ANN Lab 4
Restricted Boltzmann Machines and Deep Belief Nets

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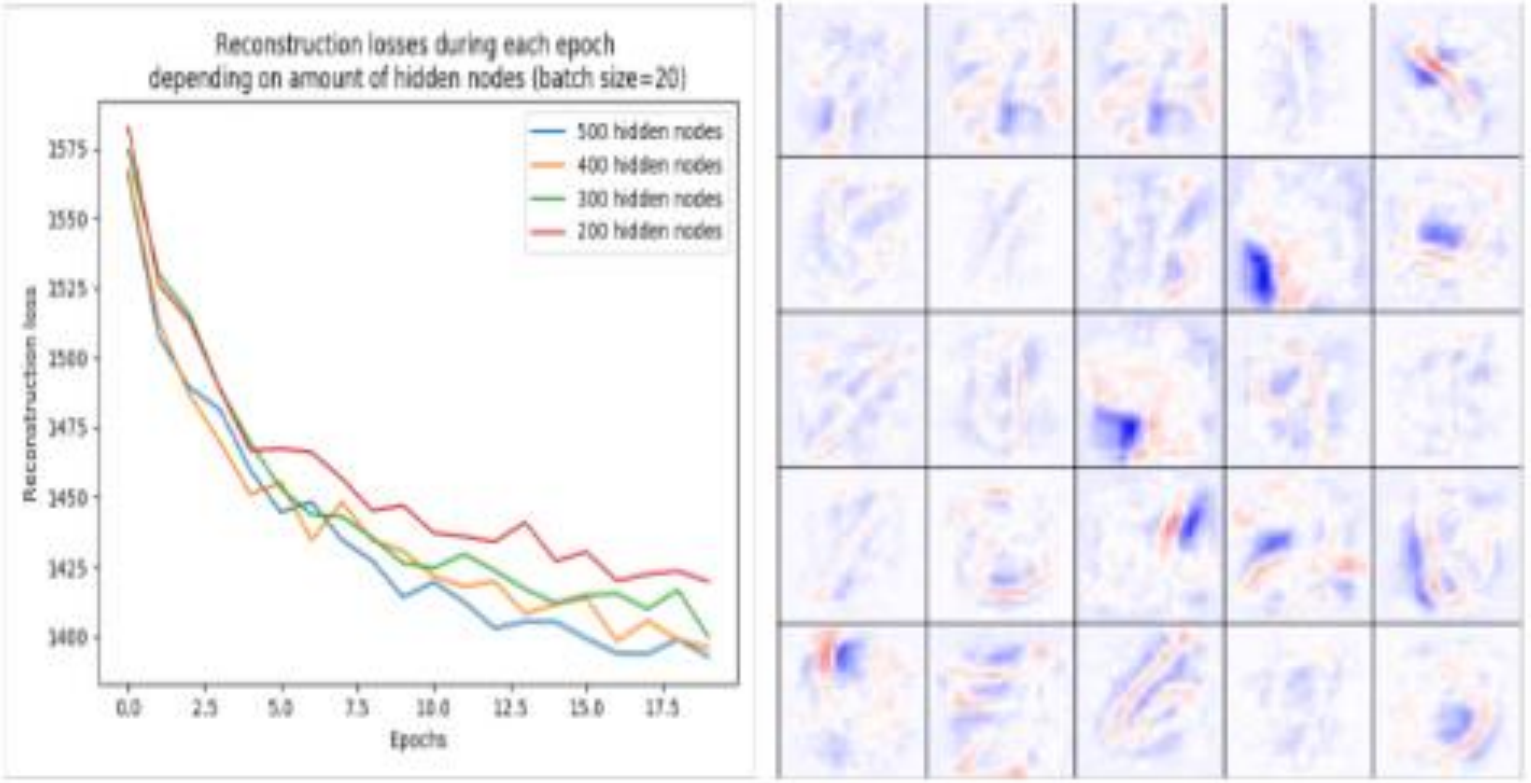
RBM for recognising MNIST image

