3.5

3.5

Computational Cognitive Neuroscience – CH3

Zhuo Wang ScM BME Brown ID# 140641091

Question 3.1

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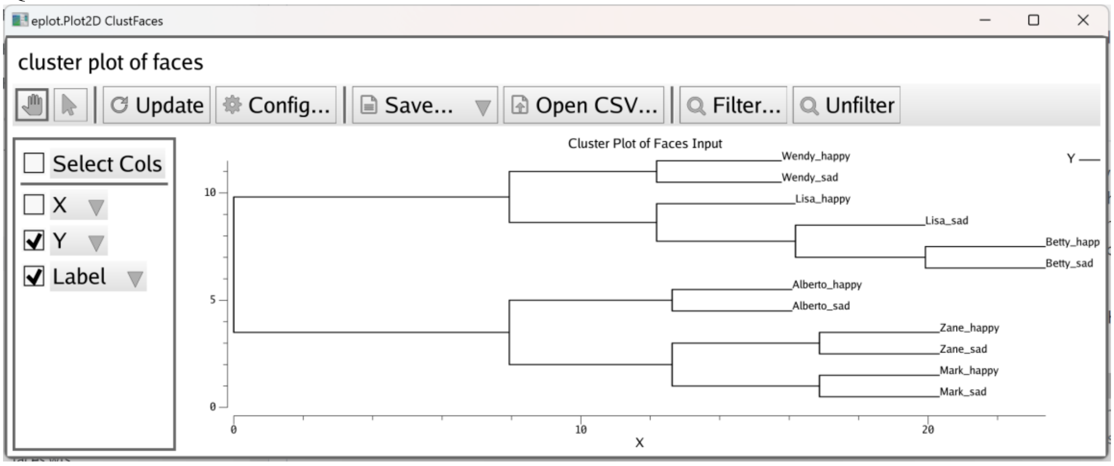

good! According to the number of overlapping color blocks, the most obvious difference is gender, because male facial features do not have longer hair than women, and this is the least similar. After gender is distinguished, identity is distinguished, because everyone has some differences in facial shape and ear size. The smallest difference is the emotional distinction of the same person, which may only be the difference between the eyes and the mouth. So shared similarity is more emotional than identity than gender.

