



Webinar Titled "Humanoid Tech for a Competitive Nation: Bridging Automation, Services, and Human Well-Being"

By

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The Webinar was presented by Ir. Prof. Dr. Mohd Rizal Arshad on 9th May 2026 via Zoom, organised by MNATD. Prof. Rizal is a Pioneer in underwater robotics in Malaysia, a Senior Member of IEEE, Registered Professional Engineer (BEM), Chartered Engineer (UK Engineering Council), Fellow of IMarEST, and Fellow of the Academy of Sciences Malaysia (2024). The session examined global humanoid robotics trends, core enabling technologies, Malaysia-specific deployment opportunities, and the ethical dimensions of adoption. The global robotics market is projected to grow from USD 66 billion (2024) to USD 218 billion (2028) at a CAGR exceeding 34%, driven by labour shortages, ageing populations, and rapid advances in artificial intelligence.

According to Prof. Rizal, humanoid robots are intelligent machines designed to operate in human-built environments through human-like form, motion, and AI-enabled perception. Three defining characteristics were highlighted: human-like form enabling use of existing infrastructure without redesign; human-compatible interaction via natural gestures and communication; and AI-enabled autonomy for real-time decision-making and task adaptation. Notable platforms include Tesla Optimus, Figure AI, Boston Dynamics Atlas, Unitree G1, and SoftBank Pepper. Seven interdependent subsystems underpin humanoid capability: AI and Foundation Models; Computer Vision for 3D perception and SLAM mapping; Force Sensing for safe tactile interaction; Locomotion for stable bipedal movement; Dexterous Manipulation via multi-DOF hands; Edge Computing for on board real-time control; and high energy-density Battery Systems.

These subsystems work in integration to produce robots capable of perceiving, reasoning, moving, and interacting safely in unstructured environments. Significant engineering challenges remain before wide commercial deployment is feasible. Current limitations include inadequate battery endurance, unresolved dexterity for complex tasks, cybersecurity vulnerabilities, and high hardware costs with uncertain ROI for SMEs. Prof. Rizal noted that many public demonstrations remain carefully controlled showcases, and realistic near-term targets are confined to task-specific deployment within structured environments over the next five to ten years.

The webinar addressed Malaysia's labour constraints: dependency on approximately 2 million foreign workers in semi-skilled roles; an ageing technical workforce where 30% of skilled workers are aged 50 and above; talent shortages with over 60% of employers unable to source digital and engineering skills (TalentCorp Malaysia); and a 35–40% productivity gap versus developed economies (World Bank, 2023). Strategic sectors for humanoid deployment include manufacturing, smart ports and logistics, healthcare,

agriculture, and disaster response. Malaysia's established electrical and electronics ecosystem, maritime economy, and growing interest in AI research position it well to emerge as a regional robotics hub. On ethical dimensions, responsible deployment must embed trust, bias mitigation, accountability, and transparency into AI design. While some roles will be automated, the goal is to augment rather than replace workers. Reskilling programmes, workforce transition support, and inclusive design for rural communities are essential policy priorities alongside a national AI policy and formal robotics governance framework.

In conclusion, the webinar provided a timely overview of humanoid technology and its implications for Malaysia. China leads global shipments at approximately 90% of deliveries in 2025, ahead of the United States, Japan, and South Korea. Malaysia must act with urgency — investing in talent, R&D, and infrastructure; deepening academia-industry-government collaboration; and embedding robotics into technical-vocational education — to remain competitive. Prof. Rizal concluded, the true measure of progress is not machine intelligence but how significantly this technology improves people's lives.

