Chapter 7

Discussion and Conclusions

In this dissertation, I've taken a sociophonological approach to identifying the mechanism of phonological change for the allophonic restructuring of /æ/ in Philadelphia. Through a combination of community-wide corpus analysis, targeted interviews with individual speakers, experimental evaluation techniques, and computational simulations, I have presented a robust analysis of the sociolinguistic and phonological mechanisms and ramifications of a phonological change in Philadelphia English. I find that this phonological change is occurring through intraspeaker competing grammars. I argue, furthermore, that the systemic behavior of speakers

In Chapter 2, I provide background into the community-level variation in /æ/ systems. In this chapter, I showed that overall, each of the six primary conditioning factors of PHL and NAS participate in the change to NAS at the same time point in the community. Rather than change proceeding from context to context – as may have been predicted by coarticulatory effects of a following velar nasal, for example – we find instead that the changing conditioning factors take an abrupt turn together in the community, heading towards NAS beginning with speakers born around 1983. I demonstrate that among younger speakers, the educational system in Philadelphia creates social fragmentation of the community that has linguistic consequences. Special Admissions non-Catholic schools are at the forefront of this change to NAS, while Open Admissions Catholic schools are the conservative stronghold of PHL. I show, furthermore, that this change occurs in three steps intergenerationally. From a child's parental input, given sufficient peer influence, children can take a PHL input and produce a mixed PHL-and-NAS-system output or take a mixed input and produce a fully NAS output.

In Chapter 3, I provided a theoretical account for PHL as a productive allophonic rule, using the Tolerance Principle (Yang, 2016) as a diagnostic of productivity. I use the Tolerance Principle to define a clear definition to the phonological classification criterion of *Predictability*, and demonstrate that under this definition of predictability, a number of phonological relationships that have previously been analyzed as "intermediate" may be straightforwardly classified as productive. I show that under all considerations, PHL emerges as a plausible productive allophonic rule.

Chapter 4 provides an in-depth investigation into intraspeaker variation between PHL and NAS for the transitional cohort speakers. Using a combination of statistical, sociolinguistic, and phonological methods, I find that the mechanism of phonological change for the allophonic restructuring of /æ/ in Philadelphia is best analyzed as competing phonological grammars. Most of the speakers analyzed produce a PHL system (for those who have not yet undergone the change), a NAS system (for those who have completed the change), or grammar competition between the two systems as a whole. The few exceptional speakers are clearly analyzed as producing phonetic mitigation of their tense tokens as a reaction to the phonological change surrounding them rather than as a driver of that phonological change.

Given the finding that speakers produce variation between the abstract parameter governing PHL and the abstract parameter governing NAS, Chapter 5 turns to the question of whether these abstract parameters may be the target of social evaluation. In a Matched Guise task containing the same number of tense and lax tokens for the PHL and NAS guise, participants rated the PHL guise more *accented* than NAS. In a modified Magnitude Estimation task, I demonstrate that participants also produce systematic overt ratings of tokens of PHL and NAS. Younger participants born after the introduction of NAS into the community learn the traditional PHL evaluation system of downgrading tense PHL-consistent tokens, as found in Labov (2001), but have also adopted a second evaluation system of upgrading any tokens consistent with PHL. Older participants born before the introduction of NAS into the community also reproduce the findings in Labov (2001) by downgrading tense PHL-consistent tokens. However, when asked to rate NAS-consistent tokens, older participants' ratings are best analyzed as following abstract conditioning factors rather than phonetic production of those conditioning factors. In other words, older participants are found to produce negative evaluations of the *conditioning factors* rather than the phonetic realization of those conditioning factors. These results reveal a surprisingly abstract evaluation by older participants which only emerges when testing evaluations of a changing phonology. This surprising result demonstrates that sociolinguistic inquiry of a phonological change may reveal sociolinguistic facts that would otherwise be obfuscated by analyzing that variable during a period of stability.

Finally, in Chapter 6, I take on the question of whether the change from complex PHL to simple NAS was an inevitable outcome. Using the Tolerance Principle (Yang, 2016) as a measure of the plausibility of a phonological rule given a child's input, I demonstrate that NAS is not a plausible reanalysis of PHL, despite being a subset of the featural specification of PHL. Using a computational simulation, I furthermore demonstrate that successive simplifications of PHL leading to NAS is not a likely route by which this change occurred. Finally, I turn to dialect contact with NAS as a source for this phonological change, finding that NAS becomes a plausible reanalysis of the input when a child is receiving roughly 40% NAS input and 60% PHL input. Furthermore, both PHL and NAS emerge as fully viable when a child is receiving between 46 and 54% NAS input, suggesting an input profile that may account for the systemic variability between PHL and NAS found in the transitional cohort speakers. We find that the allophonic restructuring of Philadelphia English /æ/ is not an inevitable simplification of a complex rule, but more likely the result of a relatively high degree of dialect contact with NAS speakers for a particular subset of the community.

7.1 Similarity to Syntactic Change

In this dissertation, I've found evidence drawn from targeted recordings of transitional cohort speakers to support a competing grammars hypothesis for phonological change. The particular change investigated here, from a PHL parameter governing a complex set of conditioning factors to a NAS parameter, provides strong evidence for competing grammars in phonology, given that variation is found in all conditioning factors that differentiate PHL from NAS. As a mechanism of phonological change, this provides a challenge to the conventional wisdom of change driven by accruing phonetic errors. The parallels with Kroch (1989) are fairly striking, as at the time of writing, competing grammars provided a challenge to the widely accepted idea "that language change proceeds context by context, with new forms appearing first in a narrowly restricted context and spreading to others only later" (Kroch, 1989).

Here, I find similar evidence for competing grammars as the mechanism by which phonological change occurs, where change proceeds not context by context, but rather by intraspeaker competition of the two outputs of a single allophonic system parameter. This produces a probabilistic variation between PHL-consistent tokens and NAS-consistent tokens. As with syntactic change, this variation manifests within a single speaker and even within a single speech style. My findings here echo the results in Fruehwald (2013), who finds evidence for Kroch (1989)'s Constant Rate Hypothesis applying to phonological change, as well as the results in Fruehwald et al. (2013), who argue for competing grammars as the mechanism of change in Middle High German stop fortition.

That phonological change is found here to proceed by the same mechanism that syntactic change proceeds raises a number of additional questions. The first is whether the competing grammars found here is a mechanism of phonological change more generally or whether it is the mechanism by which change via dialect contact proceeds. This is a question that may only be answered with more investigations into community endogenous changes, which will require extensive corpora of speech in order to capture the community norms spanning the entire change. As more large-scale speech corpora are being built, this emerges as a possibility for future research. The second point is a more general theoretical one. There is no clear reason for phonological change to proceed by the same mechanism as syntactic change, yet I find evidence here that it does, which suggests that competing grammars may be the mechanism by which language in general changes.

7.2 Directions for Future Research

This dissertation represents one step towards an overall research program in phonological change. In it, I have demonstrated that an analysis of phonological change requires a robust understanding of the full set of sociolinguistic and phonological facts both on the macro-social (community) and micro-social (individuals and subsets of the community) level. I've also demonstrated the benefit that the study of sound change in progress provides to a larger understanding of phonological processes more generally as well as to our understanding of the sociolinguistic evaluation: by investigating changing norms in linguistic production and linguistic evaluation, we gain a deeper insight into the target of linguistic variation as well as the target of linguistic evaluation. While the work presented here provides a thorough sociophonological account of the allophonic restructuring in Philadelphia /æ/, it also paves the way for a number of future research directions.

First, in Chapter 6, we have presented specific numerical predictions about the acquisition of PHL and NAS under a mixed input. Namely, we have argued that a child receiving between 46% and 54% NAS input will be able to posit both systems. This predicts that a child with one NAS speaking parent and one PHL speaking parent who receives roughly equivalent input from both parents will acquire both systems, at least before their peers become a strong influence on acquisition. This prediction may also extend to school peer input – a child whose peers produce between 46% and 54% NAS input may be expected to acquire both systems, but a school environment that is tipped more strongly towards NAS or PHL predicts that child will only acquire one. Testing these predictions would provide important empirical support for the models presented in Chapter 6, though I note that because this change is rapidly coming to completion in the community, such an investigation must be conducted relatively soon.

The phonological representation of allophonic rules that I have argued for in Chapter 3 also generates predictions that may be tested empirically. That Chapter 4 finds speakers producing variation in the lexical exceptions provides one piece of support for such a representation. Future work may additionally benefit from more experimental approaches. For instance, Schuler et al. (2016) found experimental support for the claim that morphological rules follow the Tolerance Principle for productivity in an acquisition-like period. Schuler et al. (2016) found that in an artificial language experiment, children (aged 5-6) given a rule with greater than θ_N exceptions do not form a productive rule while children given a rule with fewer than θ_N exceptions do form a productive rule. This work could be extended to test the limit of lexical exceptions for phonological rules as well. If the Tolerance Principle should replace the traditional definition of *Predictability*, as I have argued in Chapter 3, then an artificial language experiment conducted on phonological processes should exhibit the same patterns found for morphological productivity.

Additionally, community-level language change is not the only locus of phonological variation that may be investigated for an individual speaker. As very young children acquire language, articulatory constraints result in different stages of child phonology. During acquisition, children must acquire both the abstract phonological features of their adult phonology as well as the articulatory capabilities of producing that phonology. As children mature from child phonology to a more adult-like phonology, it may be the case that the transition between the two occurs via grammar competition as well. Becker and Tessier (2011) provide some support for this idea, finding that during acquisition, Trevor (Comppton and Streeter, 1977) produces variation between consonant harmony and faithful productions for non-harmonious lexical items (e.g., *goat, cat, duck*). Becker and Tessier (2011) analyze this as variation that occurs when Trevor acquires a new constraint in his phonology, though they name it as the effect of stored lexical productions rather than variable grammars. If competing grammars is the mechanism by which longitudinal phonological change occurs, it follows that competing grammars may also be the mechanism by which children develop their adult-like competencies. If this is the case, it predicts a Constant Rate of development across all contexts affected by the child phonology in question, as well as a bimodal distribution of production between the child phonology and the more adult phonology parameter.

Finally, it is my hope that this dissertation may serve as an example of a return to the study of variables as a structural unit. Labov's original formulation of the linguistic variable, as outlined in Labov (1966) "The Linguistic Variable as a Structural Unit", conceives of the linguistic variable as a systemic property. In discussing variable non-rhoticity in New York English, (Labov, 1966, pg. 6) describes the variability not as variation between two segments /ɹ/ and /ø/, but rather as "the oscillation of entire phonemic categories: the set of ingliding phonemes appears and disappears as a whole." In other words, Labov analyzed speakers as varying between one phonemic *system* which includes ingliding phonemes (the vocalized variants of /r/ nuclei) and a second system that does not include ingliding phonemes, capturing the vocalic variation that accompanies /r/-vocalization in

New York English as well as the /r/-vocalization itself. In this dissertation, I approach the variation in /æ/ as a systemic variable as well. Analyzing the variation between PHL and NAS as grammar competition between a single parameter that governs /æ/ allophony, both on the community level as well as the individual level, provides the best explanatory account for the data, and produces additional testable hypotheses for both sociolinguistic variation and phonological architecture.

Appendix A

Lexical Exceptions for Traditional PHL

My full formulation for lexical exceptions in PHL is provided in (27), which orders all lexical exception according to word frequency as measure in the SUBTLEX-US corpus. Words that vary from speaker to speaker as to whether they are exceptional are denoted with an asterisk. We find, for example, wide variation in production of diminutive names (e.g. *Danny*, *Annie*), which I have listed here as an exception to lax because as noted in Chapter 3, children acquire a productive diminutive suffix -y relatively early.

(27) **PHL:**

1. IF w = *and* THEN /æ/ → lax
2. IF w = *can* THEN /æ/ → lax
3. IF w = *an* THEN /æ/ → lax
4. IF w = *am* THEN /æ/ → lax
5. IF w = *than* THEN /æ/ → lax
6. IF w = *bad* THEN /æ/ → tense
7. IF w = *glad* THEN /æ/ → tense
8. IF w = *mad* THEN /æ/ → tense
9. IF w = *ran* THEN /æ/ → lax
10. IF w = *Danny** THEN /æ/ → lax
11. IF w = *program** THEN /æ/ → lax
12. IF w = *planet** THEN /æ/ → tense

13. IF w = _Annie_* THEN /æ/ → lax
14. IF w = _began_ THEN /æ/ → lax
15. IF w = _Africa_ THEN /æ/ → lax
16. IF w = _math_* THEN /æ/ → lax
17. IF w = _Sammy_* THEN /æ/ → lax
18. IF w = _exam_ THEN /æ/ → lax
19. IF w = _nanny_ THEN /æ/ → lax
20. IF w = _candidate_* THEN /æ/ → lax
21. IF w = _Granny_ THEN /æ/ → tense
22. IF w = _aspirin_ THEN /æ/ → lax
23. IF w = _Fanny_* THEN /æ/ → lax
24. IF w = _astronaut_* THEN /æ/ → lax
25. IF w = _Nana_ THEN /æ/ → tense
26. IF w = _alas_* THEN /æ/ → lax
27. IF w = _aft_ THEN /æ/ → lax
28. IF w = _swam_ THEN /æ/ → lax
29. IF w = _asteroid_ THEN /æ/ → lax
30. IF w = _Daffy_* THEN /æ/ → lax
31. IF w = _Grammie_ THEN /æ/ → tense
32. IF w = _afro_ THEN /æ/ → lax
33. IF w = _asphalt_ THEN /æ/ → lax
34. IF w = _affirmation_ THEN /æ/ → lax
35. IF w = _asterisk_ THEN /æ/ → lax
36. IF w = _badminton_* THEN /æ/ → tense
37. IF w = _aspirate_ THEN /æ/ → lax
38. IF w = _carafe_ THEN /æ/ → lax
39. IF w = _gaffe_ THEN /æ/ → lax
40. $\text{æ} \rightarrow \text{æh} \;/\; \_\begin{bmatrix} \text{+anterior} \end{bmatrix} \cap \left(\begin{bmatrix} \text{+nasal} \end{bmatrix} \cup \begin{bmatrix} \text{-voice} \\ \text{+fricative} \end{bmatrix} \right)]\, \sigma$

All /æl/ words found in CHILDES are listed below. While I do not count these words as lexical exceptions to PHL for reasons discussed in Chapter 3, I include them here for completeness.

Word	N
Al	1518
ala	7
Albert	46
album	10
albums	4
Albuquerque	31
alcohol	10
Aleck	3
Alex	238
alfalfa	2
Alfred	8
algae	3
Alice	59
Alison	7
alkaseltzer	2
Allen	254
allergy	3
alley	10
alligator	335
alligators	54
ally	13
alphabet	116
alphabets	32
alphabits	4
Al's	15
alto	4
Alvin	17
balance	92
balanced	9
balances	5

Table A.1: /æl/ words.

Word	N
balancing	18
balcony	16
balla	2
calculator	20
calendar	62
callous	2
calorie	2
calories	8
calvary	5
Calvin	9
challenge	5
Dallas	10
falcon	36
gal	2
galaxy	5
gallery	4
galley	2
gallon	3
gallop	16
galloping	3
immortality	2
Italian	37
Hal	9
hallo	5
malapropism	2
Malcolm	3
Malik	24
mallard	30
mallards	2
mallet	4

Table A.2: /æl/ words.

