Notes on the Theory of Networks for Approximation and Learning

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# Introductory Notes

Learning an input-output mapping from a set of examples, of the type that many neural nets have been constructed to perform, can be regarded as synthesizing an approximation of a multi-dimensional function, that is solving the problem of hypersurface reconstruction. From this point of view this form of learning is closely related to classical approximation techniques, such as generalized splines and regularization theory. We would like to investigate

# References

[1] [A Theory of Networks for Approximation and Learning, T. Poggio et al, 1989](https://github.com/dimitarpg13/statistical_learning_and_kernel_methods/blob/main/literature/articles/learning_as_approximation/A_Theory_of_Networks_for_Approximation_and_Learning_Poggio_Girosi_1989.pdf)

[2] [The Statistical Mechanics of Learning A Rule, T. Watkin et al, 1993](https://github.com/dimitarpg13/statistical_learning_and_kernel_methods/blob/main/literature/articles/learning_as_approximation/The_Statistical_Mechanics_of_Learning_A_Rule_1993RevModPhysWatkin.pdf)

[3] [Statistical Mechanics of Learning, Andreas Engel, 1999](https://github.com/dimitarpg13/statistical_learning_and_kernel_methods/blob/main/literature/articles/learning_as_approximation/Statistical_Mechanics_of_Learning_Engel_1999.pdf)

[4] [The Peaking Phenomenon in Semi-Supervised Learning, JH Krijte, M. Loog, 2016](https://github.com/dimitarpg13/statistical_learning_and_kernel_methods/blob/main/literature/articles/learning_as_approximation/The_Peaking_Phenomenon_in_Semi-supervised_Learning_Krijthe_2016.pdf)

[5] [Reconciling modern machine learning practice and the bias-variance trade-off, Mikhail Belkin et al, 2019](https://github.com/dimitarpg13/statistical_learning_and_kernel_methods/blob/main/literature/articles/learning_as_approximation/Reconciling_modern_machine_learning_practice_and_the_bias-variance_trade-off_Belkin_2019.pdf)

[6] [Kolmogorov-Arnold representation theorem, WIkipedia](https://en.wikipedia.org/wiki/Kolmogorov%E2%80%93Arnold_representation_theorem)

# Appendix

## Kolmogorov-Arnold Representation Theorem