Consonant Confusions for Initial and Final Positions

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October 8, 2014

Abstract

1 Introduction

2 Methods

3 Results

When observing the Error vs. Entropy graphs of confusion matrices there were different groups the results could be categorized in. There were some sounds in initial and final positions that where easily recognized by all the subjects, unrecognizable by all the subjects and the interesting cases where there was an obvious separation between the reading control and reading disabled subjects. In the following images we have the Reading Disabled group represented by the Red symbols and the Reading Control group distinguished by the blue symbols.

3.1 Comprehended by All

The first groups of consonants observed were the case where neither the reading control and reading disabled groups struggled recognizing in CV tokens.

For consonants in initial position there where different sounds that were easily recognizable that those is final position. We will begin by observing a few of the consontants in initial position.

(a) d in Initial Position.

(b) r in Initial Position.

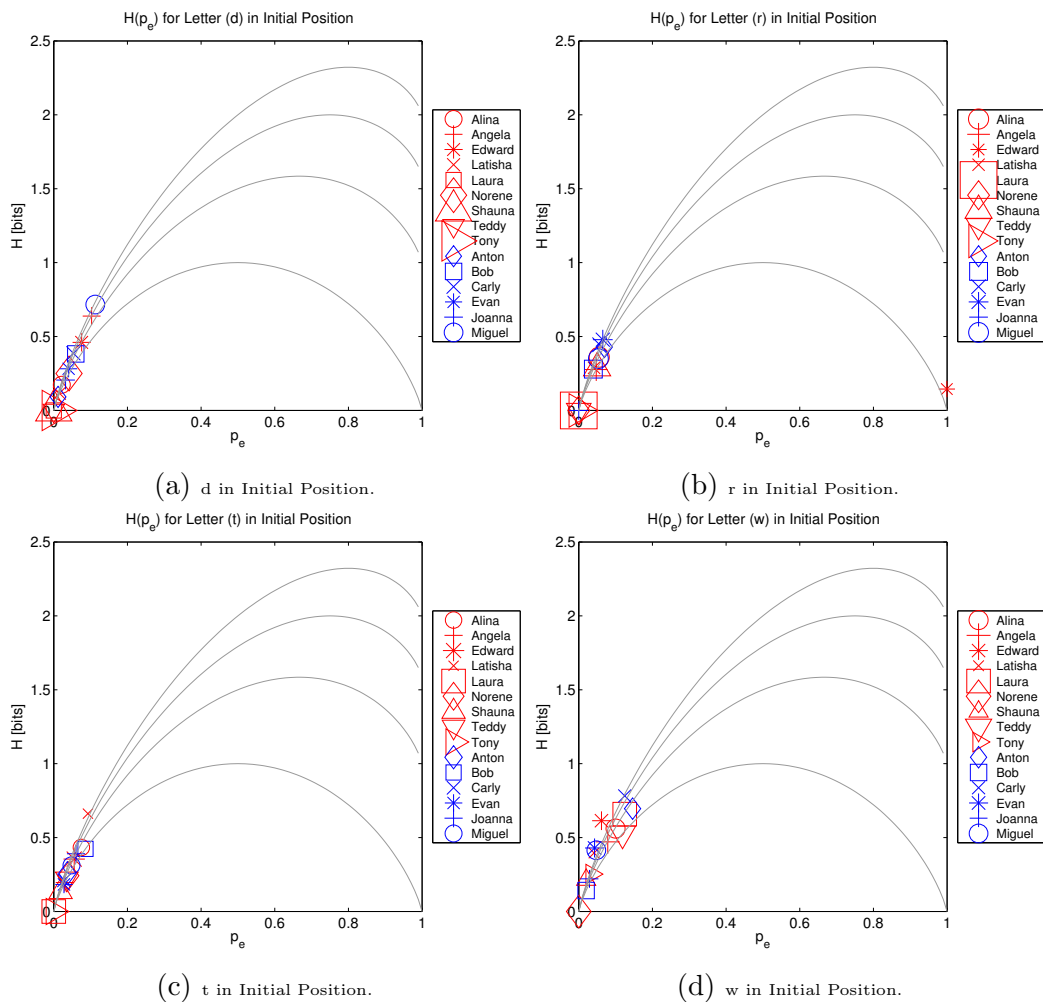(c) t in Initial Position.