Question 3.2

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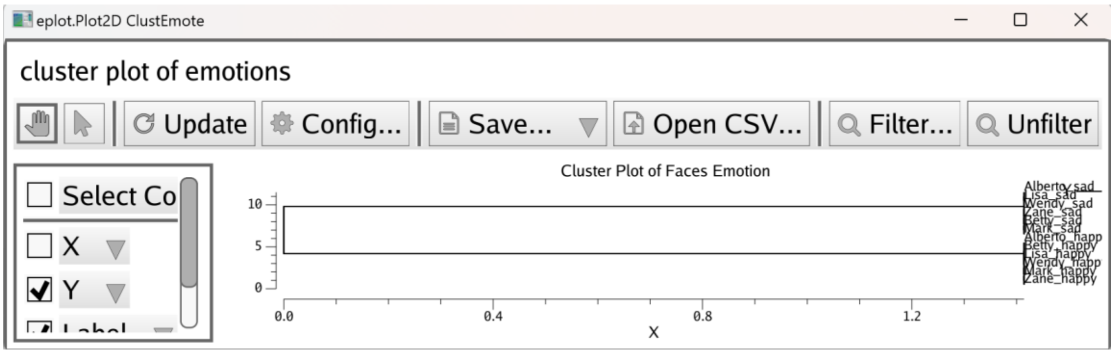
