



I-Hub Foundation for  
**ROBOTICS**



# COBOTICS NEWS

VOL. 1, NO. 1, JAN 2021 ISSUE

**MEDICAL**



**AGRICULTURE**



**INDUSTRY**



**DEFENCE**



## Message from Secretary, DST

Congratulation to IIT Delhi for succeeding in earning a Technology Innovation Hub (TIH) in the area of Cobots. IIT Delhi is one among 25 host institutes where in such TIHs were established by the Department of Science & Technology (DST) under National Mission on Interdisciplinary Cyber Physical Systems (NM-ICPS), a new Mission launched by DST, Govt. of India (GoI).

I am happy to note that the TIH, i.e., a Section-8 company, I-Hub Foundation for Cobotics (IHFC), at IIT Delhi is planning to bring out its first newsletter for the benefit of its collaborators and stakeholders to share the progress and plan of the Company in order to achieve its targets. It has been planned that all the TIHs must collaborate with each other in a complementary way to fulfill the vision of the Government. They also should become self-sufficient within 5 years so that government's objective of *Atmanirbar Bharat* could be achieved in advanced technology & application areas. The eco-system and products created through the IHFC will certainly take the country in the forefront of the CPS technologies. I wish IHFC of IIT Delhi all the best in its endeavor!

A lot of knowledge gets generated in India in our academic institutions but a large part of it remains untapped for societal benefit. As part of the TIH mandate, the idea is to bring academia, industry and startups together and create an ecosystem for knowledge to wealth translation in our institutions. IIT Delhi is fully geared towards this with more than 50 faculty members from IIT Delhi and almost an equal number of faculty/researchers/company professionals from around the world collaborating with each other in the TIH. IHFC at IIT Delhi would be pleased to collaborate with many more and welcomes your participation for the success of the NM-ICPS.



**Prof. V. Ramgopal Rao**

Director  
IIT Delhi

## Message from Project Director, IHFC

I am happy to write few words for the first newsletter of our new Section-8 (non-profit) company I-Hub Foundation for Cobotics (IHFC), which is essentially a Technology Innovation Hub (TIH) at IIT Delhi initiated by the Department of Science and Technology (DST), Ministry of Science and Technology (MST), Government of India (GoI) under their newly launched National Mission on Interdisciplinary Cyber Physical Systems (NM-ICPS). I would like to thank the DST for approving the fund of Rs. 170 crores (~USD 20 million) for the important area of Cobotics or Collaborative Robotics. The area is very very important for the country like India as we do not want to displace our huge workforce. We would rather like to enhance human capabilities through robotic interventions.

It is expected to not only increase the productivity and efficiency but also the quality of the lives of the people. As per one of the DST's mandates, we MUST convert research in the laboratories into products by appropriately



**Prof. Subir Kumar Saha**

Professor, Dept. of Mechanical  
Engineering, IIT Delhi



**Prof. Ashutosh Sharma**

Secretary, DST

## Message from Director, IIT Delhi

Happy New Year!

I am happy to write a few words for the first newsletter of our newly formed Section-8 (non-profit) company I-Hub Foundation for Cobotics (IHFC), which is a Technology Innovation Hub (TIH) at IIT Delhi created with funding from the Department of Science and Technology (DST), Ministry of Science and Technology, Government of India. This TIH is created under the newly launched National Mission on Interdisciplinary Cyber Physical Systems (NM-ICPS). I would like to thank DST for considering a fund of Rs. 170 crores (~USD 21 million) for the important area of Cobotics or Collaborative Robotics which is a very important field of research for a country like India as we do not want to displace our huge workforce, rather we would like to enhance their capabilities through robotic interventions.

## Message from CEO, IHFC

funding the start-ups and industries. IIT Delhi is fully geared towards that with more than 50 faculty members from IIT Delhi and almost equal number of collaborators from IITs/R&D/Industries in India, Japan, Korea, Australia, Canada, USA, and others. IHFC at IIT Delhi would be pleased to collaborate with many more for the success of the NM-ICPS.

Let me take this opportunity to thank all our colleagues and the students who effectively spearheaded the preparation of the proposal in November/December 2019, and later in submitting the DPR. Special thanks are also due to the Executive Committee (EC) members who were formed by the approval of our Director, IIT Delhi since sanctioning of the TIH in March 2020. This has helped me immensely in coordinating the activities of the TIH in an effective and transparent manner. They are guiding us for the day-to-day activities of the company. The Hub Governing Body (HGB) formed out of three prominent companies in the area, namely, TCS, Milgrow Robotics, and Samsung and prominent academician in the area, namely, the Director of IIT Jodhpur, has been a strong support in advising us about what kind of activities are good for us to achieve the intended objectives of the GoI.

