Feedback Neural Networks Best Explain Human Object Recognition on Degraded Images

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Presentation Abstract Summary Feedforward neural networks are currently the dominant model to understand human object recognition. The visual cortex has more feedback connections than feedforward, which enable humans to robustly recognize degraded objects. A computational model of feedback has not yet been evaluated as a model for human object recognition. In this work, we test the hypothesis that a feedback neural network correlates closely to human behaviour and outperforms feedforward networks in recognition of degraded objects. A number of architectural extensions to the standard feedforward network is proposed with the introduction of feedback loops at different hierarchical levels. The computational models are evaluated on a noisy MNIST dataset and further compared against human behaviour to demonstrate its biological plausibility. Our results show that feedback models outperform feedforward model at different noise levels. Testing for human object recognition performance, increased reaction time is observed with increase in image noise level. Furthermore, feedback models have higher correlation to human performance compared to feedforward networks. Our results suggest that feedback networks are essential for object recognition and match human object recognition better than the standard feedforward models.

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