



AI4DSpeckle: Label-Free SLC Despeckling & Practical Applications

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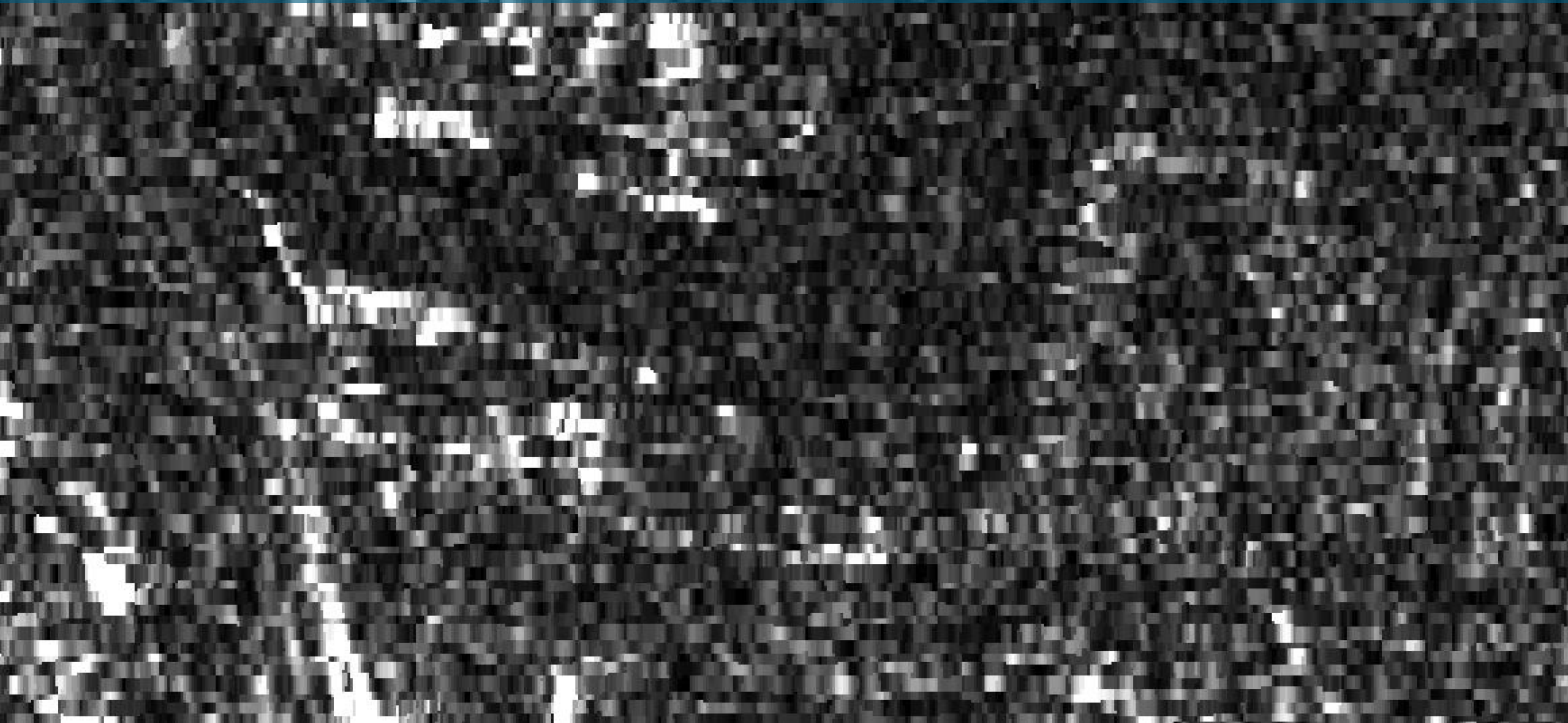
Optical image



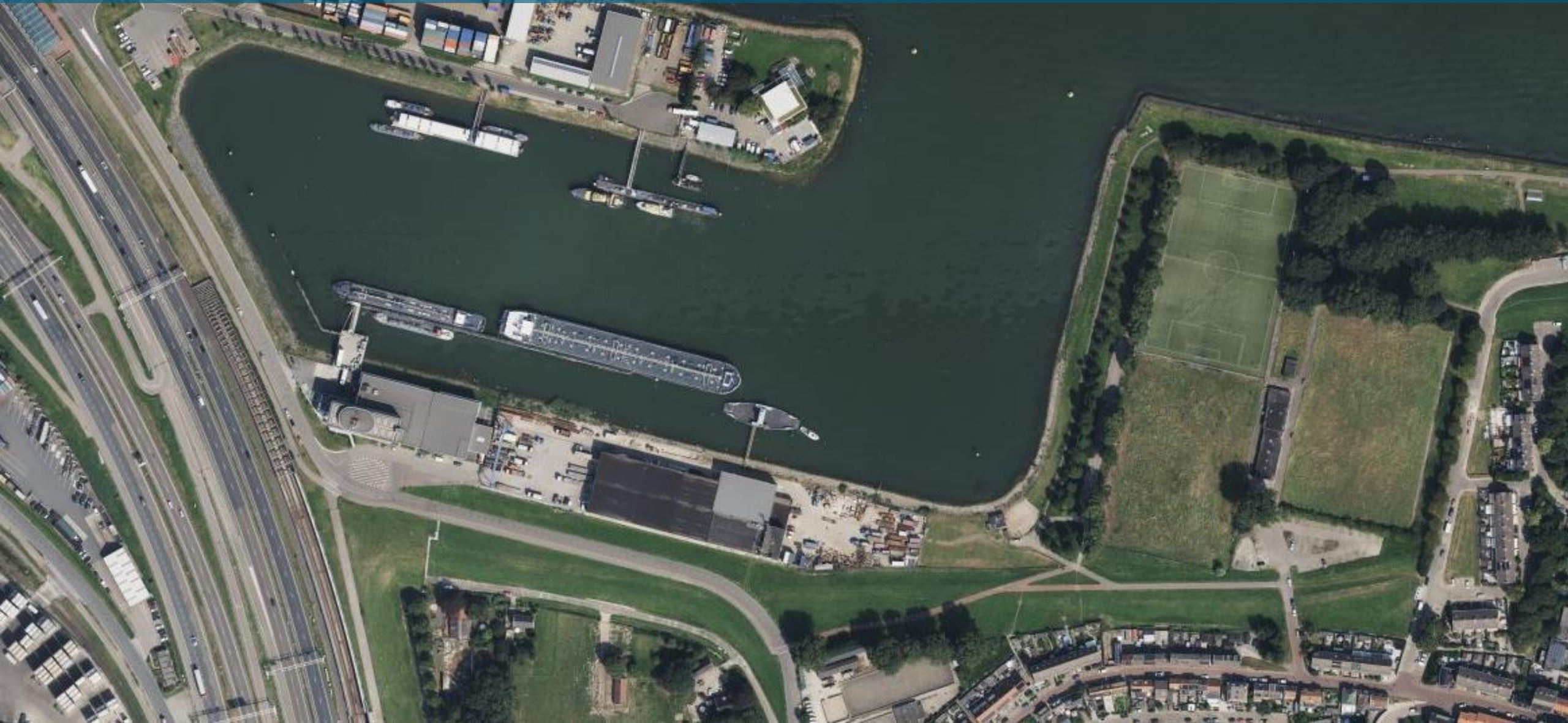
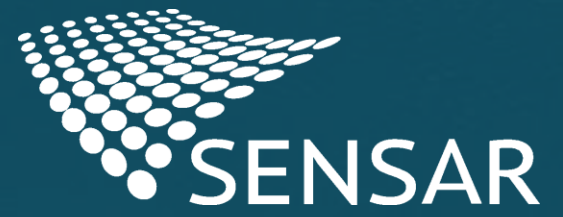
Synthetic Aperture Radar (SAR)