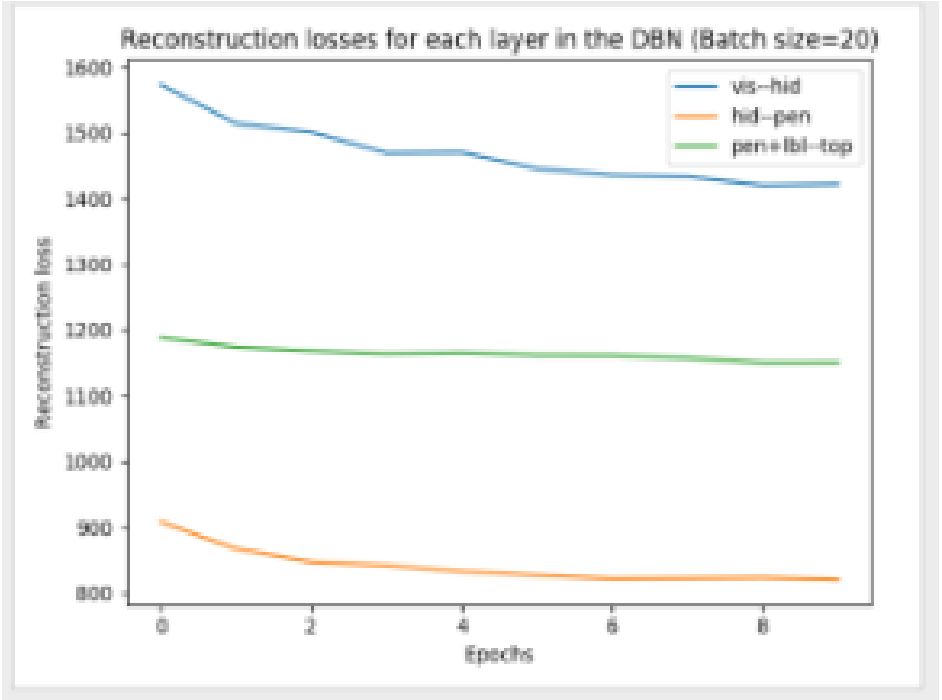


(a) Learning curves (b) Receptive fields

Figur 1: VIS-IIID RBM

Deep Networks - Greedy Layerwise Pre-training

- Extended the single-hidden layer network to a deeper architecture by following the idea of greedy layer-wise pretraining

