A. Briefly describe overall research program at your laboratory.

I have worked with several students for summer research projects in mathematical modeling. Projects in the past two summers are:
(1) Mathematical Model of the Force Curve of a Soccer Ball and Analysis of Women’s Soccer Injuries
(2) Mathematical Models for Two Factor Interest Rate Models
(3) Mathematical Models for COVID-19
(4) Applying Mathematical Modeling in High School Classroom
Currently I am working on projects: (i) polynomial regression for 2 dimensional and 3 dimensional parametric curves; (ii) mathematical modeling with dimensionality reduction methods; and (iii) mathematical modeling with machine learning.

B. Briefly describe specific project(s) for your teacher:

Mathematical models are of great importance in natural sciences and engineering. Often a mathematical model: discrete or continuous, linear or nonlinear, explicit or implicit, static or dynamical, deterministic or probabilistic, is chosen to best fit the given data (supervised and unsupervised) from a real-world application. For this RET project, we will study how to develop mathematical models using regression methods. We will go through the following topics in detail: data collecting, regression methods, mathematical modeling using regression methods, statistics methods for analyzing and evaluating a developed model, and improving a model with given or additional data. Each participant will choose one real-world application as his/her project. I look forward to working you!

C. Will any other people (post docs, grad students, undergraduate students, colleagues, etc.) be involved directly with your teacher?

There may be one graduate student that will work with the teacher.

D. Will you require any advanced reading/preparation for the teacher? If yes, please briefly describe.

No prerequisite is required for this project. Some brief reading on background information about algorithms for mathematical modeling and real-world applications will be recommended. A document file will be created for each participant in Google Docs at https://docs.google.com. Weblinks to all reading materials will be posted in this document. We will go over the reading materials through working on the project. All discussion and work for the project will be recorded in this document.