RoboRumble: STEM Innovation Competition Sourcing, Preparing and Nurturing a Pipeline of Innovators

POWERED BY:

IN PARTNERSHIP

Competition Background

The Robo Rumble: STEM Innovation Challenge is a groundbreaking initiative by the Algorythmlab Living Lab in partnership with Sekhkhune TVET College, AlgoAtWork, University of Limpopo, UL Digital Hub, Engen, MLab, Department of Science and Innovation, Technology Innovation Agency, CHIETA and Lethaba TVET College, designed to ignite curiosity, innovation, and technical excellence among the youth. As South Africa stands at the crossroads of technological advancement and economic transformation, this competition aims to bridge the gap between theoretical learning and practical application, equipping participants with the skills needed to thrive in the evolving world of the fourth industrial revolution, with a focus on internet of things, robotics, artificial intelligence, and automation.

The competition has brought together over 350 youth and school learners from Limpopo, Gauteng and KwaZulu-Natal, providing a high-impact platform where they will conceptualize, design, and develop real-world technological solutions powered by digital, IoT, artificial intelligence technologies addressing challenges faced in the industrial, manufacturing, energy and mining sectors.

The Robo Rumble: STEM Innovation Competition is more than just a competition— see it is a launchpad for young visionaries, problem-solvers, and future industry leaders. The competition serves as a structured talent sourcing pipeline where top solutions are identified, incubated, and supported into viable, funding-ready products with support from the Technology Innovation Agency's funded Living Lab R&D Incubation Program.

The competition is following a structured four-phase format:

1. **Robo Rise - Regional Makerthon and Hackathon Competitions (Ideation & Prototyping)**
2. **Hackathon Ultimate Eliminations**
3. **Robo Code - 1 Month Support Program**
4. **Robo Grand Final Showdown**

Beyond the competition, winning teams will gain access to the Algorhythm Living Lab and the Research & Development Incubation Program, where they will receive structured mentorship, funding, and commercialization support to transform their prototypes into scalable, market-ready solutions.

Competition Technical Framework

Problem statements were drawn from real challenges in Africa's industrial, manufacturing, and mining sectors, aimed at inspiring practical and impactful robotics and IoT solutions. Students are required to utilise **Wokwi - World's most advanced ESP32 simulator software** to develop their prototype kits.

https://wokwi.com/

Problem Statements

1. Predictive Maintenance

Develop a system that predicts and prevents industrial equipment failures before they occur.

Context: Many African industries face frequent equipment breakdowns due to the lack of predictive maintenance systems, leading to costly downtimes. UN Trade and Development (UNCTAD)+8ScienceDirect+8LinkedIn+8

2. Worker Safety

Design a solution that monitors and enhances worker safety in hazardous industrial or mining environments.

Context: Unsafe working conditions, including exposure to toxic gases and unstable structures, are prevalent in African mining sectors. Mining Review

3. Task Automation

Create a robotic or IoT solution that automates repetitive or dangerous tasks in factories or mines. Reuters+1African Development Bank Group+1

Context: The lack of automation in African manufacturing leads to inefficiencies and increased risk of human error. African Review

4. Smart Inventory

Build a system that tracks and manages factory or warehouse inventory in real time.

Context: Inefficient inventory management in African factories results in overstocking or stockouts, affecting production schedules. LinkedIn+2African Development Bank Group+2NEPAD+2

5. Quality Inspection

Develop a smart inspection tool that detects defects or quality issues automatically during production.

Context: *Manual quality checks in African manufacturing are time-consuming and often miss defects, leading to product recalls. [African Union+27Latest news & breaking headlines+27Mining Review+27]*

6. Real-time Monitoring

Create a solution that enables real-time monitoring of critical processes in factories or mining operations.

Context: *The absence of real-time monitoring systems hampers decision-making and quick response to issues in African industries.*

7. Waste & Recycling

Design a robotic or IoT system that sorts, manages, or recycles industrial waste efficiently.

Context: *Improper waste management in African industries leads to environmental pollution and health hazards.*

8. Autonomous Navigation

Build a robot or drone that navigates and transports tools or materials safely in industrial or mining areas.

Context: Transporting materials in African mining sites is often hazardous due to rough terrain and a lack of proper infrastructure.

9. Environmental Impact

Create a technology that reduces environmental harm caused by factory or mining activities.

Context: Mining activities in Africa have led to significant environmental degradation, necessitating sustainable solutions. [African Union+8African Development Bank Group+8NEPAD+8]

Competition Judging Rubric

Teams will be evaluated across five key performance areas. A winning team will be determined based on the judges' assessment and scoring of the team's technical understanding and development of the technology, the innovation and creativity aspect of the solution, a compelling demonstration of the working prototype, the team's effective articulation and presentation, and a comprehensive business and market analysis.

Criteria	Score	Key Examples	Description
1. Technical Understanding and Development (*The Know Your Build Factor*)	30	• Dimensions • Programming Language • System Battery Life	Teams must demonstrate a clear understanding of the technical aspects of their project, including mechanical design, electronics, and programming. They must be able to confidently explain and showcase their system to the audience, proving they know exactly what they're working on.
2. Innovation & Creativity (*The Add Something New Factor*)	10	• A regular light bulb is now smart because a sensor has been added	Teams should demonstrate creative thinking by introducing new ideas or combining existing technologies in unique ways to improve processes.
3. Working Prototype Demonstration (*The Show It In Action Factor*)	20	• Turn it on and off • Let it spin, turn, or move • Let it heat up	Teams must present a working prototype, power it on, and demonstrate it live to prove it functions in real time.
4. Team Articulation & Presentation (*The Pitch Perfect Factor*)	20	• PowerPoint (compulsory) • Clarity of expression • Team Coordination • Audience Attention and Engagement • Dressing	Teams must communicate clearly and confidently, using articulate language, good posture, and effective coordination.
5. Business & Market Analysis (*The Build It, Sell It Factor*)	20	• Target Users / Market • Product build cost • Product selling price	Teams must present the business aspects of their system, including target

			market, competitors, production costs, and selling price.
	100		

hRobo Rumble: STEM Innovation Competition Calender

Activity	**Date**
Phase 1 - Robo Rise	
Robo Rise Makerthon/ Hackathon Begins	19 June 2025
1st Arm Embedded Workshop	28 June 2025
2nd Arm Embedded Workshop	05 July 2025
3rd Arm Embedded Workshop	11 July 2025
Phase 2 - Ultimate Hackathon Elimination	
Ultimate Hackathon Elimination	19 July 2025
1 Month Rumble Support Commence	21 July 2025
Phase 3 - Robo Final Showdown	
Robo Final Showdown	23-25 August 2025

END.