# Replication of Tyler et al. (2000)

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## 1 Replicating the Model

The focus of replication is the modelling account presented in the following journal article:

> Tyler, L. K., Moss, H. E., Durrant-Peatfield, M. R., & Levy, J. P. (2000). **Conceptual structure and the structure of concepts: A distributed account of category-specific deficits**. *Brain and language*, 75(2), 195-231.

In terms of the code you have written so far, it is relatively straightforward to replicate what Tyler et al. (2000) have done provided you can find the values for the implemetation parameters and other modelling properties of the network. *Before* you attempt any changes to your code answer the following questions to help clarify what needs changing:

1. Describe the input and target patterns. (Do not bother typing these in yourself, I will give them to you.)
2. What learning algorithm is being used?
3. List the values and names of the parameters to do with learning (e.g., the learning rate).
4. Decsribe the network architecture: how many, how wide, and what types of layers are used?
5. How are the weights initialised?
6. Consider the connectivity of the model: are there any recurrent connedctions?
7. What type and size of epochs are used?
8. Are there any ambiguities in the description of the model?

Now apply the above to your code. If you need a fresh copy of the network you can always download it again. If you need the patterns I have supplied them as a `.csv` file and you may open them using the following command:

```
Patterns = np.genfromtxt('tyler_patterns.csv',
                         delimiter=',',
                         dtype=int,
                         skip_header=1)
```

The only reason above that I changed line and did not list each of the arguments within the brackets on the same line is to be tidy on this document. In Python, you do not need to have any space between the arguments — they can all be on the same line.

When you have applied all of the above, answer the following:

1. Would the network still learn with minor or dramatic changes to any of the above?
2. Whatever your answer above what would that imply for the model? What about for the theory more broadly?
3. How do you know if your replication has worked for the "healthy" model?

# 2 Thinking about the Conceptual Structure Account

In order to successfuly replicate the model you must understand both the theory and the implementation details of the model. In other words, it is important to understand what the Tyler et al. (2000) account is — what explanations, hypotheses, predictions, does their framework provide?

Apart from training on the given patterns and evaluating its performance, which you are expected to do as part of this week's practical, it is important to be able to articulate what it is the model is and is not capturing. So while you (re)read the paper make sure to think about more cognitive, methodological, and theoretical, questions:

1. What theory is this model part of?
2. What assumptions does the theory make?
3. What assumptions does the model make?
4. Which implementation details are central to the model and which are not?
5. Which imprelemtation details are central to the theory and which are not?
6. Does the model uniquely support a theory? Do results from the model lend support only to one theory?
7. What mechanism(s) is the model proposing?
8. What are the models predictions?
9. Can the model account for data it has not seen? If so, how — if not, why not?

# 3 The Next Step

In addition, to thinking about the original authors' work, consider what you can do with your knowledge of their model:

1. What kind of text would you like to run on the model? If you want to recreate the exact results presented in Tyler et al. (2000), which involves removing weights, think about how this might be done. Otherwise, think of other useful ways of evaluating the model of healthy semantic cognition, might there be other variables you can play with other than lesioning (i.e., setting to zero) subsets of weights? This is up to your own judgement and you may perfeorm any number of experiments on the model motivated by your own curiosity and a sensible rationale.

2. In addtion, you may propose some extra features to be added to the model. What kind of augmentation to the model would you propose? This is optional and can be anything you think is appropriate; again a sensible motivation and a clear modelling goal are all that is required.