**Undergraduate Research Project**

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| **Project Name:** | Application of Hamilton-Jacobi Theory to Geometric Optics | **Number of Positions:** | 2 |
| **Supervisor:** | Mahesh Sunkula |
| **Supervisor e-mail:** | msunkula@purdue.edu |
| **Project Description:** | Students derive the Hamilton-Jacobi equation and explore its connection to Fermat’s principle and the eikonal equation. Through computational exercises, students implement ray tracing to model light propagation in gradient-index media. The project enhances understanding of classical mechanics’ role in optics, bridging theory and practice through both analytical and numerical methods. |
| **Final Deliverables:** | Report |
| **Weekly Working Hours** | 5-10 |
| **For Credits/Voluntary**  | Either is okay |
| **Desired Qualifications**  | Required: Differential Equations, Classical MechanicsPreferred: Differential Geometry, Python |

**If you are interested in participating in this research project, please send an e-mail to the supervisor e-mail listed above together with a resume, a list of what courses you’ve taken or a copy of your transcript, and a personal statement explaining why you are interested in this project.**