# Informatics 1 Cognitive Science – Tutorial 2, Part 2

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## Week 3

This tutorial has two aims. First, you will learn to read and understand a research paper in cognitive neuroscience. Research papers tend to be technical and precise, and sometimes hard to follow if you are not an expert in the relevant field. The paper chosen here is no exception, but the background you have from the lectures will help you to get the main points:

Maguire, E. A., Gadian, D. G., Johnsrude, I. S., Good, C. D., Ashburner, J., Frackowiak, R. S., & Frith, C. D. (2000). Navigation-related structural change in the hippocampi of taxi drivers. Proceedings of the National Academy of Sciences, 97(8), 4398-4403. `https://www.pnas.org/content/97/8/4398.short`

As a neuroimaging study it contains some technical details about the experiments (the scanning parameters for instance) that are not really relevant for understanding the main results, but important for experts to see the study was technically solid. Such details can therefore be ignored.
We will ask how much we can learn about the brain by looking just at anatomy, without measuring activity. The paper describes an analysis that Eleanor Maguire[1] carried out of structural brain scans from London taxi drivers. These taxi drivers are special (in many ways, but here we focus on their navigation skills): to obtain a license, they have to "Learn the Knowledge of London"[2], which requires them to know 320 routes within the six-mile radius of Charing Cross. This not only means memorising around 25,000 streets, but also how they are connected.

Some potentially unfamiliar terms explained:

**Voxel-based morphometry, VBM** A method for analysing MRI scans where each scan is first aligned to an average brain. This allows identification of different brain areas.

**Anterior/posterior hippocampus** Anterior is an anatomical term that refers to the front, and posterior to the back (cf.lectures). This distinction is made here to describe different parts of the hippocampus. Figure 2 illustrates this.

**ANOVA** Stands for Analysis of Variance, a type of statistical hypothesis testing based on comparing mean values between groups. Used here to find potential confounders that can explain the observed differences.

**Sagittal section** A section (e.g. a 2D scan) along the plane that divides the body in left and right.

**Coronal section** A section that divides the body in front and back.

**Z score** Number of standard deviations a measured value is away from the mean.

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[1] `https://en.wikipedia.org/wiki/Eleanor_Maguire`
[2] `https://tfl.gov.uk/info-for/taxis-and-private-hire/licensing/learn-the-knowledge-of-london`