Recently, the appointment of the Chief Executive Officer (CEO) in October 2020 was a great addition to our system, along with a blend of very senior scientist, fresh Ph.D, and young engineers. I think now we are really in a take-off mode with the planned launch of few online certificate courses in collaboration with industry partners, and commercializing 1-2 technologies plus liaising with incubated startups. The readers are encouraged not only to reach out to us but also share our initiatives to their friends, colleagues, and others worldwide whom they may feel benefit from us, our endeavours and expertise.

Till then, a very Happy New Year 2021.

My heartfelt thanks to Department of Science & Technology and IIT Delhi for their vision and further setting up the Technology Innovation Hub. What's worth mentioning is that it has been set-up as a section-8 company (IHFC), which allows us to work and execute like any other corporate entity. The motto of the IHFC is to let human beings, who have inherently intelligent brains, work with robots who never get tired, to bring out the most efficient, economic, healthy, and sustainable products or processes. Hence, Human-Robot Collaboration is our theme. We are proud that the DST has appropriately assigned the area of Cobotics or Collaborative Robotics for IIT Delhi.

The four key verticals or the Perceived Application Scenario (PAS), as we refer in IHFC, in focus are Medical Robotics, Agriculture and Disaster Management, Defence, and Smart Manufacturing (Industry 4.0). We already initiated two mission critical projects with the advices of few doctors from AIIMS New Delhi, PGI Doctors and two companies in the area of Medical Robotics to overcome few of the challenges faced due to Covid-19 pandemic. They are expected to be field-trialled in March 2021. We are also in a dialogue to collaborate one of our incubated startup with an industry leader in renewable power generation. With these initiatives, I feel we are in the right track to fulfil the objectives of the DST, GoI. In the meantime, several projects were sanctioned to more than 20 faculty members from IIT Delhi and outside to initiate the translational research work in their chosen area which were already a part of the Detailed Project Report (DPR) submitted to the DST. Our monthly online seminar in association with the Center of Excellence (CoE) on Biologically Robots and Drone (BIRD) and the newly launched M. Sc programme in Cognitive Science by the Humanities and Social Science (HSS) Department of IIT Delhi is helping us take it to 100+ collaborators at IIT Delhi and outside (including industries).

With a belief that this initiative will take India one step closer to becoming the global leader in Science & Technology in the coming year, I wish you an incredible New Year 2021!

### Technology Innovation Hubs in India

IIT Bombay	IIIT Hyderabad	IIT Indore
IIT Guwahati	IIIT Delhi	IIT Madras
IIT Tirupati	IIT Kanpur	IIT Ropar
IIT Bhubaneswar	IIT Jodhpur	IIT Hyderabad
IIT BHU	IIT Patna	ISI Kolkata
IIT Roorkee	IISC Bangalore	IIIT Bangalore
IIT Dhanbad	IIT Kharagpur	BITS Pilani
IIT Palakkad	IIT Mandi	IISER Pune



**Mr. Ashutosh Dutt Sharma**

Chief Executive Officer (CEO)  
IHFC - IIT Delhi

## Journey of IHFC at IIT Delhi

### What is TIH?

Recent advances in technology have paved the way for the Cyber-Physical System (CPS), which is a new class of engineered systems consisting of cyber components and physical components. CPS includes technology areas of Mechatronics, Cybernetics, Design and Embedded systems, Internet of Things (IoT), Big Data, Artificial Intelligence (AI), and many more. The CPS systems are intelligent, autonomous and efficient and are expected to drive innovation in sectors as diverse as agriculture, water, energy, transportation, infrastructure, security, health and manufacturing. It is thus touted as the next evolutionary shift in technology that can exponentially spur growth and development. To harness the potential of this new wave of technology and make India a leading player in CPS, the Union Cabinet of India launched the National Mission on Interdisciplinary Cyber-Physical Systems (NM-ICPS) to be implemented by the Department of Science & Technology (DST) with a total outlay of Rs. 3660 Crore for a period of five years. The Mission aims to create a strong foundation for CPS technologies by coordinating and integrating nationwide efforts encompassing knowledge generation, human resource development, research, technology and product development, innovation and commercialization. The mission has been implemented through 25 Technology Innovation Hubs. Indian Institute of Technology (IIT) Delhi has been identified to lead TIH on Cobotics i.e. Collaborative Robotics.

