

[Webinar report](#)

Charting Progress: Mid-Internship Insights from UDA Summer Interns from IITs (Event held on 28th June 2025)

About:

The Maritime Research Center (MRC), in collaboration with Nirdhwani Technology Private Limited, recently organised (on June 28, 2025) a webinar highlighting the mid-internship progress of talented students in the 2025 Underwater Domain Awareness (UDA) Summer Internship Program. The event featured compelling presentations by interns from some of India's leading academic institutions, including IIT Bombay, IIT Kharagpur, and IIT Madras. These presentations offered a glimpse into the cutting-edge research and technological innovation being undertaken by young engineers and researchers in the underwater domain. The primary objective of the webinar was to showcase the innovative research and technological exploration conducted by these budding engineers and researchers in the field of UDA. This internship program plays an essential role in nurturing the next generation of innovative minds by providing them with hands-on experience and exposure to real-world challenges in underwater research and technology.

Background:

The UDA Summer Internship Program is designed to nurture young talent and engage them in real-world applications of underwater research. This program serves as a crucial platform for facilitating interdisciplinary collaboration, encouraging innovation, and building strategic capabilities in a domain necessary for national security, environmental sustainability, and blue economic growth. The mid-internship presentation webinar marked a critical milestone in the program's timeline. It served as a platform for the interns to present their progress, share their initial findings, and receive feedback that will help steer the remaining phase of their projects. This webinar was carefully curated to ensure that it not only celebrated achievements but also addressed existing challenges and guided future efforts.

Core objectives of the webinar:

The core objectives of conducting this mid-internship review include:

1. **Showcase Research Outcomes:** Interns had the opportunity to present their ongoing projects, demonstrating the innovative solutions they are developing and the scientific methods they are employing. This allowed stakeholders to gauge the potential impact of their research on the underwater domain ecosystem.
2. **Encourage Knowledge Sharing:** The webinar fostered a collaborative environment in which interns could learn from one another's work. It also facilitated meaningful dialogue among students, mentors, and attending professionals, fostering a culture of open knowledge exchange and interdisciplinary learning.
3. **Provide Constructive Feedback:** Experienced researchers, academicians, and industry experts offered valuable insights and technical guidance. Their constructive feedback will be instrumental in refining the interns' approaches, improving the quality of research, and aligning outcomes with real-world applications.

4. **Strengthen Networking:** The webinar provided a unique opportunity for interns to establish professional connections with a broader network of stakeholders. These interactions not only enhanced the learning experience but also laid the foundation for future collaborations in research, academia, and industry.

By providing such a structured and supportive platform, the UDA Summer Internship Program continues to play a crucial role in developing India's human resource capabilities in the underwater domain—a strategic sector essential for maritime security, environmental sustainability, and the growth of the blue economy.

Key takeaways from the esteemed speakers of the webinar:

During the webinar, we were joined by an esteemed panel of assessors, including Mr. Gopal Krishna Pillai, Former Home Secretary of the Government of India, and Ambassador Anup Kumar Mudgal, Former Indian Diplomat and Member of the Blue Economy Task Force at FICCI. We are grateful for their invaluable presence and insights. We were also joined by industry assessors, Dr. Anju Gupta, Co-Founder and President of IvyCamp, and Mr. Roshan Talera, Executive Director of Dynamic Logistics, who offered their thoughtful feedback and support in nurturing young talent.

Drawing on decades of public service and national security expertise, Mr. Pillai emphasised the importance of surveying the underwater environment and translating that awareness into actionable policy frameworks. He highlighted the strategic necessity of integrating UDA capabilities into India's broader national security priorities, remarking, "Comprehensive underwater domain awareness is no longer optional; it's essential for safeguarding India's maritime interests."

Ambassador Mudgal framed UDA within the broader vision of SAGAR (Security and Growth for All in the Region) and the Blue Economy. He spoke passionately about the oceans as a dual-use domain, crucial for both security and economic growth. He stressed, "Oceans can either facilitate global stability or disrupt it, depending on how we treat them," and emphasised that responsible underwater stewardship is indispensable to harnessing environmental, economic, and security benefits.

Bringing an entrepreneurial lens to the table, Dr. Gupta underscored the critical role of mentorship and innovation ecosystems in translating intern research into real-world impact. She encouraged interns to adopt a startup mindset, embracing experimentation, iterating rapidly, and designing for scalability. Mr. Roshan Talera, on the other hand, offered a pragmatic perspective on field deployment. He emphasised the importance of operational feasibility, noting that data must be reliable under extreme underwater conditions, interoperable with existing maritime networks, and cost-effective. He ensured that participants understood that these underwater technologies can be integrated smoothly into industry or defence systems.

