Systematic Studies of Two Particle Correlations in Relativistic Heavy Ion Collisions

J.J. Zanazzi
Mentor: Rene Bellwied
Chanaka De Silva

Particle accelerators collide particles at velocities near that of light. The result of those collisions is a multitude of scattered subatomic particles.

Will be studying the relationships between centrality and momentum of scattered particles.
What is centrality?

Centrality is a measure of how “central” something is.

In this diagram, the red node has the highest degree centrality, because it has the most links.

How Relates to Physics:

Relationship with how “head on” collision is, and how dense system is, from particles scattering outwards in certain trajectories.

Can use this phenomenon to probe into the correlation structures of particles.

Also will be looking into the momentum of these particles.
Can derive the momentum of particles two ways:

Magnetic Fields applied where particle collision takes place
Lorentz Force: \( \mathbf{F} = q(\mathbf{E} + \mathbf{v} \times \mathbf{B}) \)
Software reconstructs particle tracks, can deduce force, then velocity.

Calorie meter detectors detect energy from neutral particles.
Value is directly proportional to momentum.

What I will be doing over the summer.

Use fit function to analyze compiled Cu+Cu and Au+Au collision data.

Graph parameters extracted from data.