



Master Thesis Idea

Title: Lightweight Vision Model Compression for Space Applications under Resource-Constrained Deployment Requirements

This thesis studies lightweight model compression methods for vision models in the context of space-related perception tasks. The main goal is not to build a complete space system, but to investigate whether recent compression methods can preserve useful performance under the computational and deployment constraints expected for resource-limited space platforms.

Since the group does not yet have a strong space background, part of the work includes identifying a suitable task, dataset, and evaluation setting from the space domain. The final problem setting may therefore be refined during the early phase of the thesis.

- Review relevant space-related perception tasks and select a suitable dataset and benchmark setting for the thesis.
- Apply and analyze a recent compression method, potentially inspired by activation-aware low-bit quantization, on a selected space vision task.
- Evaluate the compressed model with respect to accuracy retention, model size, computational efficiency, robustness, and deployment feasibility.

Relevant references: Ji Lin et al., “AWQ: Activation-aware Weight Quantization for LLM Compression and Acceleration”; Jiayi Liu et al., “LuSNAR: A Lunar Segmentation, Navigation and Reconstruction Dataset based on Multi-sensor for Autonomous Exploration”.

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