Speckle



Optical image



Despeckling – Traditional methods

- Limitations
 - **Resolution loss**
 - **Parameterization**

Speckled amplitude

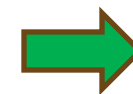
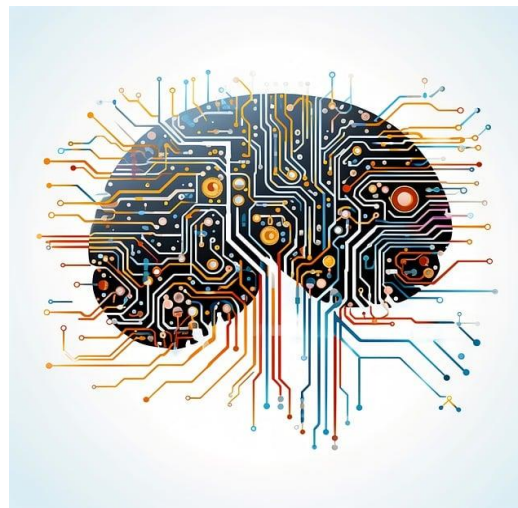
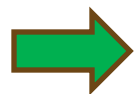
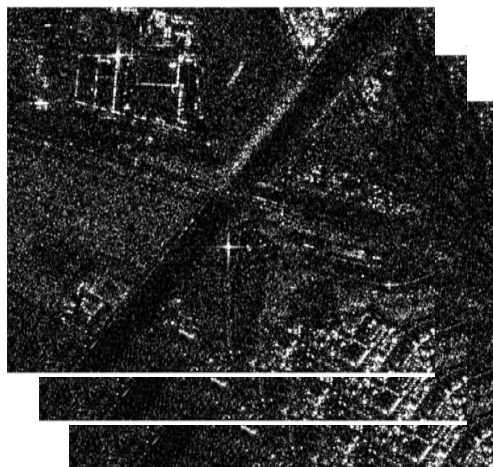


Lee Sigma

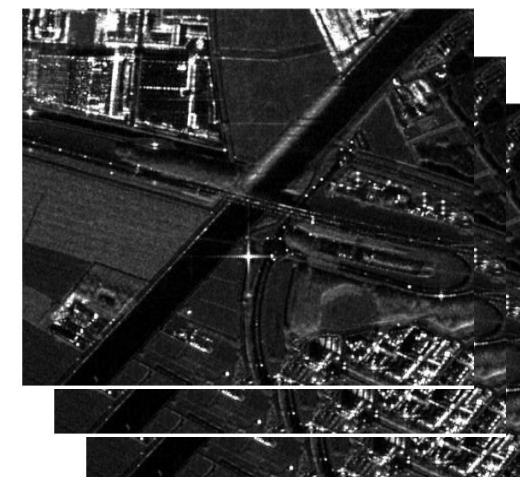


Despeckling – Deep Learning

Input: **speckled**



Target: **despeckled**



Require labels!



How will we deal with labels then?



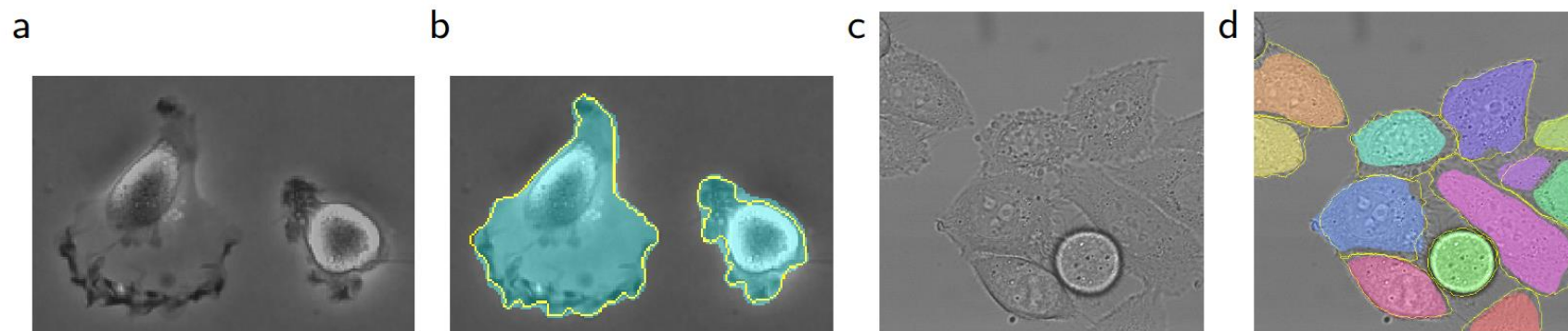
How will we deal with labels then?