(d) w in Initial Position.

Figure 1: Easily Recognizable Consonant Sounds in Initial Position

For Consonants in initial position we see we have 4 cases in which both reading disabled subjects and reading control groups. For the case of Figure 1b we see that we have one outlier in the reading control group, namely, Edward. By the nature of the test when each subject was told to speak the sound they heard, Edward's apraxia of speech was reflected by the sound of

w. This is verified by the fact that Edwards high error lies along the 1 bit entropy line. In Figure 1d all subjects are able to recognize this sound with low error and entropy.
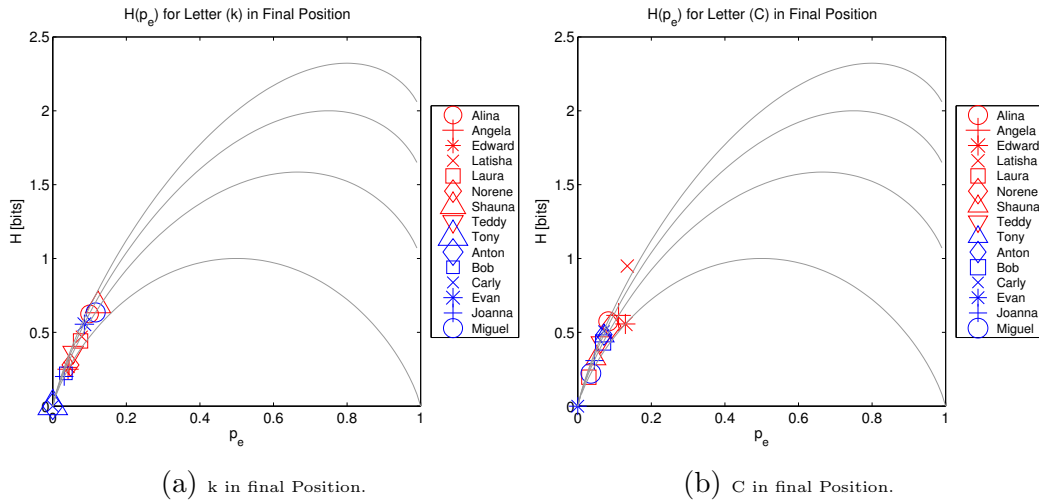

(a) k in final Position.　　　　(b) C in final Position.

Figure 2: Easily Recognizable Consonant Sounds in Final Position

For Consonants in final position we see that k and C are recognizable by both the Reading Disbaled and control groups. When presented over all vowels all subjects, we see that in Figure 2a we see that all subjects had an error less that 20% and entropy less that 1 bit. For Figure 2b we only have 1 outlier, Latisha, however the error is still similar to those in Figure 2a.

3.2 Comprehended by None

The second group of consonants can be classified as the Unrecognizable sounds, in which both the reading control and the reading disabled groups struggled to correctly identify the sound and had very high entropy. We begin by looking at the consonants in initial position.