Word	N
medallion	2
pal	43
palace	63
palaces	2
Palo	5
pals	8
personality	3
rally	2
Ralph	16
reality	2
Sal	4
salad	230
salads	3
Salazar	2
Sally	446
scalps	2
shall	1734
shallots	2
shallow	12
talent	6
talented	6
talon	3
Val	10
Valentine	225
Valentine's	40
Vallerie	22
valley	22
valuable	2
valve	2

Table A.3: /æl/ words.

Appendix B

Alternative Methods for Token Classification

B.1 Clustering algorithms

K-means Clustering K-means clustering is a simple unsupervised learning algorithm that clusters observations into *k* clusters, through minimizing the within-cluster sum of squares and maximizing the between-cluster sum of squares. With the data analyzed here, k-means clustering could potentially identify underlying clusters of tokens, enabling us to then identify (1) the tenseness value of tokens and (2) whether each cluster contains only PHL-tense tokens (in the case of spontaneous phonologization) or tokens from each test condition (in the case of competing grammars). One downfall of k-means clustering is that *k* must be set *a priori*, and there is not a statistical method for determining the optimal number of clusters. This is often done visually through an "elbow plot" method, which plots the decrease in variance captured by the clusters as the number of clusters increases. K-means was tested here on tokens using just F1 and F2 values (as these are the primary perceptual indicators of tenseness), as well as on the output of PCA and t-SNE analysis (as these methods enable the incorporation of all measurements).

Algorithmically, a k-means algorithm assigns each observation to the cluster whose mean has the least squared Euclidean distance (B.1), then updates the new means to be the centroids of the observations in the new clusters (B.2).

$$S_i^{(t)} = \{x_p : \parallel x_p - m_i^{(t)} \parallel^2 \leq \parallel x_p - m_j^{(t)} \parallel^2 \; \forall j, 1 \leq j \leq k\} \tag{B.1}$$

$$m_i^{(t+1)} = \frac{1}{|S_i^{(t)}|} \sum_{x_j \in S_i^{(t)}} x_j \tag{B.2}$$

Hierarchical Clustering Hierarchical clustering is a method of cluster analysis that builds a hierarchy of clusters. Here, I use the `hclust()` function in R, which applies an agglomerative hierarchical clustering. Each observation is first counted as its own cluster, then pairs of similar clusters are merged as the hierarchy is built up. For clustering /æ/, tokens were merged according to similarity as measured by complete linkage, shown in (B.3).

$$\max\{d(a,b) : a \in A, b \in B\} \tag{B.3}$$

B.1.1 Applying Clustering Algorithms to F1 and F2 values

Figures B.1 and B.2 display the results of K-means clustering (right panel) and Hierarchical clustering (left panel) for our simulated PHL speaker and NAS speaker. Because the simulated data is constructed using known underlying phonological values, this enables us to identify where the clustering algorithms have assigned specific tokens to the wrong cluster, shown in red.

Figure B.3 displays the results of the clustering algorthims on F1 and F2 for the Cohort 3 Competing Grammars speaker. Again, we can identify the inaccurately classified tokens, because the simulated data contains information about whether any individual token was drawn from the PHL sample or the NAS sample. Inaccurate tokens are displayed in red.

For analyzing the production of phonological change via phonetic incrementation, we turn to the Cohort 3 production of the test-token phonetic incrementation speaker. We use this version of phonetic incrementation because it is the most difficult to distinguish from a competing grammars analysis of sound change, so it is crucial to obtain a classification method that can distinguish between these two mechanisms of sound change in the actual data. Because change via phonetic

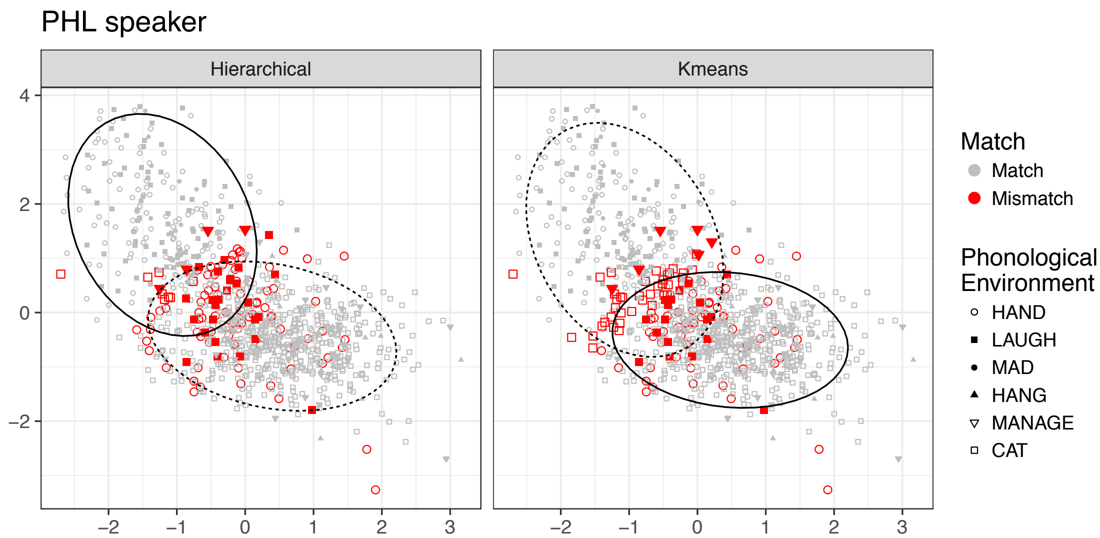

Figure B.1: Accuracy of clustering algorithms for PHL speaker F1 and F2. Red tokens display inaccurately classified tokens.

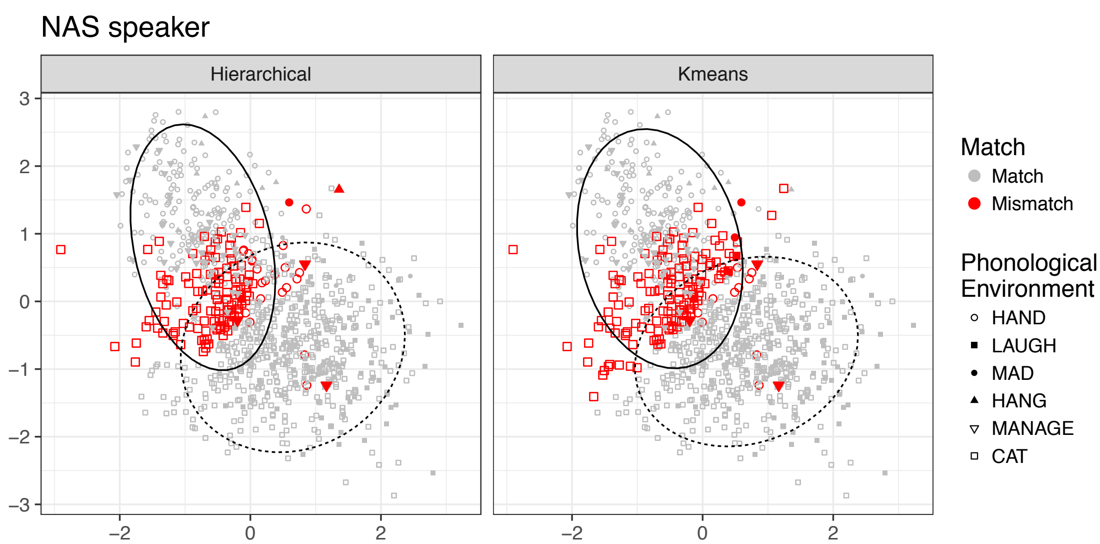

Figure B.2: Accuracy of clustering algorithms for NAS speaker F1 and F2. Red tokens display inaccurately classified tokens.

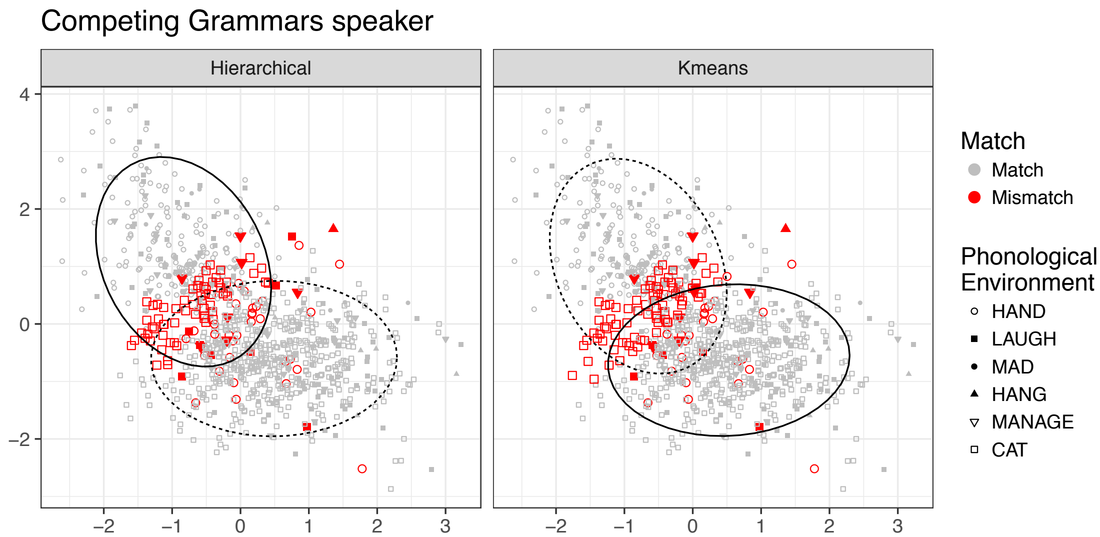

Figure B.3: Accuracy of clustering algorithms for Competing Grammars speaker F1 and F2. Red tokens display inaccurately classified tokens.

incrementation does not assume any underlying phonological reasons for a change, it is not possible to identify whether tokens classified by either K-means or Hierarchical algorithms are accurate (given that there is no underlying phonological classification to the tokens in the first place).

The one expectation that can be made for a phonetic incrementation transitional cohort speaker is that they would produce test tokens as a distinct phonetic target from their HAND and CAT classes. In other words, any clustering algorithm set to find three clusters should identify HAND as one cluster, CAT as a second cluster, and all test tokens as a third cluster. Figure B.4 displays the results of a K-means (right) and Hierarchical (left) clustering model set at $k = 3$ for the simulated phonetic incrementation speaker.

As we can see in Figure B.4, neither the Hierarchical model nor the K-means model selects test tokens accurately as belonging to an intermediate cluster of tokens. Similarly, the clustering algorithms for the PHL and NAS speakers produce a fairly high rate of misanalyzed tokens near the overlapping space between PHL and NAS, where the glm classifier produced between 3 (for the NAS data) and 7 (for the PHL data) inaccurately classified tokens.

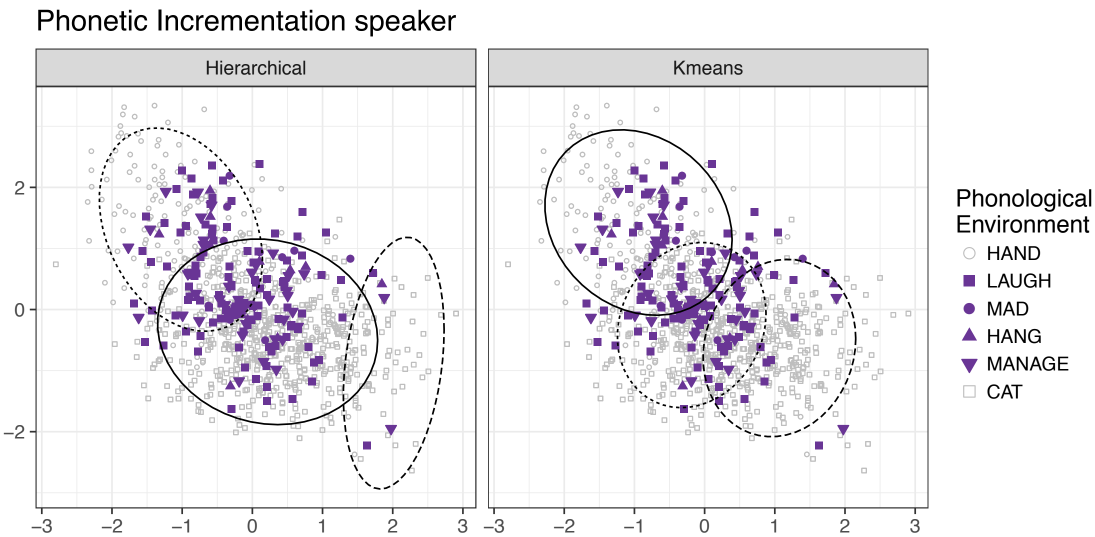

Figure B.4: Accuracy of clustering algorithms for Phonetic Incrementation speaker F1 and F2. Purple tokens display test tokens, which should fall within a single cluster.

B.2 Dimensionality Reduction

While F1 and F2 serve as the primary acoustic cues for tenseness, we must also consider the possibility that additional parameters contribute to a token's identity as tense or lax, and that the misanalyses presented above are the result of taking only two dimensions of tenseness into account. Indeed, in the glm classifier that emerges as the best classifier of token tenseness, F3, duration and stress all factor into the classification of tokens as tense or lax. In addition to the glm classifier described in Chapter 4, I also tested whether a K-means and Hierarchical clustering algorithm accurately classified the data when it had been submitted to a dimensionality reduction algorithm. For this, simulated data for a competing grammars speaker and a phonetic incrementation speaker were created that included a simulated duration for each token, calculated using the covariance matrices for F1, F2, and duration.

Principal Components Analysis Principal Components Analysis (PCA) is an unsupervised dimensionality reduction algorithm that reduces a set of observations into linearly uncorrelated variables, or *principal components*. The first principal component accounts for the highest variance. After this, the second component accounts for the highest of the remaining variance. In theory, a PCA analysis would be able to determine the similarity of test tokens and training tokens along all relevant measurement dimensions and produce groupings that cluster test tokens either as part of the HAND or CAT class underlyingly or as phonetically distinct. The resulting data can then be submitted to a K-means and a Hierarchical cluster algorithm.

T-distributed stochastic neighbor embedding T-distributed stochastic neighbor embedding (t-SNE) provides a type of dimensionality reduction similar to PCA. t-SNE creates a probability distribution over pairs of observations in high-dimensional space. This results in a set of probabilities $p_{i,j}$ that represent the similarity of observations x_i and x_j. Based on these probabilities, t-SNE produces a k-dimensional map of clusters (typically set to $k = 2$), which can then be either visually distinguished or clustered by K-means or Hierarchical analysis.

B.2.1 Applying Clustering Algorithms to Reduced Dimension Data

In what follows, I present accuracy plots for clustering algorithms run on PCA and t-SNE transformed data. The resulting plots display high levels of inaccuracy for clustering dimensionality reduced data for all simulated speakers.