### TIH proposal of IIT Delhi

In the month of December 2019, DST invited applications from Institutions within 50 National Institutional Ranking Framework (NIRF) Overall Ranking to apply in various domains of CPS. IIT Delhi administration decided to apply in the 'Robotics and Autonomous System' domain and the responsibility to lead this activity was given to Prof. Subir Kumar Saha. The team of various faculty and research scholars across the departments was formed. In the first meeting, the theme for the TIH at IIT Delhi has been decided to be *Human-Robot Collaboration for Enhancing Human Capabilities, Reducing Risk, and Improving Productivity*. The target application scenarios have been conceived as *Medical, Defence, Agriculture, and Industry*.

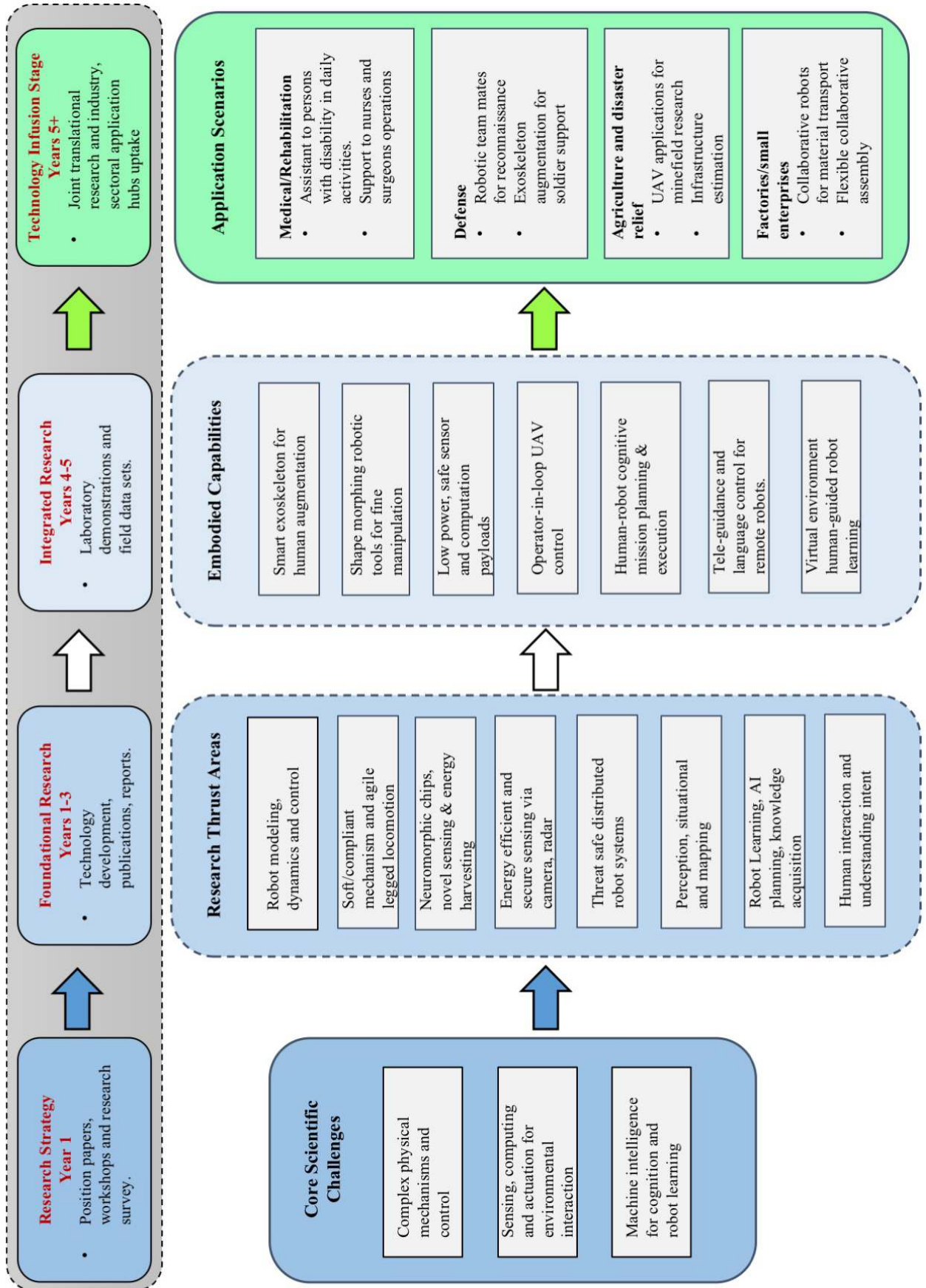
Recent advances in sensing, computation, and autonomy are enabling robots and autonomous systems to enter real-world domains such as manufacturing, defence, medical, agriculture, etc. where machines must work alongside and interact with humans. We are entering an era of “manned + unmanned” teaming where humans and robotic systems must work together towards common goals. Intelligent robotic teammates, have the potential to expand human capabilities, reduce the risk of harm, increase safety, productivity, and ultimately the quality of life for our people. The competency in Cobotics or Collaborative Robotics is crucial for our country such that robotic systems can enhance the capabilities of our workforce rather than trigger replacement. Internationally, a number of research programs have turned attention to this area. Hence, it is vital for India to create capacity and advance capabilities in this area. The proposed TIH for Cobotics at IIT Delhi is driven by the vision of moving the nation towards the cutting edge in this area of strategic importance. The hub at IIT Delhi is envisioned as a world-class technical resource with competencies in foundational research, complex system design, and vibrant application-focused innovation. The proposed TIH will initially focus on core scientific challenges (Year 1) as depicted in the figure on next page. Technical advances in scientific areas will be addressed by research activities organized in thrust areas culminating in new capabilities and evaluation (Year 1-3). Progress in multiple research thrusts will be collated and realized on robotic platforms leading to Embodied Capabilities (Years 4-5). The embodied capabilities would represent several sub-systems working together in laboratory-scale demonstrations and enable interface with agencies, industries, and other organizations for embarking on translational research and technology infusion (Years 5+). Our guiding principle will be to serve India's strategic interests, the competitiveness of our industries/agencies, and the quality of life for the common people. The hub will target application scenarios in the following domains: (i) Defense and strategic national interest, (ii) Medical and assistive/rehabilitation, (iii) Agriculture and disaster relief, and (iv) Factories and small enterprises. This is indicated under the “Application Scenarios” of the figure as follows.



