

# GRADUATE SEMINAR

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## Cameron-Liebler Sets for 2-Transitive Groups

*supervised by  
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**2:00 PM**

**Math Lounge**

### **Abstract:**

The Kneser graph,  $K(n, k)$ , has been studied in great detail and many of its properties have been well established. For example, its eigenvalues are known, the size of its maximum cocliques are known, and all of the cocliques of  $K(n, k)$  have been found. This presentation will address these three properties for the derangement graph,  $\Gamma_G$ , where  $G$  is a 2-transitive permutation group. Specifically for  $G = S_3$  (the symmetric group of order 3), it will present: (1) the largest and smallest eigenvalue of  $\Gamma_G$ ; (2) the size of a maximum coclique of  $\Gamma_G$ ; and (3) all maximum cocliques of  $\Gamma_G$ . This final point is the main focus of the research project. Some of the maximum cocliques of  $\Gamma_G$  have been found for a general 2-transitive group  $G$ ; however, there are potentially more. To find more cocliques, the problem can be reduced to solving a matrix-vector product:  $Nv = b$ , where the vector  $b$  is a characteristic vector and is an example of what is called a "Cameron-Liebler set". Any characteristic vector for a maximum coclique is an example of a Cameron-Liebler set. The presentation will close with an example that will illustrate the challenges in finding such vectors and also some of the strategies that will be used to accomplish this search.