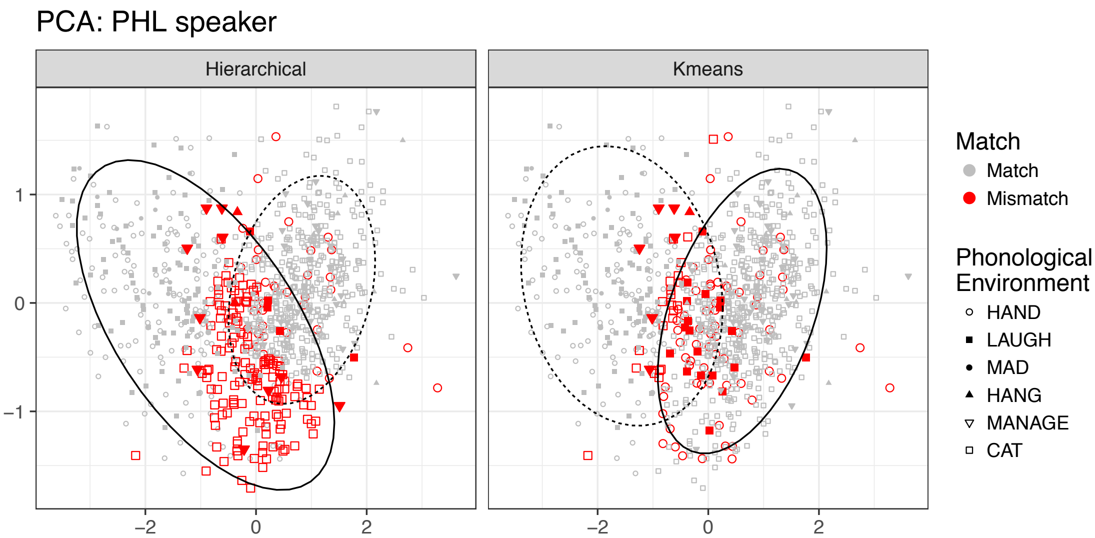

Figure B.5: Accuracy of clustering algorithms for PHL speaker PCA data. Red tokens display inaccurately classified tokens.

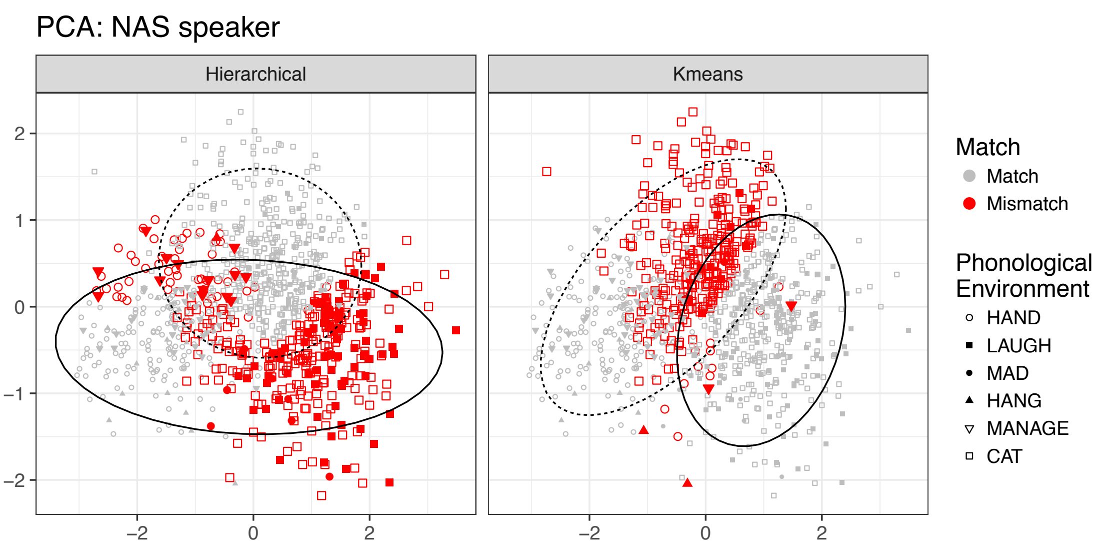

Figure B.6: Accuracy of clustering algorithms for NAS speaker PCA data. Red tokens display inaccurately classified tokens.

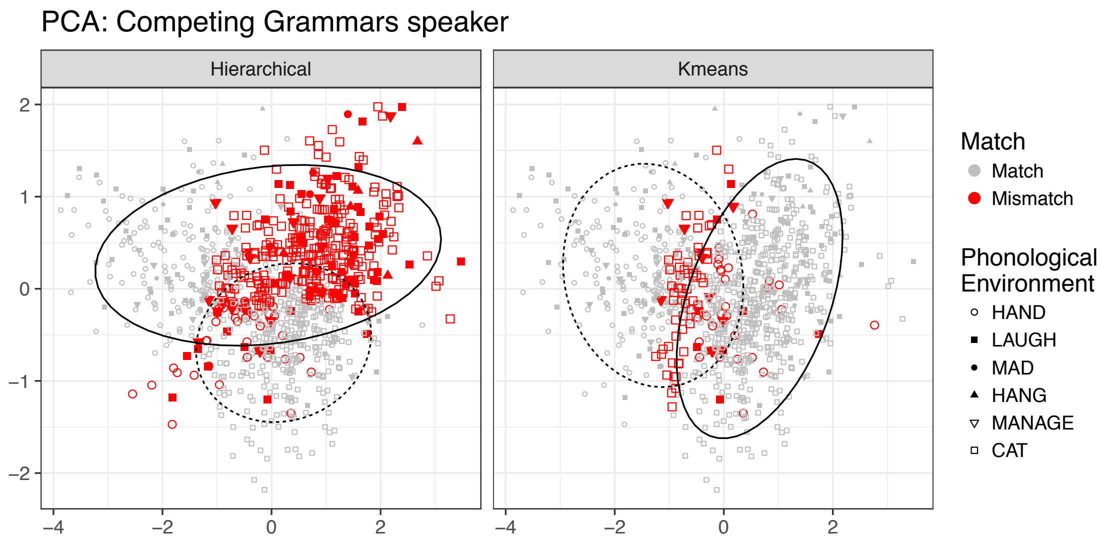

Figure B.7: Accuracy of clustering algorithms for Competing Grammars speaker PCA data. Red tokens display inaccurately classified tokens.

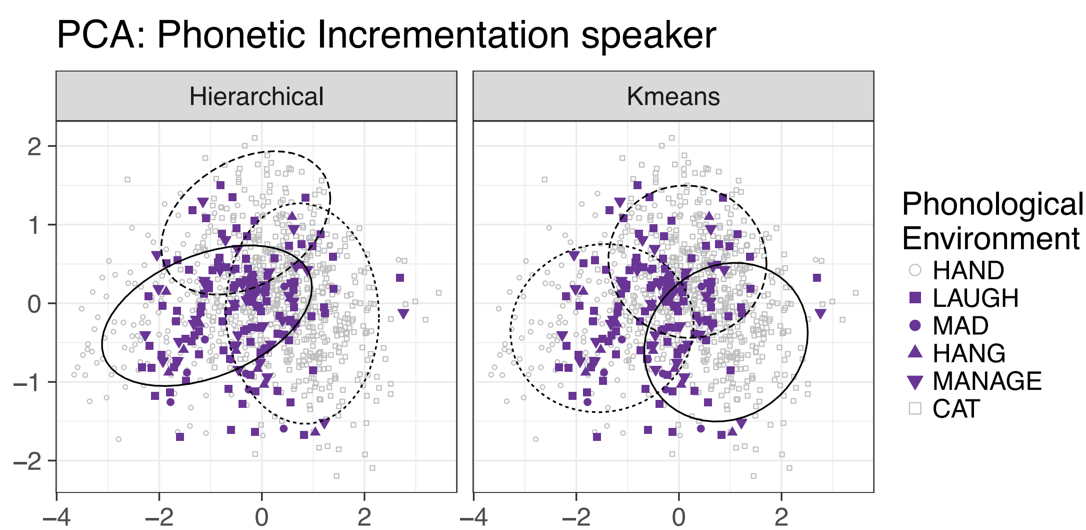

Figure B.8: Accuracy of clustering algorithms for Phonetic Incrementation speaker PCA data. Purple tokens display test tokens, which should fall within a single cluster.

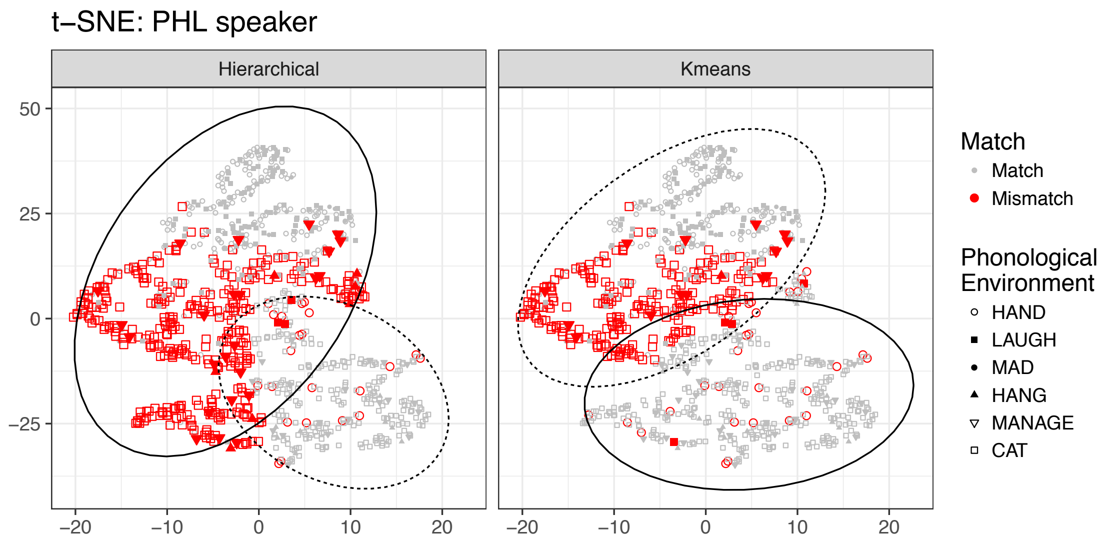

Figure B.9: Accuracy of clustering algorithms for PHL speaker t-SNE data. Red tokens display inaccurately classified tokens.

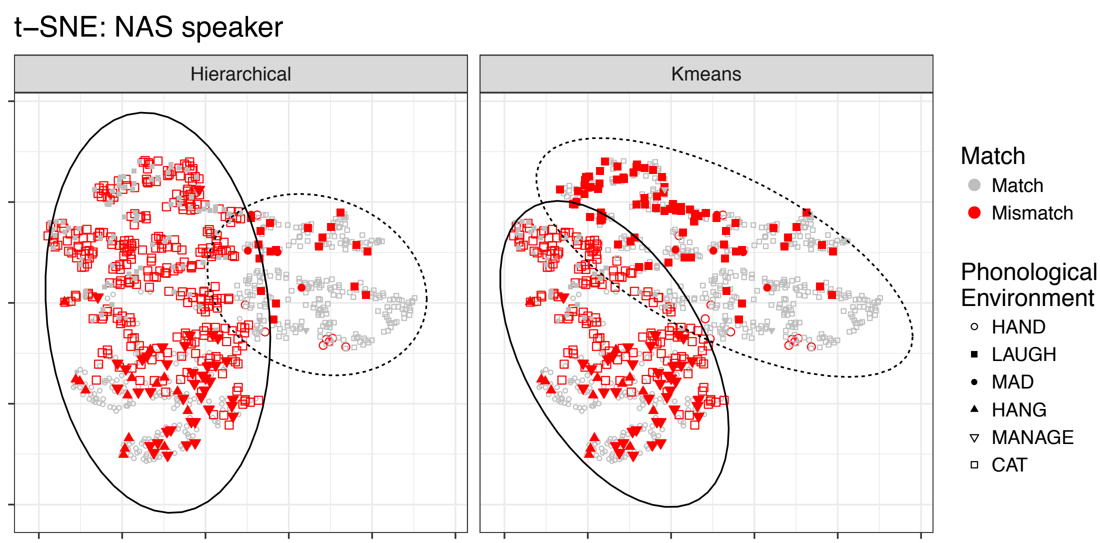

Figure B.10: Accuracy of clustering algorithms for NAS speaker t-SNE data. Red tokens display inaccurately classified tokens.

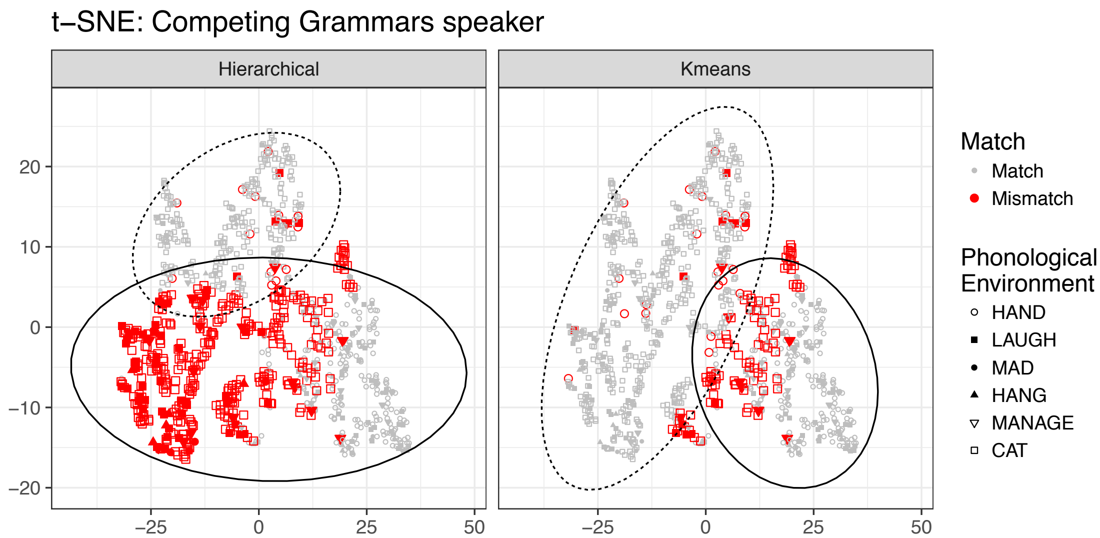

Figure B.11: Accuracy of clustering algorithms for Competing Grammars speaker t-SNE data. Red tokens display inaccurately classified tokens.

