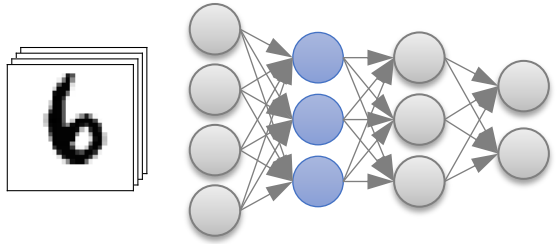
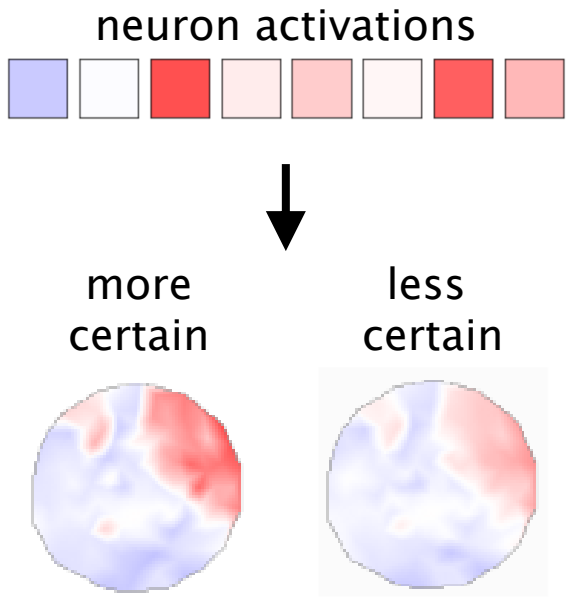
Relation of Activity and Confidence when Training Deep Neural Networks





Valerie Krug, Christopher Olson, Sebastian Stober

Artificial Intelligence Lab at OVGU Magdeburg

contact: valerie.krug@ovgu.de
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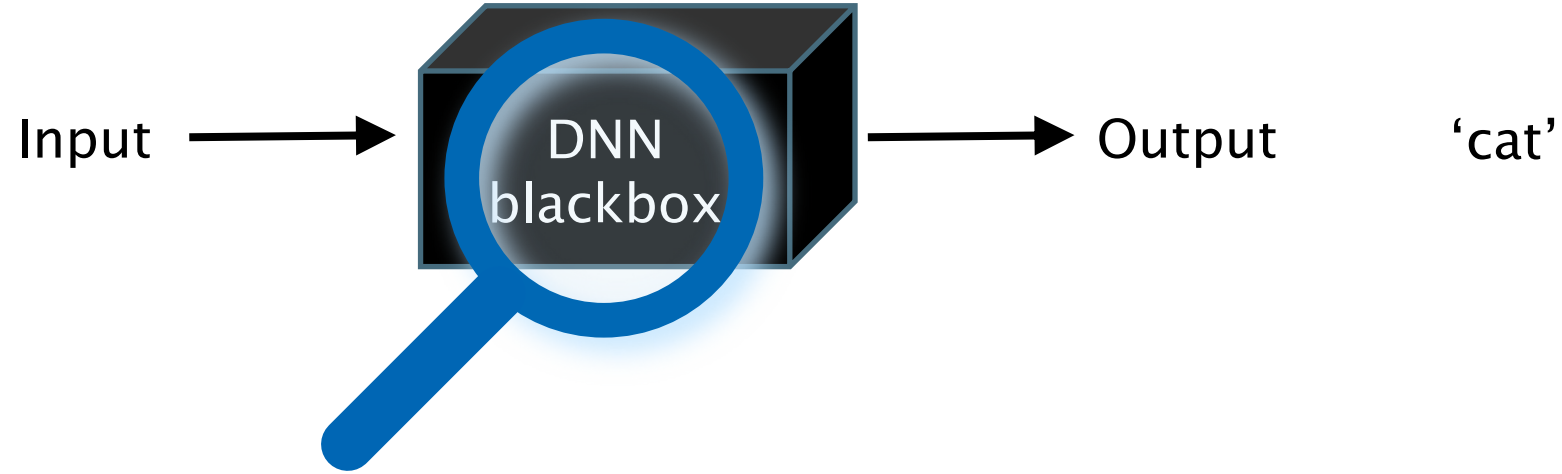
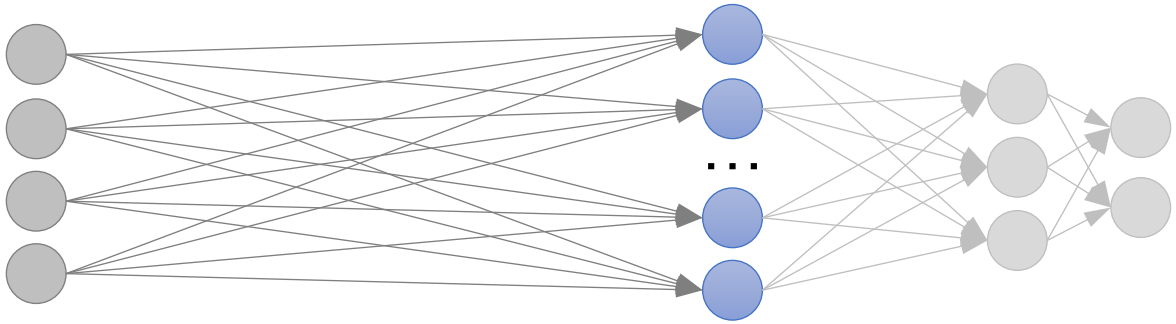
Uncertainty meets Explainability

