

Deep learning solutions for domain-specific image segmentation Vadineanu, S.

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Propositions

Propositions accompanying the thesis *Deep Learning Solutions for Domain-Specific Image Segmentation*.

- 1. The robustness of deep learning models to annotation errors depends significantly on the architecture of the model. (Chapter 2)
- 2. Models with few parameters and simple architectures should be preferred for tasks where the annotations are expected to be noisy. (Chapter 2)
- 3. Perturbation-based training pipelines enable neural networks to generalize from noisy annotations. (Chapter 3)
- 4. The effectiveness of few-shot learning for cell segmentation depends significantly on the structural similarity between the support set and the query samples. (Chapter 4)
- 5. Besides their role in interpretability, activation maps can also serve as effective proxies for segmentation annotations in settings with limited expert availability or annotation resources, such as archaeology. (Chapter 5)
- 6. Including domain knowledge in explainability techniques results in more accurate pseudo-annotations for segmentation compared to directly using their raw outputs. (Chapter 5)
- 7. The interpretability of deep learning models should be prioritized alongside accuracy to ensure its broader adoption, especially in specialized fields such as archaeology.
- 8. Synthetic data sets with perfect annotations are essential tools for evaluating the impact of annotation errors on deep learning models.
- 9. Approaches combining deep learning and traditional machine learning will become standard in annotation-scarce domains that require interpretability.
- 10. The success of machine learning in specialized fields requires interdisciplinary collaboration, where domain knowledge can compensate for the lack of annotated samples.
- 11. When submitting a new algorithm to a venue, the lack of a standardized interface (such as the interface of the pre-trained torchvision models) for training and evaluation should result in a desk reject.
- 12. Large conferences should split into smaller, more targeted events, reducing the need to rent large venues and distributing the workload for reviewers.

Şerban Vădineanu, Leiden, 08-10-2025.