Interns' presentations: Exploring the depths of maritime innovation:

During the webinar, the summer interns, guided by their mentors, presented their ongoing research projects, which spanned a diverse array of topics within the Underwater Domain Awareness (UDA) framework. Representing premier institutions such as IIT Bombay, IIT Kharagpur, and IIT Madras, these young researchers showcased their efforts to develop innovative, interdisciplinary solutions to real-world maritime challenges.

Each presentation demonstrated a profound commitment to problem-solving, seamlessly integrating theoretical insights with practical applications. The collaborative guidance from mentors enabled the

interns to engage meaningfully with complex subjects, sharpening their focus on solution-oriented outcomes.

Key themes presented:

Coastal Management: Interns addressed issues related to coastal erosion, pollution, and environmental sustainability. Their work explored the use of satellite data, remote sensing tools, and acoustic monitoring systems to enhance real-time decision-making for coastal resilience and disaster mitigation.

Biofouling: The interns explored the biological and economic challenges of biofouling on underwater infrastructure. Their research focused on identifying antifouling materials and developing predictive models to monitor and mitigate these impacts.


Sediment Transport and Management: Presentations highlighted sedimentation dynamics in estuaries and harbours, with interns working on hydrodynamic simulations and acoustic profiling to propose sediment control strategies critical for port operations and marine ecology.

Underwater security and surveillance: Addressing growing concerns in maritime security, interns presented novel methods for passive acoustic monitoring, sub-surface detection, and anomaly tracking. Their work aimed to enhance surveillance capabilities for both civilian and defence purposes.





Fisheries and Aquaculture monitoring: Some projects focused on sustainable fisheries management, including sonar-based fish population mapping, behaviour tracking in aquaculture systems, and the integration of underwater sensors for environmental monitoring.

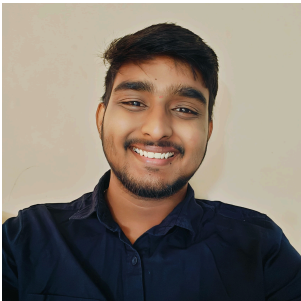



Dark ship detection: In response to illegal or unregulated maritime activity, interns showcased tools and algorithms designed to detect dark ships —vessels that disable their transponders to avoid detection. Their research emphasised the role of multi-source data fusion, including satellite imagery and acoustic signatures.

[View all the presentations and keynote addresses below:](#)

Speaker	Image	Video
Mr Gopal Krishna Pilai, Former Home Secretary, Government of India		Link here

Speaker	Image	Video
Amb. Anup Kumar Mudgal, Former Indian Diplomat and Member of the Blue Economy Task Force at FICCI		Link here
Dr. (Cdr) Arnab Das, Founder and Director, MRC, Pune		Link here
Dr. Anju Gupta, Co-Founder and President at IvyCamp		Link here
Mr Roshan Talera, Executive Director at Dynamic Logistics		Link here

Speaker	Image	Video
<p>Romit Kaware, MRC Fellow</p> <p>Topic: Sediment Management in the Tropical Waters of Indo-Pacific</p>		Link here
<p>Jay Pinjarkar, MRC Research Engineer</p> <p>Topic: Digital Transformation for the Shipping Radiated Noise Management</p>		Link here
<p>Arkadipta Saha from IIT Kharagpur</p> <p>Topic: Neural Network for Estimation of Transmission Loss in the Indian Ocean Region</p>		Link here
<p>Deepak Kumar from IIT Kharagpur</p> <p>Topic: Dark Ship Detection using SAR and AIS Data in the Indian Ocean</p>		Link here

Speaker	Image	Video
<p>Sai Kushal (IIT Kharagpur)</p> <p>Topic: Fisheries and Aquaculture in the Andaman and Nicobar Islands'</p>		<p>Link here</p>
<p>Thummalapelli Jeevan Kumar (IIT Kharagpur)</p> <p>Topic: Potential Fishing Zones</p>		<p>Link here</p>
<p>Suchir Mamidala (IIT Madras)</p> <p>Topic: Digital Mapping of the Fouling in the Tropical Waters</p>		<p>Link here</p>
<p>Angothu Yaswanth (IIT Kharagpur)</p> <p>Topic: Satellite-Based Sediment Load Estimation and Sediment Classification</p>		<p>Link here</p>