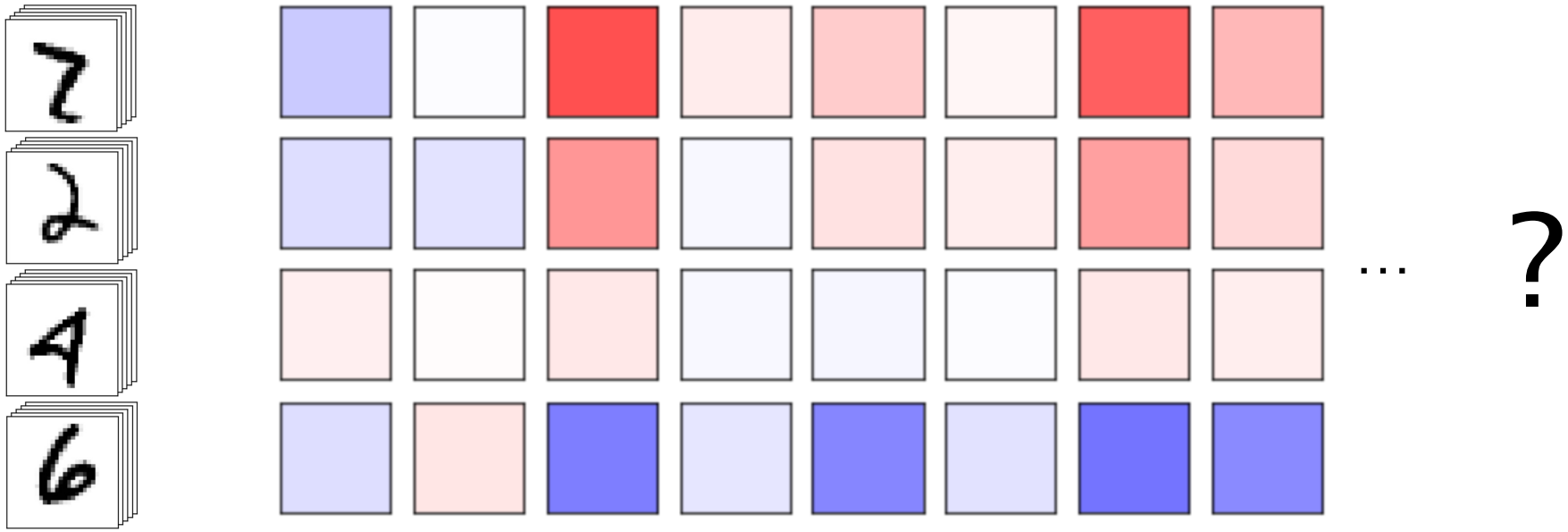
GEFÖRDERT VOM Bundesministerium für Bildung und Forschung

Uncertainty meets Explainability

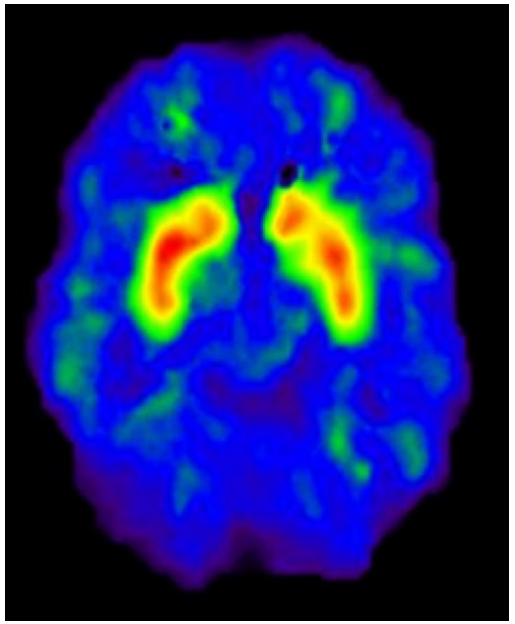


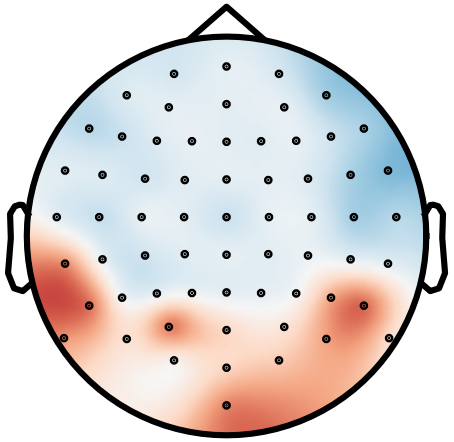
DNN Activations are not Visually Interpretable