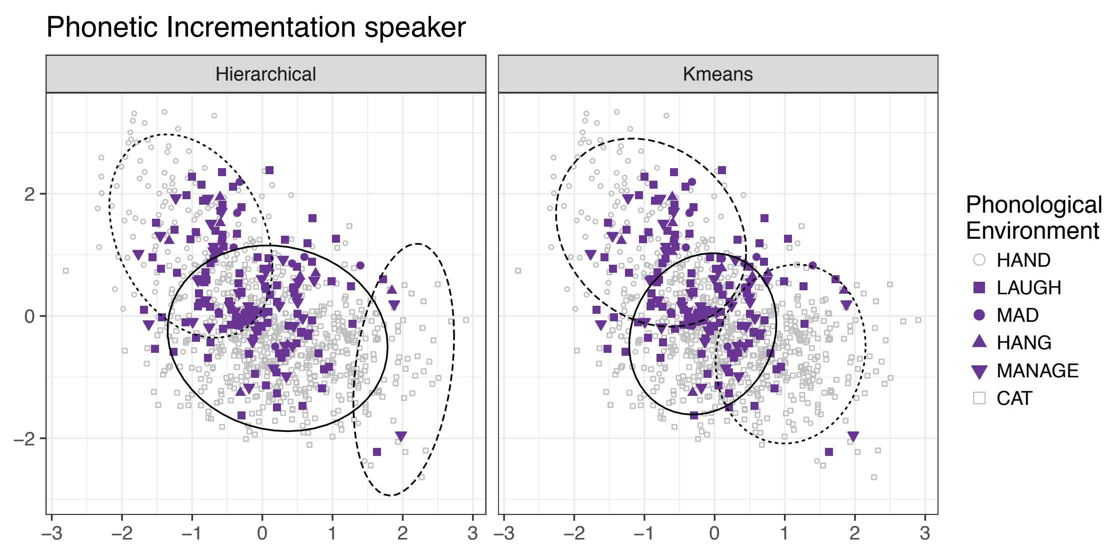

Figure B.12: Accuracy of clustering algorithms for Phonetic Incrementation speaker t-SNE data. Purple tokens display test tokens, which should fall within a single cluster.

Appendix C

IMPC Methods

marry	dog	bother	stock
hassit	hand	Miami	planet
stalk	personality	sauce	ask
father	dad	corner	Don
collar	Murray	awed	big
pacify	calm	alas	tiny
am	trannel	prass	Alice
merry	spider	ham	chocolate
Snyder	log	path	have
I can	ice	class	tiger
wide	very	bank	baff
nath	Friday	classic	palm
gas	Girard	white	sad
rider	tot	cash	right
dawn	league	Spanish	law
bang	croth	furry	Mary
and	athlete	pal	tin can
odd	down	bad	aspirin
valley	taught	asterisk	glad
angle	mouth	ferry	crown
classify	manage	man	south
caller	ride	lang	pass
groll	eyes	toss	crayon
Charlie	half	math	nearer
salve	mad	hammer	salmon

Table C.1: IMPC wordlist.

Conversational prompts

How did you two meet? Did you become friends right away?

What did you do for fun when you were a kid? Were your parents strict? Did you play with the kids on your street? Were there games you liked to play with your friends/neighbors?

Does school/work stress you out? What about the election? What do you do for fun and to de-stress?

When is the last time you got really mad? Have you two ever gotten into a fight with each other? What do you do when you're angry?

What about the last time you were embarrassed? Do you remember a time that one of your friends did something really embarrassing?

What's the last time that you remember feeling scared? Is there anything that makes you feel like you're going to panic?

Do you remember the 90s? What about the 2000s? What kind of trends do you associate with being a child of that decade? (Clothes? Music?)

Have you maintained strong relationships with the people who you grew up with? Or are you making new friends as an adult? Is it harder to make new friends as an adult?

Do you like the idea of traveling or would you rather stay home? Have you been anywhere cool? Where would you go if you could go anywhere in the world for free?