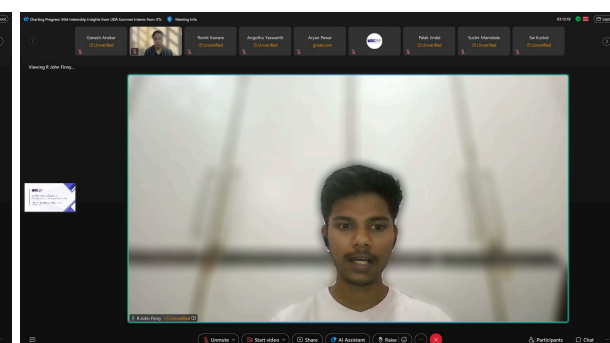
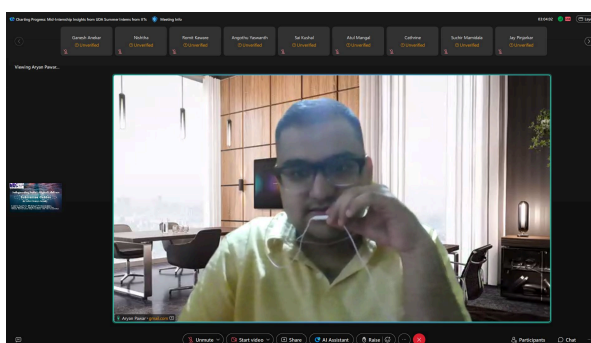
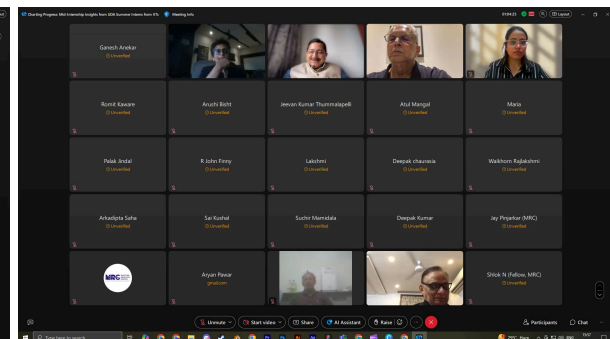
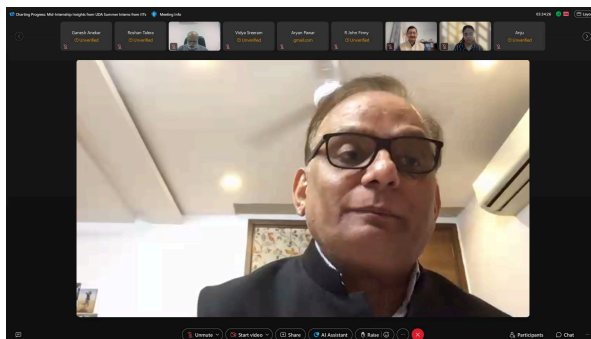
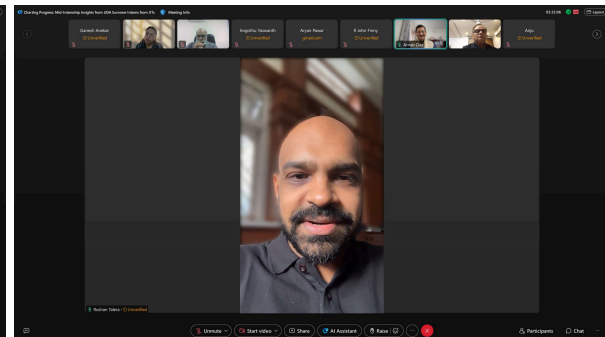
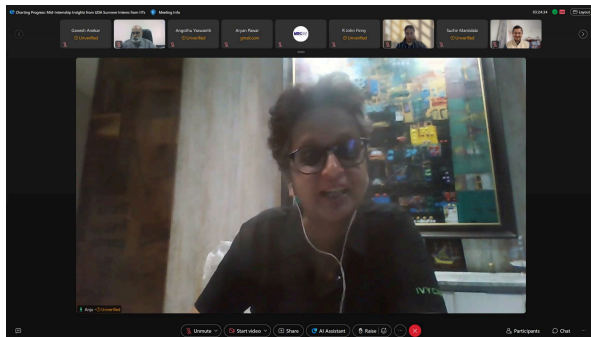
Speaker	Image	Video
<p>Aryan Anil Pawar (IIT Bombay)</p> <p>Topic: Safeguarding Undersea Cables for India's Strategic Security</p>		<p>Link here</p>
<p>R John Finny (IIT Madras)</p> <p>Topic: Sediment Transport Modelling for Ujjani Reservoir</p>		<p>Link here</p>