After an initial observation of the Unrecognizable consonants in initial position we see that the majority of the subjects all have high error and high entropy mistakes. However, a closer look at Figure 3d shows that there are lower entropy mistakes for the reading control group yet still high errors. For the purposes of this test it is important to note that G was removed from consideration because (insert reason)
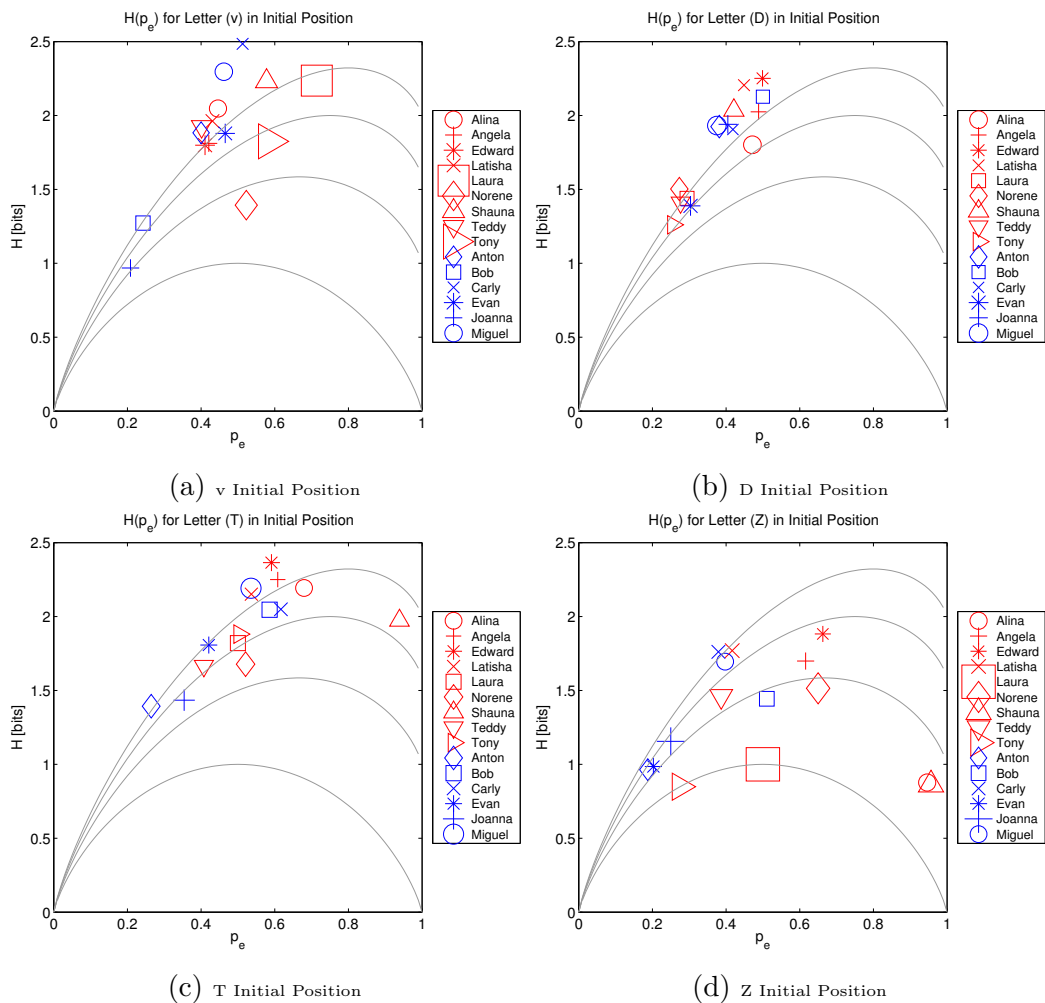
3

Figure 3: Unrecognizable Consonants in Initial Position

In final position we see that we have two expected consonants D and G are hard to recognize by all of the subjects. In addition we see that Figure 4c shows the difficulty with recognizing T in the final position. Its worth noting that in Figure 4 all figures show both reading control and reading disabled subjects performing at chance, indicating that for certain CV tokens they were essentially guessing.
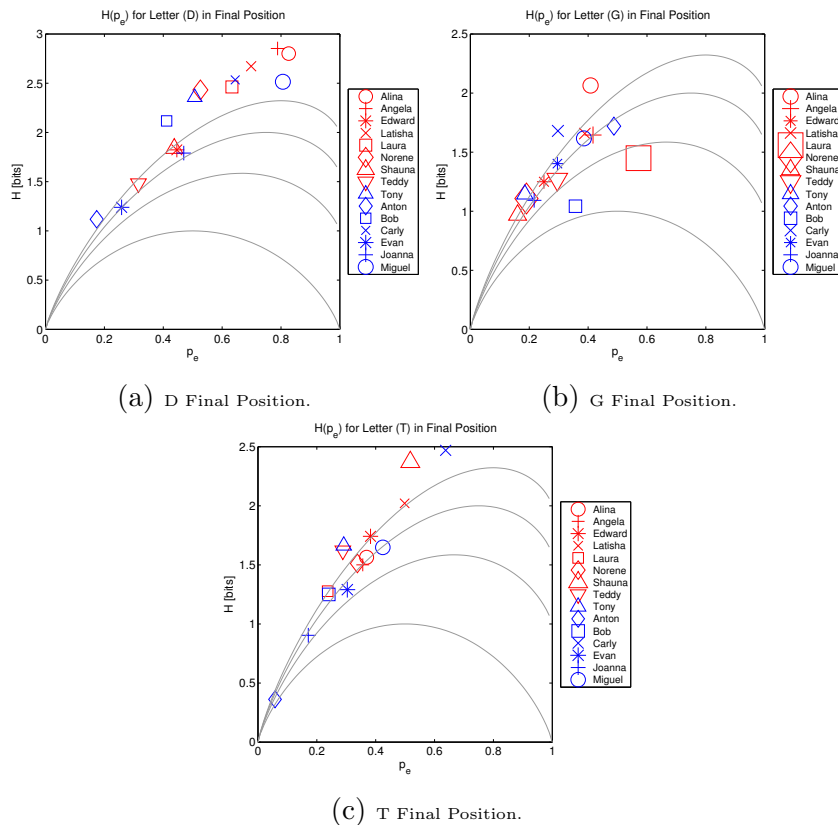
(a) D Final Position.