We won't!



U-Net

- Convolutional Neural Network
- Biomedical image segmentation

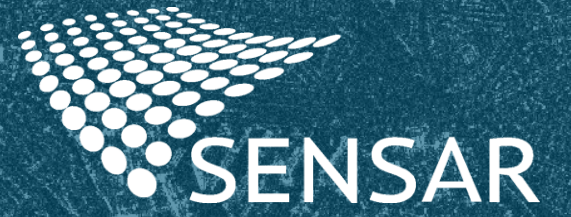


Segmentation results with U-net. Adapted from:

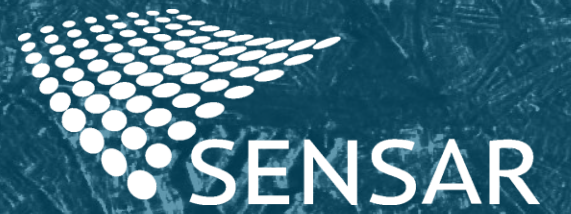
Olaf Ronneberger, Philipp Fischer, Thomas Brox, *U-Net: Convolutional Networks for Biomedical Image Segmentation* [arXiv:1505.04597](https://arxiv.org/abs/1505.04597) 18 May, 2015



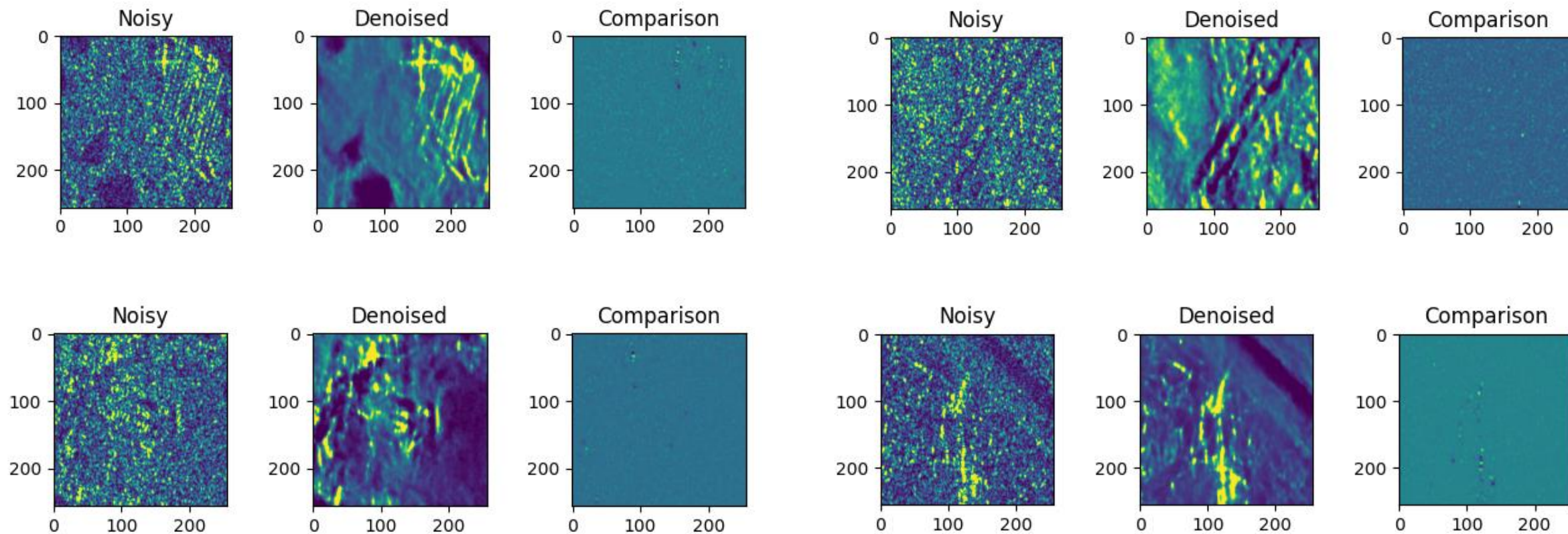
Speckled input



AI4DSpeckle output



Some results in detail

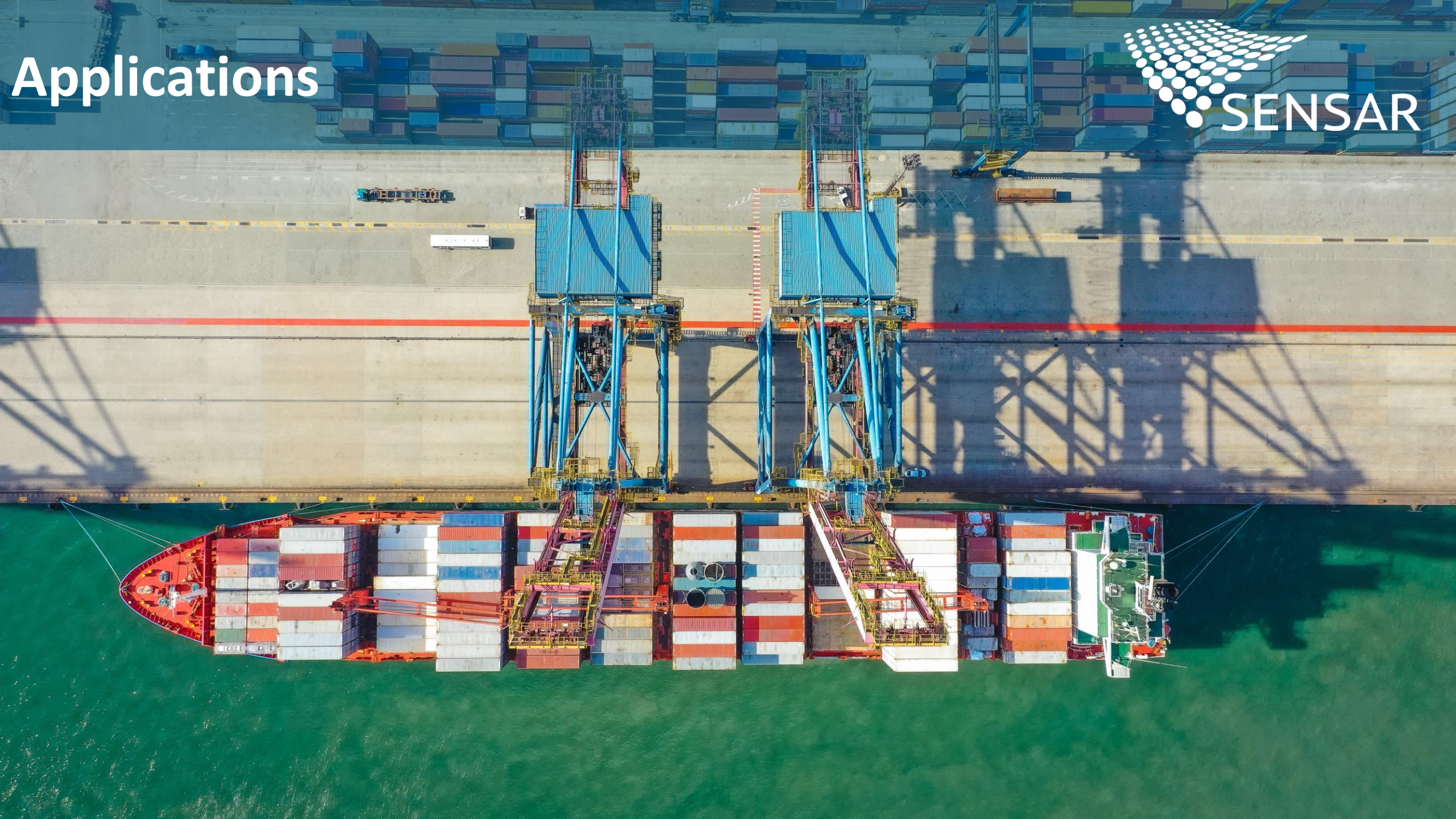
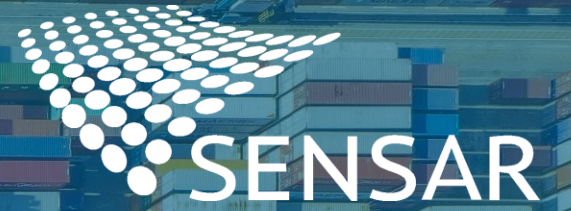


