The SUMO Speaker Series for Undergraduates
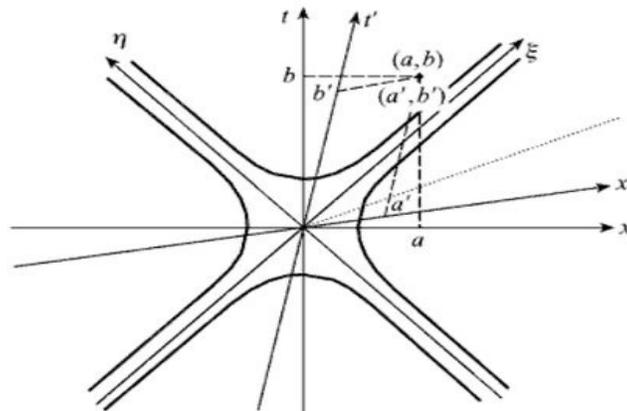
(Pizza Provided)
Wednesday, November 17th
4:30-5:20, room 380C

Relativistic Addition and Group Theory

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ABSTRACT:

Since the speed of light c is the largest speed in nature, the velocity of two colliding objects cannot be simply the sum of the individual velocities, as in classical mechanics. This leads to a new addition $v + w = (v+w)/(1+(vw)/c^2)$. From the mathematical point of view this means that we have defined a group structure on the open interval $I = (-c,c) \subset \mathbb{R}$. Surprisingly, this new addition is related to the classical addition $(\mathbb{R},+)$ via the hyperbolic tangent function $\tanh(x)$ and its addition formula. Starting from this example above from Einstein's theory of relativity, we will classify all possible new additions on open intervals $I \subset \mathbb{R}$.. As a byproduct, we obtain the addition formulae for $\tanh(x)$, $\log(x)$, etc.

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