I. IDENTIFICATION DATA

Thesis name:	**Fusion of data from dual RGB sensors and thermal camera**
Author's name:	**Kafka Ondřej**
Type of thesis :	master
Faculty/Institute:	Faculty of Electrical Engineering (FEE)
Department:	Department of Computer Science
Thesis reviewer:	Josef Kaufmann
Reviewer's department:	SEA.AI GmbH

II. EVALUATION OF INDIVIDUAL CRITERIA

Assignment   **challenging**

Evaluation of thesis difficulty of assignment.

For completing the assignment, it was required to use images from existing databases of RGB and thermal images, whose precise alignment was challenging. Due to the large amount of partly repetitive data, intelligent algorithms had to be used for selecting data for efficient model training. Designing and implementing deep-learning models for multimodal image data was the final task of this challenging thesis assignment.

Satisfaction of assignment   **fulfilled**

Assess that handed thesis meets assignment. Present points of assignment that fell short or were extended. Try to assess importance, impact or cause of each shortcoming.

All goals were achieved. Useful insights were generated. Implementation, results and conclusions are very useful for further work.

Method of conception   **outstanding**

Assess that student has chosen correct approach or solution methods.

The student has chosen correct approaches and has shown a high degree of independence and creativity.

Technical level   **A - excellent.**

Assess level of thesis specialty, use of knowledge gained by study and by expert literature, use of sources and data gained by experience.

State-of-the art methods were used, literature research was performed, own conceptions were compared to those drawn from literature. The implementations and methodology show a very high level of technical skill.

Formal and language level, scope of thesis   **A - excellent.**

Assess correctness of usage of formal notation. Assess typographical and language arrangement of thesis.

Formal notation is used correctly. Thanks to skilled use of LaTeX, the thesis is typographically pleasing.

Selection of sources, citation correctness   **A - excellent.**

Present your opinion to student's activity when obtaining and using study materials for thesis creation. Characterize selection of sources. Assess that student used all relevant sources. Verify that all used elements are correctly distinguished from own results and thoughts. Assess that citation ethics has not been breached and that all bibliographic citations are complete and in accordance with citation convention and standards.

The thesis cites 57 sources, including monographs, journal papers and theses. They cover all fields relevant for this thesis.

Additional commentary and evaluation

Present your opinion to achieved primary goals of thesis, e.g. level of theoretical results, level and functionality of technical or software conception, publication performance, experimental dexterity etc.

This master's thesis was an overall challenging project. Unforeseen challenges had to be overcome, which required independent research of methods and getting familiar with a large ecosystem of data base structure and product

specifications.
In the frame of this thesis a large repository of code was developed. It is well-structured, well-documented and uses state-of-the-art software tools. The programs are written in a very clear style and will also be of high value in the future.

III. OVERALL EVALUATION, QUESTIONS FOR DEFENSE, CLASSIFICATION SUGGESTION

Summarize thesis aspects that swayed your final evaluation. Please present apt questions which student should answer during defense.

The thesis addresses important topics for SEA.AI and sheds light on a potential path for new developments. Partly unexpected challenges were tackled with creativity and solved in a beneficial way. Although in some parts the writing style could benefit from some more polishing, the aforementioned reasons definitely justify giving the best possible grade (A) to the thesis.

Depending on time constraints, some or all the following questions may be asked during the defense:

- Explain the intrinsic calibration matrix (K) for pinhole camera model. (What is its purpose, what is the meaning of the parameters?)
- Explain why it was not possible to do alignment of thermal and RGB images with frequency domain methods.
- What is an affine transformation (explain geometric effects).
- In a processing pipeline for multimodal data, there are different approaches to how the fusion of channels is done and at which point in the pipeline it is done. Which approaches did you try; how would you classify them?
- What are, according to your experience and opinion, the pros and cons of an early-stage sensor fusion such as yours, compared to the approach in our existing products?
- With respect to various metrics, the largest model (CMX-b2) performs only slightly better than some of the smaller ones, while having much higher inference time. Which can be possible reasons that explain this behavior?

I evaluate handed thesis with classification grade **A - excellent.**

Date: June 12, 2024 **Click here and enter the date.**   Signature: