2026 MARITIME ROBOTX CHALLENGE | COMMUNITY & OUTREACH SUBMISSION

EMPOWERING RESILIENT COASTAL COMMUNITIES THROUGH AUTONOMOUS OCEAN ROBOTICS

Tumi Robotics - Pontificia Universidad Catolica del Peru (PUCP) | Application: **RX26-0000000043** | USV *Libertad* & UUV *BlueROV2 Heavy*

120+	4+	10+	100%	0-Risk
Students Mentored in Marine Robotics	Coastal & Lake Communities Engaged	Applied R&D Oceanic Projects	Open-Source Autonomous Stack	Divers Replaced in Hazard Zones

1. Hands-On Academic Mentorship & STEM Training

Tumi Robotics and PUCP actively mentor over 120 undergraduate and secondary school students annually through specialized marine mechatronics workshops, immersion test basin demonstrations, and laboratory practicums. Our team bridges the gap between university theory and littoral field execution, guiding multidisciplinary students through ROS 2 Humble software architecture, 3D LiDAR point-cloud processing, underwater acoustic USBL positioning, and fail-safe power design. By providing accessible testbeds on the Pacific coast, we equip Latin America's next generation of engineers with real-world maritime autonomy skills.

2. Diversity, Inclusion & Multidisciplinary Leadership

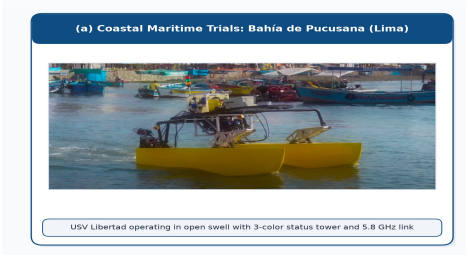
Recognizing that complex ocean exploration demands diverse viewpoints, our initiative actively promotes female leadership and cross-disciplinary student participation across engineering domains. Women engineers lead critical subsystems in our team, spanning electrical architecture, thruster telemetry, and flight avionics. Through university-wide 'Women in Ocean Robotics' roundtables, high school robotics bootcamps, and inclusive mentorship, we cultivate an empowering environment where undergraduate students from mechatronics, mechanical, and software engineering collaboratively tackle global autonomous maritime challenges.

3. Coastal Community Resilience & Marine Conservation

Peru's 3,000-km Pacific coastline is chronically exposed to El Nino storm surges, port closures, and environmental disruptions. Tumi Robotics works directly with artisanal fishing cooperatives, port authorities, and coastal municipalities in Bahia de Pucusana and Paracas. We conduct community field demonstrations showcasing how autonomous surface (USV) and subsea (UUV) robots detect underwater pipeline leaks, track oil hydrocarbons, and inspect storm-damaged piers with 50 mm accuracy - completely eliminating the risk to human divers while promoting environmental stewardship.

4. Open Science, Gazebo VRX Simulation & Global Impact

We believe technological breakthroughs should empower the entire international robotics community. Tumi Robotics disseminates open-source ROS 2 maritime packages, Virtual RobotX (Gazebo VRX) simulation tutorials, and technical webinars to universities across Peru and South America that lack coastal testing access. Our research has resulted in 9 peer-reviewed IEEE Oceans and IFAC publications, fostering cross-border academic-industry partnerships and establishing Peru as an innovative, collaborative leader in the global RoboNation ecosystem.



(a) Coastal Swell Field Ops: Autonomous USV trials and student teleoperation station in Bahia de Pucusana.



(b) Subsea Immersion Training: BlueROV2 Heavy inspection and student acoustic localization trials at PUCP basin.



(c) High-Altitude Community Testing: Extreme-environment lake trials with local stakeholders (Laguna Langui, 4,000m ASL).

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