

Physics-Informed Distillation for Scene Interpretations of A β Depositions



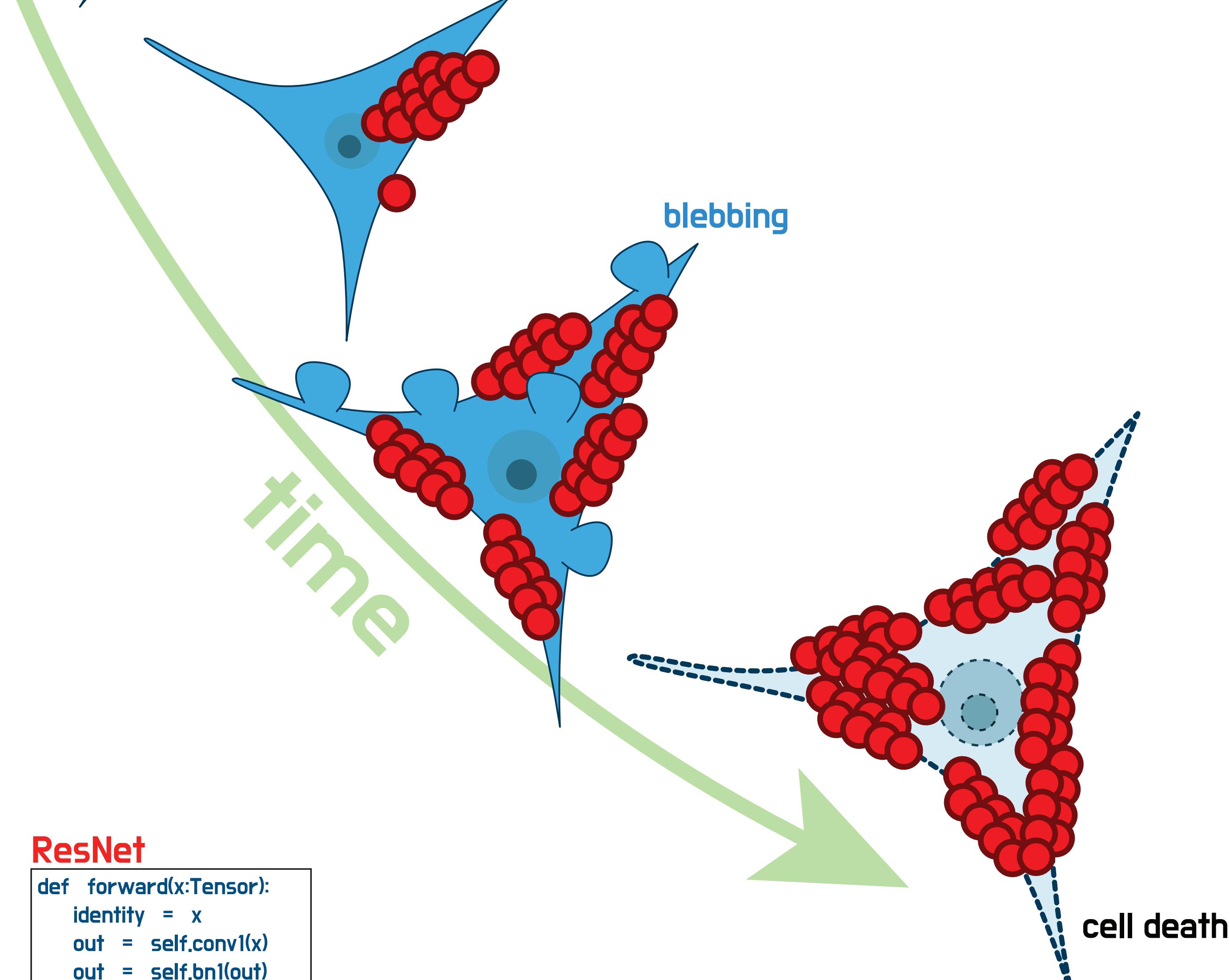
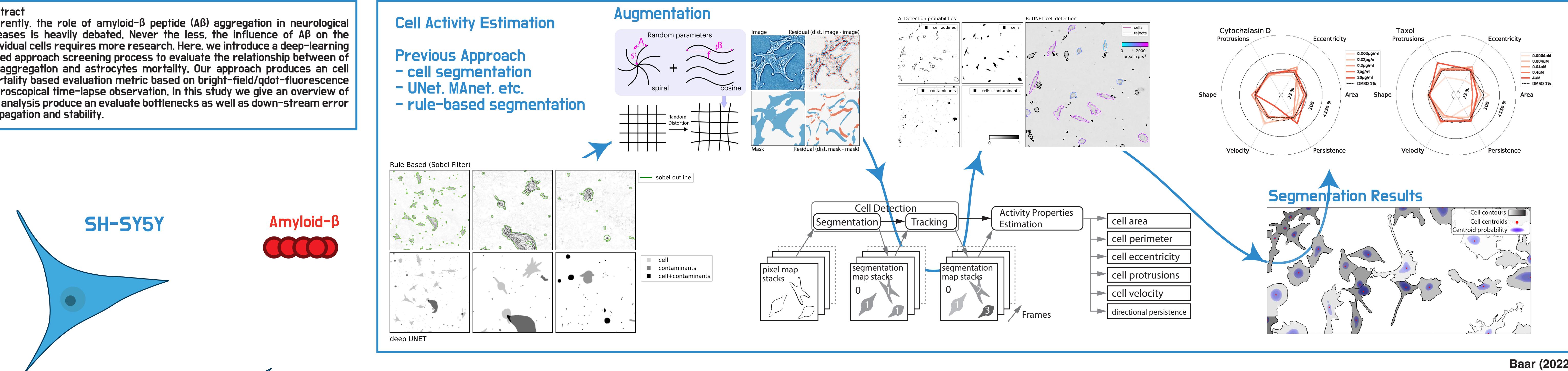
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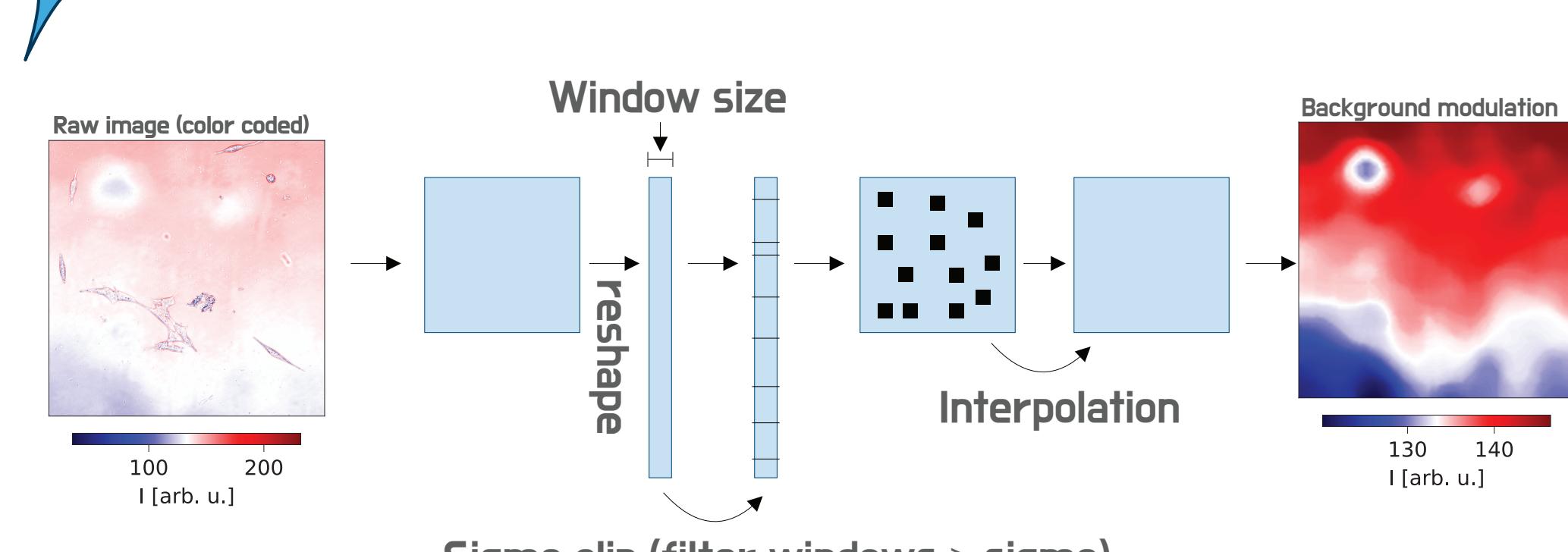