## Proposed TIH on Robotics & Autonomous Systems at IIT Delhi

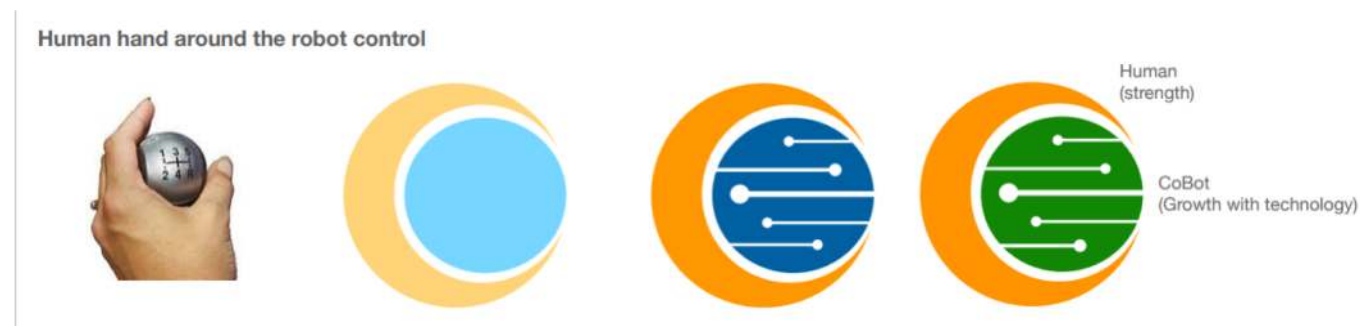
Theme: Human-Robot Collaboration

Vision: A fundamental and applied research program on intelligent robotic systems for enhancing human capabilities, reducing risk or harm and improving productivity



## Logo of IHFC

The logo of IHFC has been designed by Prof. Jyoti Kumar from Department of Design, IIT Delhi. The logo nicely portrays how humans and robots can work together to achieve shared goals.



## IHFC Initiatives

### Seminar and Lecture Series

As a part of the hub's objective to generate and transfer knowledge, IHFC at IIT Delhi has initiated a seminar series with speakers participating from IIT Delhi, various academic institutes and industries. Prof. Arpan Chattopadhyay (EE, IIT Delhi) and Dr. Venkat Bokka (Research Engineer, IHFC) are heading the organizing committee for conducting the seminar series.