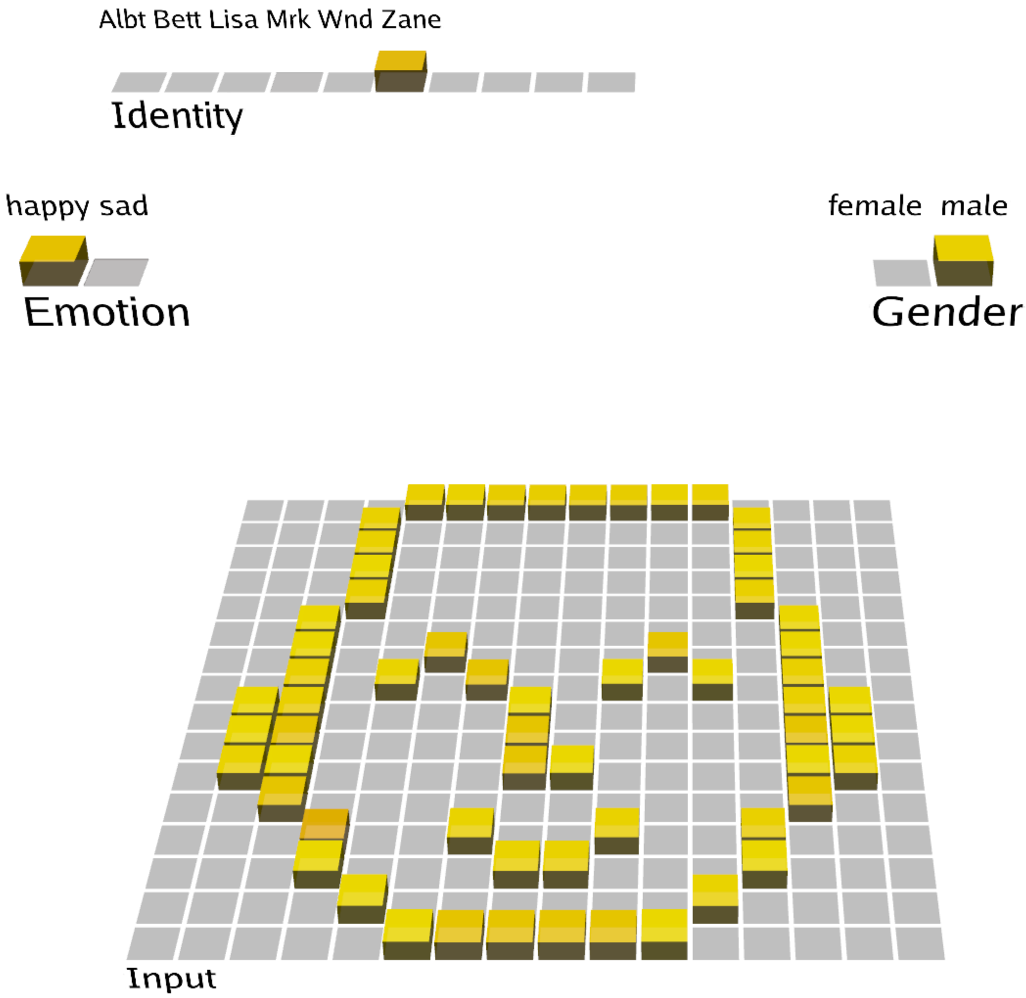
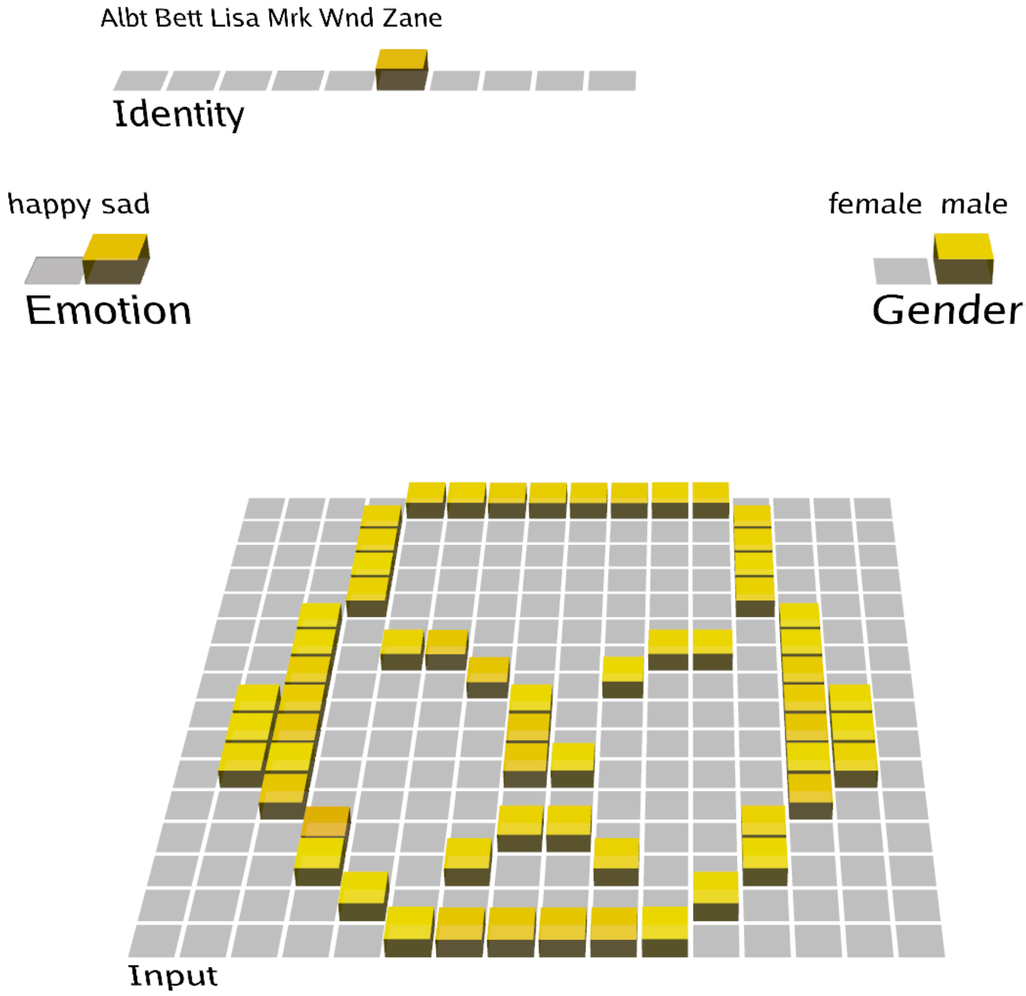


