

# Development of WISE Program to foster AI Professionals for Marine Industries



## Contact

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<https://www.g2.kaiyodai.ac.jp/marine-ai/eng/>

## WISE Program

(Doctoral Program for World-leading Innovative & Smart Education)

At its core, what propels the WISE Program is each university leveraging its unique strengths and capabilities. Building upon their heretofore accomplishments in campus reform, these universities carry out systematic collaborations with other universities, research institutions and corporations in and outside Japan. By establishing integrated master's-doctoral programs, which over a 5-year period endow their students with a melding of top world-class educational and research prowess, these universities cultivate the kind of outstanding PhD professional who can pilot forward various sectors of society. Concurrently, the program propels the establishment of excellent academic hubs capable of sustainably advancing human resource development and exchange and of generating new joint research initiatives.

## Overview

The Doctoral Program for World-leading Innovative & Smart Education (WISE Program) for the Development of AI Professionals in the Marine Industry at TUMSAT fosters AI professionals for marine industries including innovators, advanced professional engineers, and marine policymakers, who can employ AI accurately and lead the social implementation of AI based on marine, maritime, and fisheries expertise, and extensive field experience learned at TUMSAT.

### Faculties (organization / structure)

**Program Coordinator:** MAITA, Masashi (Director of Marine AI Development and Evaluation Center (MAIDEC), Executive Director, Professor, Department of Marine Biosciences)

**Head of program:** TAKENAWA, Tomoyuki (Vice Director of MAIDEC, Professor, Department of Logistics and Information Engineering)

**Dean of the graduate school:** HYODO, Tetsuro (Professor, Department of Logistics and Information Engineering)

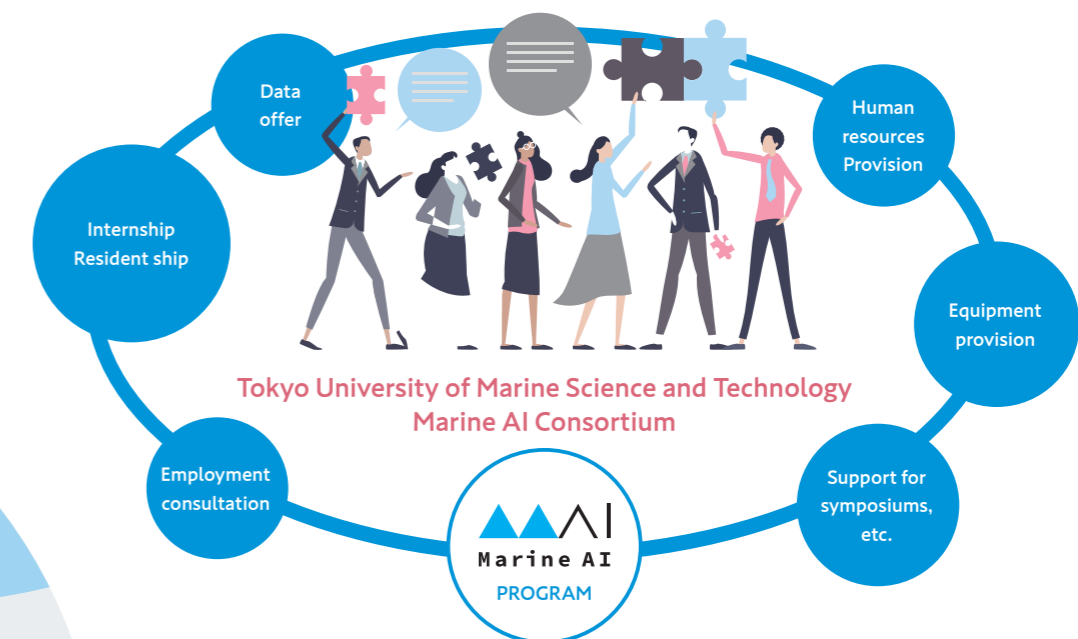
**Coordinator:** KINO, Toru (Project Associate Professor)

### Organization by research fields

- AI / Machine Learning Algorithm Related Working Group
- Big Data Sharing Platform Construction Working Group
- Autonomous Sailing Ships Working Group
- Analysis of Aquatic Genome Information Working Group
- Marine Observations Working Group
- Smart Fisheries Working Group
- Working Group on Fishery Resources Assessment and Management
- The Aquatic Culture, Processing, and Distribution working group
- Water area data acquisition / management / utilization working group

### Marine AI Consortium

The Marine AI Consortium, which was formed with our partner institutes, is based at the Marine AI Development and Evaluation Center (MAIDEC) established on November 1, 2019. The consortium promotes this program through industry-academia-government collaborations.



