**Project title:** Counting and identifying trace polynomials

**Lead faculty:** Tarik Aougab, Haverford College, <http://taougab@haverford.edu>

**General area:**  Mathematics Geometry and topology

**Description:**

The purpose of the project is to study the lengths of closed geodesics on hyperbolic surfaces (a type of shape that shows up very frequently when studying topology and geometry). A closed geodesic is a loop on the surface of shortest possible length. Given such a loop, its length can be expressed as a function of the lengths of finitely many, very simple loops. This function is called the trace polynomial of the geodesic. We will try to understand when two geodesics have the same trace polynomial, and when a geodesic is the only one with its particular trace polynomial. The project will involve some reading and some basic computer programming.

**Requirements:** Some background in abstract algebra at the undergraduate level (including group theory). Exposure to very basic differential geometry is a plus but not at all required. Some basic programming skills would also be helpful.

**Start date, end date:**  01.02.2023 - 01.02.2023

**Estimated hours per week:** Depends completely on student interest: Anywhere between 1 and 10