# Motivation Letter

Mahya Mohammadi Kashani,
PhD Fellow at IT-University of Copenhagen

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I am a Ph.D. student in Computer Science at the IT-University of Copenhagen (ITU). My Ph.D. project is part of the European Training Network (ETN) on Reliable AI for Marine Robotics (REMARO). My Ph.D. project mainly concentrates on designing a Bayesian-inference-based prospection method to improve the reliability of underwater robots performing subsea infrastructure inspection tasks. I've also obtained my MSc. degree in Artificial Intelligent and Robotics. My background is in Content-based Image Retrieval, specifically, Search-based Automatic Image Annotation using deep models. Having experienced in Machine Learning and Information Retrieval leads me to discover an interdisciplinary research topic within my PhD project, ***Statistical Assessment of plans via probabilistic optimization of reliability***.
Until now, I've developed a probabilistic decision-making model to assess risks and use this model to assist in plan selection for UUVs (Unmanned Underwater Vehicles) called **Risk-averse Planning for Marine Robots**. Although there exist plenty of low-level and high-level probabilistic planners to generate valid plans for robots, we do not have access to any intelligent high-level planners publicly that can work on the decision-making level for automated vehicles and apply them in real scenarios of UUV missions, according to the best of my knowledge. The only attempt was research group at King College London (KCL) university where they developed ROSPlan framework. This high-level plan-based controller is considered a crucial part of autonomous systems when we are troubleshooting the system. Although most of those models used conditional probabilities tables by expert knowledge, having a bottom-top approach without expert knowledge is also problematic to find a reliable solution while the robot is in the dilemma decision stage.

According to a set of regulations suggested by the Petroleum Safety Authority Norway (PSA) mentioned in safety 4.0 project and new risk definition by ISO 31000 and these plans are descriptive, we would like to quantify risks assigned to sub-plans by fusing the Large Language Models (LLMs) and our probabilistic planning system to extract valuable information as a context of scenarios defined from Incident Response Plan (IRP). IRP is a document that it's been provided, by some expert people, before, during, or after any incident. Those documents contain not only description about vehicle, its sensor but also described the mission in the beginning; there are plenty of experimental results

from specific incident and explain how, why, and under what conditions that incident happened. It is usually possible a subsea team leader's opinions attached to those statistical evaluations as a textual letter which are so valuable. Therefore, We would like to extract existing scenarios and generate new scenarios using random sampling from those reports. To have a better understanding whether extracted information give us useful information and cover appropriate knowledge, we define some experiments inspired by Epidemiology research area for the effect of treatment such as using placebo vs real medicine.

Finally, we collected some reports which contain more than 100 pages and explain everything in reports. we would like to find a correlation between number of samples according to number of variables. The number of sample can be affect directly in our experiments. All these experiments can lead us to have a more realistic probabilistic planner for marine robot to allow to fail less.