### Partner institutes / cooperating institutes (As of February, 2023)

#### Partner institutes

- Japan Agency for Marine-Earth Science and Technology (JAMSTEC)
- Japan Fisheries Research and Education Agency
- National Institute of Maritime, Port and Aviation Technology
- IDEA Consultants, Inc.
- BEMAC Corporation

- NPO Marine Technologist
- Technical University of Denmark
- Ocean Policy Research Institute (OPRI) of the Sasakawa Peace Foundation

#### Cooperating institutes

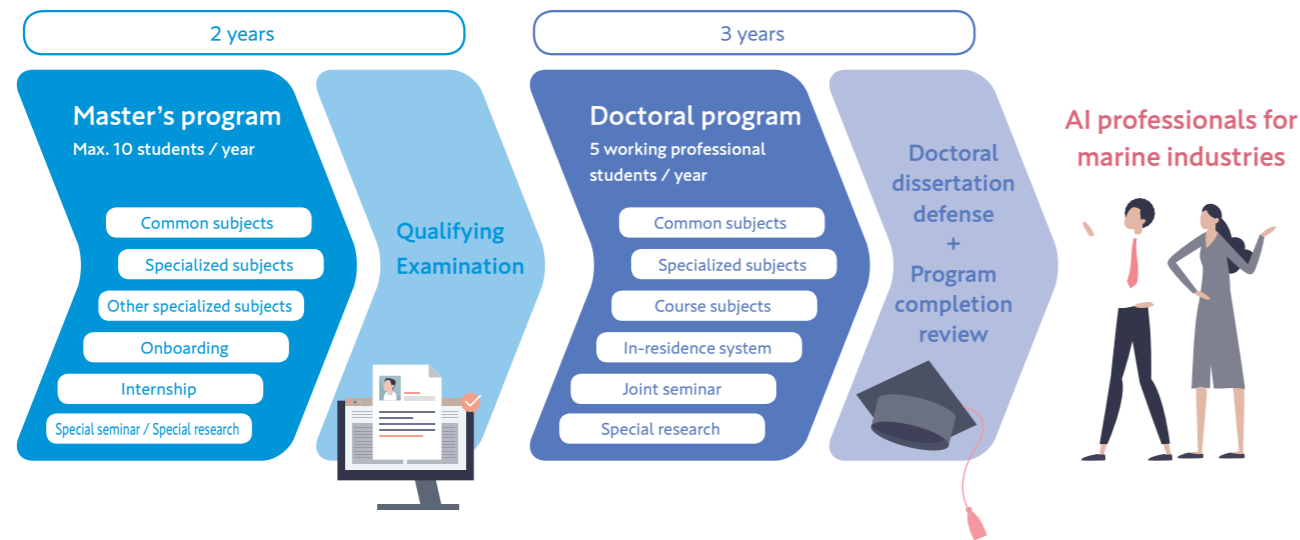
- Innoqua Inc.

- Japan Weather Association
- Nissui Corporation
- Maruha Nichiro Corporation
- FURUNO ELECTRIC CO.,LTD.
- Japan Radio Co.,Ltd.
- MTI Co., Ltd.

# Curriculum

This program is established as an educational program for a five-year integrated graduate school course. For the master's program, we established lectures on big data analysis and machine learning as well as training sessions at Marine AI Development and Evaluation Center (MAIDEC) as technical literacy education. These lectures and sessions offer multi-disciplinary practical training. At the end of the master's program, we conduct a Qualifying Examination with the goal of identifying personnel capable of socially implementing their specialized doctoral education. We established two new courses in our doctoral

program: the Course on Advanced Reliability Assessments and the Course on Social Implementation Impact Assessments. In the former, students learn how to evaluate the performance of AI, which must be highly reliable. In the latter, students learn about the impact of AI on our society. Students gain experience in social implementation of AI and develop necessary skills as leaders by taking our newly established specialized courses on the introduction of AI, participating in field work and or in-residence course, which allows students to participate in actual businesses (projects) at partner institutes.