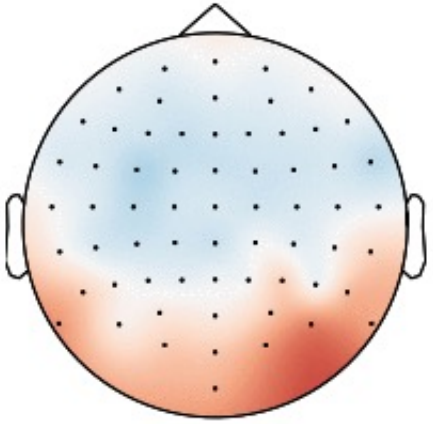




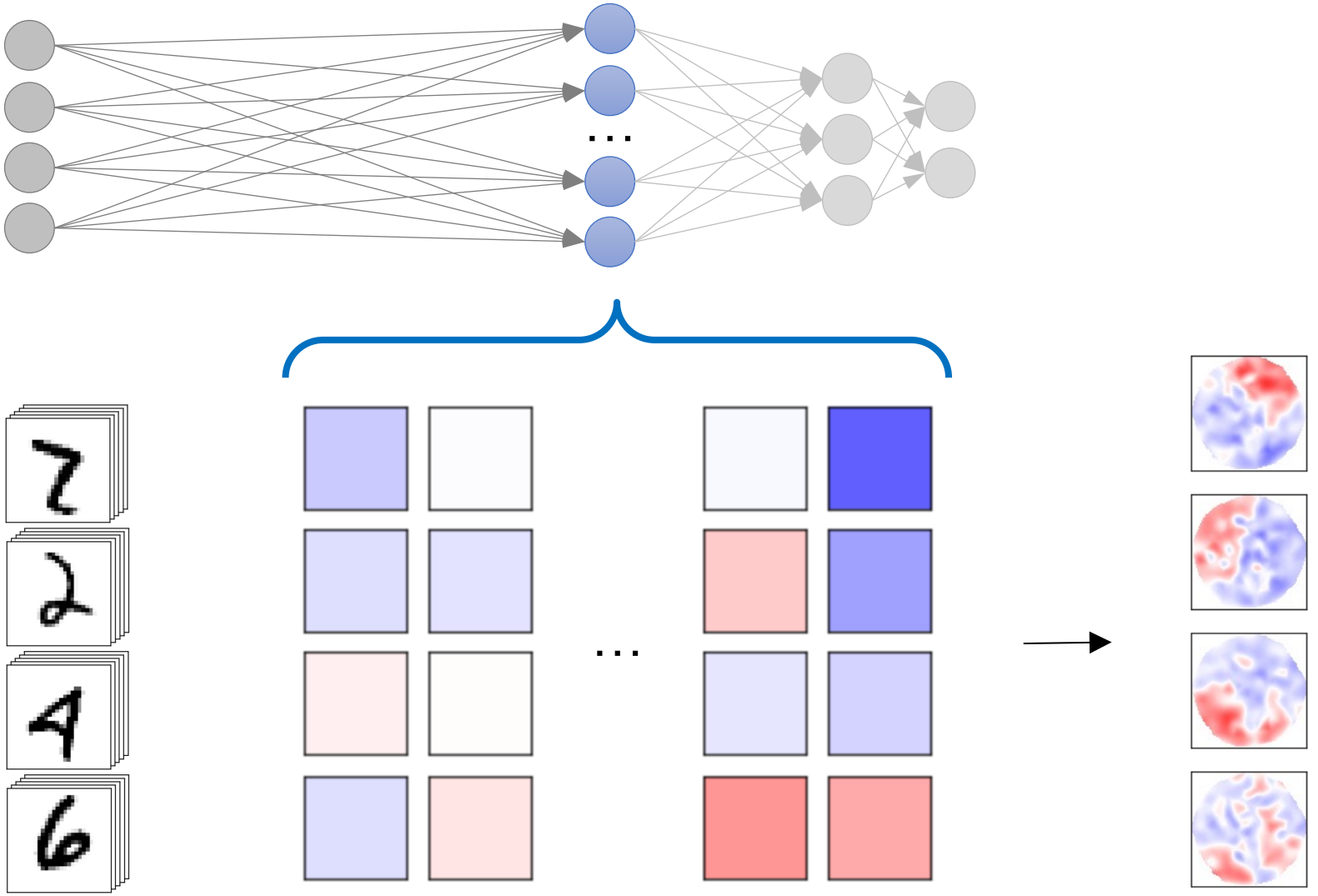
Visualizing Brain Activity



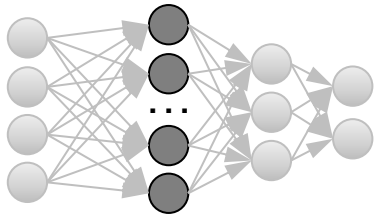




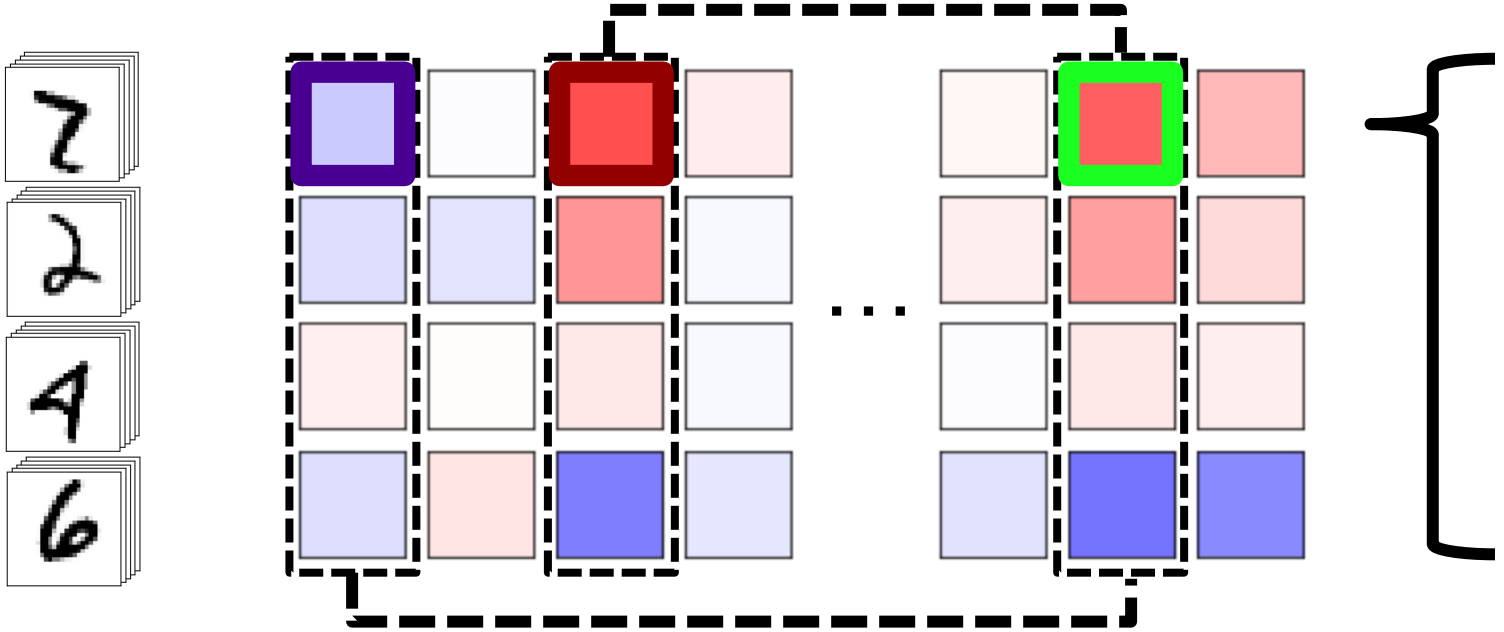
Visualizing DNN Activations



Topographic Activation Maps



high activation similarity across groups
→ small distance in layout



low activation similarity across groups