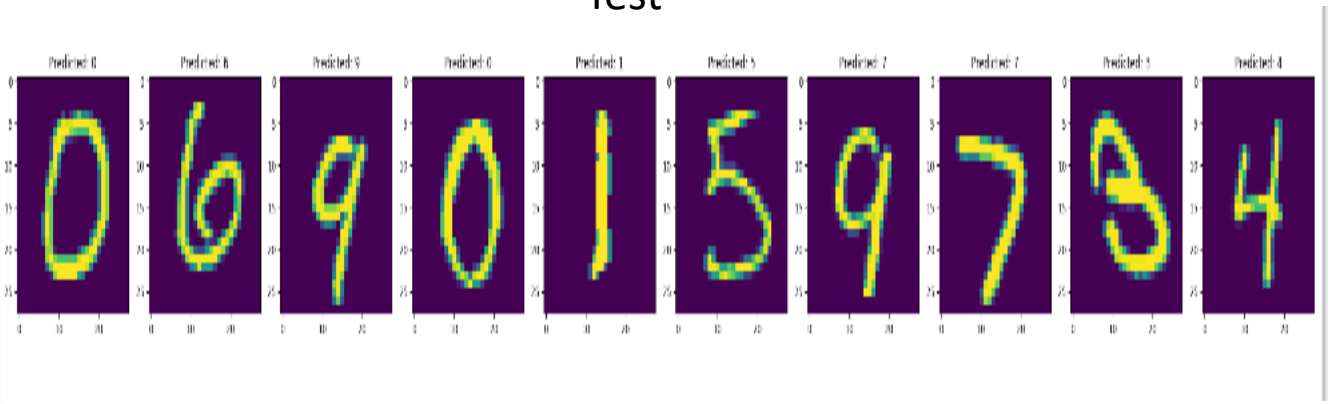


Figur 2: Reconstruction loss at different layers

Image Recognition

Dataset	Average Accuracy
Train	83.76
Test	83.43

Test



Training

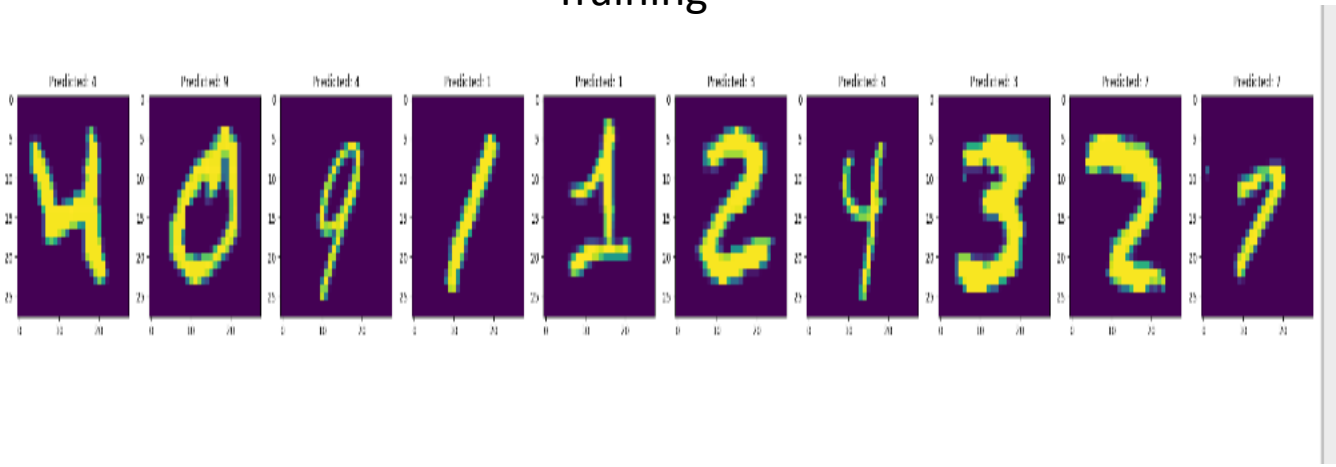
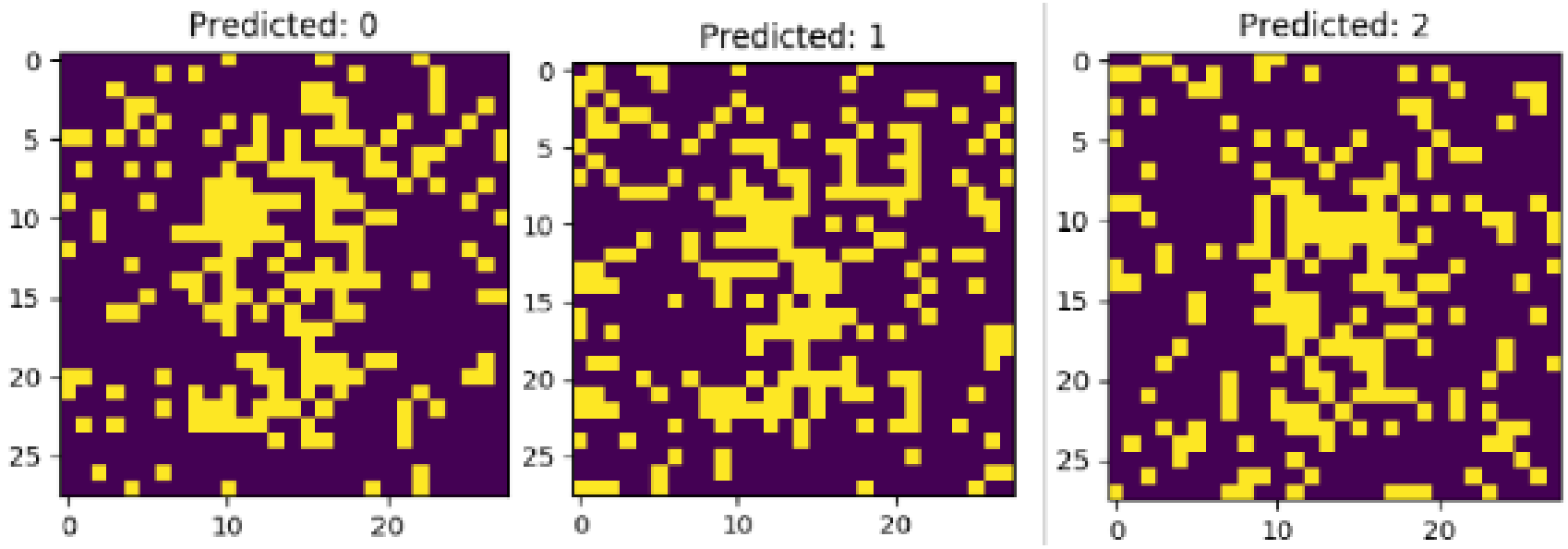