Figure C.1: IMPC Conversational Prompts

Appendix D

Production Plots for IMPC and IHELP Speakers

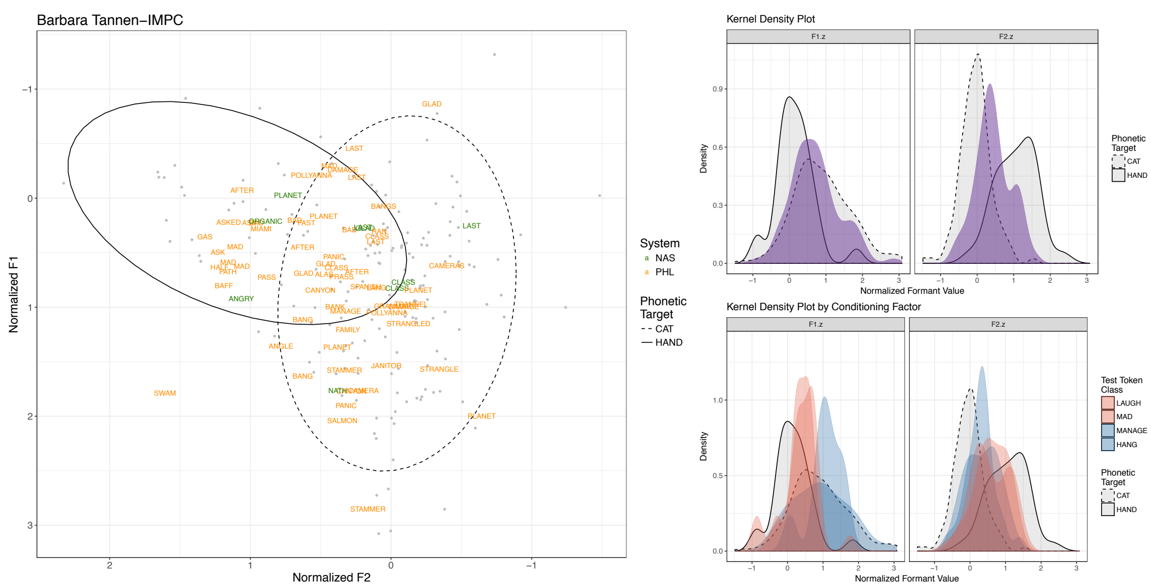

Figure D.1: Barbara Tannen, PHL

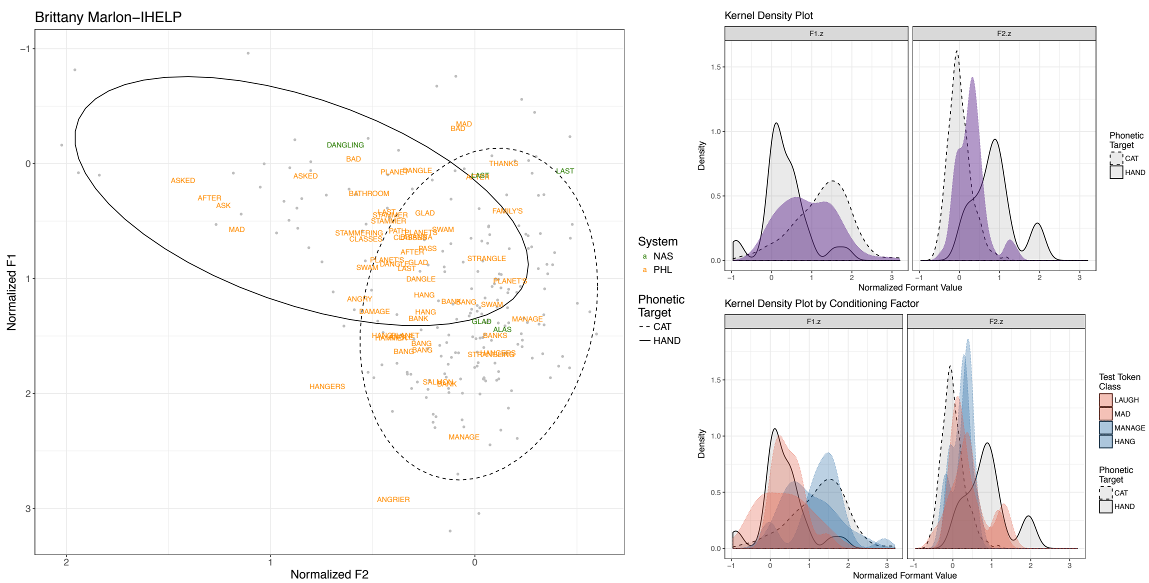

Figure D.2: Brittany Marlon, PHL

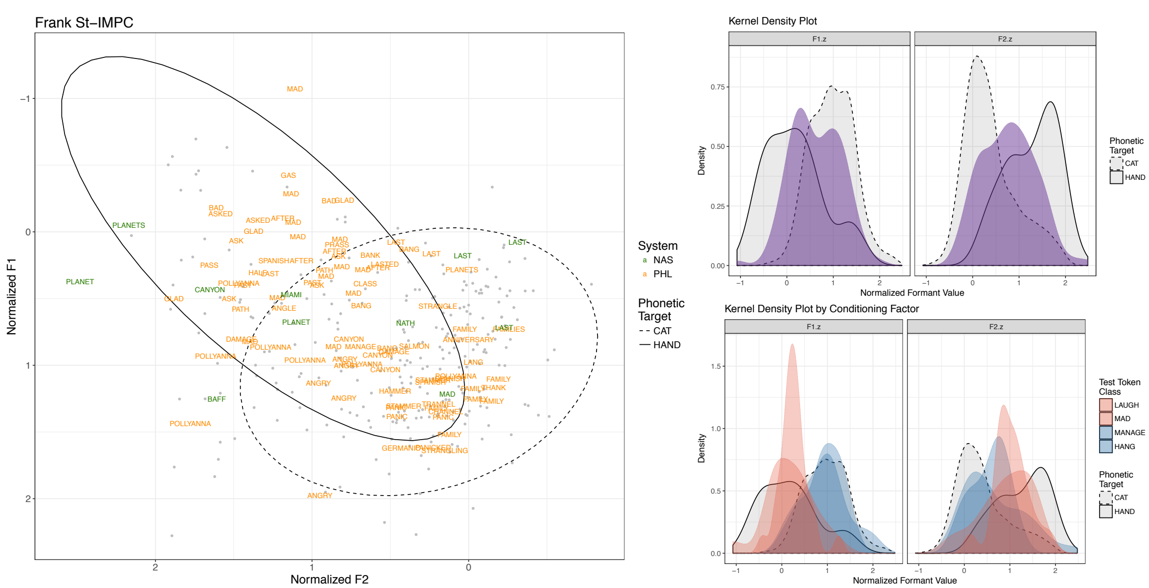

Figure D.3: Frank St, PHL

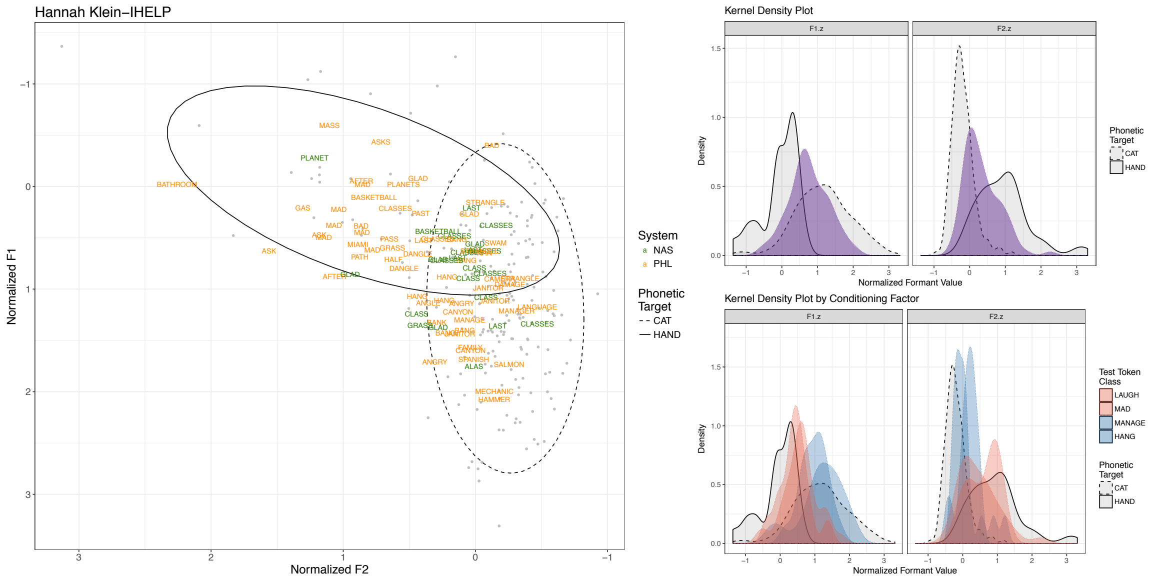

Figure D.4: Hannah Klein, PHL

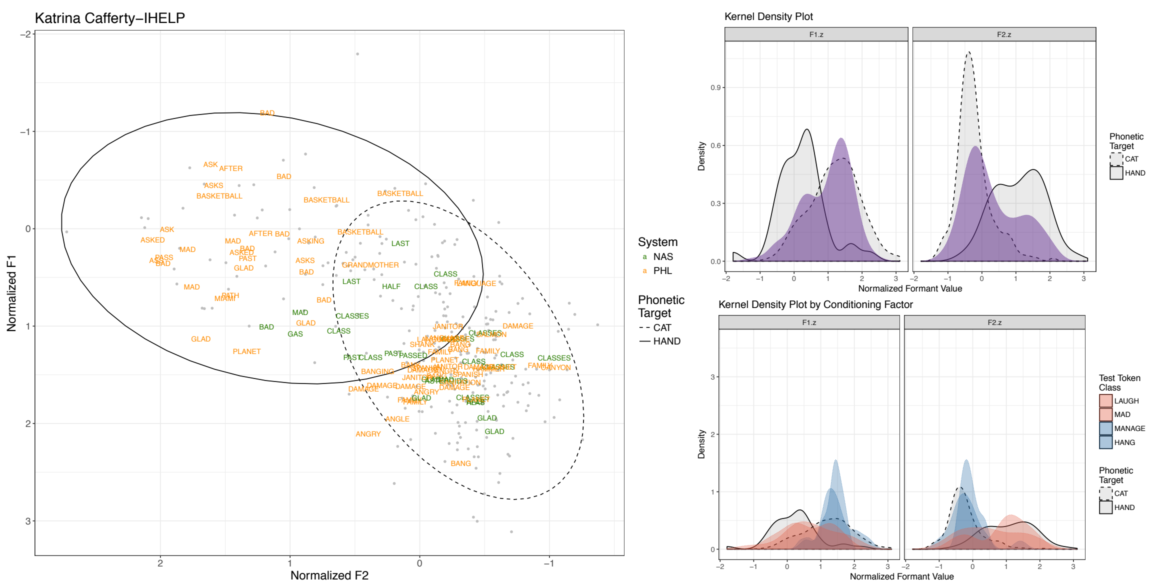

Figure D.5: Katrina Cafferty, PHL

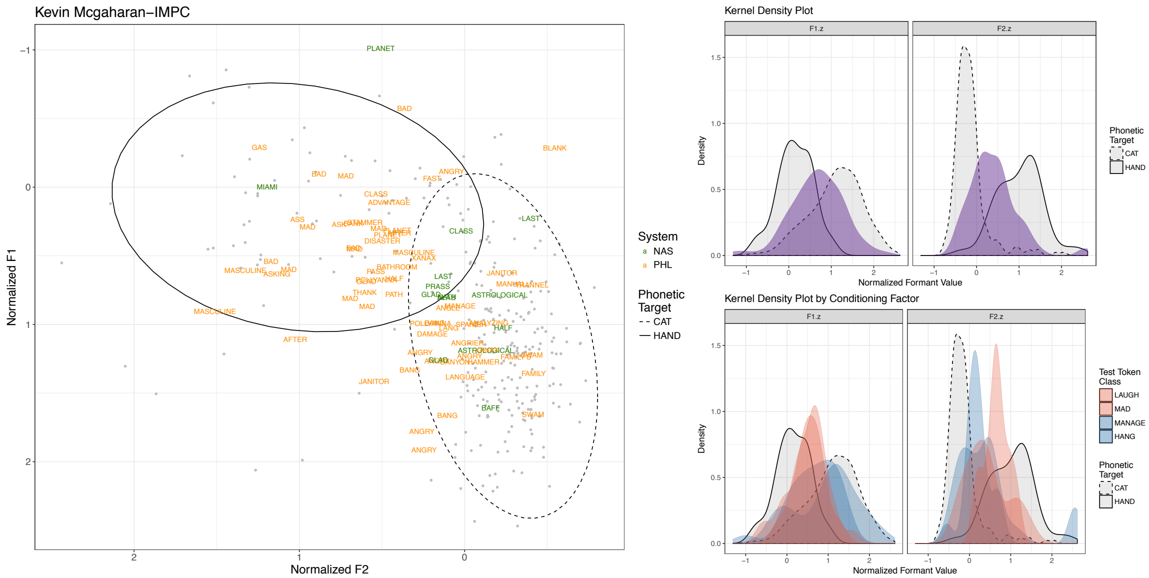

Figure D.6: Kevin Mcgaharan, PHL

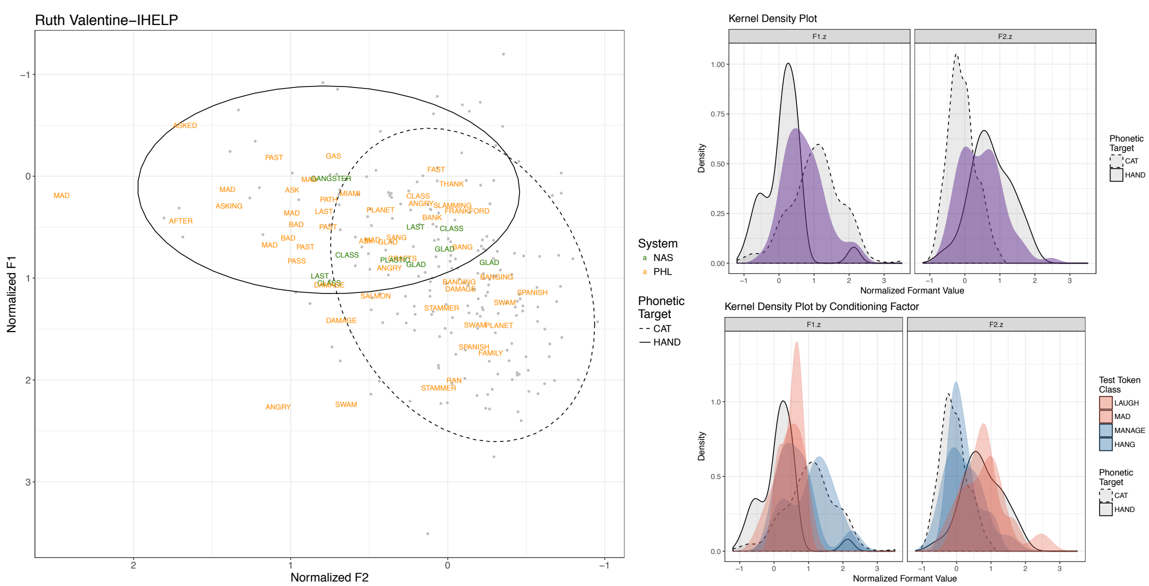

Figure D.7: Ruth Valentine, PHL

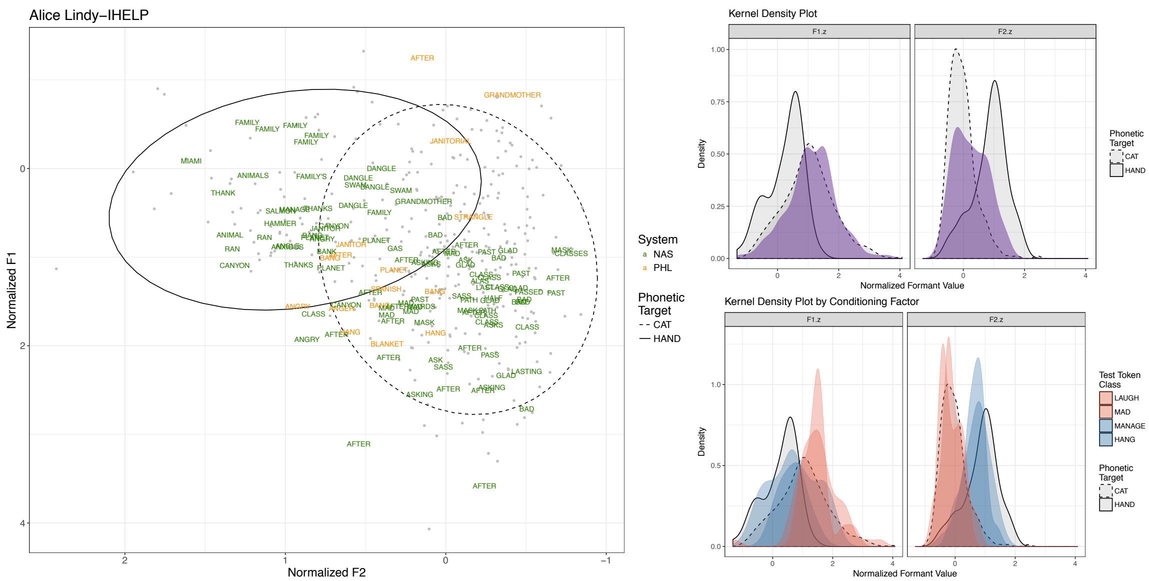