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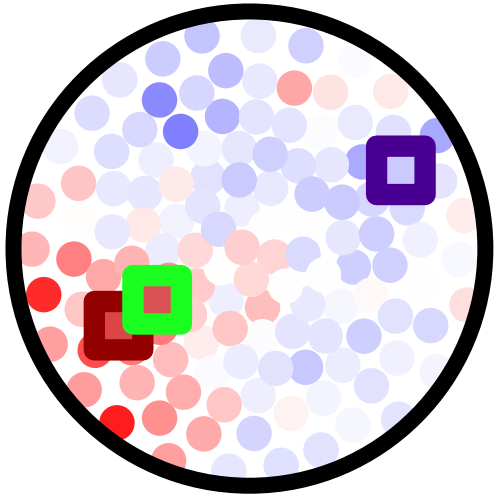
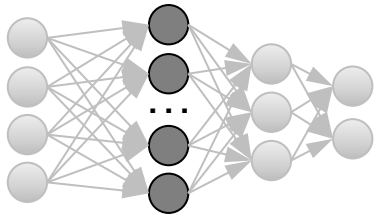


layouted neurons
colored by activation
values for group ‘7’

Topographic Activation Maps



high activation similarity across groups
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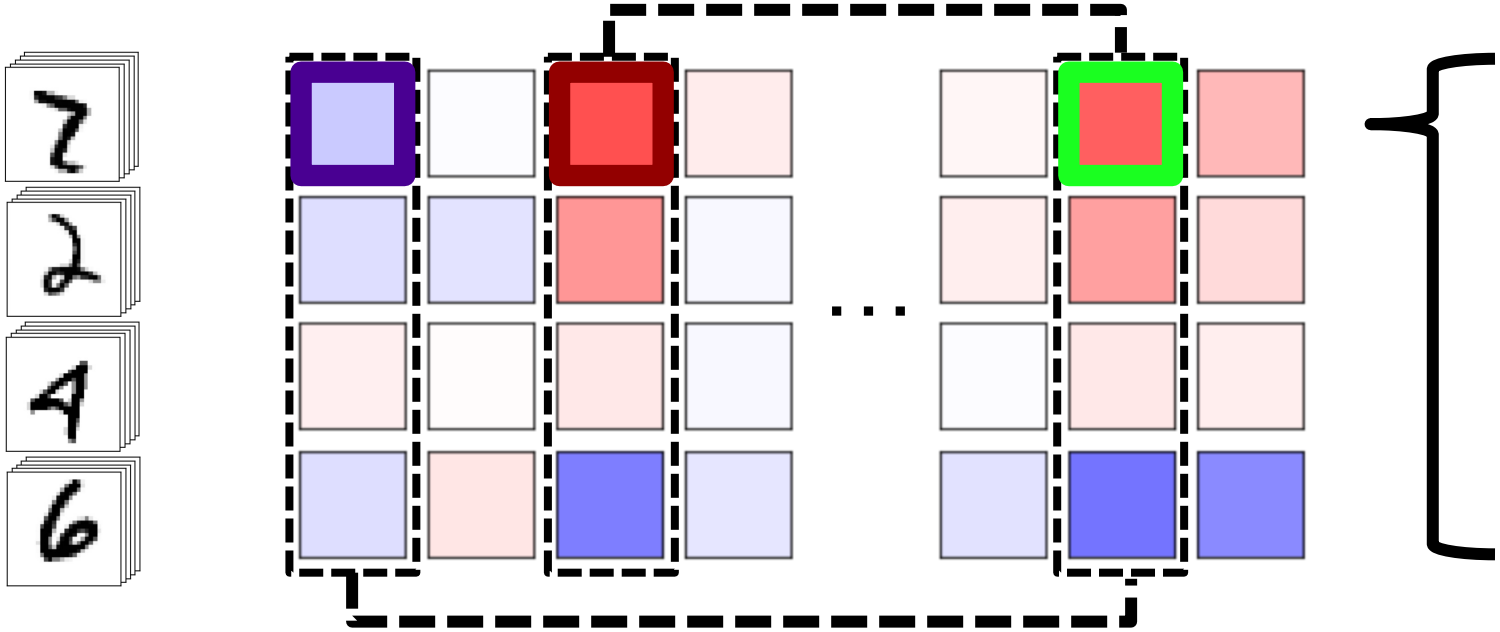
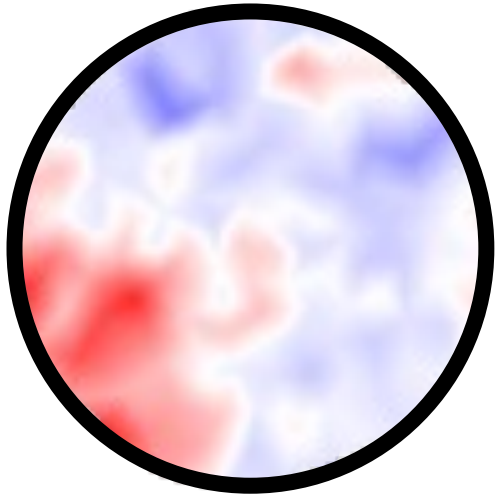


