Unicycling Helps Your French: Spontaneous Recovery of Associations by Learning Unrelated Tasks

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May 1995 — revision October 1995

Abstract

We demonstrate that imperfect recall of a set of associations can usually be improved by training on a new, *unrelated* set of associations. This spontaneous recovery of associations is a consequence of the high dimensionality of weight spaces, and is therefore not peculiar to any single type of neural net. Accordingly, this work may have implications for spontaneous recovery of memory in the central nervous system.

1 Introduction

A spontaneous recovery effect in connectionist nets was first noted in (Hinton & Sejnowski, 1986), and analysed in (Hinton & Plaut, 1987). A net was first trained on a set of associations, and then its performance on this set was degraded by training on a new set. When retraining was then carried out on a proportion of the original set of associations, performance also improved on the remainder of that set.

In this paper a more general effect is demonstrated. A net is first trained on a set of associations, called task $\mathcal{A}$; and then performance on this task is degraded, either by random perturbations of the connection weights, or as a result of learning a new task $\mathcal{B}$. Performance on $\mathcal{A}$ is then monitored whilst the net is trained on another new task $\mathcal{C}$. The main result of this paper is that in most cases performance on the original task $\mathcal{A}$ initially improves.

The following is a simplistic analogy, which assumes that this effect carries over to human learning of cognitive tasks. If you have a French examination tomorrow, but you have forgotten quite a lot of French, then a short spell of learning some new task, such as unicycling, can be expected to improve your performance in the French examination. Students of French should be warned not to take this

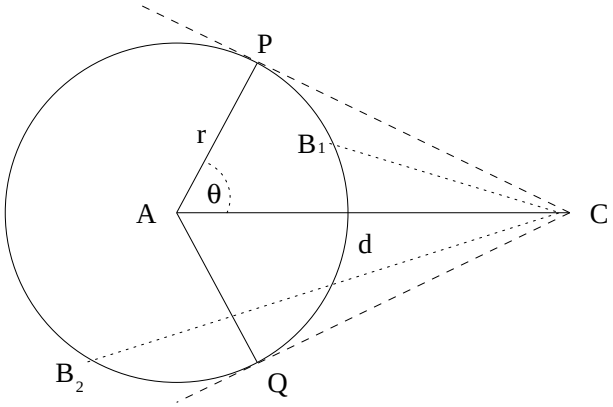
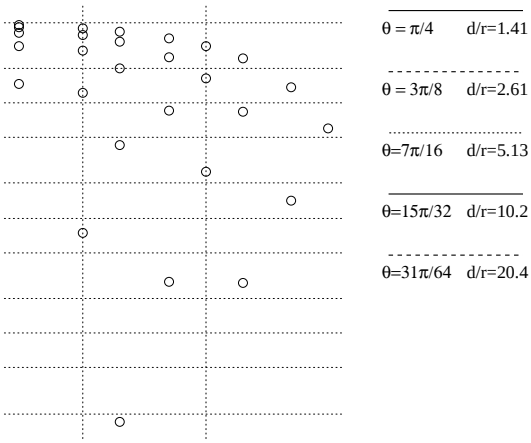


Figure 1: *The circle is a 2-D representation of hypersphere $\mathcal{H}$. Initial movement from a point B on the circumference towards C has two possible consequences: trajectory $B_1 \rightarrow C$ is outside $\mathcal{H}$, whereas $B_2 \rightarrow C$ intersects $\mathcal{H}$.*



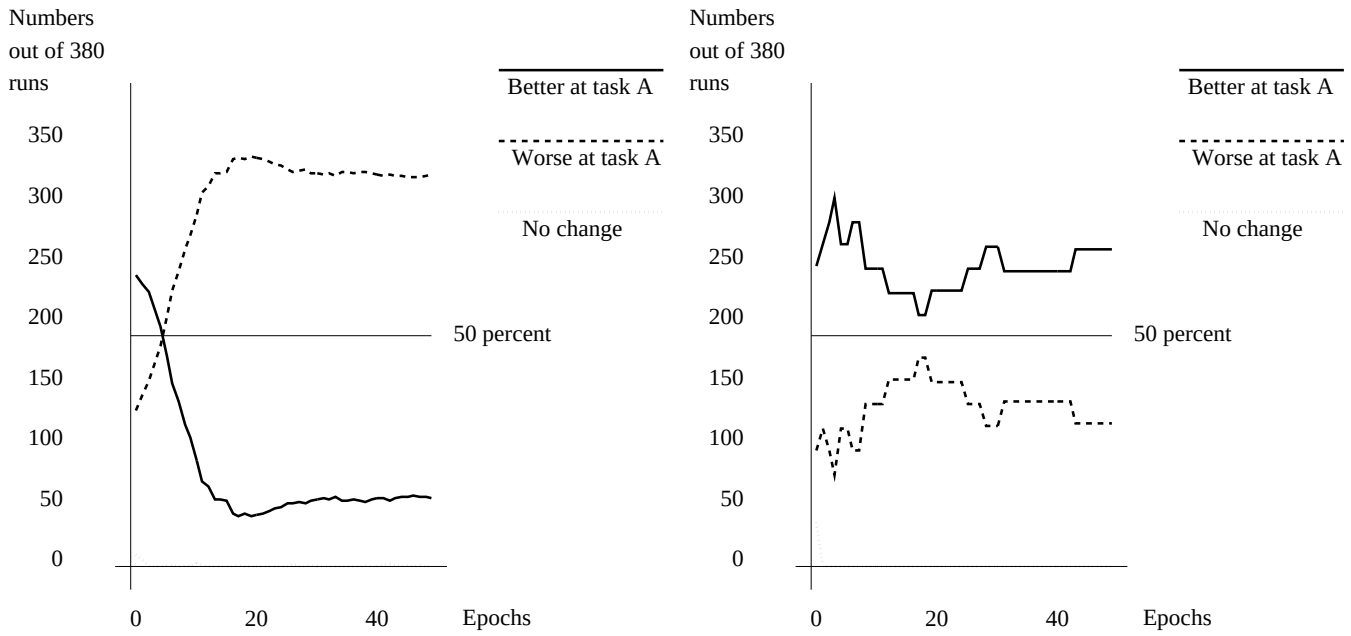


Figure 3: *Graphs of 380 runs, showing numbers improving in performance on $\mathcal{A}$, during 50 epochs of training on $\mathcal{C}$. On the left, experiment 1, the weight vector W was perturbed from A to B by training on task $\mathcal{B}$. On the right, experiment 2, W was perturbed by a randomly chosen vector of length 7 from A to B.*

5 Discussion

A new effect has been demonstrated, such tha2e/R65d059.7(ep)4M453000.3(50)-1u3000(a)-12999.7(eh)-11000.4(task)]TJ/R

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