

ALGORITHMS FOR ABELIAN SURFACES

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This talk will give an overview of algorithms for working with abelian surfaces, both analytically and arithmetically.

In the first part of the talk, we describe the reconstruction of principally polarized abelian surfaces (ppas) from their period matrices; for simple ppas, this comes down to reconstructing a genus-2 curve, which can be done both geometrically (over \mathbb{C}) and arithmetically (over the natural field of definition of the ppas). We discuss this theme, the link with theta functions and their derivatives, and currently available algorithms in various systems.

The second part of the talk describes how to recover principally polarizations on a given lattice in \mathbb{C}^2 . We also consider a Prym variety that is a natural example of a non-principally polarized abelian surface over \mathbb{Q} and for which a principal polarization over \mathbb{Q} is not available.

We conclude by discussion explicit modularity results on abelian surfaces and the link with the L-Functions and Modular Forms Database (LMFDB).

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