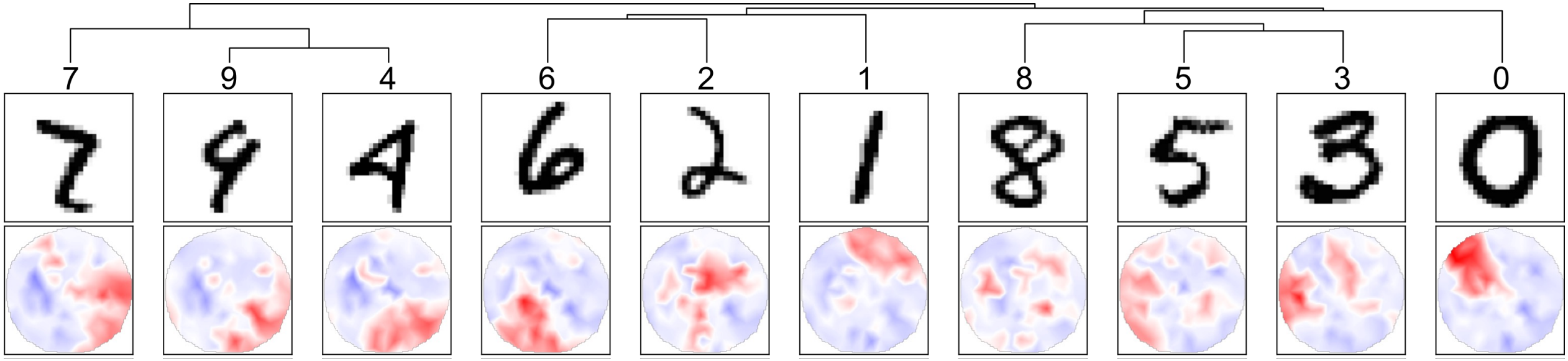
low activation similarity across groups
→ high distance in layout



layouted neurons
colored by activation
values for group ‘7’

