

**Maritime Hackathon 2025**  
**Category A Problem Statement**

**Release On: 17 January 2025, Friday**

**Release Time: 09:00 hrs (SGT)**

**‘Vessel Deficiency Severity Prediction’ Model Development**

**Background:**

Vessels visit various ports during their commercial life. During this period, they are subject to harsh marine environmental and deteriorating conditions which at times lie outside their normal operating circumstances.

In addition to that, any plant or mechanical and electrical system undergoes performance degradation as its mechanical components age. Some examples are – rusting of bolts and nuts, holed pipes, fuel leakages, metal cracks and fractures, bend in structures etc.

On top of that, the most crucial one is the human factor. Systems, components and their maintenance can be the best to start with but if the operator is not skilled, trained, motivated and guided by processes and policies, a brand-new ship can face disastrous incidents which can compromise life, cargo and environmental safety.

Similarly, if the procedures to be followed are not defined, the operator may have to rely on experience and verbal local instructions with a high probability of an incident or accident since the crew is always changing at frequent intervals and such local guidelines can quickly get lost.

To aid and therefore maintain the integrity of the vessel so that cargo, life or environmental safety is not compromised frequent inspections and audits are done by internal and external teams such as Port State Control (PSC) inspections, Ship Inspection Report programme (SIRE), RightShip Inspection (RISQ) etc. These third parties help provide an external pair of eyes to evaluate the condition of the vessel and help the crew and management identify shortcomings and deficiencies which go unnoticed in the bigger scheme of managing and operating a floating asset.

With the best intention of these third parties, the deficiencies identified upon are immediately resolved, evaluated for quick resolution or an extension granted for a specific period and where the severity severely compromises the safety of the vessel, it is detained. However, some of these evaluations are subjective and descriptive in nature as a formal report with the severity of the finding subject to the surveying individual's training, point of view and experience and thereby can affect the business viability of the vessel in trade.

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#### **Objective:**

The objective can be divided into two phases:

**Part 1: The objective is to study the severity assigned by a group of Subject Matter Experts (SMEs) for some identified deficiencies.**

You will be provided with a dataset which contains the deficiency text, and the severity decision provided by 3 or more SMEs. A deficiency text consists of the nature of deficiency, its description, root cause analysis, corrective and preventive action. Based on these SME decisions, the team would need come up with a logic to derive the overall or consensus severity.

**Part 2: Use dataset along with the labels derived from Part 1 and build a model that predicts the severity when provided with a new deficiency.**

You are strongly encouraged to consider the decision-making tools like machine learning and/or Generative AI to predict severity where multiple possibilities and subjective results exist for a single point. Teams would need to train and validate their models on the deficiency description data, or any additional fields provided. For this, the team would need to split the dataset into training and validation set.

#### **Area of Focus:**

The dataset is curated by extracting deficiencies from PSC closeout reports and storing it as a csv file. Each deficiency was provided to 3 or more annotators who classified the severity of each deficiency as High, Medium or Low. These annotators are subject matter experts from the maritime industry.

#### **Data Sources:**

- Deficiency dataset
- Out of sample test set

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### **Deliverables:**

- Submission
  - Submitted via <https://forms.gle/3H7XXSc38Y6kMYKB7> by **18 January 2025, Saturday, 09:00 hrs (SGT)**
- A case paper including methodology/rules/assumptions used to arrive at consensus severity
  - Cover page + a half-page abstract (max 200 words) + max 4 pages with double spacing, Times New Roman font size 12.
- Severity predictions on the provided out of sample test set.
- A Python script/ Jupyter notebook which details the key steps taken to build and validate the model.

### **Link to required materials:**

[https://drive.google.com/drive/folders/1Y2HeBFHf4HfZ-DISM8wfGGuEecKnC767?usp=share\\_link](https://drive.google.com/drive/folders/1Y2HeBFHf4HfZ-DISM8wfGGuEecKnC767?usp=share_link)

### **Judging Criteria:**

- Creativity and innovation in the approach to derive the consensus severity
- Accuracy of prediction model on test dataset against RightShip's results.
- Clarity and effectiveness of the presentation

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#### **Conclusion:**

Safety of ships is very important for cargo, life and environment. Deficiencies identified as part of third-party inspections help keep close control on the safety of a vessel while helping the ship's crew and management identify situations which they cannot identify in their daily operations. Such deficiencies are also subject to human bias and subjectivities of the individual surveying the ship who may be time and resource pressed given the quick turnaround time of the vessel involved for commercial reasons. The speed and detail of such inspections affects the business viability of the vessel. To tackle this situation and help surveyor's focus more on the deficiencies while worrying less on how severe it is, the scope of this problem statement is to educate the teams on the decision making tools and machine learning and or Generative AI tools which can assist the surveyor by giving them more time and help them to support the ship and its management focus more on finding deficiencies.