Student Research Presentations Fall 2021

- **Tuesday 31 August beginning 4:00pm in Jepson 109**

(4:00) Dr. LeCrone’s group: **Discontinuous Medial Axis Structures: A variation of obstacle spaces and control models**
   
   Caitlin Sales, Anna Fortunato, Thomas Spiker, Dylan Hooper, Mengqi Zhang, Lily Dickson

(4:15) Sarah Gregory (REU Middle Tennessee State University): **The Minimum Distance of Polar Hermitian Grassmann Codes**

(4:30) Dr. Bhakta’s group: **New Algorithm Attempt on liver transplant allocation system**
   
   Ioana-Andreea Cristescu, Zhuoyuan “Naron” Chen, Ying Zhu

(4:45) Kartikey Sharma (Dr. Bhakta): **Markov Chain Monte Carlo and Degree Sequences**

- **Abstracts for Tuesday’s talks**

**Team LeCrone**

Title: Discontinuous Medial Axis Structures: A variation of obstacle spaces and control models

Abstract: Self driving cars. Obstacle structures. Dr. Jeremy LeCrone. What do these things have in common? They all are connected to the discontinuous medial axis. For our summer research, our team designed projects regarding medial axes and their structures in various obstacles spaces, focusing on combining aspects of both geometric and non geometric medial axes with models from control theory. We will discuss obstacle spaces that feature curved corners, straight walls, and extreme angles, as well as various control models including the forward airplane model, the Galaga model, and Dubins’ car.

**Sarah Gregory**

Title: The Minimum Distance of Polar Hermitian Grassmann Codes.

Abstract: The Grassmannian is one of the most widely studied objects in Algebraic Geometry, and we use the Grassmann code to study its properties. The polar Hermitian Grassmann code is a subvariety consisting of all spaces isotropic under a sesquilinear form. In this research, we worked to determine the minimum distance of the Polar Hermitian Grassmann codes of form 3x6.

**Team Bhakta**

Title: New Algorithm Attempt on liver transplant allocation system

Abstract: The current Liver transplant allocation system in the U.S. is built upon a greedy algorithm based on MELD (Model for End-Stage Liver Disease) score within a defined geographic unit (acuity circle). Certain variables, such as population density, were not placed into the calculation of MELD score which raises questions of fairness regarding the system. We thought that a different algorithm could come into play and work with the MELD score to achieve the goal of maximizing patients’ life time. In this presentation, we are going to explain why some of the algorithms we attempted failed to improve the system. And finally, we are going to describe how the new algorithm we are currently implementing has its chance of approaching a solution to liver distribution.

**Kartikey Sharma**

Title: Markov Chain Monte Carlo and Degree Sequences

Abstract: The degree sequence of a graph refers to the non-increasing sequence of each of its vertex degrees. There is academic interest in being able to sample uniformly from the set of all simple graphs with a given degree sequence, but simply enumerating all the possibilities is computationally infeasible. Hence approaches such as Markov Chain Monte Carlo are employed. In this talk we will discuss this problem, the MCMC approach, and our work on creating software to generate all the graphs with a certain degree sequence for a small number of vertices.