Comparison against Lee Sigma

Satellite	Raw image [dB]	Lee Sigma [dB]	AI4DSpeckle [dB]
Sentinel-1	33.0	7.12	7.01
RadarSAT-2 XF	0.081	0.032	0.009
TerraSAR-X SM	0.054	0.026	0.013



Applications



Idea:

- **Increasing coverage** on quay walls
- How: using **AI4DSpeckle** and **outlier removal methods**
- Tests on **areas of high activity**

- Joint effort with the **Port of Rotterdam**



Port of Rotterdam by Dkvtig, 19 April
2023. [https://commons.wikimedia.org/wiki/File:Haven_van_Rotterdam_2023_\(06\).jpg](https://commons.wikimedia.org/wiki/File:Haven_van_Rotterdam_2023_(06).jpg)



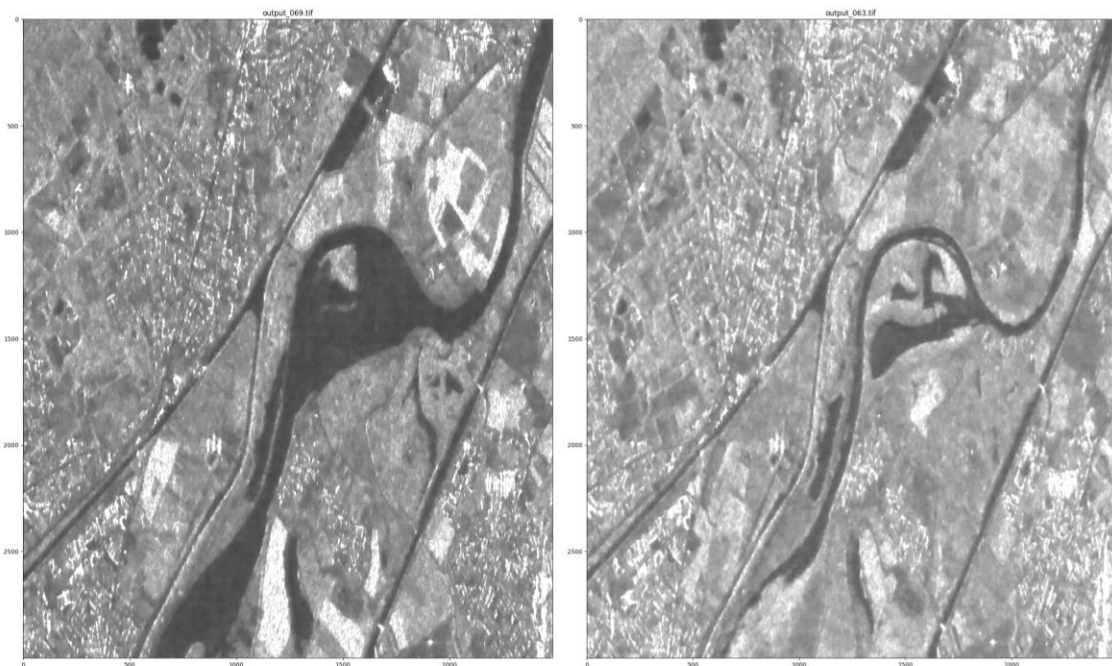
Results

- Coverage improvement: **26%**
- **Without loss of quality**



Other applications

Monitoring of water bodies



Object identification

New infrastructure



A photograph of a group of five people in a meeting room, overlaid with a semi-transparent teal filter. One man stands on the left pointing at a whiteboard, while four others sit around a table on the right, listening attentively. The room has large windows with blinds in the background.

ALONE WE CAN DO SO LITTLE
TOGETHER WE CAN DO SO MUCH