(b) G Final Position.

(c) T Final Position.

Figure 4: Unrecognizable Consonants in Final Position

3.3 Interesting Case

The final group of consonants are the case where we have a seperation between the reading control and reading disable groups, both in terms of percent error and the entropy related with these errors. We begin by looking at the intresting consonants in initial position.

The plots in Figure 5 show the seperation that occurs between the reading control and reading disabled groups. For Figure 5a and Figure 5f, specifically, we see that the Reading disable group has a much greater error and entropy than the reading control group. (Quantify later?) When observing Figure 5d there are two outliers, Edward and Laura, but the rest of the RC and RD groups where less than about 10% error with entropy less than 0.5 bits.

It is important to point out Figure 6. Here we see that one of the reading control group, Miguel, stood out from the rest of the subjects having 20%

error and about 1 bit entropy.

Similar to the initial position we have several intresting cases in the final position. Recall Figure 5f, well we see that in Figure 7b, the consonant J shows another seperation between the reading control and reading disable groups. Figure 3d shows Z is unrecognizable by all subjects, however we can see in Figure 7d that we have large seperation between the groups but still a larger error than we'd expect intutively by the control group.

Figure 8a and Figure 8b stand out due to the fact that we have reading control subjects with the worse performance. With the exception of Tony and Anton, respecitvely we have the similar seperation between groups that was seen in Figure 7.

4   Discussion

(a) g Initial Position.

(b) h Initial Position.

(c) p Initial Position.

(d) s Initial Position.

