**Classification Images Measured in a Same/Different Face Discrimination Task**

**Patrick J. Bennett1,2,3,4, Matthew Pachai1,2 & Allison B. Sekuler1,2,3,4**

1. Department of Psychology, Neuroscience and Behaviour, McMaster University, Hamilton, Ontario, Canada; 2. CIHR Strategic Training Program in Communication and Social Interaction in Healthy Aging; 3. CIHR Research Group on Sensory and Cognitive Aging; 4. Centre for Vision Research, York University, Toronto, Ontario, Canada

---

### Introduction

**Goal**

Deive a simple method for deriving a classification image from data collected in a same-different task.

**Problem**

The decision space for the same-different task is quadratic: internal responses that are positive and negative can cause the observer to respond “different”. Therefore, traditional methods of estimating a classification image do not work.

---

### Solution

We analyze data only from trials on which the stimuli differed. On such trials, noise fields that are positively correlated with those of the stimuli that influence behaviour should increase the probability of responding “different”. Furthermore, noise fields that increase “different” responses on <A,B> trials will be anti-correlated with the same type of noise fields on <B,A> trials.

---

### Simulations

**Classification Images**

Identification | Same-Different
---|---

**Regression Image**

Same-Different Task

Regression Weights

Significant Pixels

Simulations estimated the linear template used by an ideal detector in a 1-interval identification task and a same-different task. All 5,000 simulated trials were used to estimate the classification image in the identification task, whereas only 2,500 trials from the same-different task were used to estimate the template. Correlations between classification images derived from multiple simulations of the identification task were approximately 0.52. When the number of trials was reduced from 5,000 to 2,500, the correlation between classification images was approximately 0.57.

**Face Discrimination**

Identification | Same-Different
---|---

**Regression Image**

Same-Different Task

Regression Weights

Significant Pixels

Correlations between classification images derived from multiple simulations of the identification task were approximately 0.48. When the number of trials was reduced from 5,000 to 2,500, the correlation between classification images was approximately 0.52.

---

### Experiments

**Ideal Template**

Classification Images

Identification | Same-Different
---|---

**Simulations**

- Stimulus black & white squares embedded in white, static Gaussian noise
- Two tasks: 1-interval identification (“black” or “white”) & same-different
- Stimulus Duration = 100 ms
- Same-Different: ISI = 500 ms
- Contrast adjusted with a 2-down/1-up staircase procedure
- Several thousand trials in each task

**Face Discrimination**

Identification | Same-Different
---|---

**Experiments**

- Stimulus two male faces embedded in white, static Gaussian noise
- Two tasks: 1-interval identification & same-different
- Stimulus Duration = 100 ms
- Same-Different: ISI = 500 ms
- Contrast adjusted with a 2-down/1-up staircase procedure
- Several thousand trials in each task

---

### Conclusions

- It is possible to derive “classification images” from same-different data
  - provide good estimates of linear templates used by simulated observers
  - similar to standard images obtained from human observers
- More work is needed to:
  - extend method to same-different task using more than two stimuli
  - compare method to related computational approaches (see references)

---

### References


For more information, please contact the first author at bennett@mcmaster.ca