Date	Speakers	Topic
14.10.2020	Prof. S.K. Saha (ME, IIT Delhi)	Inaugural Talk
	Prof. Rohan Paul (CSE, IIT Delhi)	Journey of IHFC formation
	Prof. Ashwini Vaidya (HSS, IIT Delhi)	Computational Linguistics
11.11.2020	Prof. Sumitava Mukherjee (HSS, IIT Delhi)	Cognitive insights into human judgement and decision making
	Dr. Atanendu Sekhar Mandal (IHFC, IIT Delhi)	Cognitive Computing
09.12.2020	Prof. Sunil Jha (ME, IIT Delhi)	Robotics applications in smart factory
	Prof. Samar Hussain (HSS, IIT Delhi)	Natural Language Modeling

### Cobotics Student Forum

IHFC at IIT Delhi has also taken the initiative to engage students in its activities. These activities include collaborative work, project-based learning and extracurricular activities. With this vision, "*Cobotics Student Forum*" has been inaugurated by team IHFC which presently consists of students from IIT Delhi. The forum is planning for exciting joint venture programmes with collaborating institutes and industry personnel in time to come.

### Robocon 2020

IHFC in its aim to encourage students in pursuing Robotics and allied areas coordinated with IIT Delhi to organise the national Robotics competition "*Robocon 2020*". The theme of the event this year was the sports event "*Rugby*". Even during these pandemic days, the competition saw a huge participation from the top Indian colleges in virtual mode with several rounds of screening. Eventually, team from MIT World Peace University, Pune became the national winners with GTU and IIT Roorkee as the first and second runners up, respectively. Top two teams will be competing at the international level.

### global Project Based Learning (gPBL)

A global project based learning (gPBL) programme was also organized in collaboration with Shibaura Institute of Technology (SIT), Japan. The theme of the programme was focused on developing assistive mobile robots for dedicated COVID treatment hospitals.

## Executive Committee, IHFC



**Prof. Subir Kumar Saha**

Professor, Dept. of Mechanical Engineering, IIT Delhi



**Prof. Indra Narayan Kar**

Professor, Dept. of Electrical Engineering, IIT Delhi



**Prof. Arun Kumar**

Professor, Dept. of Computer Science and Engineering, IIT Delhi



**Prof. Sukumar Mishra**

Associate Dean (R&D), IIT Delhi



**Prof. Chetan Arora**

Associate Professor, Dept. of Computer Science and Engineering, IIT Delhi



**Prof. Sitikantha Roy**

Associate Professor, Dept. of Applied Mechanics, IIT Delhi



**Prof. Rohan Paul**

Assistant Professor, Dept. of Computer Science and Engineering, IIT Delhi



**Mr. Ashutosh Dutt Sharma**

Chief Executive Officer (CEO) IHFC - IIT Delhi



**Prof. Bodhaditya Santra**

Assistant Professor, Dept. of Physics, IIT Delhi

## Student Team

*“The TIH for Cobotics at IIT Delhi will provide infrastructure and funding for research on Collaborative robotics with its full emphasis on supporting product-driven solutions. I believe that the hub will steer academic institutes of India towards multidisciplinary research and foster relations with Indian society from universities around the world. I am highly grateful to IIT Delhi and Prof. S.K. Saha for giving me the opportunity to be a part of this initiative. I look forward to working with an amazing team of the IHFC and contributing in any possible manner towards achieving objectives of TIH.”*



**Deepak Raina**

Ph.D., Mechanical Engineering Department, IIT Delhi

*“I would like to thank IIT Delhi and Prof. S.K. Saha for giving me this opportunity to be a part of an amazing TIH team. I believe that the hub through its cutting edge technologies and products will play an immense role in making India a global leader in the emerging sectors of human-robot collaboration. Further, the Hub’s concept of creating an unique research ecosystem between various global academic institutes and industries will bring everyone on the same page with a common goal. I am eagerly looking forward to contribute towards the goal of the Hub.”*



**Udayan Banerjee**

Ph.D., School of Interdisciplinary Research, IIT Delhi

*“The I-Hub Foundation for Cobotics fosters an exciting work environment. The techno-managerial nature of the work is very enriching and provides continuous learning opportunities. I firmly believe that the work of the core team would pave the way forward in making India a self-reliant stalwart in the field of Collaborative Robotics. I am immensely obliged to IIT Delhi and Prof. S.K. Saha for providing me an opportunity to contribute to this grand vision conceived by the Government of India.*



**Utkarsh Bajpai**

Research Engineer, IHFC





**Mobile  
Robots**



**Parallel  
Robots**



**Flying  
Robots**



**Industrial  
Robots**



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### **EDITORIAL TEAM**

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