(e) C Initial Position.
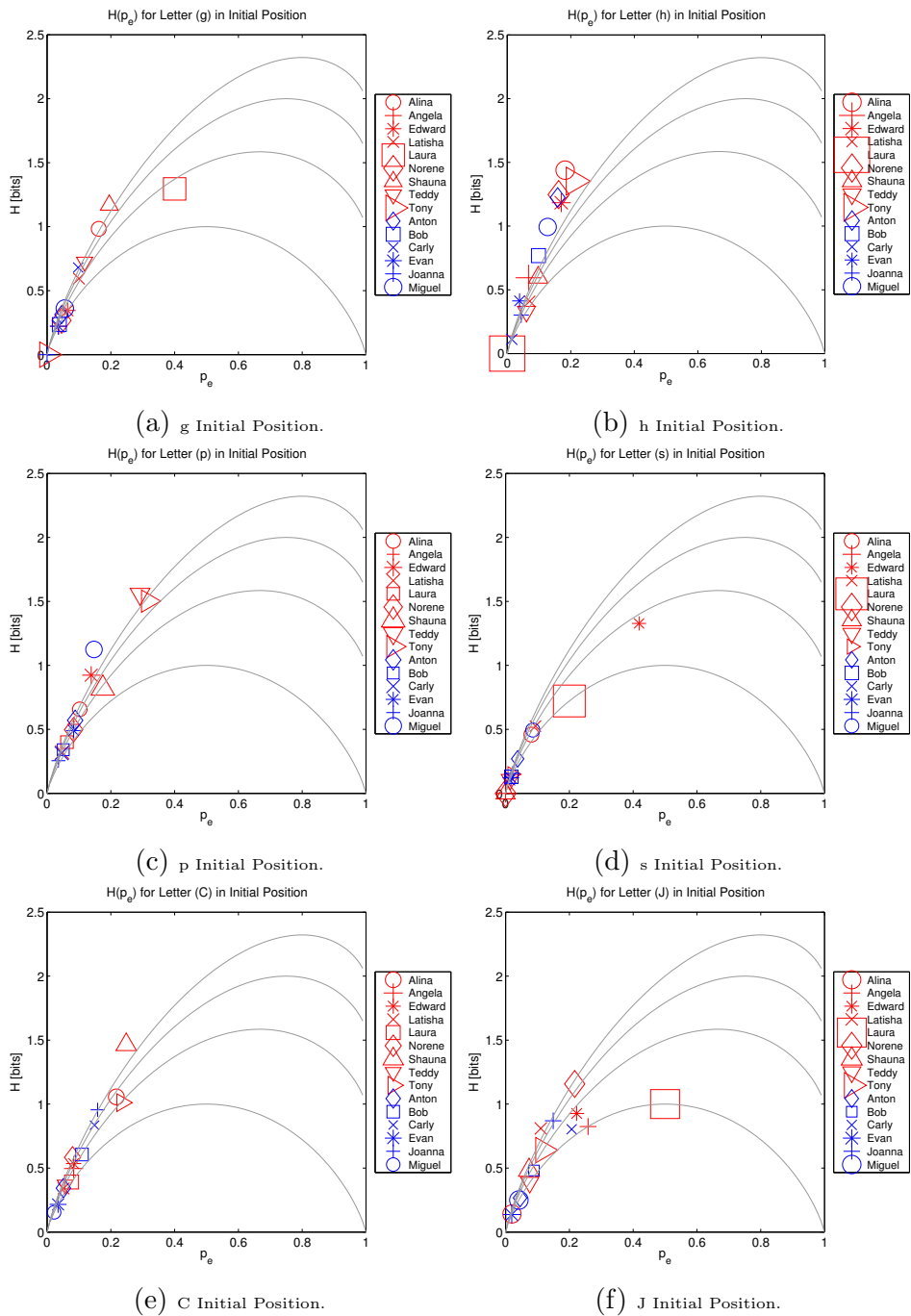
(f) J Initial Position.

Figure 5: Confusion Seperation for Consonants in Initial Position

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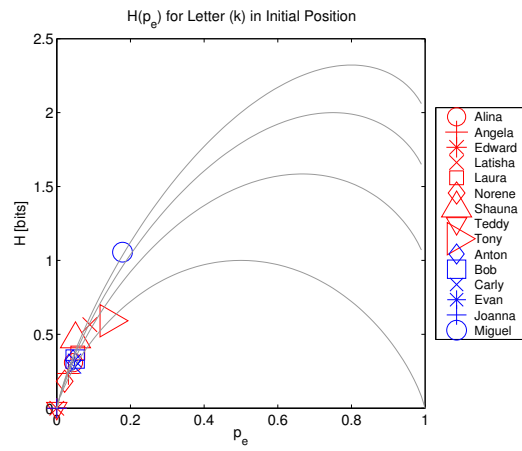
Figure 6: k Initial Position.