Image Gallery:



Enclosure

Underwater Domain Awareness (UDA) Framework

Dr (Cdr) Arnab Das

The concept of Underwater Domain Awareness (UDA), in a more specific sense, translates to our eagerness to know what is happening in the underwater realm of our maritime areas and the freshwater systems. This keenness for underwater awareness from the security perspective means defending our Sea Lines of Communication (SLOC), coastal waters, and varied maritime assets against the proliferation of submarines and mine capabilities intended to limit access to the seas and littoral waters. The freshwater systems, particularly the transboundary Rivers, are not defended by the Navy & the Coast Guard, but these waters are equally vulnerable and more complex to manage. However, military requirements may not be the only motivation for generating underwater domain awareness. The earth's underwater geophysical activities have a lot of relevance to the well-being of humankind, and monitoring them could provide vital clues to minimize the impact of devastating natural calamities. The commercial activities in the underwater realm need precise inputs on the availability of resources to effectively and efficiently explore and exploit them for economic gains. Underwater resources include fisheries, aquaculture, seaweeds, pharma ingredients, minerals, and others with significant market value. The regulators, on the other hand, need to know the pattern of exploitation to manage a sustainable plan. The connectivity through the water bodies has been recognized as the most effective and efficient mode of transportation, however, ensuring navigability in these water bodies requires a massive amount of UDA. With so many commercial and military activities, there is a significant impact on the environment. Any conservation initiative needs to precisely estimate the habitat degradation and species vulnerability caused by these activities and assess the ecosystem status and climate change risk. The scientific and research community needs to engage and continuously update our knowledge and access of the multiple aspects of the underwater domain. The global community is looking at the Indo-Pacific strategic space for their geopolitical and geostrategic engagements. The Indo-Pacific region, by definition, is the tropical waters of the Indian and Pacific Oceans. The tropical waters present unique challenges and opportunities regarding rich biodiversity and resource availability. However, the sub-optimal sonar performance is the biggest issue, limiting the UDA in these regions. The sonars that were designed for the temperate & polar waters of the Greenland, Iceland, United Kingdom (GIUK) gap during the Cold War era suffered 60% degradation when deployed in tropical waters. The developing nations in tropical waters need to customize these technologies to suit their conditions. The Western nations that are pushing this hardware do not have the manpower to deploy it. In contrast, the tropical nations, have the manpower but lack the appreciation of the technology and the know-how. The proposed UDA Framework, presented in the figure below, can optimize resource deployment and provide nuanced policy and technology intervention, along with acoustic capacity & capability building to manage the tropical challenges and opportunities. There is significant fragmentation among all four stakeholders, namely Strategic Security, Blue Economy, Sustainability & Climate Change Risk Management, and Science & Technology (Digital Transformation), and the UDA framework provides a comprehensive way forward for the stakeholders to engage and interact.

