# Summary for the application for "Olle Jonson-priset" 2024

Our names are Gavin Man and Arvid Sundberg. During the spring of 2024, we wrote our bachelor thesis focusing on AI and machine learning in a production line to minimize the operators and workload and to maximize the result.

**Title thesis:** Enhancing quality assurance by automating manual work with AI and Machine Learning

## Abstract

The rapid advancement in technology, drives towards modernization and automation which gives opportunities for all engineers. This thesis researches the potential of using Machine Learning (ML) and Artificial Intelligence (AI) to automate the manual work in a production line. This is a collaboration between Chalmers University of Technology and Volvo Cars. The focus has been on the borging process at Volvo Cars, a critical quality assurance that involves manually inspecting and verifying the precision of screws in car assembly. The primary objective is to identify innovative cost-saving strategies and increase efficiency by integrating AI and ML into the production line while ensuring safety and maintaining high-quality standards.

The automotive industry is continuously introducing new models, necessitating adjustments to the assembly processes to fit different parts and materials. Every new model and improved material go through multiple testing and validation phases, which currently include a manual borging process. This manual process involves checking the screws using torque wrenches and visual inspections to ensure that they meet specified standards. Data from these checks is collected, stored, and compared against predefined values (PKI values).

This thesis dives into the possibilities of automating or semi-automating the borging process to reduce manual work, lower costs, and improve production efficiency. The research methodology includes literature studies, data analysis, interviews with industry experts, and site visits to Volvo Cars production facilities. These activities provided a detailed understanding of the current process.

Replacing manual work with AI in the production line will save the company labor costs, increase efficiency, and enhance safety for both cars and operators. This will result in more consistent outcomes by minimizing the human factor. Currently, multiple external workers are required to check all the screws on the cars in the production line. By replacing that with AI, the labour cost will be reduced massively.

Python is the chosen tool to develop the program and research due to its adaptability for machine learning tasks and relevance for training ML models. Various ML

techniques, including supervised and unsupervised learning, were explored to predict the status of screw tightening.

The result of this research highlighted the benefits of using AI and ML in the assembly process. This thesis includes a final code that works on a smaller scale but is adjustable to all the different screws and stations in the production line. To maintain high safety when making predictions about the tightening process, a two-step verification method is implemented.