First distinguish between emotion and then identity, and in this case emotion is the most similar and then identity.

Question 3.3



Albt Bett Lisa Mrk Wnd Zane
Identity
happy sad
Emotion
female male
Gender
Input


Albt Bett Lisa Mrk Wnd Zane
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female male
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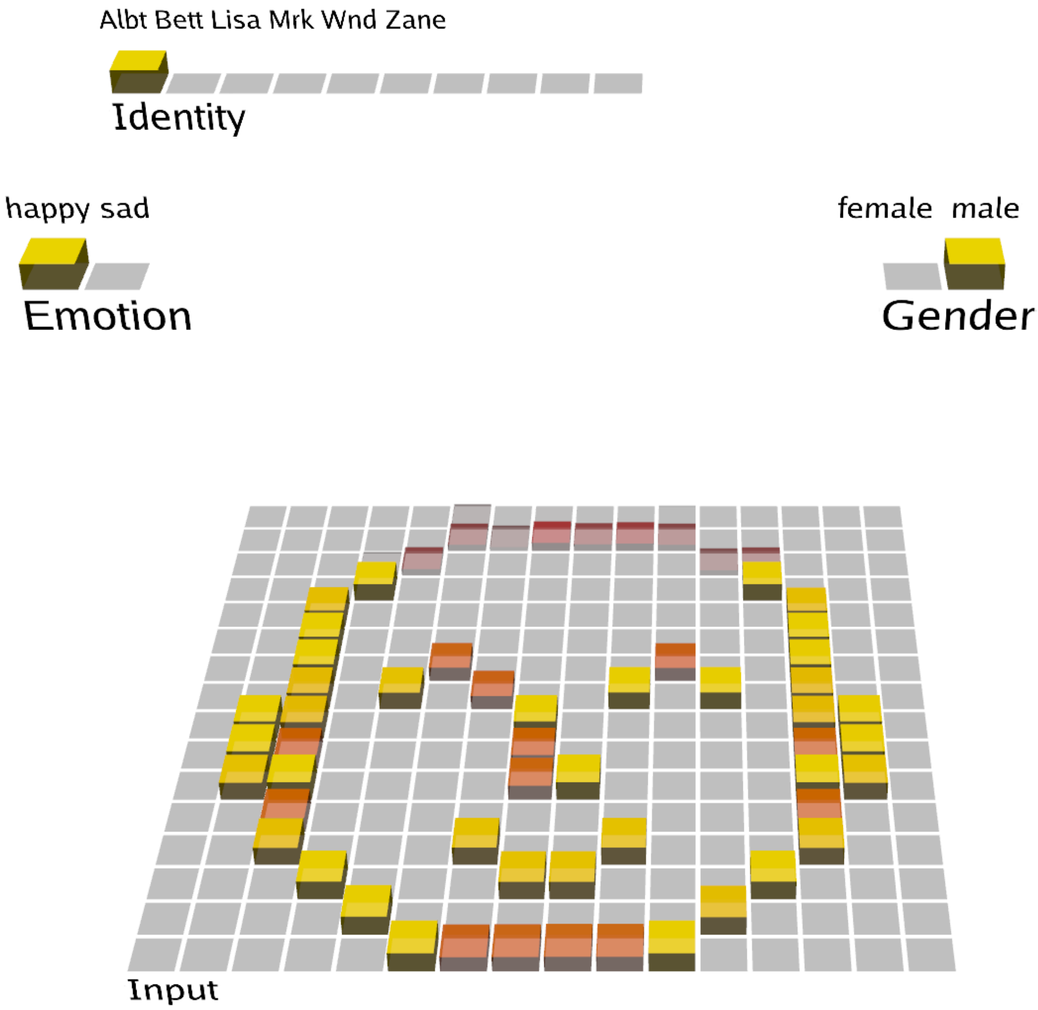