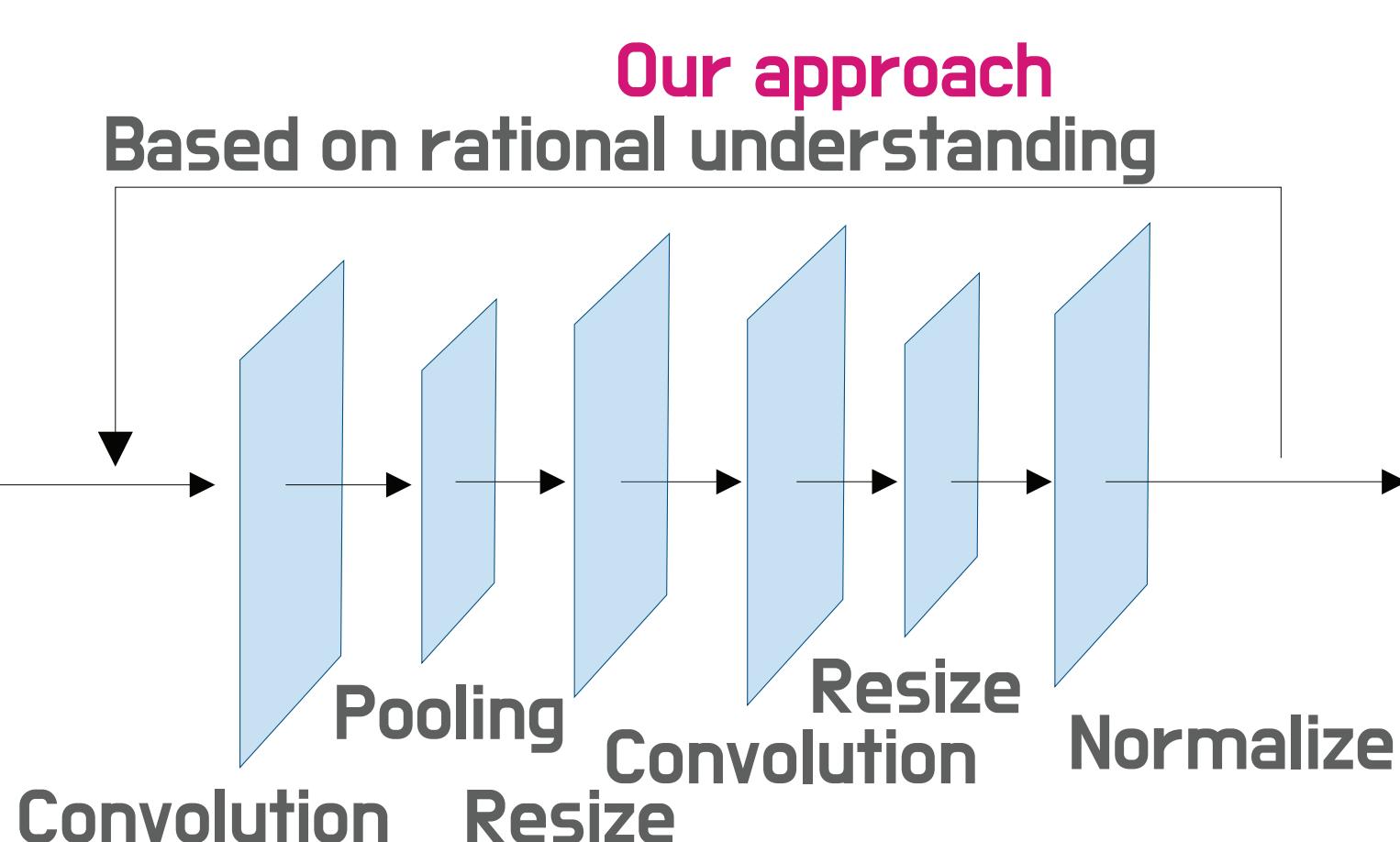
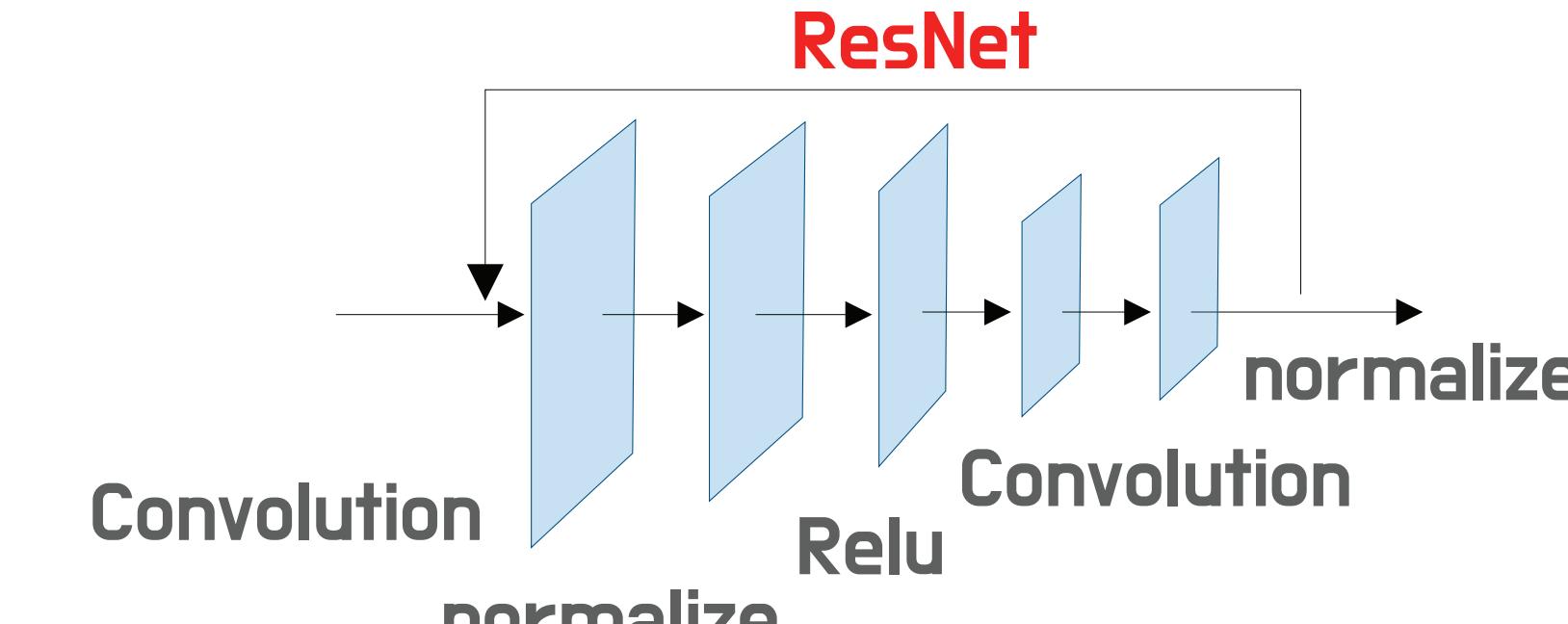
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Abstract
Currently, the role of amyloid- β peptide (A β) aggregation in neurological diseases is heavily debated. Never the less, the influence of A β on the individual cells requires more research. Here, we introduce a deep-learning based approach screening process to evaluate the relationship between of A β aggregation and astrocytes mortality. Our approach produces an cell mortality based evaluation metric based on bright-field/odot-fluorescence microscopical time-lapse observation. In this study we give an overview of the analysis produce an evaluate bottlenecks as well as down-stream error propagation and stability.