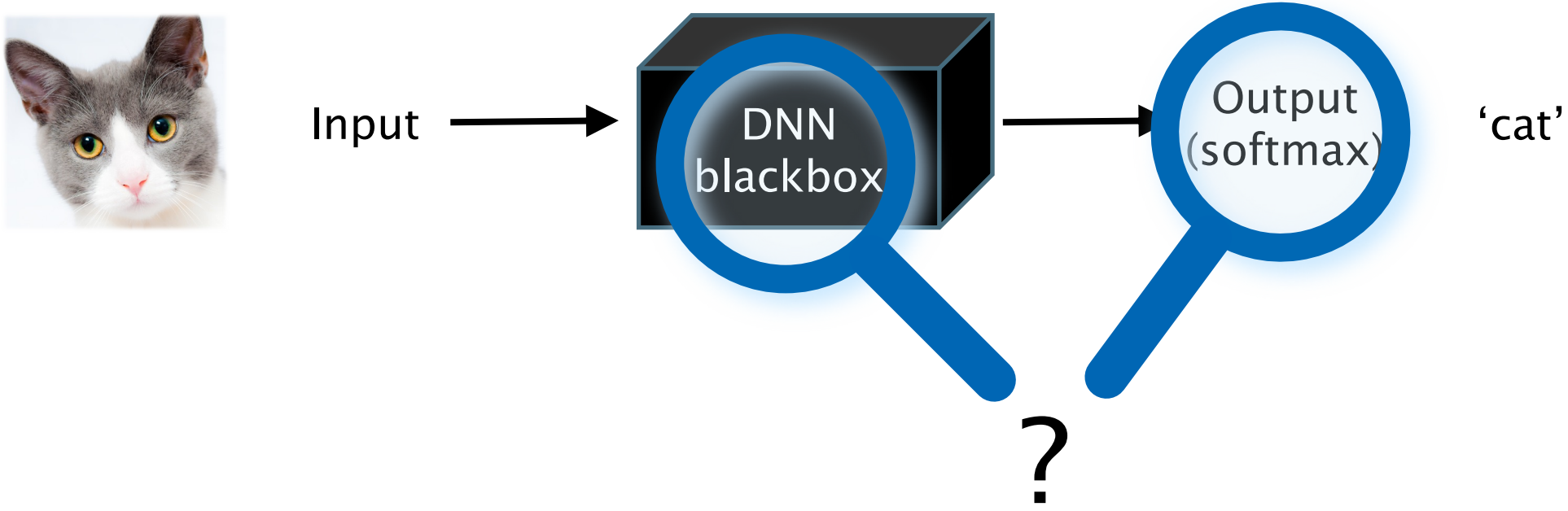
Comparing Groups with Topographic Maps

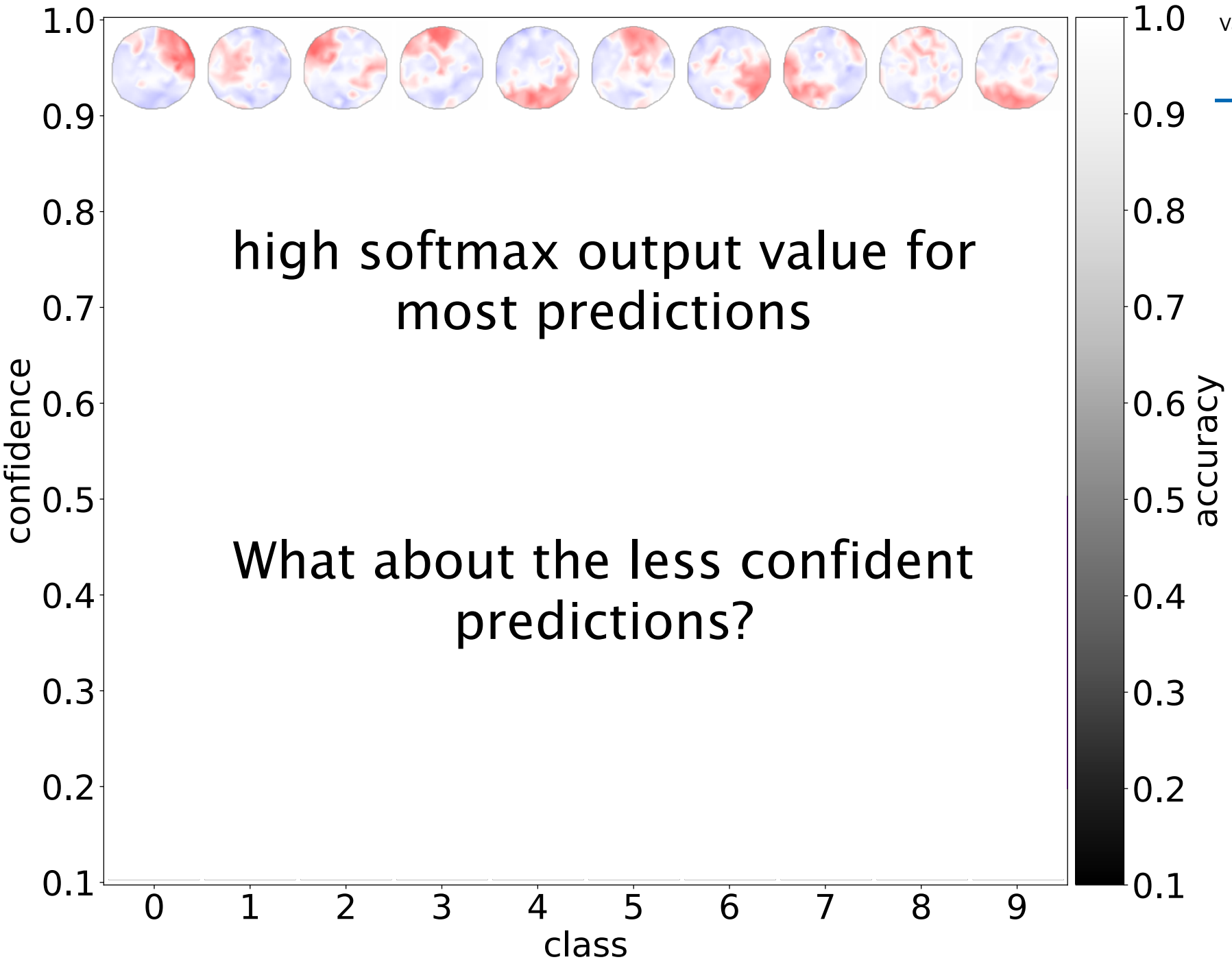
same layout, different activity per group