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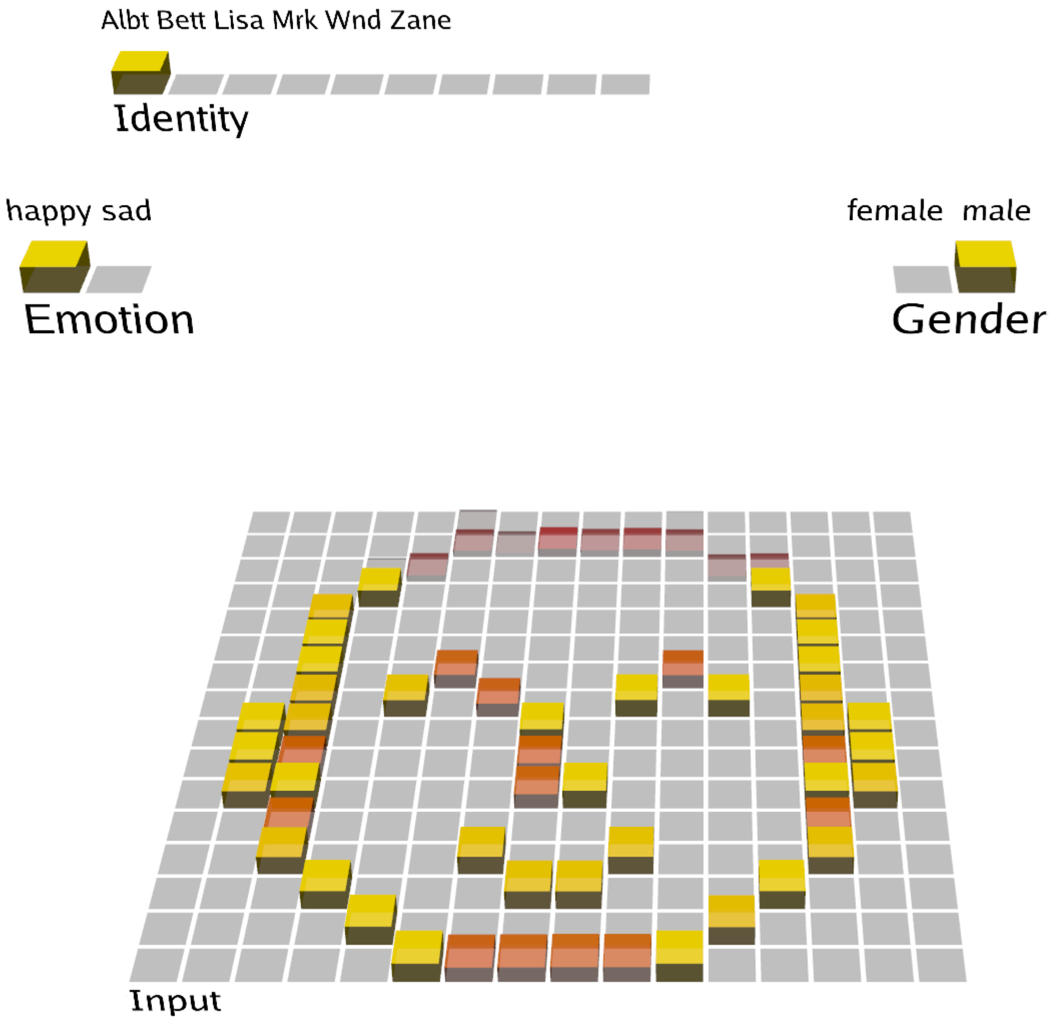
Albt Bett Lisa Mrk Wnd Zane
Identity
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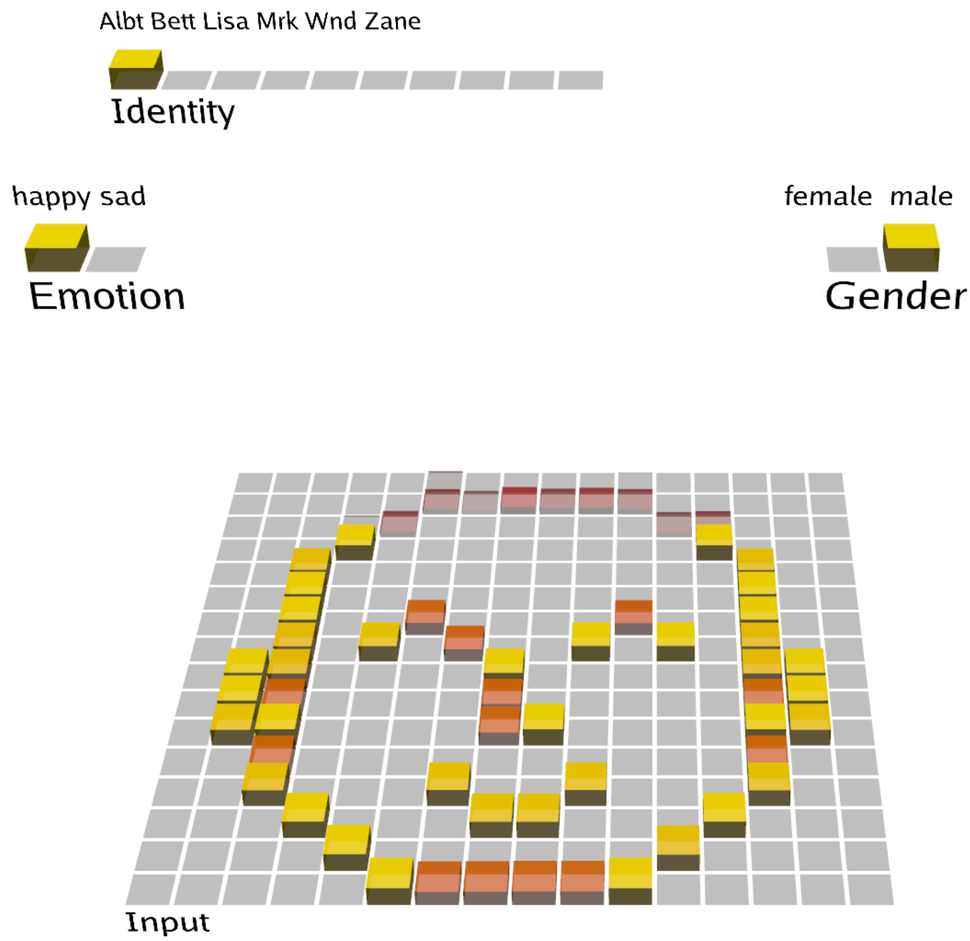
female male
Gender
Input



