



MATHEMATICS COLLOQUIUM SERIES TWO-DAY SPECIAL EVENT FEATURING STUDENT SPEAKERS:

NAZIBA A. NUHA AND ALESSANDRO XELLA

EVENT #1

Day and Time: Thursday, April 21st from 12:30-1:20pm

Location: Parker 338

Speaker: Alessandro Xella, NSU Mathematics Major Class of 2022



Title: A weighted probability measure for objects in Euclidean space

Abstract: Since we were little kids, we developed our own sense dimension as a measure of some kind of extent. Whether it be length, width, or height, we intuitively understand how these features fit in the three-dimensional world we live in, and how to measure it. Nevertheless, mathematicians have found themselves dealing with objects, like fractals, and spaces, like R^4 , that challenge our intuitive and self-developed definition of measure, to the point that it is not sufficient anymore. Lebesgue measure and Harsdorf measure for example are ways of assigning a measure to objects that belong to n -dimensional Euclidean spaces, in an effort to find better and more general methods to compare figures, quantities, and masses. Here, I have compared spaces of concentric circles (targets), and studied their behavior in terms of probability masses, varying the number of targets, the size of the circles, and the dimension they belong (plane, space, R^4 , R^n).

EVENT #2

Day and Time: Friday, April 22nd from 12:00-12:50pm

Location: Parker 301

Speaker: Naziba Akther Nuha, NSU Mathematics Major Class of 2022

Title: A novel TCR clustering method for SARS-COV-2 epitopes



Abstract: T-cell epitopes are peptides generated from antigens that are presented by MHC class I and class II molecules to T-cells. These epitopes are usually identified by T-cell receptors (TCRs) of CD4 T-cells which then causes transformation of CD4 T-cells to helper or regulatory T cells. Recently, there has been growing interest in the role of T cells and their involvement in various ailments including SARS-COV-2, cancer, autoimmune diseases and other infectious diseases. However, the mechanism of TCR epitope recognition by T-cell receptors (TCRs) of CD4 T-cells at a repertoire level is still not fully understood. In this project, we reviewed standard TCR clustering methods and developed a novel TCR clustering technique for two SARS-COV-2 epitopes. Using Principal Component Analysis, we analyzed twenty different physiochemical properties of amino acids and then converted the amino acids in the TCR sequences to numerical strings. We then used four distances methods (Cosine, Cityblock, Euclidean and Correlation) on these strings, and clustered the TCRs in order to compare the dendrogram outputs and see which method does a better job of grouping together like TCRs activated by each epitope. Results were compared to standard matrices such as BLOSUM, PAM, and Gonnet. We thus present a novel TCR clustering technique that will be less computationally strenuous and more cost-effective compared to traditional methods and can be easily utilized by the scientific community to learn more about TCR repertoire sequencing.

Refreshments will be served in the Department of Mathematics Suite prior to and after the conclusion of each talk to celebrate the achievements of our students.

The entire NSU community, including students at all levels of mathematics, is invited and encouraged to attend.

For more information about the Mathematics Colloquium Series and the Fall 2022 speaker series, please contact Julienne Kabre, Ph.D., Assistant Professor of Mathematics at jkabre@nova.edu