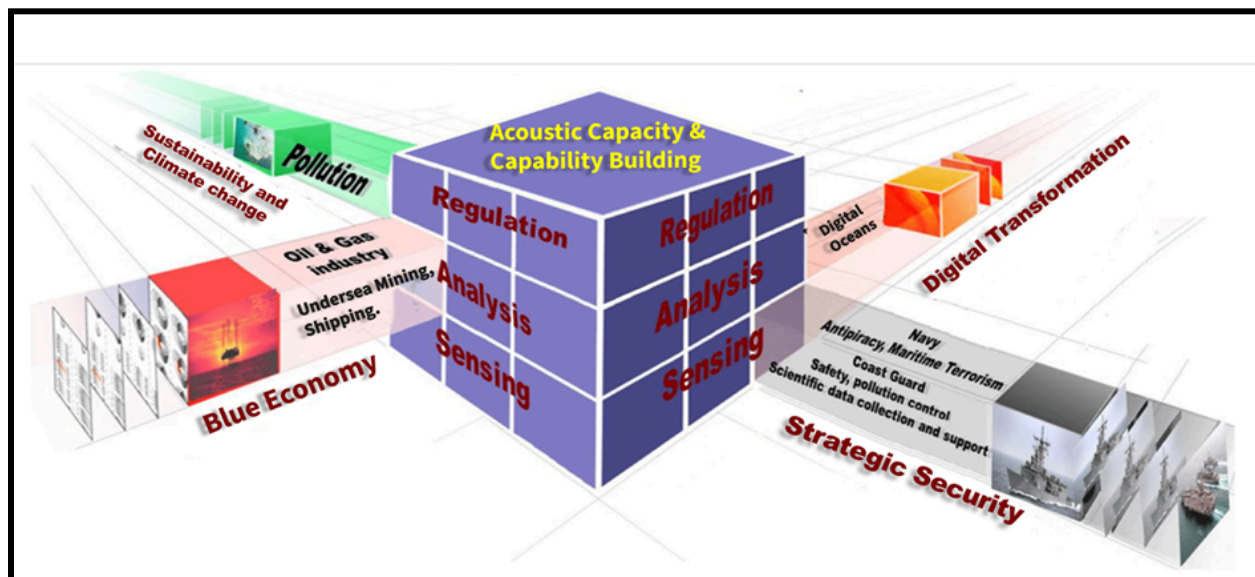


Figure. Comprehensive Perspective of the UDA Framework

On a comprehensive scale, the UDA Framework needs to be understood in terms of its horizontal and vertical construct. The horizontal construct would be the resource availability in terms of technology, infrastructure, capability, and capacity specific to the stakeholders or otherwise. The stakeholders represented by the four faces of the cube will have their specific requirements, however, the core will remain the acoustic capacity and capability. The vertical construct is the hierarchy of establishing a comprehensive UDA. The first level, or the ground level, would be the sensing of the underwater domain for threats, resources, and activities. The second level would be making sense of the data generated to plan security, conservation, and resource utilization strategies. The next level would be to formulate and monitor regulatory framework at the local, national, and global levels. The individual cubes represent specific aspects that need to be addressed. The 'User-Academia-Industry' partnership can be seamlessly formulated based on the user requirement, academic inputs, and the industry interface represented by the specific cube. It will enable a more focused approach and a well-defined interactive framework. Given the appropriate impetus, the UDA Framework can address multiple challenges being faced by the global community today. Meaningful engagement of the young and aspirational population is probably the most critical aspect that deserves attention. Multi-disciplinary and multi-functional entities can interact and contribute to synergize their efforts towards a larger goal seamlessly.

The UDA Framework is a structured, comprehensive, and inclusive framework to drive the underwater domain effectively and efficiently. The structured approach will minimize the fragmentation among the stakeholders, regional players, national authorities, and local bodies. The multiple entities will have divergent interests and priorities, thus, converging them into one single and focused governance mechanism will be a challenge. The governance mechanism must be comprehensive and recognize all dimensions of the stakeholder requirement. The dimensions include varied layers that are instrumental in building a strong governance mechanism. The first layer would be five pillars: research, skilling, academia, innovation, and policy. The second layer is its translation into policy & technology intervention, along with acoustic capacity & capability building. The inclusive aspects include varied socio-economic, socio-political, and socio-cultural native groups in the larger governance framework. The varied socio-economic strata of the society, particularly the coastal & riverine communities, get

excluded from the conventional development models. The students need to prepare for real-world challenges and get very late before they get exposed to the nuances of real-world issues. The political spectrum is always driven by the social structure, based on left or right leanings. The governance mechanism has to address the concerns and aspirations of both sides. The cultural divide translates to the traditional practices and beliefs that drive their livelihoods and social structure. The governance mechanism has to address these divides and integrate everyone into one national, regional, or global framework.

The global community is also professing the triad of people, economy, and nature for enhanced governance mechanisms. The people component includes the livelihood, well-being of the native communities, social dynamics, and more. The economic component is the growth and prosperity associated with the activities. The nature component addresses sustainability and climate change risk management. This is also measured in terms of the Environmental, Social, and Governance (ESG) formulation. The UDA Framework is consciously addressing all these varied measures of global good parameters.

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Some important links have been mentioned below for your kind reference:

- MRC website: <https://maritimeresearchcenter.com/>
- UDA Foundation website: <https://udafoundation.in/>
- NDT website: <https://nirdhwani.in/>
- Our latest Newsletter (Q2-2025): [Link here](#)
- UDA Digest: [Link here](#)
- UDA Knowledge Center: [Link here](#)