Figure D.8: Alice Lindy, NAS

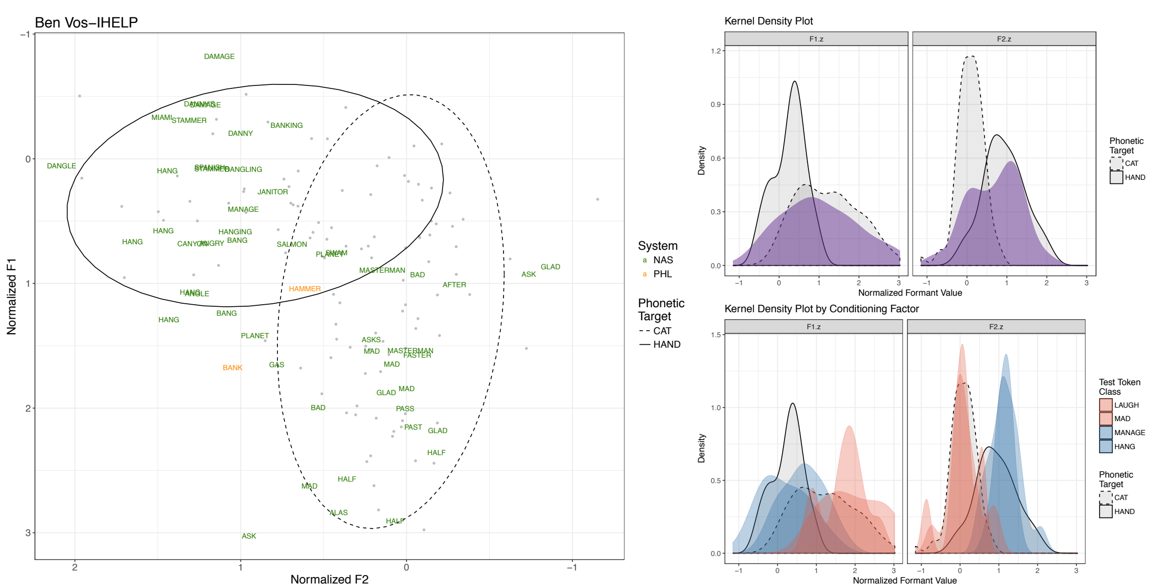

Figure D.9: Ben Vos, NAS

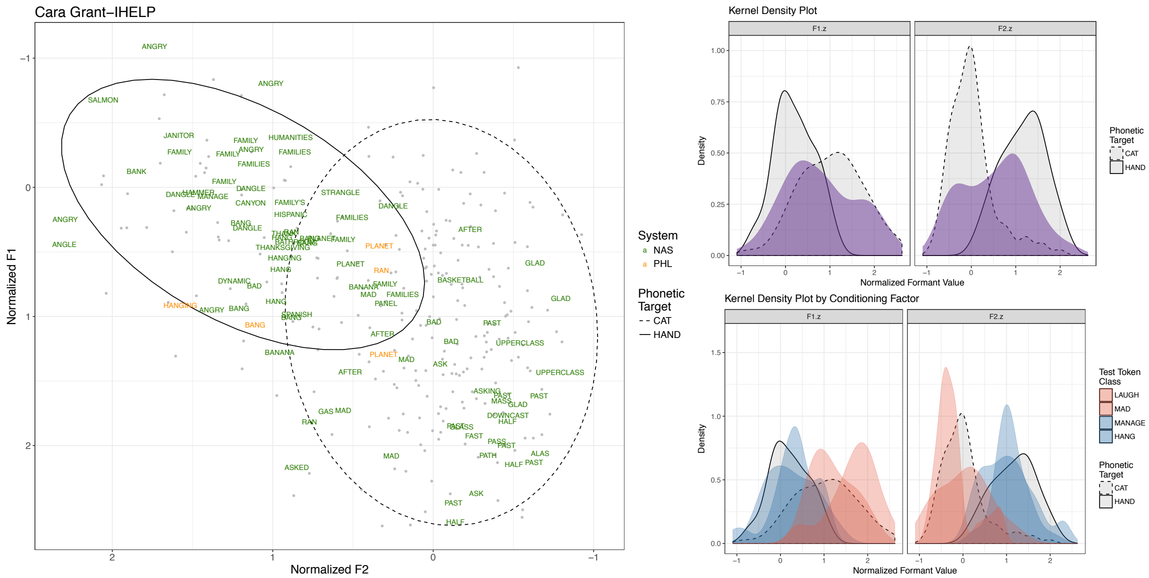

Figure D.10: Cara Grant, NAS

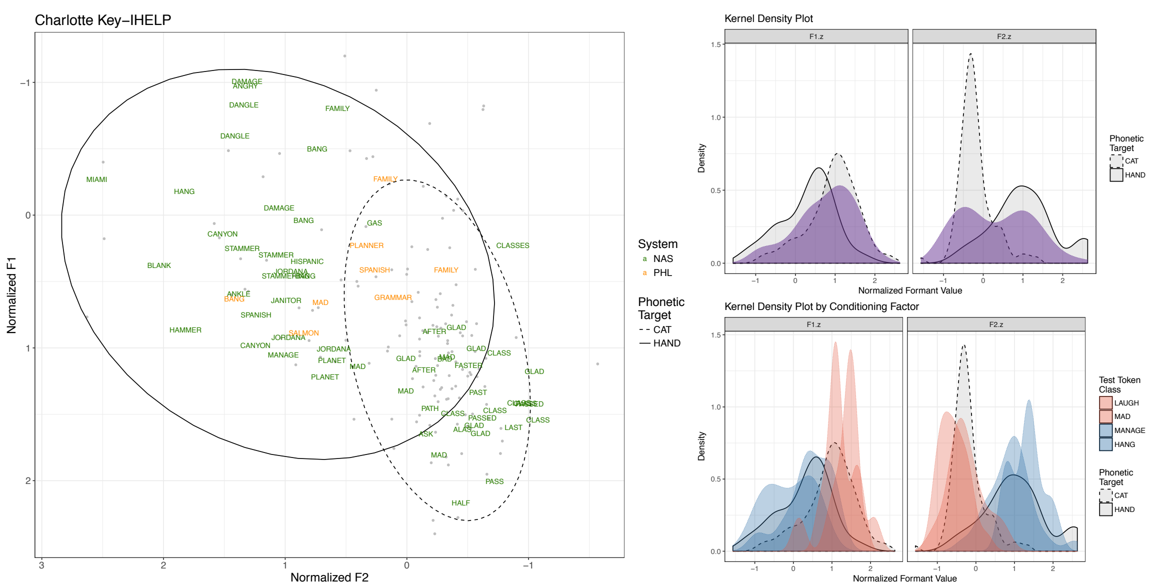

Figure D.11: Charlotte Key, NAS

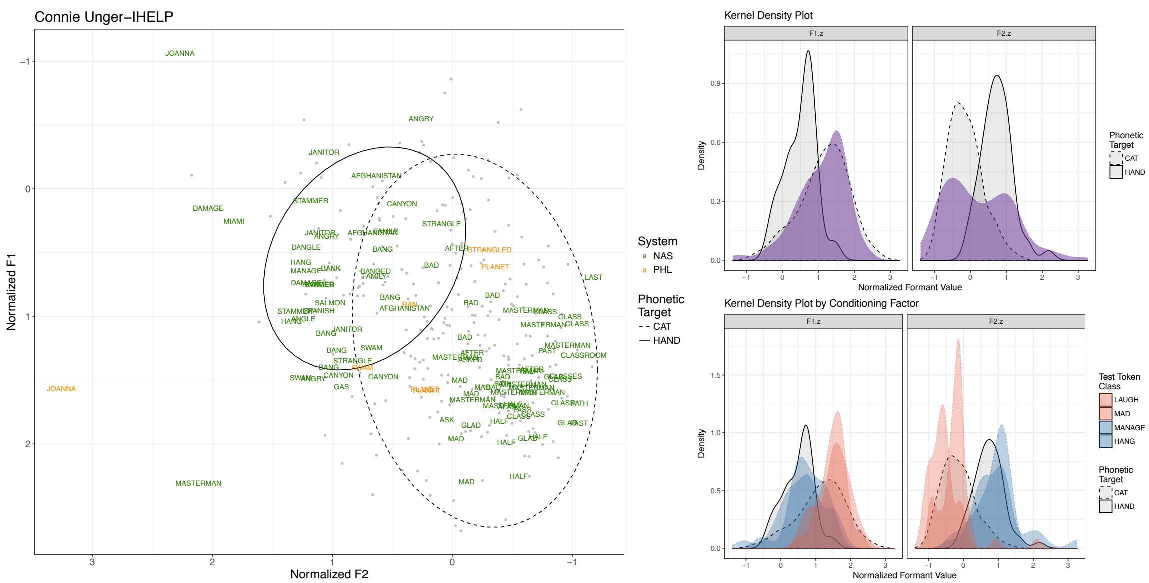

Figure D.12: Connie Unger, NAS

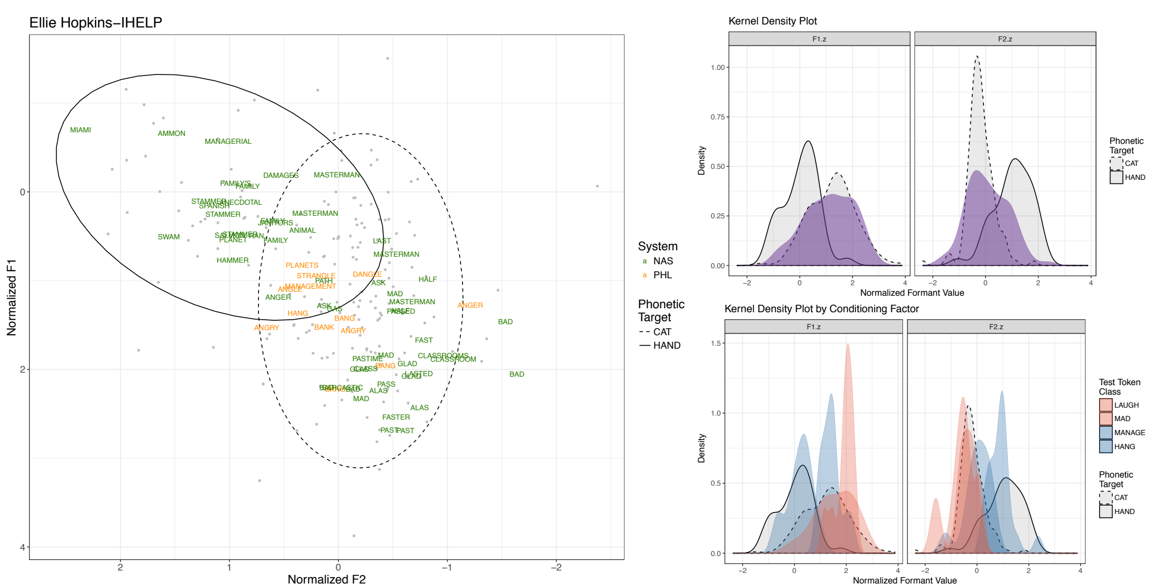

Figure D.13: Ellie Hopkins, NAS

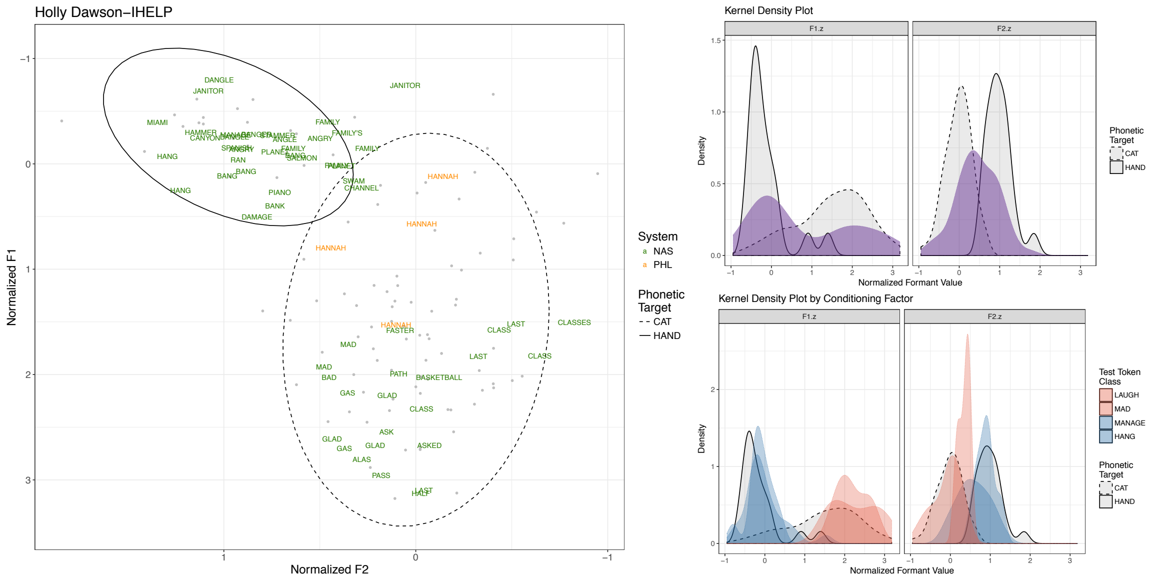

Figure D.14: Holly Dawson, NAS

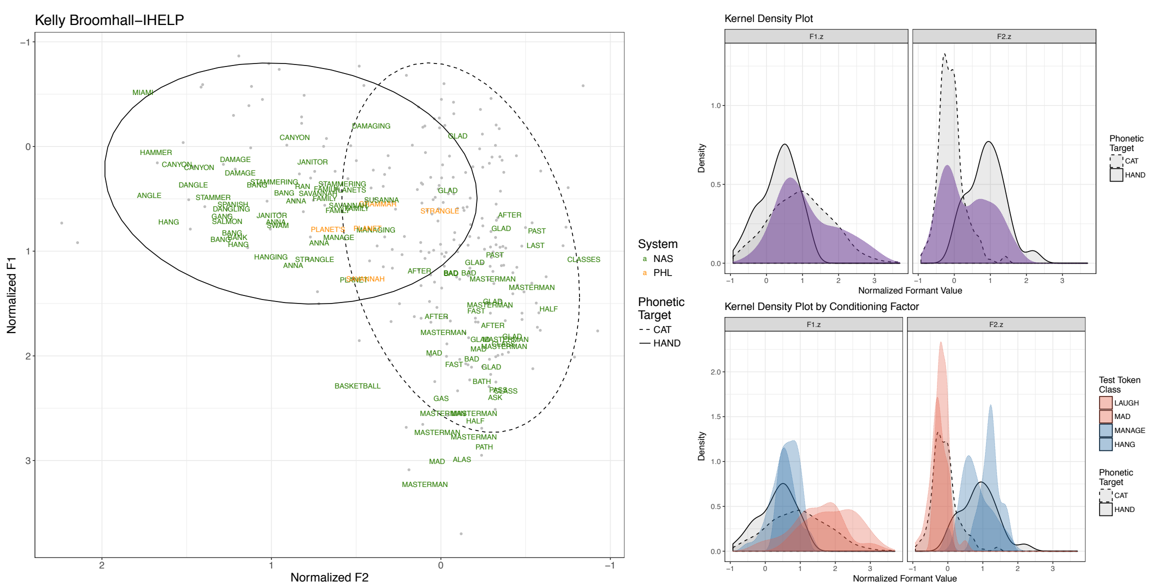

Figure D.15: Kelly Broomhall, NAS

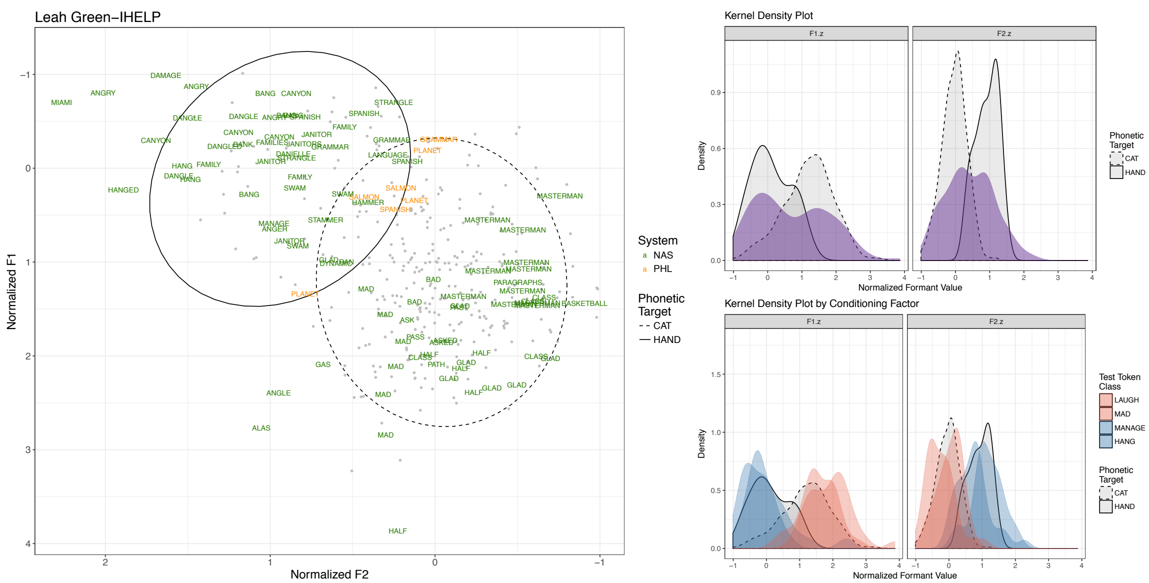

Figure D.16: Leah Green, NAS

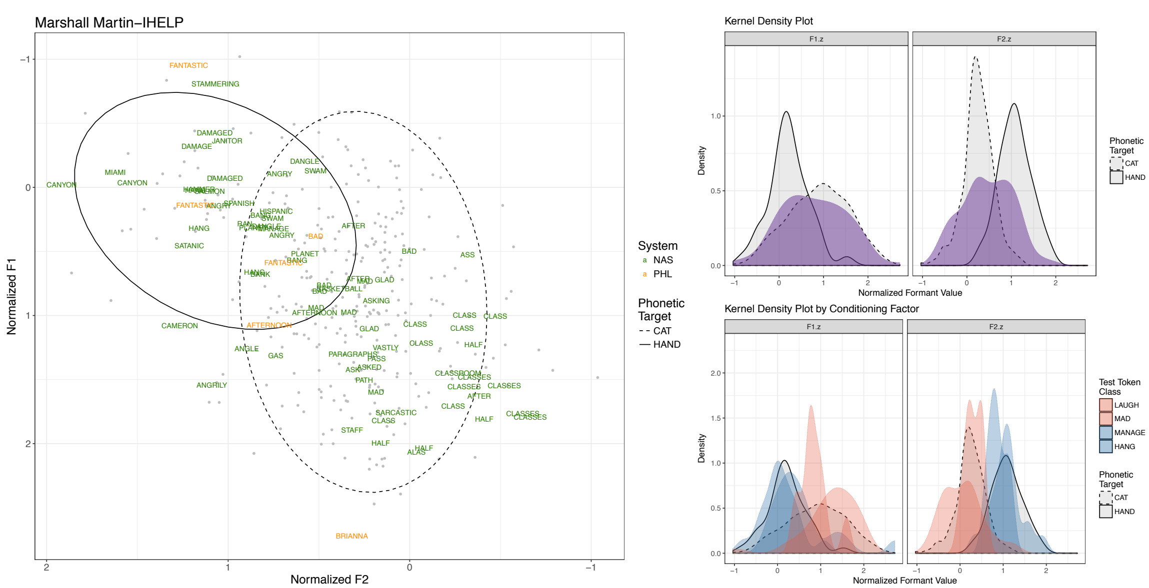

