



## Colorado Science and Engineering Fair

## 2025 Individual Project Abstract Form

**Please print 2 copies of the completed form. Sign both copies, keep 1 for your notebook and submit 1 copy to your Regional Fair Director with your other paperwork.**

Title of Project: MotionMatics: An AI Solution for Movement Comparison and Feedback

Finalist's Name: Eshaan Yendamuri

School and City: Rock Canyon High School, Highlands Ranch

Sponsor's Name: Amulya Gampala

Category: Mathematics & Computer Sciences

Division: Senior (grades 9 - 12)

Abstract (250 words or less):

Inaccurate human movement analysis hinders progress in sports and physical therapy, where existing methods are often subjective, expensive, or time-consuming. To address this, I developed MotionMatics, a novel AI-driven system that provides precise movement analysis, comparison, and personalized improvement suggestions. This study pioneers a comprehensive evaluation of two distinct approaches for movement similarity assessment: cosine similarity applied to pose estimation data and a Siamese CNN-LSTM model. The cosine similarity method rapidly compares joint coordinate vectors, providing a computationally efficient measure of movement alignment. In contrast, the Siamese CNN-LSTM model captures both spatial and temporal movement patterns, enabling a nuanced understanding of motion. Experimental validation across diverse sports revealed that cosine similarity struggles with dynamic movements, whereas the Siamese CNN-LSTM approach accurately identifies subtle deviations by learning motion sequences over time. By integrating deep learning with pose estimation, MotionMatics offers an accessible and scalable tool for skill development, injury prevention, and rehabilitation, with far-reaching applications across sports, healthcare, and workplace ergonomics.

*I hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I also attest that the above properly reflects my own work.*

Finalist's Signature:

Date:

In addition, all students must complete the ISEF Student Checklist (1A), Research Plan, Approval Form (1B), and Checklist for Adult Sponsor (1), and any other ISEF forms required for this type of project. See the International Rules and Guidelines for form requirements. Return COPIES of all of these forms to your Regional Fair Director with you Finalist Verification/Permission Form. **A signed copy of this form must be included in your notebook.**