DOCTORAL THESIS INFORMATION

Dissertation title: **Research on the Application of Artificial Intelligence and Big Data in Maritime Traffic Management on the Vung Tau - Saigon Route**

Major: **Maritime Science**, code: **9840106**

Ph.D. candidate: **Hoàng Hồng Giang**

Research Supervisors: **1. Assoc. Prof. Dr Phạm Văn Thuần**

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Education Institution: **Vietnam Maritime University**

SUMMARY OF THESIS

1. **Research aim**

   The aim of this research is to develop a method for assessing collision risks in wide maritime areas and narrow waterways. Based on this, a database will be created to evaluate collision risks between vessels on the Vung Tau - Saigon route. Additionally, the study will utilize big data and apply artificial intelligence (AI) to assess the collision risks among vessels navigating this route.

2. **Research object and scope**

   The thesis concentrates on the following aspects:

   - Maritime traffic scenarios and potential risks that could lead to maritime accidents;
   - Pilot evaluations of situations and indicators that determine the collision risk among vessels operating on the Vung Tau - Saigon route;
   - The traffic regulation activities conducted by maritime officers in Vietnam.

   To implement the research activities, the thesis concentrates on studying subjects related to the VTS (Vessel Traffic Service) stations in Vietnam managed by the Ho Chi Minh City Maritime Administration.

3. Research methods

The following research methodologies were employed throughout the thesis:

- Data analysis techniques to evaluate traffic conditions;

- Expert assessments for identifying hazardous traffic scenarios, evaluating safety risks, and managing traffic situations;

- Experimental machine learning approaches utilizing a database of traffic conditions to assess collision risks among vessels navigating the Vung Tau - Saigon route, facilitating the automatic detection of collision risks and providing alerts for maritime traffic management operations.

4. Scientific and practical significance of the thesis

Scientific significance: Upon completion, the thesis will establish a theoretical framework for identifying scenarios that pose collision risks between vessels in maritime logistics. This framework can be utilized in further research related to risk management, thereby enhancing maritime safety not only in open waters but also within the constrained environments of narrow channels.

Practical significance: The successful development of a machine learning system will improve the capability to detect and mitigate potential maritime accident risks associated with collisions between vessels and fixed structures. By identifying and signaling hotspots in maritime traffic, this system will alleviate the operational burden on maritime traffic management personnel and enhance safety in port operations, thereby supporting broader socio-economic goals.

5. New contributions of the thesis

The thesis has developed an assessment methodology for collision risks among vessels operating in constrained waterways, specifically for the Vung Tau - Saigon route, utilizing the Estimated Time of Arrival (ETA) of vessels at traffic hotspots.
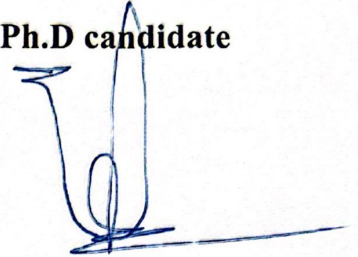
The validation of research outcomes through AI model training demonstrates a high accuracy rate for the model. This confirms that the

proposed research methodology and algorithm are fully applicable in practical settings and possess substantial scientific significance.

Haiphong, October 9th, 2024

Supervisors   **Ph.D candidate**

Assoc. Prof. Phạm Văn Thuần   **Assoc. Prof. Trần Văn Lượng**   **Hoàng Hồng Giang**