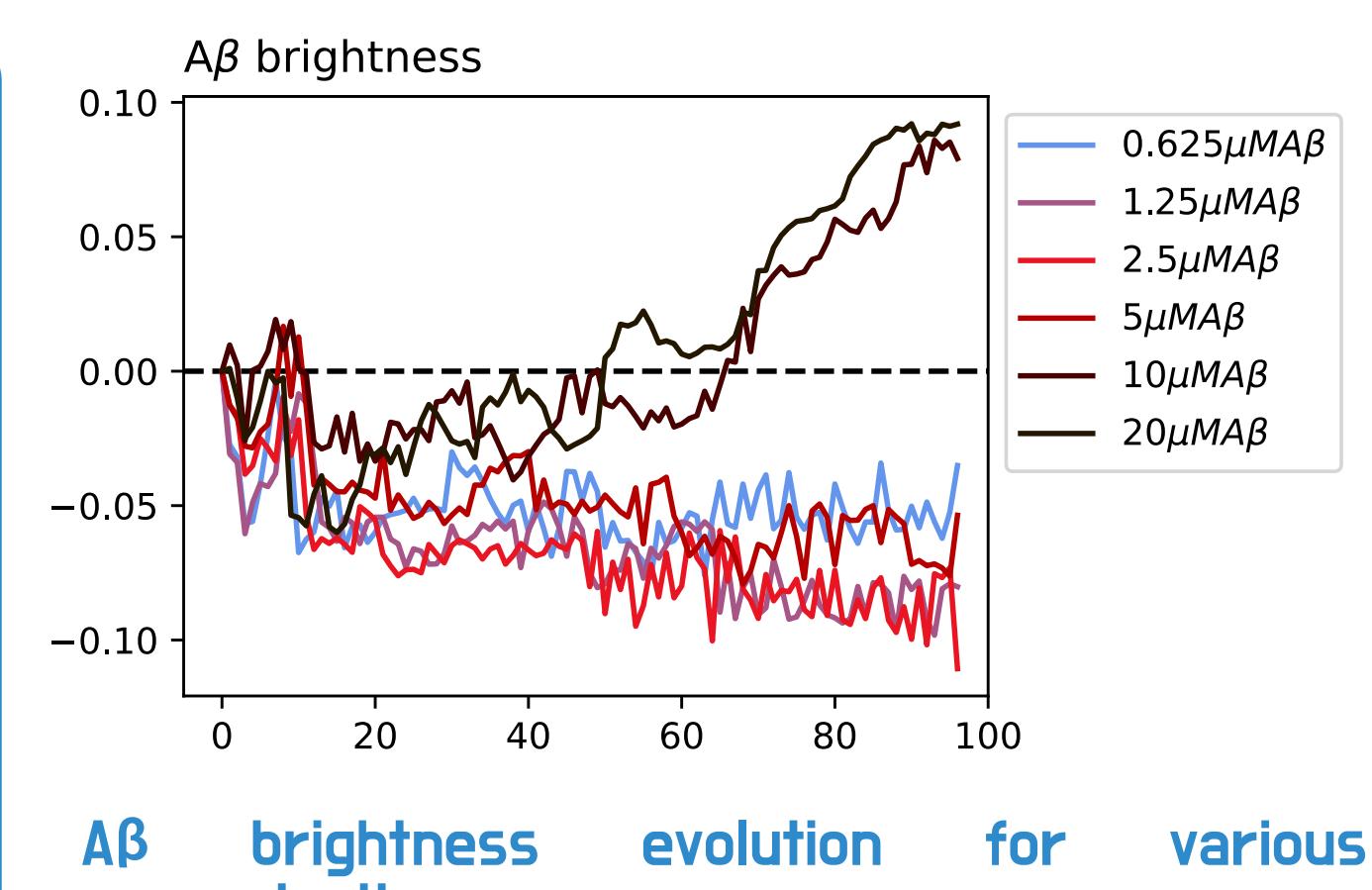
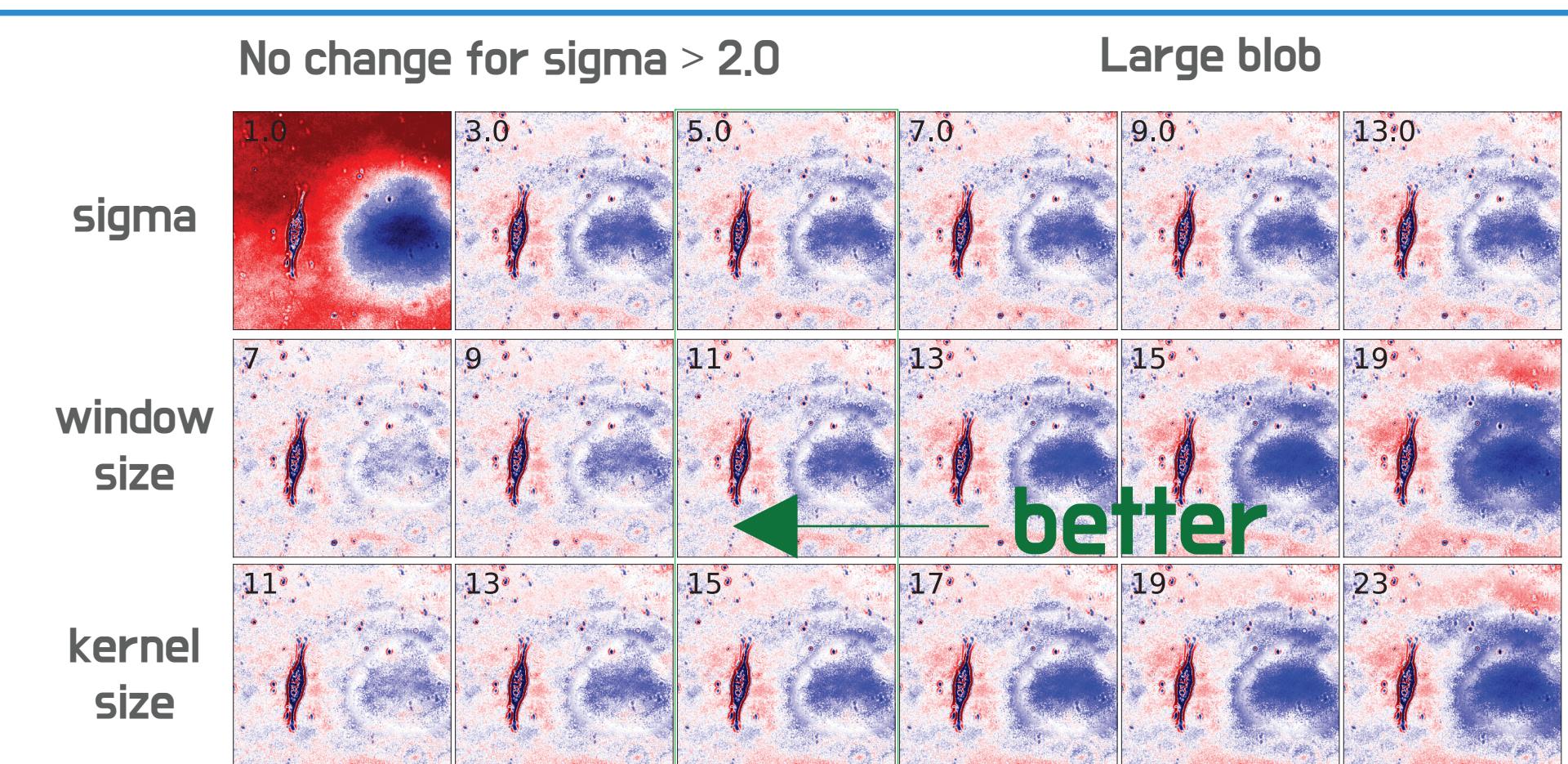


ResNet

```
def forward(x:Tensor):
    identity = x
    out = self.conv1(x)
    out = self.bn1(out)
    out = self.relu(out)
    out = self.conv2(out)
    out = self.bn2(out)
    out += identity
    out = self.relu(out)
    return out
```



Background subtraction:
consists mostly of smooth and unresolved objects



Summary
We have developed a comprehensible approach for locating cells and A β , based on the very well understood ResNet architecture. A clear advantage of our approach is, that it does not require training.