0.5

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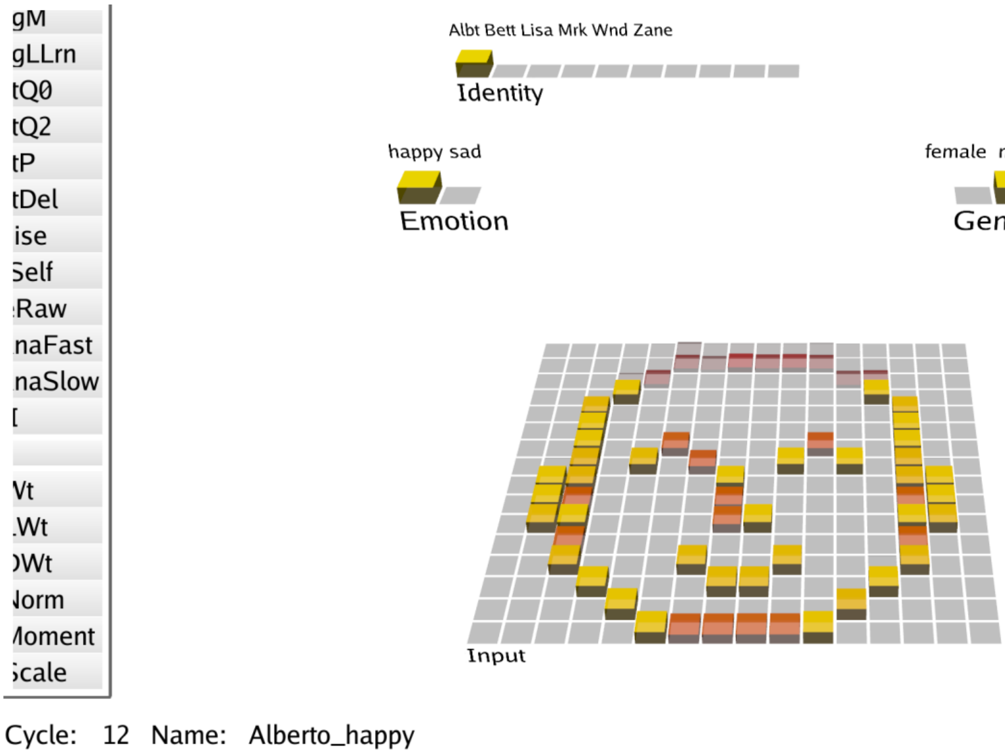
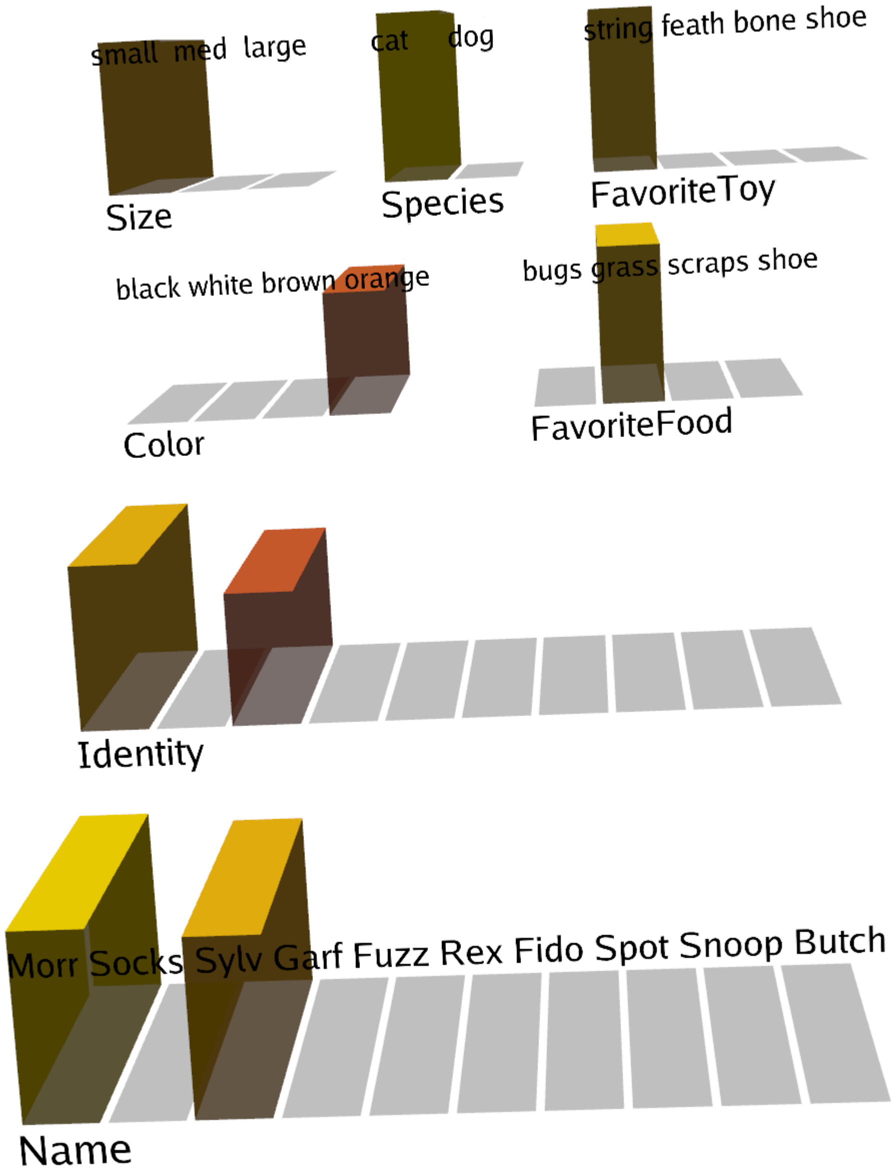
The order in which the correct categories are activated is from gender to emotion to identity.

