**Project-based research**

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| **Project Name:** | Cubic Surface and E6 root system | **Project ID:** | Leave Blank |
| **Supervisor:** | Yilong Zhang  | **Number of Positions** | 1 |
| **Project Description:** | In classical algebraic geometry, a cubic surface has 27 lines. If two lines are disjoint, then their difference is topologically equivalent to a sphere which vanishes as cubic surface become singular. These classes are called “vanishing cycles”. It turns out that there are 72 vanishing cycles on a cubic surface, and they correspond to the 72 roots in the root system of Lie algebra of type E6. In this project, we will review the classical theory on cubic surface, and we will explore an approporiate notion for “root system” when cubic surface become singular. It turns out these objects describe certain moduli space on cubic threefold. |
| **Final Deliverables:** |  Depending how far we go, student is expected to 1. write a survey on classical geometry on cubic surface and its relation to root system, and if possible, we hope to2. complete a research paper on root system on singular cubic surface. |
| **Weekly Working Hours** | 5 |
| **For Credits/Voluntary**  | Either |
| **Desired Qualifications**  | Whoever interested in geometry and topology is welcome. Students with basic knowledge in algebraic geometry and/or topology is preferred. |