## Curriculum / Requirements for completion

### Master's program

	Course type	Course title (number of credits)	Required credits
Required courses	Common courses*1	Topics in AI (machine learning)	5
		Artificial Intelligence and Machine Learning(2)	
		Deep Learning (2)	
	Exercise in Machine learning(1)		
Topics in big data	Data Science (2)	5	
	Data Engineering (2)		
	Exercise in Data Science(1)		
Interdisciplinary courses	Marine AI workshop I	1	
Required electives	Specialization courses*2	Courses required by the program of each specialization	4
Required courses	Lecture, experiment, or practicum in the field of specialization		4
	Special seminar of specialization		4
	Research of specialization or Research on specific topic in the field of specialization		8
Total			31

\*1 The course is offered as a common course for all graduate programs.  
\*2 The course is determined by the field of specialization.

### Doctoral program

	Course type	Course title (number of credits)	Required credits
Required courses	Common courses*1	Topics in AI (machine learning)	4
		Advanced Artificial Intelligence and Machine Learning(2)	
		Social Implementation of Data Science(2)	
	Topics in big data	Social Implementation of Data Science(2)	
Interdisciplinary courses	Marine AI workshop II		1
	Required electives	Specialization courses*2	Lecture in major or courses required by Exercises / experiments / practices
Required courses	Courses*3	Course on Advanced Reliability Assessments	2
		Advanced Evaluation of Ship Navigation Safety(2)	
		Course on Social Implementation Impact Assessments	
Required courses	Marine AI Residency Program		2
	Advanced seminar of specialization		2
	Advanced Research of specialization		4
Total			17

\*1 The course is offered as a common course for all graduate programs.  
\*2 The course is determined by supervisor.  
\*3 Select either course when entering the second semester program.

# Human resources development image

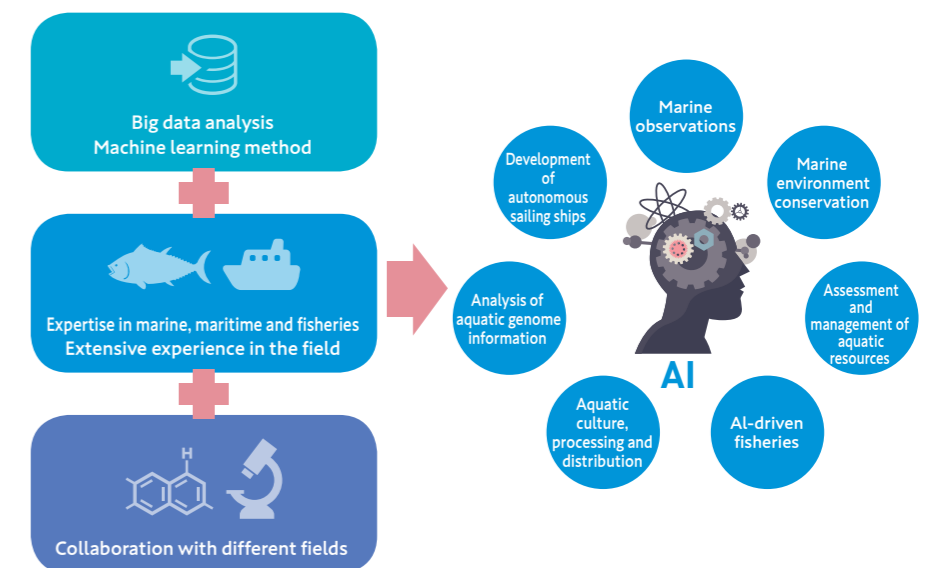
"Development of WISE Program to foster AI Professionals for Marine Industries" who are literate in big data analysis and machine learning methods, and can accurately evaluate the performance of artificial intelligence based on the specialized knowledge and abundant experience in the fields provided by the University. They are innovators for social implementation, highly specialized engineers, and marine policy makers. This program is established as an educational program for a five-year integrated graduate school course. In addition to obtaining expertise in the specialized field of graduate study, the program cultivates the following abilities and skills:



