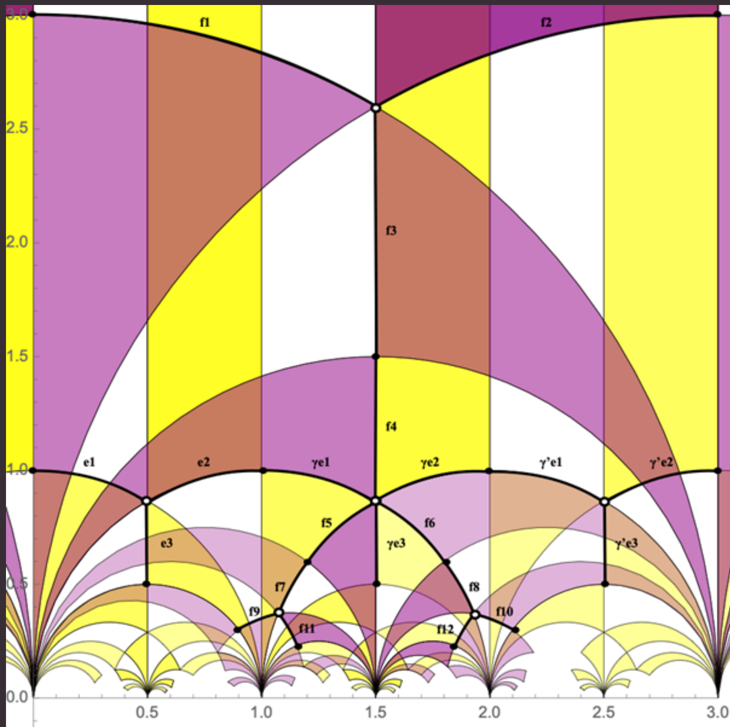
Motivated by Fermat's Last Theorem, modular forms, or a more generalized case, automorphic forms, are the central objects in the field of algebraic number theory. A modular form is a complex analytic function on the upper half-plane that satisfies a certain kind of conditions involving group actions. A particular kind of "averaging" operator that is tightly related to modular forms is the Hecke operator. On the other hand, dessins d'enfants is the French word for children's drawing, and they refer to simple bicolored graphs consisting of points and joining edges that satisfy certain conditions. Moreover, this is a one-to-one correspondence between modular forms and dessins d'enfants. In my dissertation work, I showed how Hecke operators act on the dessins, and how this action is related to that on the modular forms.

Realizing Hecke Actions on Modular Forms Via Cohomology of Dessins d'Enfants

Dena Ho

PhD Thesis

I specifically studied the action of the Hecke operator acting on where . This action can be captured step by step by the Hecke correspondence, namely, where g is a specific matrix involving p. On one hand, I built a parabolic cohomology with twisted coefficients consisting of vector-valued differential forms associated to modular forms. By doing this, I also presented a version of the proof to the Eichler-Shimura isomorphism on cusp forms and cohomology classes. On the other hand, similarly I built a combinatorial cohomology on the corresponding dessins. I then showed that the actions by on the different cohomology classes are isomorphic.



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