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Leiden

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Spectral imaging and tomographic reconstruction methods for industrial applications

Zeegers, M.T.

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Stellingen

behorend bij het proefschrift getiteld

“Spectral imaging and tomographic reconstruction methods for industrial applications”

1. In machine learning approaches to 2D X-ray imaging problems, computed tomography-generated volumetric representations of the associated 3D objects allow for efficient extraction of accurately annotated 2D training data. *(Chapter 2)*
2. Task-driven learned data compression allows for storage of hyperspectral data with less space usage and without loss of essential features. *(Chapter 3)*
3. Multi-channel imaging can improve tomographic reconstructions when channel information is combined. *(Chapter 4)*
4. The use of dictionaries with a bi-convex problem formulation can reduce ill-posedness and provide more stable solutions compared to classical reconstruction problem formulations. A spatio-spectral prior in multi-spectral computed tomography is an example of this. *(Chapter 5)*
5. In order to develop and compare food quality inspection methods, various standardized benchmark evaluation datasets should be developed and made publicly available.
6. Performance evaluation of trained convolutional neural networks on hyperspectral image segmentation should be carried out without spatial training-test data leakage. When multiple images are not available, the use of non-overlapping patch-based data is an adequate alternative (Nalepa, Myller, Kawulok, 2019).
7. The applicability of a computational method is inversely proportional to the number of its hyperparameters.
8. Spectral imaging offers enhanced insight into objects compared to conventional imaging methods that do not record spectral information. However, it requires the right problem setting, machinery, expertise and imaging settings to be successfully applied.
9. Within many families of intermittent systems, the more an invariant density is regular (i.e., closer to uniform), the more the corresponding dynamical system is chaotic. Of course, outside this context this statement does not hold in general (B.P. Zeegers, 2023).
10. The production process that takes place after acceptance of a paper does more harm than good.

11. Table football matches are helpful to the morale in a research environment, as facing exceptionally tough opponents with highly optimized defenses in thrilling showdowns makes the publication process of papers look easy again.
12. The best music is generally made with a wide spectrum of sounds.

Mathé T. Zeegers,
Leiden, Wednesday May 31, 2023.