Figure D.17: Marshall Martin, NAS

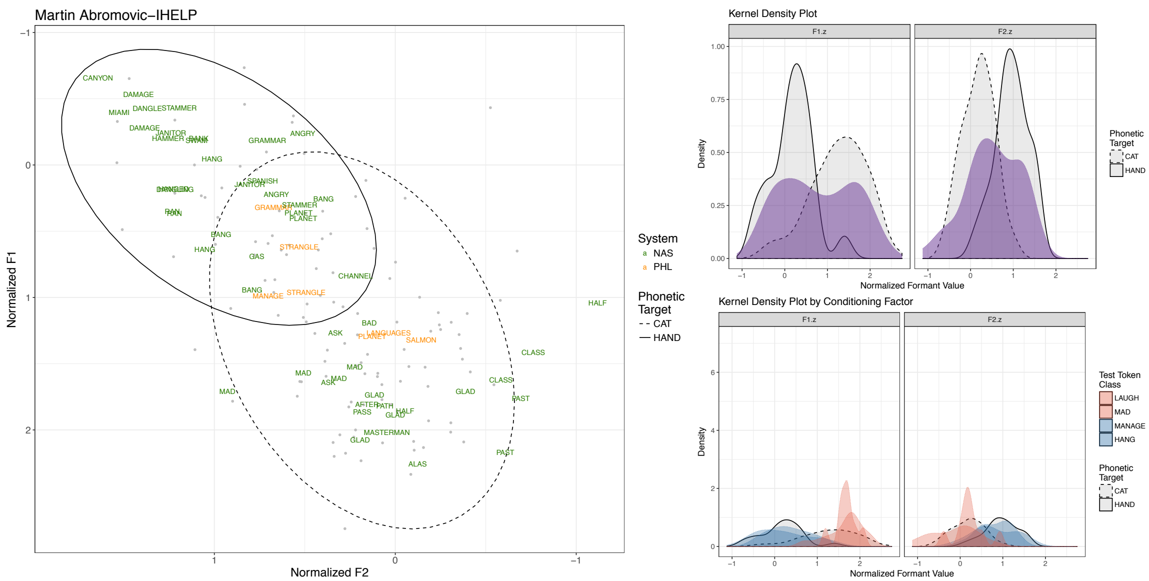

Figure D.18: Martin Abromovic, NAS

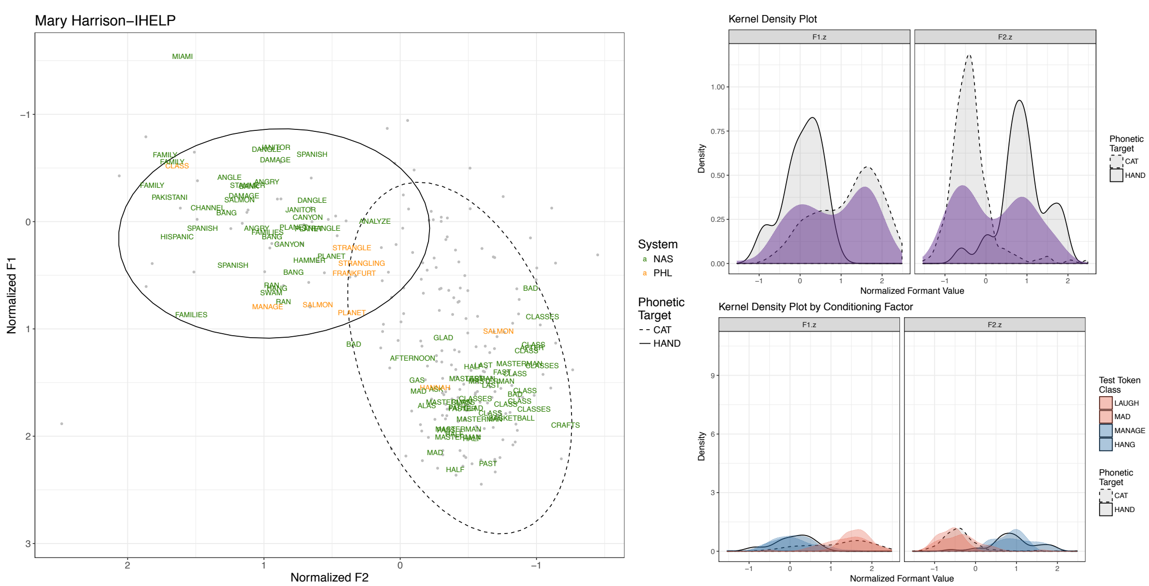

Figure D.19: Mary Harrison, NAS

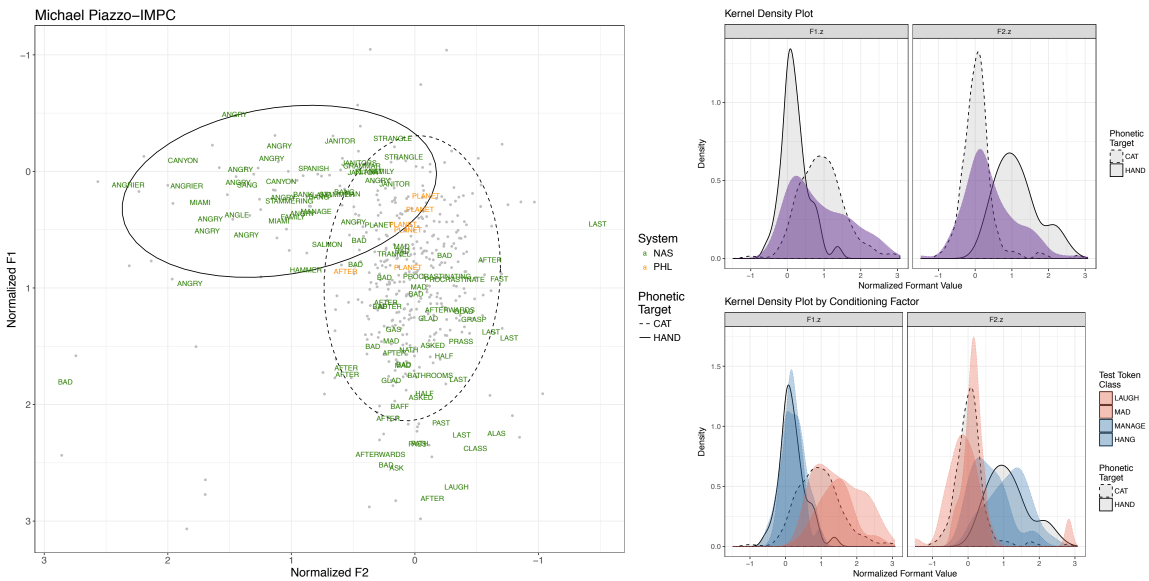

Figure D.20: Michael Piazzo, NAS

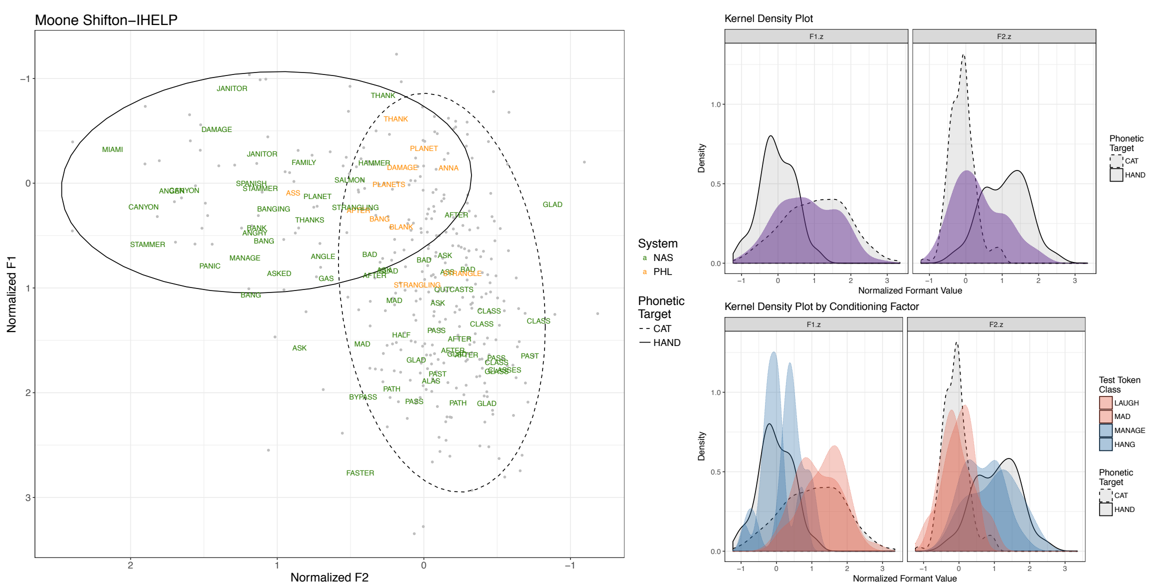

Figure D.21: Moone Shifton, NAS

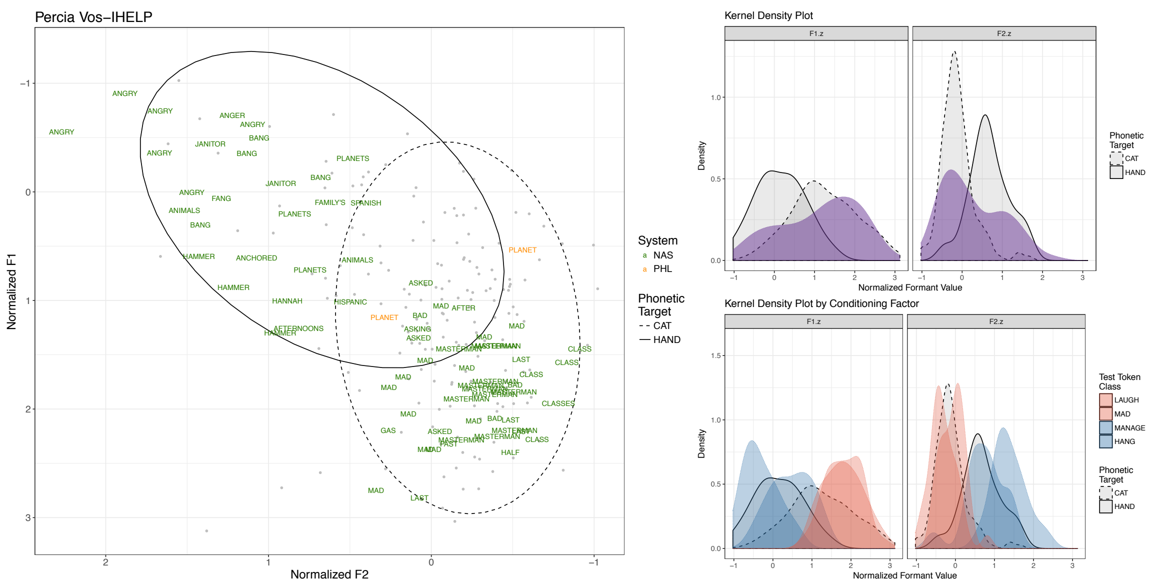

Figure D.22: Percia Vos, NAS

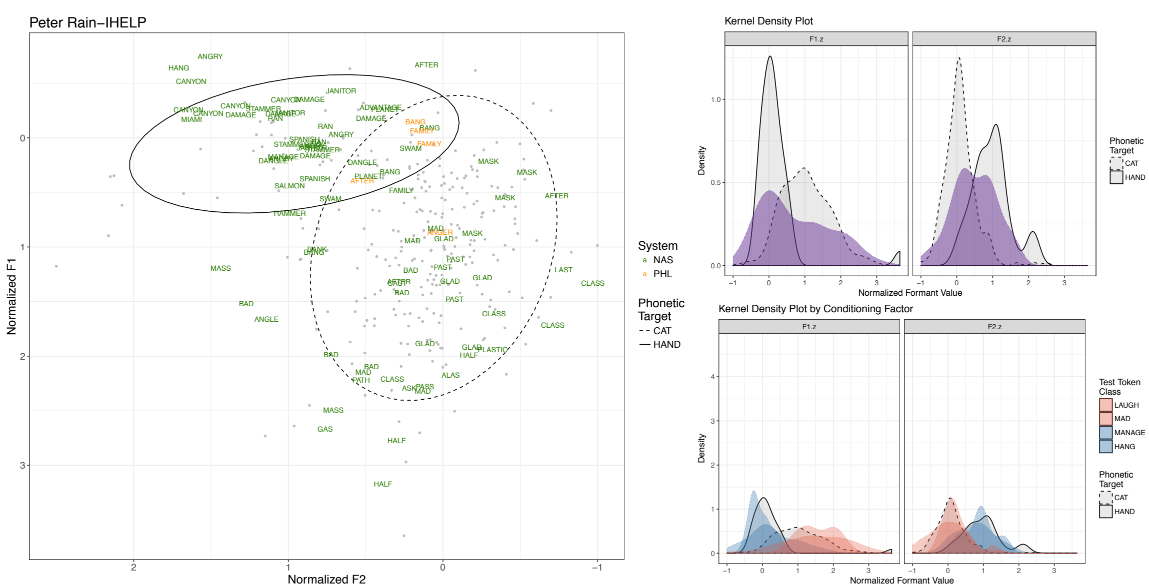

Figure D.23: Peter Rain, NAS

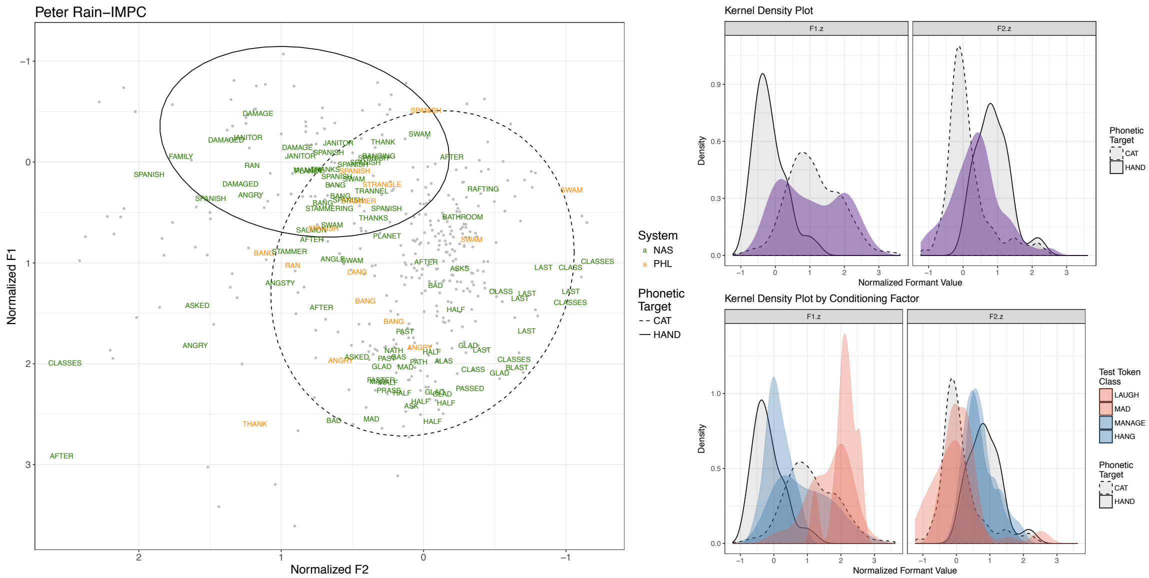

Figure D.24: Peter Rain, NAS

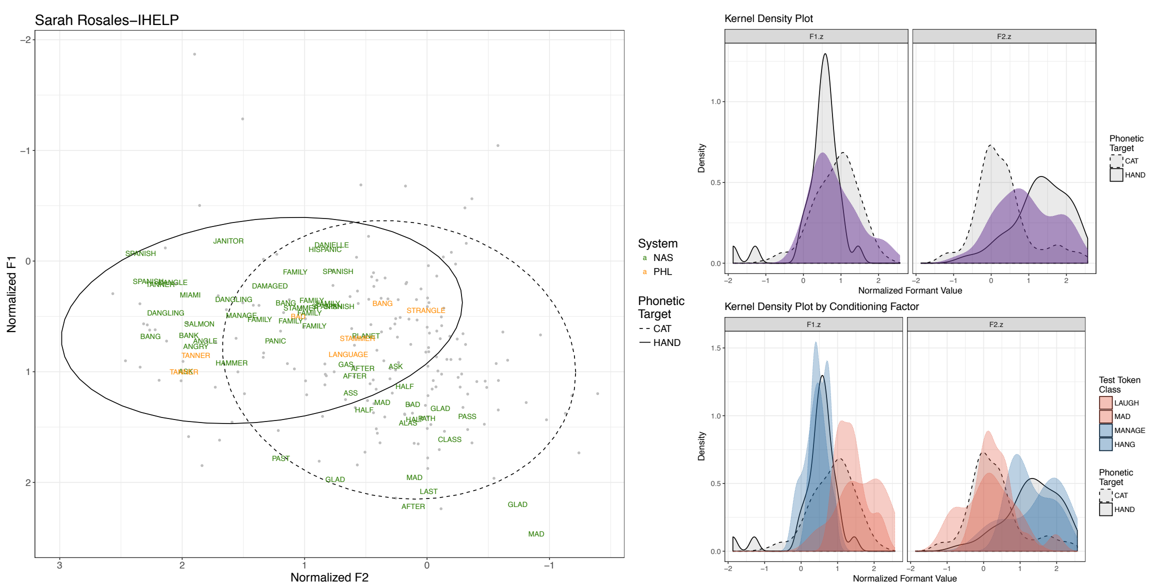

Figure D.25: Sarah Rosales, NAS

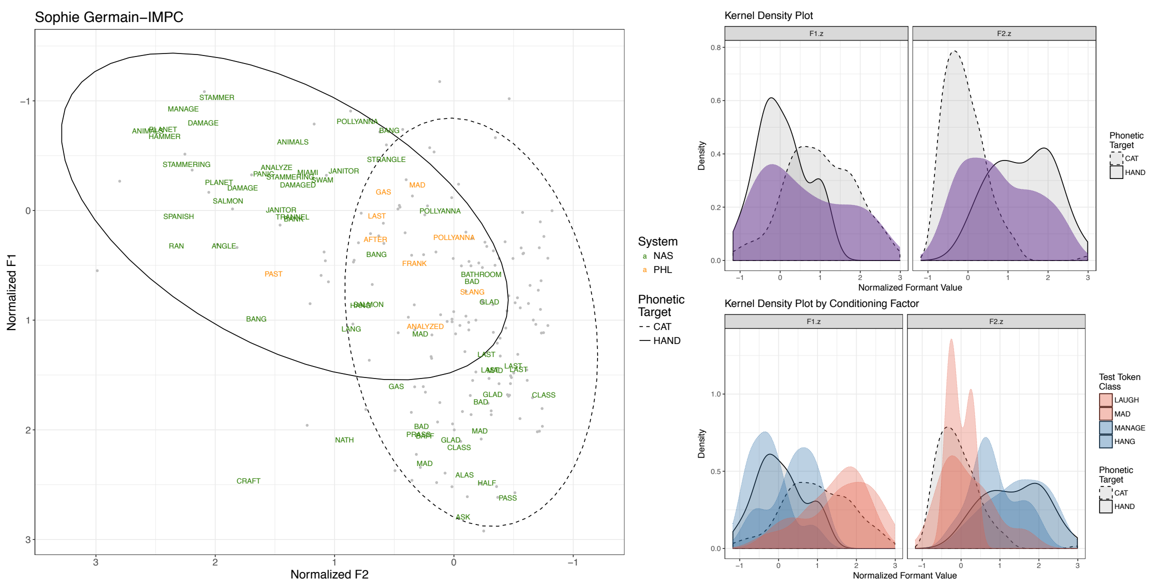