Outlook
in future studies, it will be necessary to differentiate between living and dead cells and to locate elevator features. It would be highly beneficial to derive a comprehensive approach, that is based on physical understanding.

Cell segmentation based on modified ResNet → variation pooling

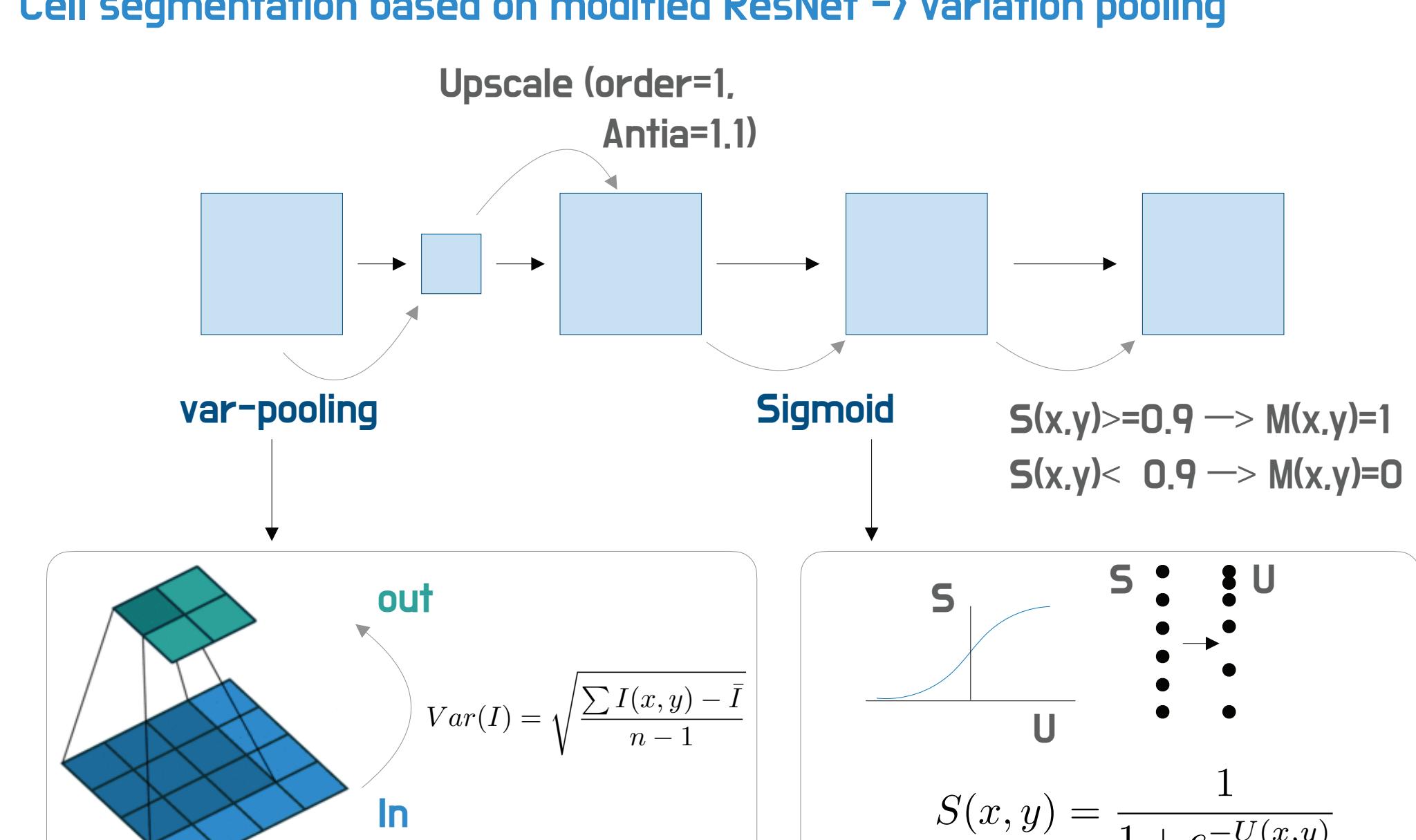
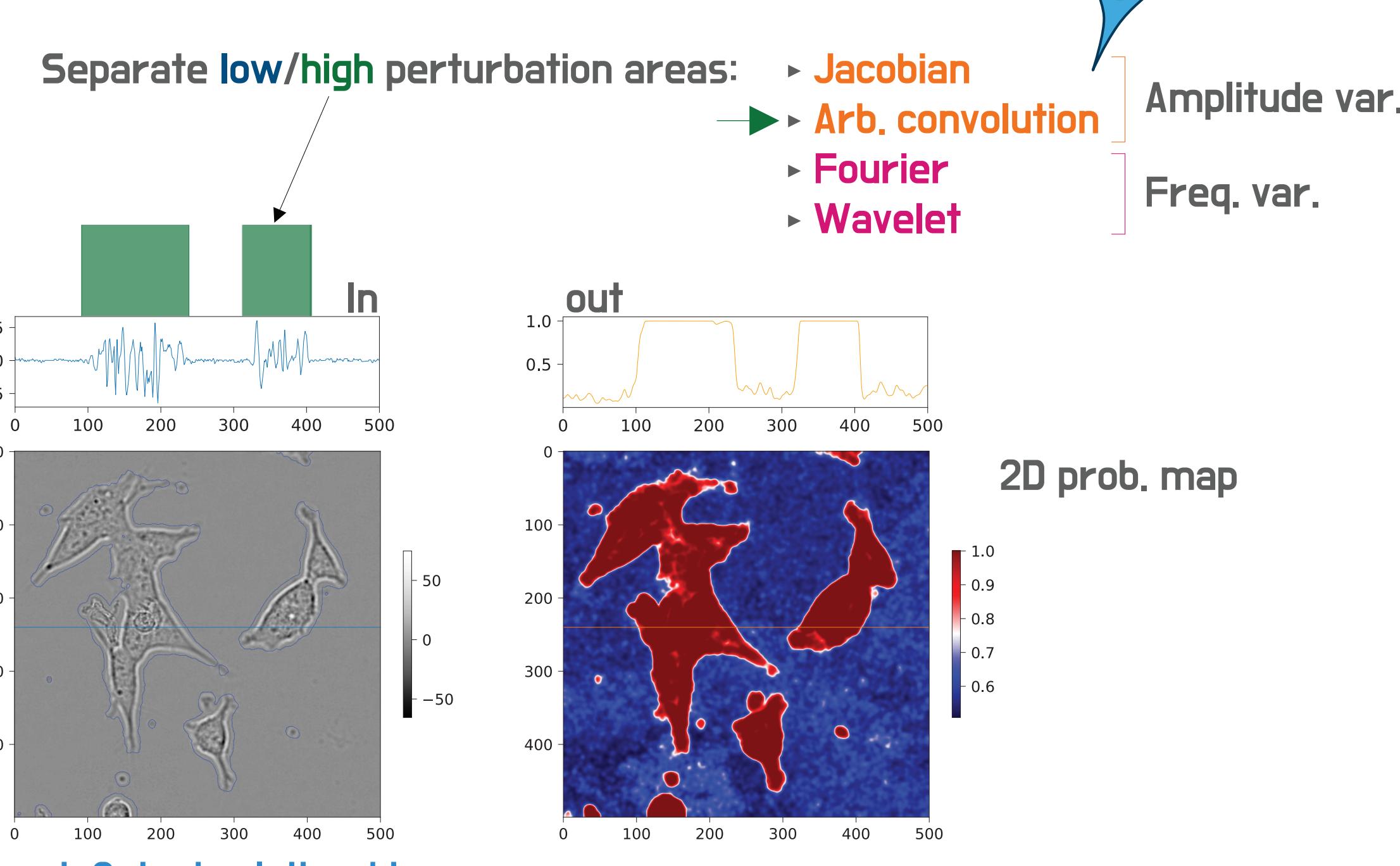


Illustration of variation pooling and the application of the sigmoid function



Baar (2022) Towards a comprehensive approach for characterizing cell activity in low contrast microscopic images

Nautrup (2022) Operationally meaningful representations of physical systems in neural networks

Chen (2022) Automated discovery of fundamental variables hidden in experimental data