

DATA.STAT.770 Dimensionality Reduction and
Visualization, Spring 2021, Exercise set 6

Part D: Human Perception

Problem D1: Simultaneous Brightness Contrast

Discuss the simultaneous brightness and contrast effect shown in the figure below and explain it using the Difference of Gaussians model. Your answer does not have to contain any mathematical calculations. Instead,

1. try to give a clear explanation why the rectangles appear to be of a different gray tone while they in fact are all of the same “color”.
2. if you enlarge the figure and look at the central rectangle, its left side looks brighter than the right side even though the whole rectangle is of a single color. Try to give a clear explanation why that happens.



Problem D2: Glyphs and Preattentive Processing

Consider the Ames Housing Data set of housing prices in Ames city, Iowa, USA. The data set is available at

<https://www.kaggle.com/c/house-prices-advanced-regression-techniques/data> but for this exercise you do not need to download the data, you only need to consider the list of variables: the houses are described by a large number of variables described in the “Data fields” section on the above page. Suppose that you have available also the physical location of each sold house, and you want to display the houses as glyphs over a map of Ames, Iowa.

Obviously the house price variable is important, but one may also want to analyze many other variables and how they relate to the price. Design a glyph that enables the preattentive perception of as many variables (discrete or continuous) as possible; you do not need to include all variables on the above page, only try to include as many as you reasonably can. How many variables can you represent with the glyph and how accurately can the values be perceived? What should be taken into account when designing the glyph?

Problem D3: Gestalt Laws

Analyze the figures below. The picture at the top is of a trolley bus in 1950's Tampere. The picture at the bottom is the subjective Necker cube. Which Gestalt laws help to group the black and white shapes into something meaningful?

