Title: Circle packings and discrete analytic functions

Instructor: David Glickenstein

Book: *Introduction to Circle Packing: The Theory of Discrete Analytic Functions* by Kenneth Stephenson

Description: In this course we will look at Thurston's idea of using circle packings to approximate conformal maps. In this way we may, for instance, approximate the map ensured by the Riemann Mapping Theorem which is not defined constructively. The circle packings form a discrete analogue of a complex structure (or even a Riemannian structure) and existence of circle packings is analogous to solving elliptic partial differential equations. The beauty of the theory, however, is that it can all be done independent of the mathematics of complex analysis, Riemannian geometry, and partial differential equations. We plan to first define circle packings, then look for discrete analytic functions both on domains in $\mathbb{C}$ and on Riemann surfaces, which is equivalent to finding circle packings. The capstone will be a look at Thurston's conjecture on discretely approximating the Riemann Mapping Theorem and Rodin-Sullivan's proof of the conjecture. If there is time, we will cover additional topics such as tilings and random walks on circle packings.

Prerequisites: Point-set topology will be needed. Some familiarity with complex analysis would be useful, but not essential.