1. Ability to apply knowledge and skills in data science, including big data analysis and machine learning, for social implementation of AI.
2. Ability to accurately grasp and solve issues in specialized fields by planning and proposing the use of application technology as well as by applying big data and machine learning technologies.
3. Ability to scientifically evaluate the effectiveness and validity of big data or machine learning applications towards social implementation of AI by proposing, validating, and analyzing research plans.
4. Ability to make decisions and transmit information based on the results of big data analysis and machine learning.
5. Ability to utilize the results of big data analysis and machine learning based on a scientifically accurate understanding.

## Fields of diplomas

Doctor of Philosophy ,  
Doctor of Engineering  
  
Name of the program to be noted:  
WISE program for the Development of  
AI Professionals in the Marine Industries



## Student Application

In principle, this program recruits program students twice a year at the time of admission in April and October of the master's program. We accept students with aspirations regardless of their major or field of study. Students who are already in master's program can also apply if they meet the requirements. We also accept adult transfer students from the doctoral program in order to develop diverse human resources. We look forward to your participation. Please see the program website for details on the application requirements.



## Message from head of program



**TAKENAWA, Tomoyuki**

Vice Director of MAIDEC, Professor, Department of Logistics and Information Engineering

As the name implies, this program is a five-year integrated graduate school education program aimed at developing people who can contribute to society with the keyword " Marine industries x AI." This program has been adopted as a Doctoral Program for World-leading Innovative & Smart Education (WISE Program) in AY2019 funded by the MEXT and accepted the 1st students the following year. There are only 30 programs\* adopted nationwide as of 2020, and many of them are from leading universities, which shows the specificity of this program and the high expectations of society. The purpose of this program is to develop people who can contribute to society, and we expect that those who have completed the five-year program will lead the marine AI industry in private companies and various institutions and will participate in the consortium. We have an educational program in cooperation with external organizations. I would like many motivated students to participate.

\*Number of adoptions by AY2020

## Student support

### Research support

- **Mentor system**  
A mentor system has been introduced to support the study of program students in the WISE Program. Mentors consist of on-campus faculty members, senior students, and consortium faculty members. Teacher mentors work with their academic advisors to give advice through regular interviews, and student mentors give advice through study sessions.
- **Marine-AI student study session**  
Not only program students but also program manager participate and hold study sessions once a week. It is a good place for sharing research results, solving questions, and interacting with each other.

### Financial supports

- **Financial Support of "Education and Research Support Expenses"** (in the form of a grant-type scholarship)

Number of people / amount	Maximum of 5 students in each enrollment year / 130,000 yen per month
Payment period	Doctoral Program
Selection method	Selected by QAU (Quality Assurance Unit) from students who have achieved excellent results in the examination conducted at the end of the master's program



### Learning support

- **Support for overseas studies & research activities**  
We subsidize research expenses and domestic and international travel expenses necessary for the activities of the program.  
\*Please contact us as the contents of assistance are subject to change.
- **RA (research assistant) system**  
As an RA, we will provide financial support by engaging in research work that is useful for the research activities of the program. The purpose is to effectively promote research activities, enhance the research system, and develop the ability to carry out research as a young researcher.
- **English training**  
As part of global human resource development, we are conducting English training for the purpose of acquiring logical conversation skills and practical meeting skills.
- **Online learning platform (Self-directed learning)**  
In this program, program students can freely study about 5,000 courses using the online learning platform.
- **Internship / Residency**  
We provide internships (in 2 years for the first semester program) and residencies (longer training, 3 years for the second semester program) that specialize in the practice of AI mainly to consortium partner institutes.
- **Employment support**  
Through the "Marine AI Consortium", which is an industry-academia-government collaboration, we will match program students with collaborative institutions and private companies, and provide employment consultation.