maybe we can check this in a lab section but the order should be gender to identity to emoti



It only takes about 12 cycles to complete the gender and emotion filling first when filling, and the subsequent cycles are applied to the identity filling.

Question 3.4



Because the neural network has probably been taught to recognize and reflect links between category-level information and particular instances or individuals within that category, the subset of cat individuals ended up getting activated when the "cat" was provided as input. One of the primary causes could be that neural networks teach
1 themselves to recognize patterns and relationships in the material they are exposed to. In this situation, the network has learned links between the category "cat" and particular traits, characteristics, or people who are frequently connected to cats. The weights of the connections within the network contain these linkages. Additionally, when the word "cat" is entered into the network, it stimulates neurons and neural pathways that are closely related to the idea of a cat. This activation is based on learnt weights in the network that relate the notion "cat" to particular traits or people. Meanwhile, there are other shared or cat-specific properties in the learning association of the network. For instance, the characteristic "whiskers" might be connected to the category "cat". When "cat" is given as input, a subset of cat individuals is activated in part due to these similar traits.

Question 3.5

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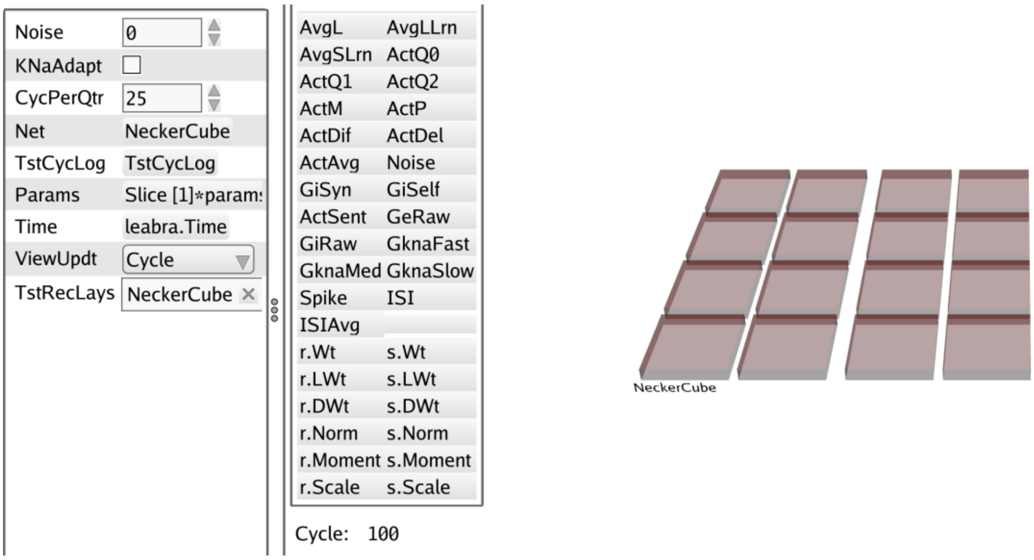
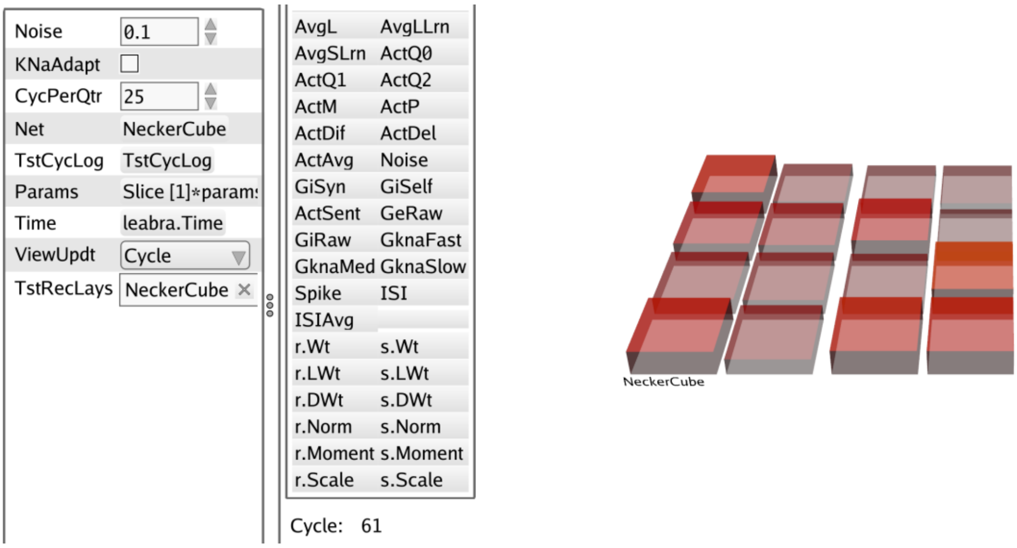
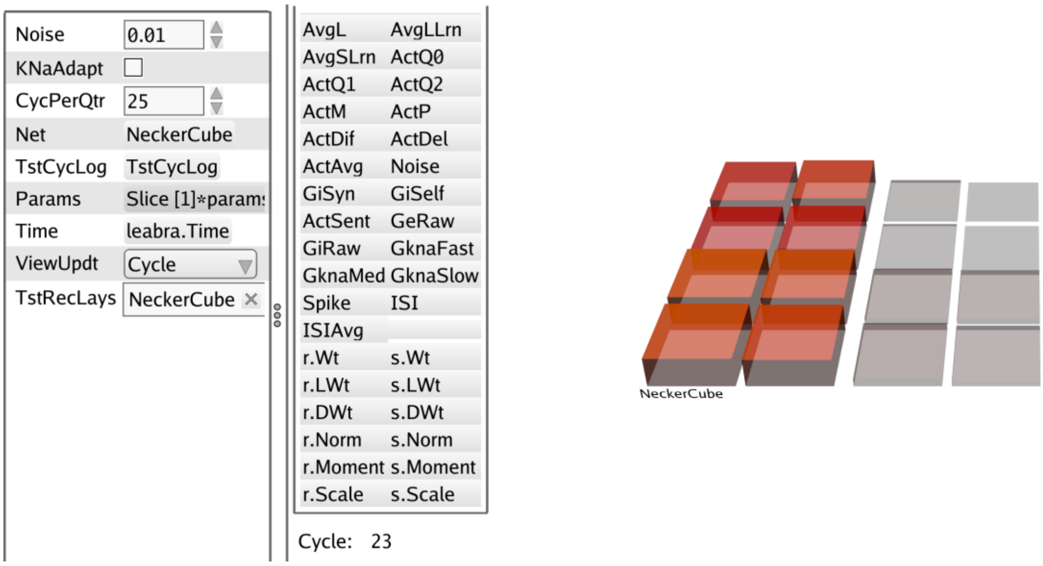