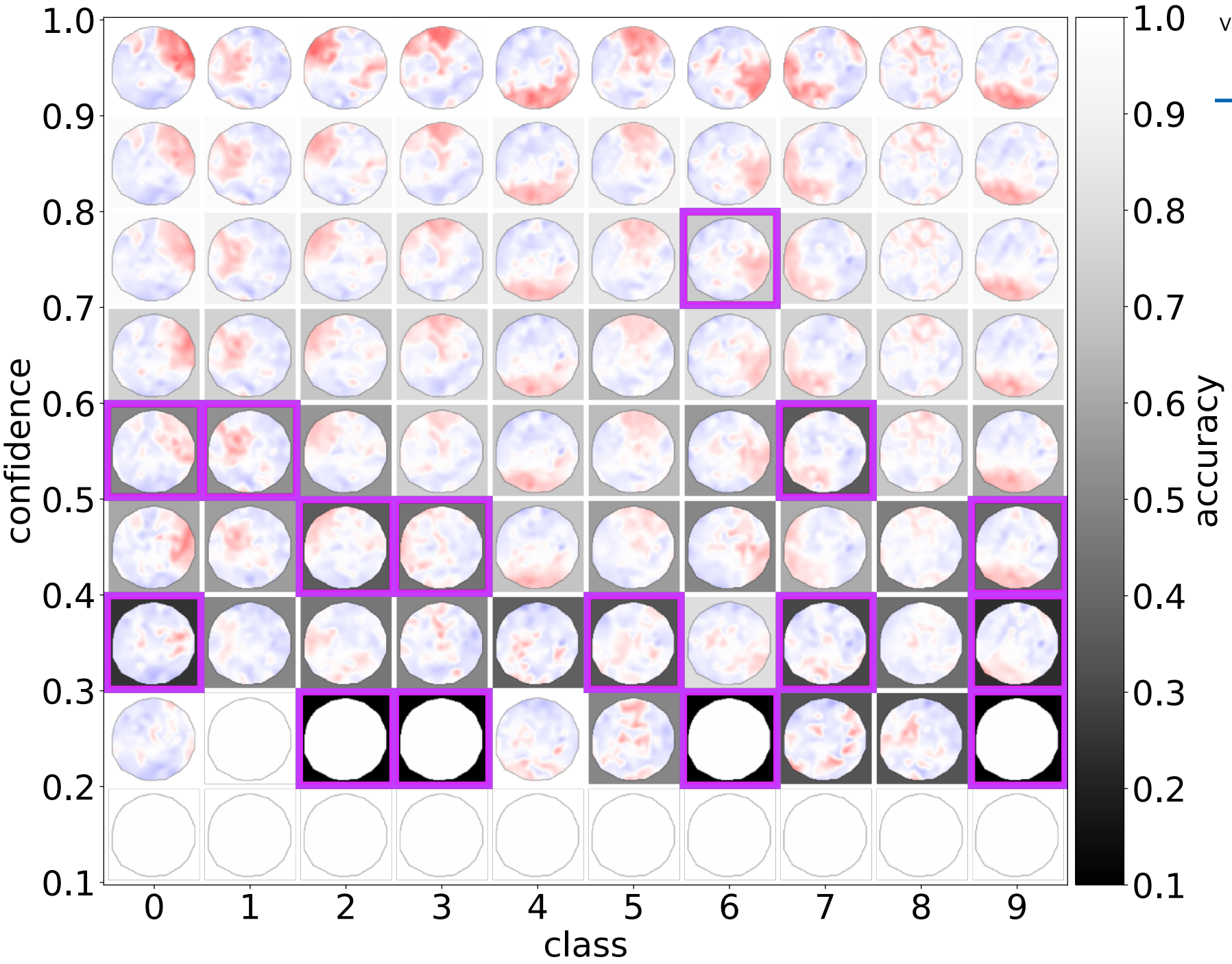


Krug et al. (2023). Visualizing Deep Neural Networks with Topographic Activation Maps. In HHAI 2023: Augmenting Human Intellect, pages 138–152. IOS Press.

Uncertainty meets Explainability




high softmax output value for most predictions
What about the less confident predictions?
confidence
class
accuracy
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1
2
3
4
5
6
7
8
9


1.0
0.9
0.8
0.7
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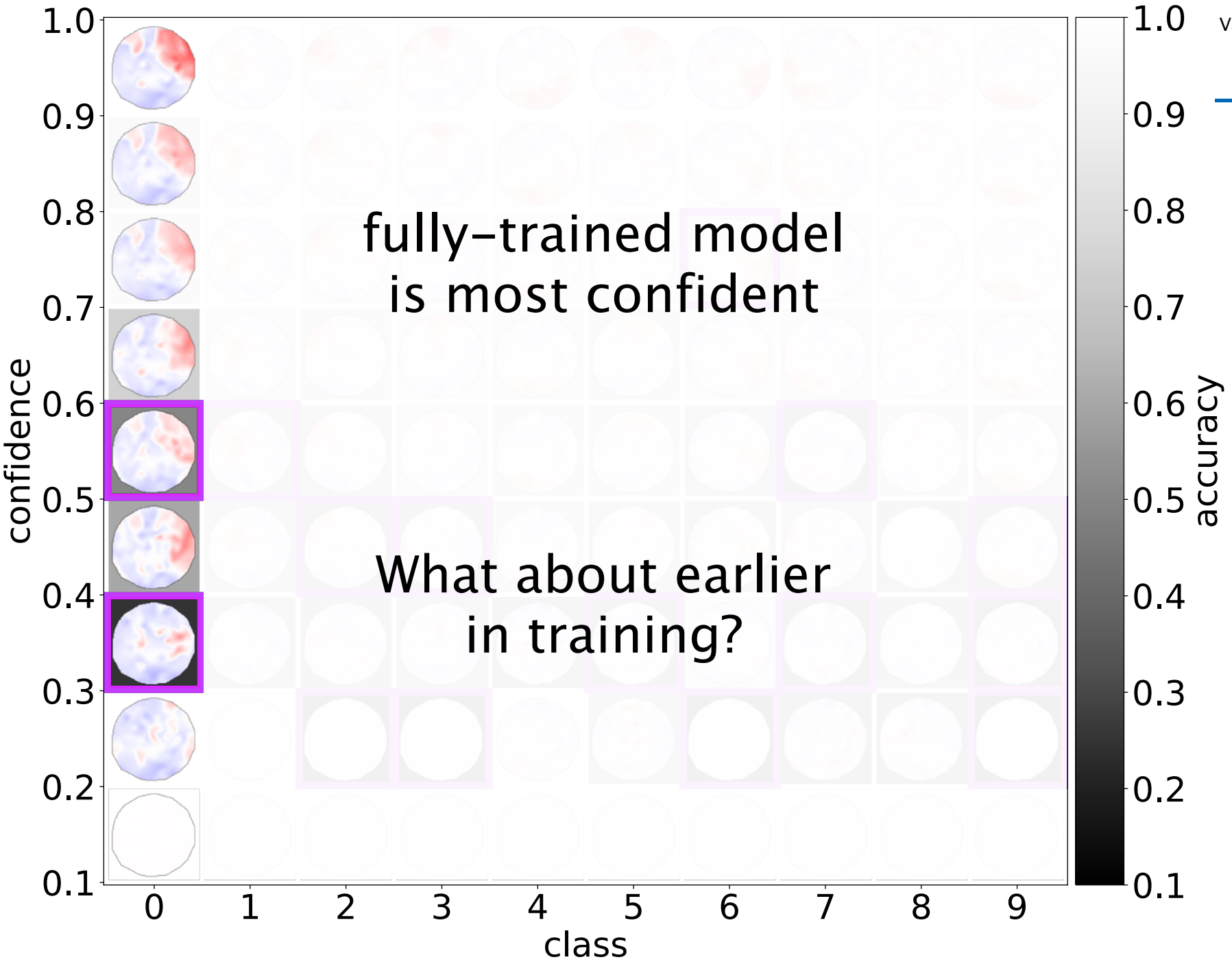
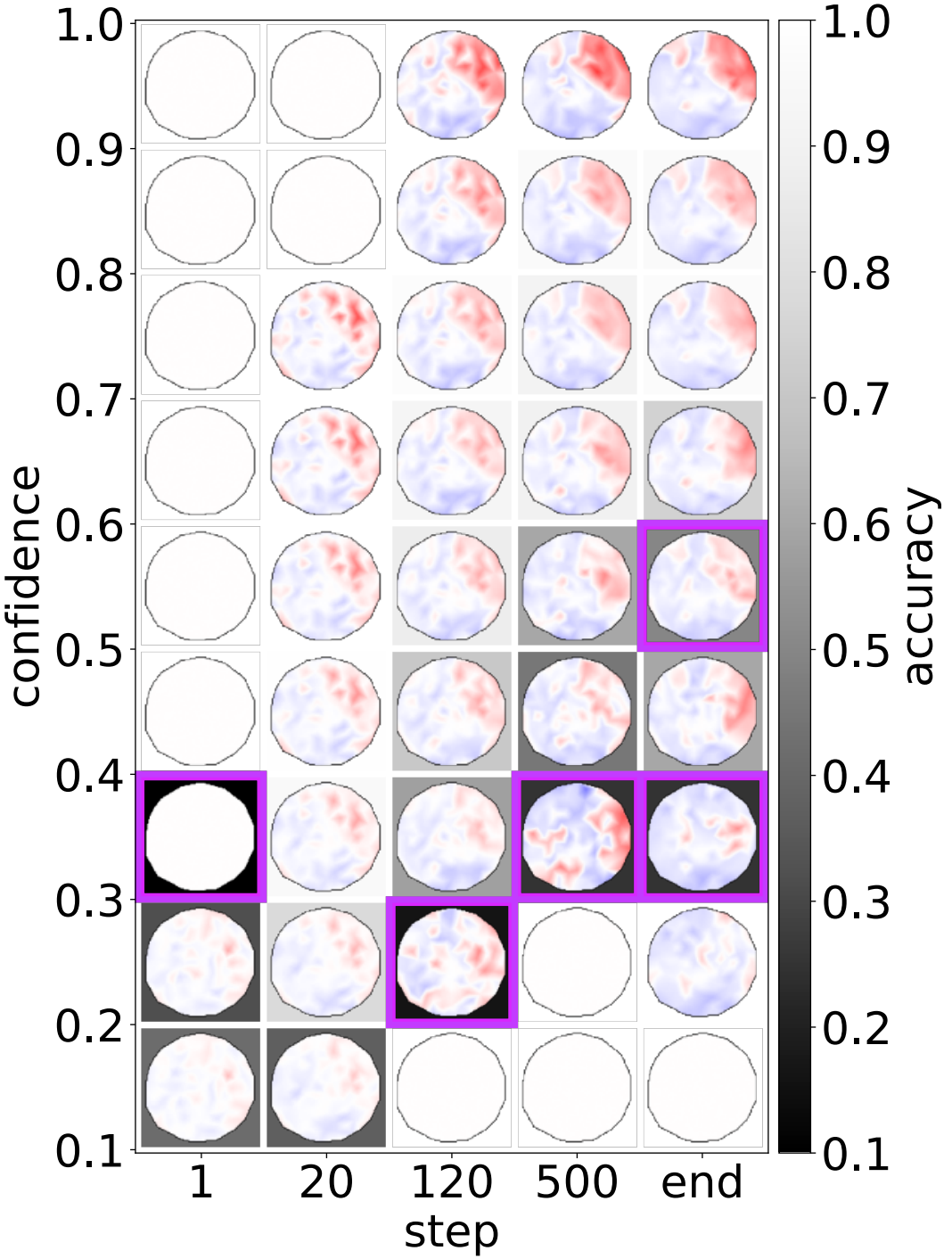
0.4
0.3
0.2
0.1
confidence
0
1
2
3
4
5
6
7
8
9
class
accuracy
overconfidence
confidence
>
accuracy



