}^{\infty}$  and  $\{p_n^*\}_{n=0}^{\infty}$ . In particular, we show that the two sequences of polynomials have comparable asymptotic behavior.

These will lead to an efficient algorithm for recovering the shape of both  $G$  and  $G^*$  using a finite set of area complex moments of  $G^*$ , and hence to applications in 2D geometric tomography.