Figure 7: Confusion Seperation for Consonants in Final Position
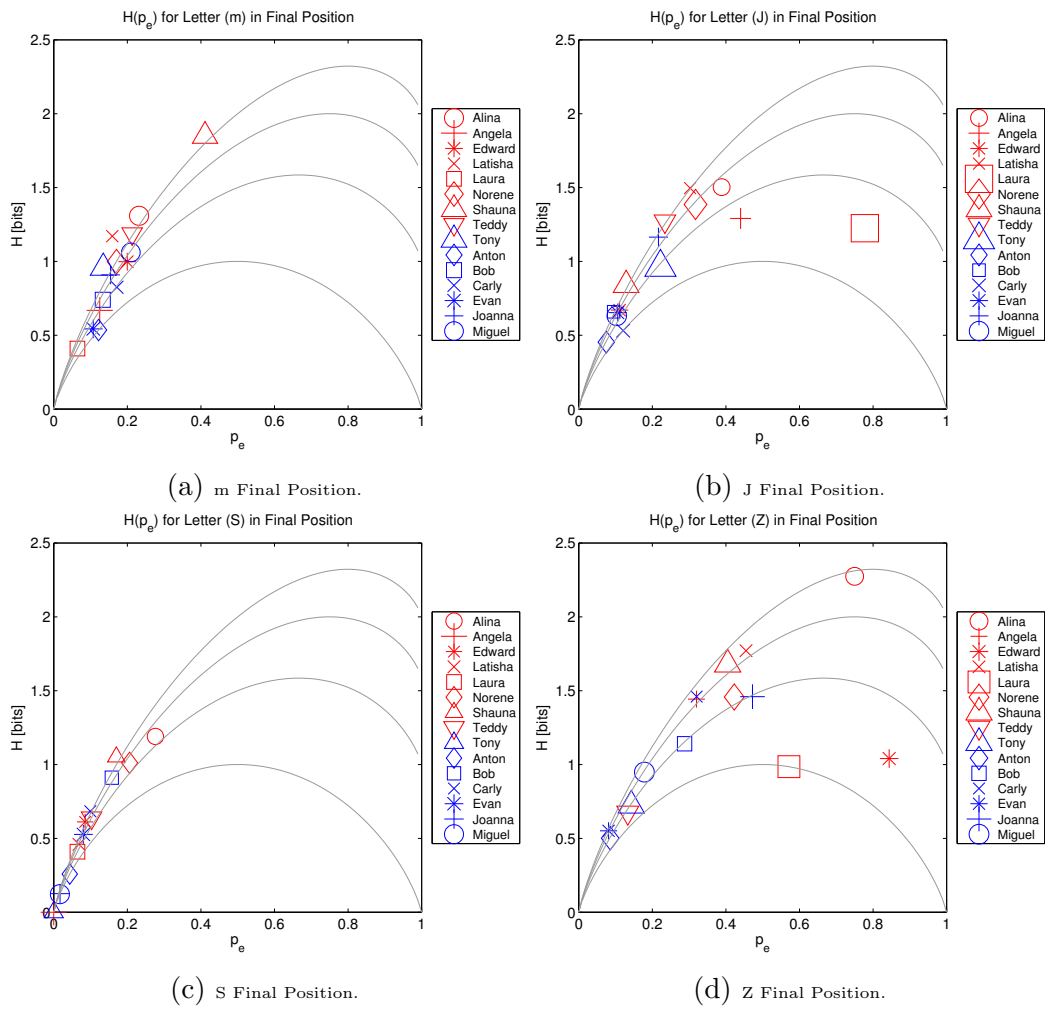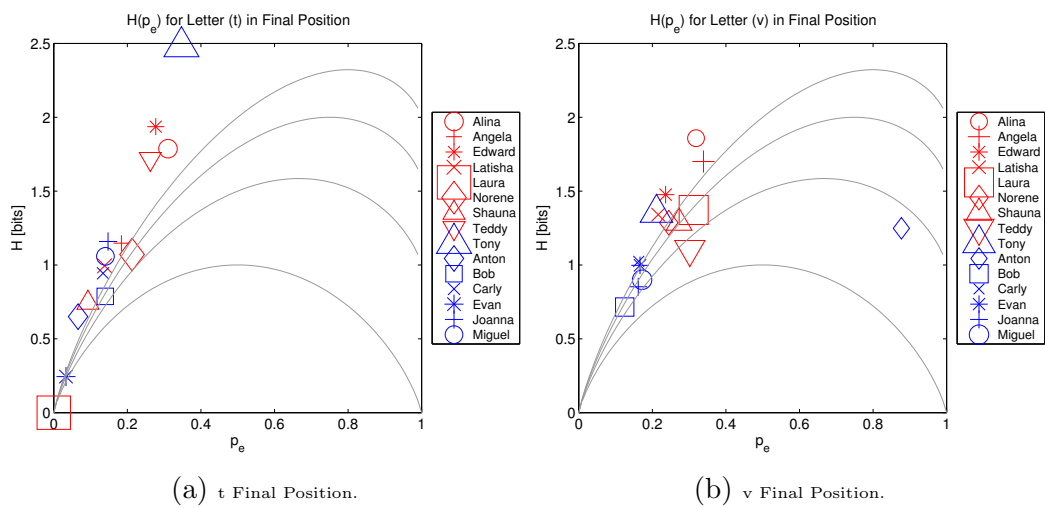
(a) t Final Position.　　　　(b) v Final Position.

Figure 8: Confusion Seperation with RC outliers in Final Position