overconfidence

confidence
>
accuracy



overconfidence

confidence
>
accuracy

Future work

Investigate:

- more complex models
- longer training times (with potential overfitting)
- more sophisticated confidence measures

Acknowledgements

Thanks to

- my co-authors
  Chris and Sebastian
- AI Lab @ OVGU Magdeburg

- BMBF for funding

- You for your attention

http://ai.ovgu.de/

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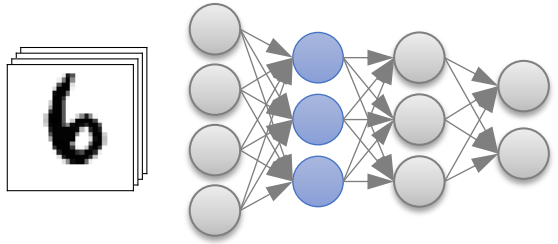

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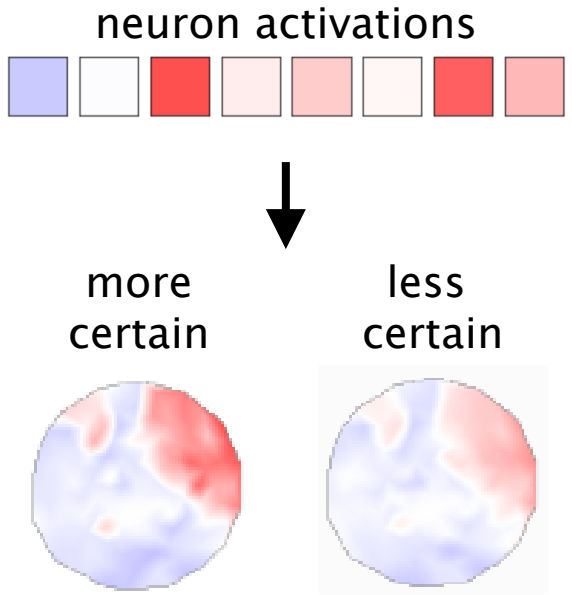
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