Figure shows some samples and their estimated labels. As you can see some of them are incorrect.

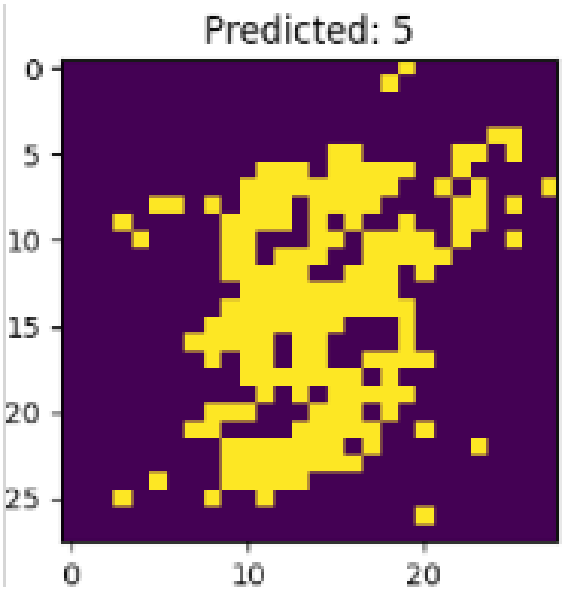
Image Generation

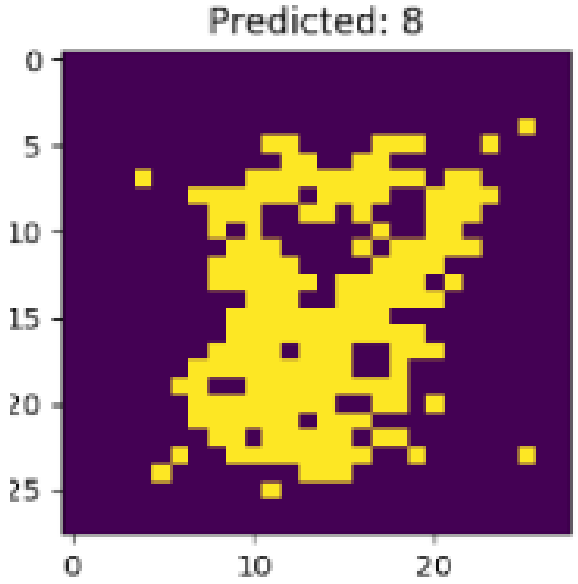


Supervised fine-tuning of the DBN

Dataset	Average Accuracy
Train	79.34
Test	79.03

Fine tuning significantly increases the performance of image generation and very slightly lowers the performance of image recognition





Simpler architecture

- The DBN that we had been using until now had the structure (784, 500, 500+10, 2000).
- We explored using a simpler architecture (784, 500+10, 2000).

- Results after fine tuning -
  - Training – 79.05
  - Test – 79.14

Final Remarks

- This was a useful assignment to get deeper knowledge about RBMs and DBNs.
- However, we found this lab to be the hardest of all others and one of the main challenges of this assignment was the run-time.
- Also, the theory as well as the implementation of DBNs was quite difficult to grasp.
- The provided code skeleton helped us in that regard!