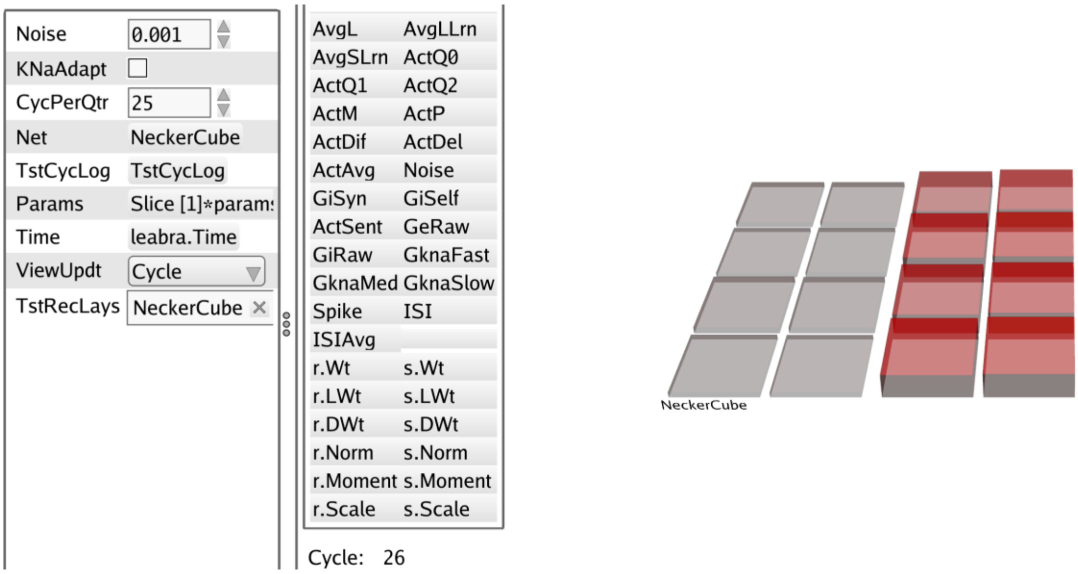
Noise = 0: When there is no noise, the settling behavior of the network may be quite predictable and constant. It might consistently stick with one Necker cube interpretation, and I don't notice much changes between the two. This is due to the absence of noise, which would otherwise introduce unpredictability or "break the tie" between the two competing interpretations.



Noise = 0.1: I notice more frequent switching between the two cube interpretations when the noise level is moderate (Noise = 0.1). The introduction of stochasticity by the noise increases the likelihood that the network will experiment with various activation states. It might not settle on one interpretation as fast or deterministically as a result, causing greater oscillations between the two.



Noise = 0.01: At lower noise levels (Noise = 0.01), I occasionally notice interpretation shifts, however they might not be as noticeable or regular as at higher noise levels. Although the network still exhibits some stochasticity, it may favor one interpretation more frequently.



Noise = 0.001: When noise levels are extremely low (Noise = 0.001), settling behavior may be very close to deterministic and resemble that of a noise-free environment (Noise = 0). The network may continuously support one interpretation and is less likely to alternate between both.

Question 3.6

Reduce HiddenGbarI from.4 to.3: By lowering HiddenGbarI, the excitatory units' level of inhibition will be reduced, which will raise the average level of excitation in the hidden units.

Moving from a value of.4 to.5 for HiddenGbarI: Increasing HiddenGbarI will have the reverse effect. It will lower the average level of excitation of the hidden units by raising the level of inhibition on the excitatory units.

Because it affects network activity by controlling the average excitation level of the inhibitory unit.

Question 3.7
FFInhibWtScale is set to 0 to remove feedforward inhibition, which causes:
The neural network's excitatory units can become active more quickly by eliminating feedforward inhibition.
The timing of activation between the two levels shows a distinct qualitative difference. Compared to the default values, the excitatory units activate earlier and faster.

When FBinhibWtScale is set to 0 and FFinhibWtScale is set to 1:
The total level of inhibitory activity is maintained even when feedback inhibition is turned off, therefore this does not greatly change it.
0.5
The timing of inhibitory activity does, however, vary. In this instance, the excitatory units are immediately restrained by inhibitory activity that develops rapidly in a feedforward fashion.

Changing these factors has an impact on the network's timing and activation patterns. While turning off feedback inhibition causes an early start of inhibitory activity and a gradual increase in excitatory activity, eliminating feedforward inhibition enables faster and more direct activation of excitatory units. The influence of feedforward and feedback inhibition on the dynamics of neural network activity is highlighted by these interventions.

Correct, but the main point is that without the feed-forward inhibition, the netw

Question 3.8
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With varied InputPct levels, the concealed average activity level changes. The hidden activity level is lower than the default 20% when InputPct is set to 10%. In contrast, the hidden activity level is higher than the default 20% when InputPct is set to 30%. It is clear from the variance in hidden activity levels that the FFFB inhibitory mechanism serves as a set-point regulator. Despite differences in input strength, it seeks to maintain a largely constant concealed activity level (the set point).