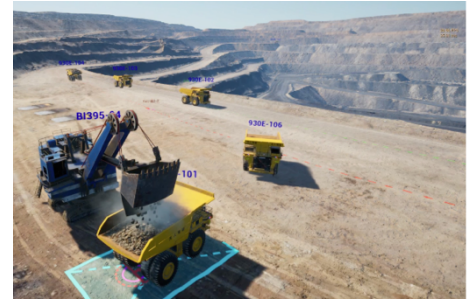




Master/Bachelor Thesis – Semester Project

Autonomous Driving on Open-pit Mines

Background

Autonomous driving in open-pit mining is a representative application of autonomous systems in unstructured or domain-specific environments. Exploring the performance of localization, perception, decision-making, planning, and control algorithms in mining environments — particularly their deployment on large-scale mining vehicles — holds significant research and practical value. **Our team has released the world's first open-source dataset^[1] dedicated to autonomous driving in open-pit mining scenarios.** We invite passionate and like-minded researchers to collaborate with us, either by leveraging this dataset or by proposing and implementing new data collection strategies to advance the field through cutting-edge research.

Your Tasks

In this thesis, your jobs can be selected from the following tasks or your own ideas relative to this topic. To be specific:

1. **Simulator:** Simulators play a critical role in autonomous driving research. Developing and exploring mining-specific autonomous driving simulators has the potential to drive forward advances in end-to-end learning, world modeling, and the integration of vision-language models within the of open-pit mines.
2. **Perception in Mines:** Due to the sparse visual features in mining areas, tasks such as visual localization and segmentation often perform poorly. Improving the performance of these tasks is an important research challenge.
3. **Speical Tasks in Mining Areas:** Research can focus on the unique characteristics of mining scenarios, such as variations in vehicle load, nighttime operations without lighting, and high dust environments, to develop tailored solutions addressing these challenges.
4. **Mining in Space:** It's a very interesting topic. You can start from simulation environments or even independently design a robot. You should also consider the effects of low gravity and the absence of atmosphere on the system.

Requirements

Candidates are expected to have strong interest, hands-on skills, programming abilities, as well as literature search and reading capabilities.

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[1] Li, Yuchen, et al. "AutoMine: An unmanned mine dataset." *Proceedings of the IEEE/CVF conference on computer vision and pattern recognition*. 2022.

[2] Li, Yuchen, et al. "AutoMine: A Multimodal Dataset for Robot Navigation in Open-Pit Mines." *Journal of Field Robotics* 42.4 (2025): 1523-1536.

[3] Ma, Boyu, et al. "Advances in space robots for on-orbit servicing: A comprehensive review." *Advanced Intelligent Systems* 5.8 (2023): 2200397.