**Practical Assignment 3**

Version 1.0

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**Before you begin**

Please follow the instruction in the Appendix

**Introduction & Motivation**

Many types of experiments compare behavioral or neurophysiological responses to variations of visual stimuli. With all else being equal, the variations in the stimuli are then considered the source of any possible difference between these responses. When, for example, two conditions consist of differently oriented lines, interpretation is not that difficult since these conditions will only differ along one dimension: orientation. However, when using natural or other forms of complex images, these images may differ in many dimensions, including local and global contrast, local and global orientation, luminance, color, and so on. In fact, many studies have demonstrated image property differences as confounding factors when interpreting results. Therefore, understanding the basic image property differences between your stimuli is crucial for interpreting your results.

**Practical**

In this practical you will use a decoding method that includes multiple feature selection analyses to test if the basic image properties of two or more categories of image are sufficiently different to decode the categories. If this is the case, the relevant basic image properties may explain a hypothetical behavioral difference between the categories. For example, angry faces are thought to attract more attention than happy faces. However, if the image properties differ, this effect may be unrelated to the emotional content (e.g. the semantics/meaning) of the images. In this practical you will 1) test if two or more categories of image can be decoded via their basic image properties, 2) interpret your findings and 3) write a (very short) report (see below).

**Materials**

*Face Set*

On blackboard, you can find a stimulus set faces with different expressions. Note that the images provided on Blackboard are manipulated images for both copywrite as well as training exercise related reasons.

*Your Own Set*

Feel free to use your own stimulus. To keep the running time of the analyses relatively low (since it can already take rather long), keep the number of images per category below 100.

**Feature Settings:**

Please run your analyses on ‘Fourier Magnitudes Only’ or ‘Color Distributions’ (since these feature type are directly related to image properties confounds) for either greyscale or color images.

**Report**

Write a report in groups of 3-5. It should be about 1-2 A4 and that contains the following sections:

1) Summary

*Summarize your finding regarding your analysis and conclusion.*

2) Introduction & Motivation

*What categories will you compare, for what stimulus property (feature) and why?*

3) Methods

*Report your methods (feel free to generate* ***and edit*** *this via protosc\_report\_methods(outputvariable))*

4) Results

*Report your results (feel free to generate* ***and edit*** *this via protosc\_report\_results(outputvariable)))*

5) Interpretation & Conclusion

*Interpret your results and explain if a comparison on a semantic level of the categories you choose is confounded by visual properties or not.*

Optional:

6) Solution

*If there is a visual property based confound, what sound be done to solve this issue?*

**Deadline Report:**

The deadline for the report is April 1st, 6pm. You can hand them in via

Blackboard/../Assignments/Assignment 3/Assignment 3. Only one group member needs to hand in the report. If you experience any issues, you can send it in via email (s.m.stuit@uu.nl).

**Appendix: Preparations for Practical Assignment 3**

In the practical we will work with Matlab and the Protosc Toolbox. Please finish the below steps ***before*** the practical.

**Getting Matlab:**

The MATLAB license of Utrecht University allows students (and faculty and staff) to install MathWorks software on their personally-owned computers.

1. Log in to the [MathWorks Portal](https://www.mathworks.com/academia/tah-portal/utrecht-university-31088092.html), using your @students.uu.nl email address. (If you don't have a MathWorks account, you may need to create one first.)
2. Download the installer for the 2019b (or later)version of MATLAB and run it.
   1. *Windows users: double click on the Installer named MATLAB\_<version number>\_win64.exe in your download folder.*
   2. *Mac users: double click on the Installer named MATLAB\_<version number>\_maci64.zip - which will extract the files in the folder named MATLAB\_<version number>\_maci64. Start the Installer by double clicking InstallForMacOSX.*
3. In the installer, select Sign in with a MathWorks Account and follow the instructions.
4. When prompted, select the Academic – Total Headcount license labeled MATLAB (Individual).
5. In the Product Selection screen, select the below products and then click Begin Install.
   1. Control System Toolbox
   2. Image Processing Toolbox
   3. Statistics and Machine Learning Toolbox
   4. Computer Vision Toolbox
   5. Parallel Computing Toolbox
   6. MATLAB Parallel Server
   7. Polyspace Bug Finder
      1. Note that the Protosc toolbox (next step) will also work without the Parallel Computing Toolbox and the MATLAB Parallel Server, just slower. Furthermore, when using Matlab 2021 MATLAB Parallel Server & Polyspace Bug Finder are not required.

**Getting Protosc:**

1. Go to <https://osf.io/f6nbu/files/> and download Protosc\_v1.03.zip and ProtoscTutorial.pdf
2. Open de tutorial pdf and follow the installation steps to add Protosc to your Matlab path.
3. When complete, type protosc\_app in your command window and press enter. An app window should appear.
4. Use the app to choose and load 2 or more categories of images. Then choose the settings of interest and click ‘run feature selection’.
5. Use the tutorial for help with running the analyses and the interpretation of the results.