Data Science Toolbox Portfolio Questions

07 Perceptrons and Neural Networks

Daniel Lawson — University of Bristol

Block 7

Portfolio 07

Choose **one question** and write up to **one page** about it. You are free to conduct further experiments to add weight to your results, and any additional material you generate can be submitted as an appendix. See The Assessment Page for advice.

These questions may make reference to the content from the current block.

Question R07.1:   Read Section 5 on Layer-wise relevance propagation (LRP) from Methods for interpreting and understanding deep neural networks. Explain what LRP is, and how it extracts interpretable features. Potentially referencing the keras-explain manual, discuss any practical constraints.

Question R07.2:   Consider the paper On Calibration of Modern Neural Networks, paying particular attention to "Temperature scaling". Explain this, by a) explaining what the calibration problem of neural networks is, b) explaining how we know a model is calibrated, and c) how temperature scaling addresses this problem.

Question R07.3:   In The Tradeoffs of Large Scale Learning it is shown that if we take into account approximation error, estimation error and optimization error, then Stochastic Gradient Descent can be seen to converge faster in terms of compute cost than regular Gradient Descent (Table 2). Describe just what is needed to interpret the key results for GD and SGD, for "small scale" and "large scale learning" and briefly interpret in terms of learning neural networks.