Figure D.26: Sophie Germain, NAS

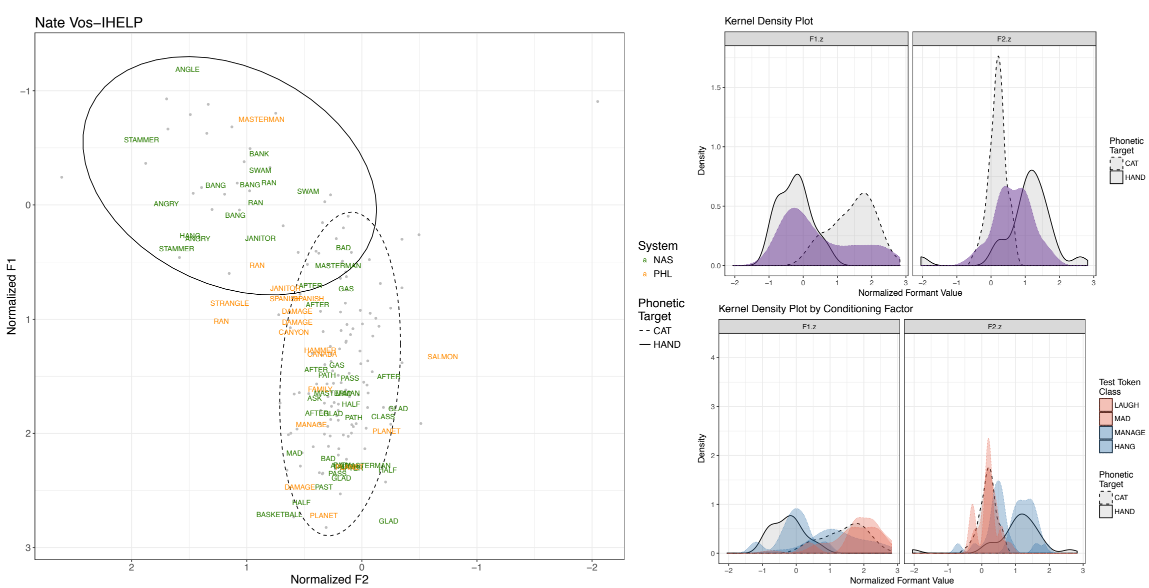

Figure D.27: Nate Vos, competing grammars

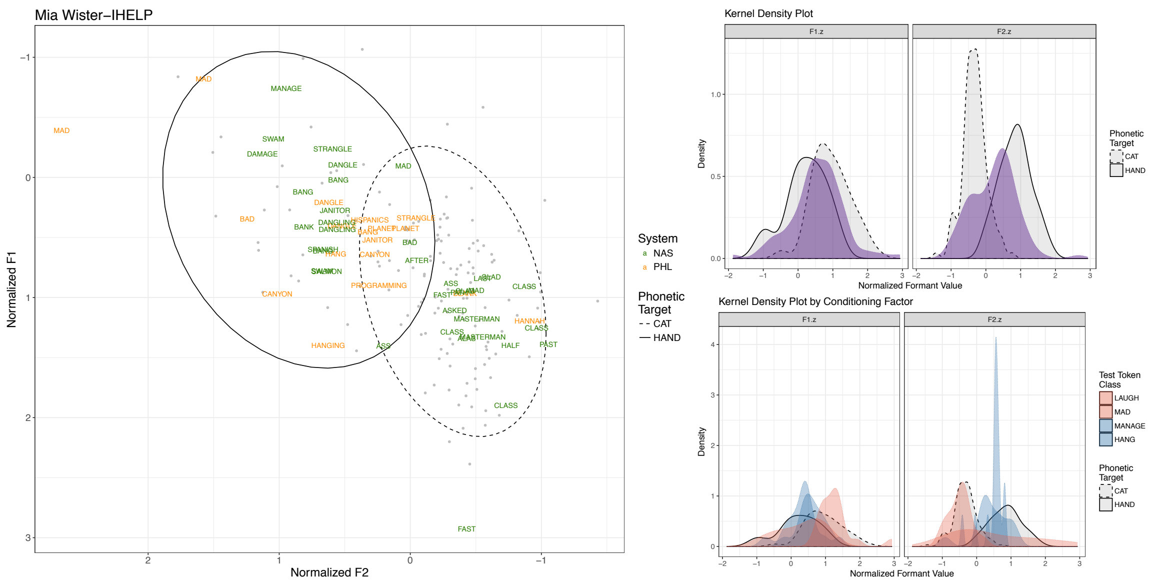

Figure D.28: Mia Wister, competing grammars

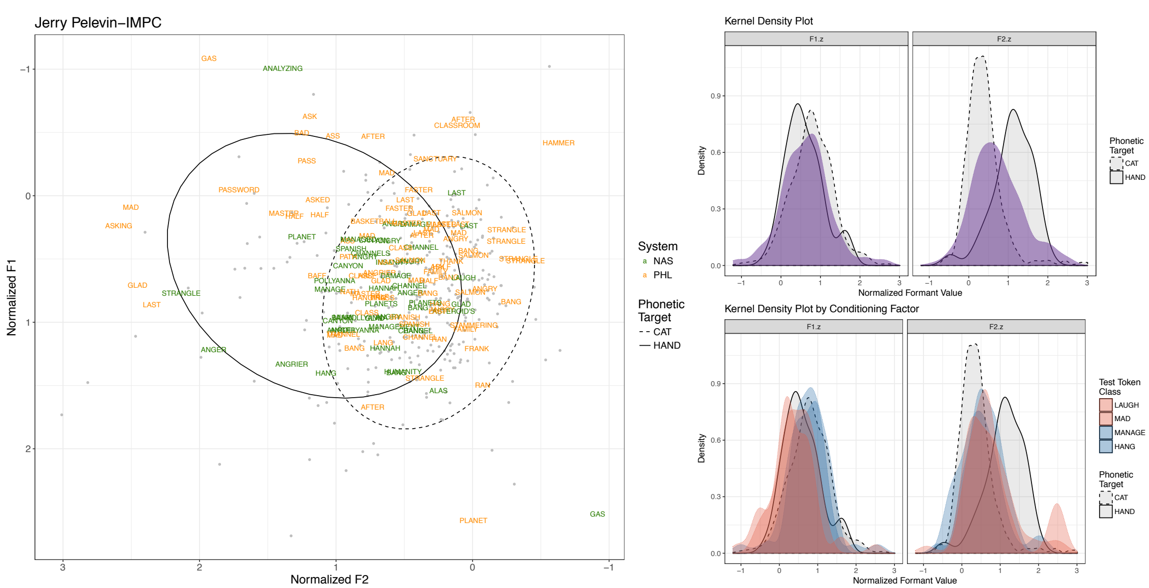

Figure D.29: Jerry Pelevin, competing grammars

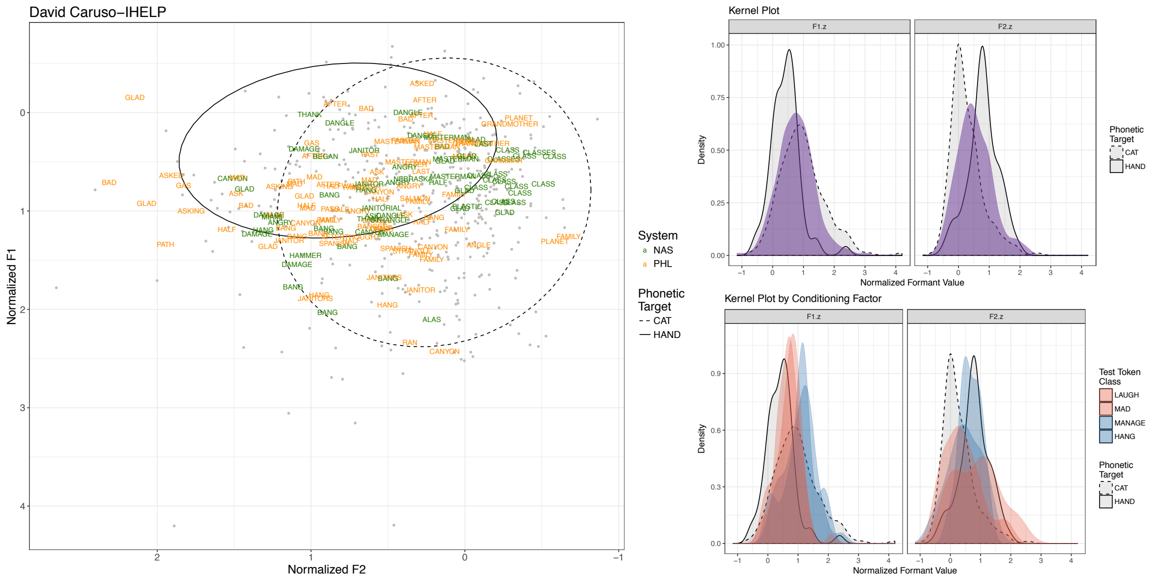

Figure D.30: David Caruso, competing grammars

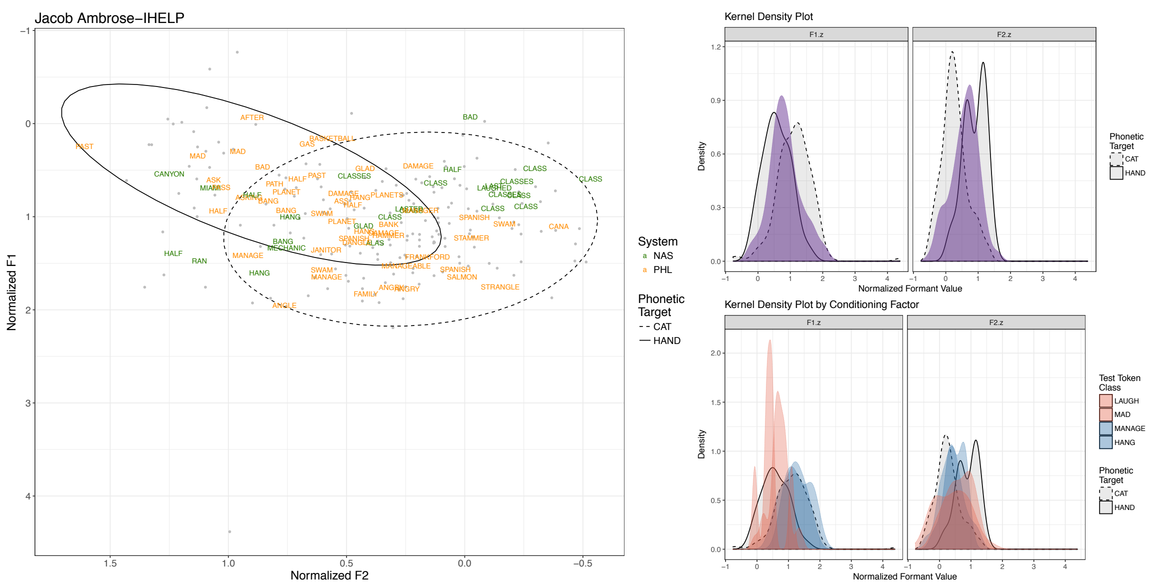

Figure D.31: Jacob Ambrose, competing grammars

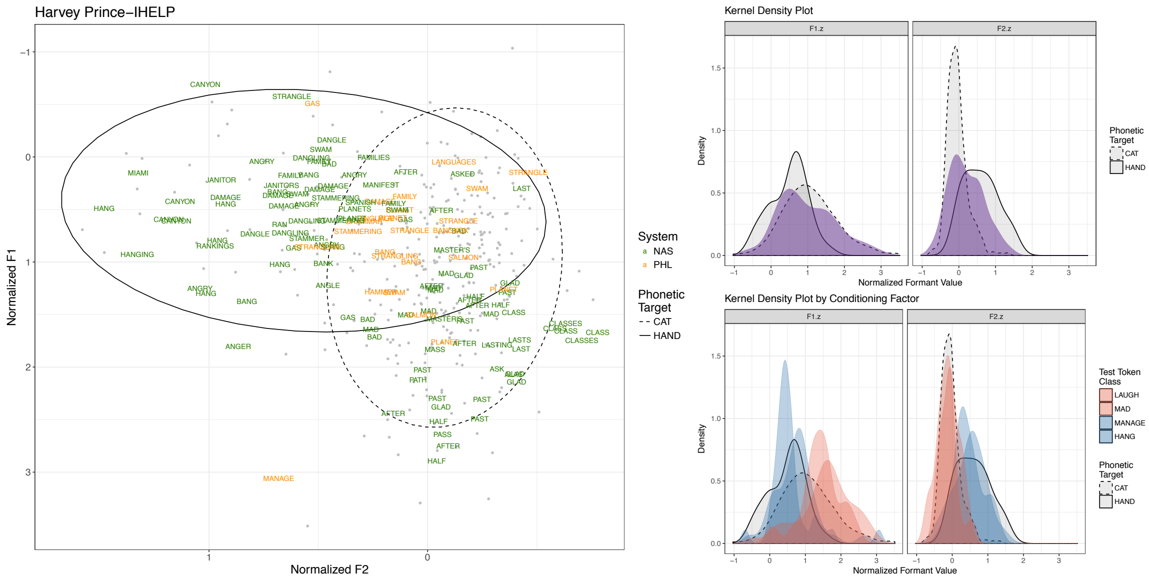

Figure D.32: Harvey Prince, competing grammars

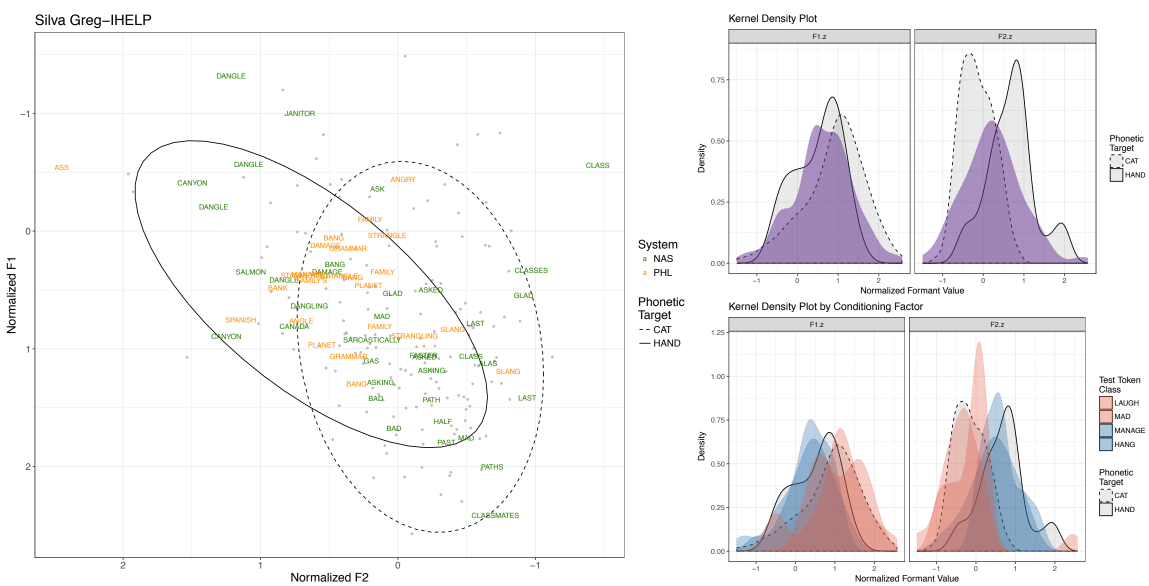

Figure D.33: Silva Greg, competing grammars

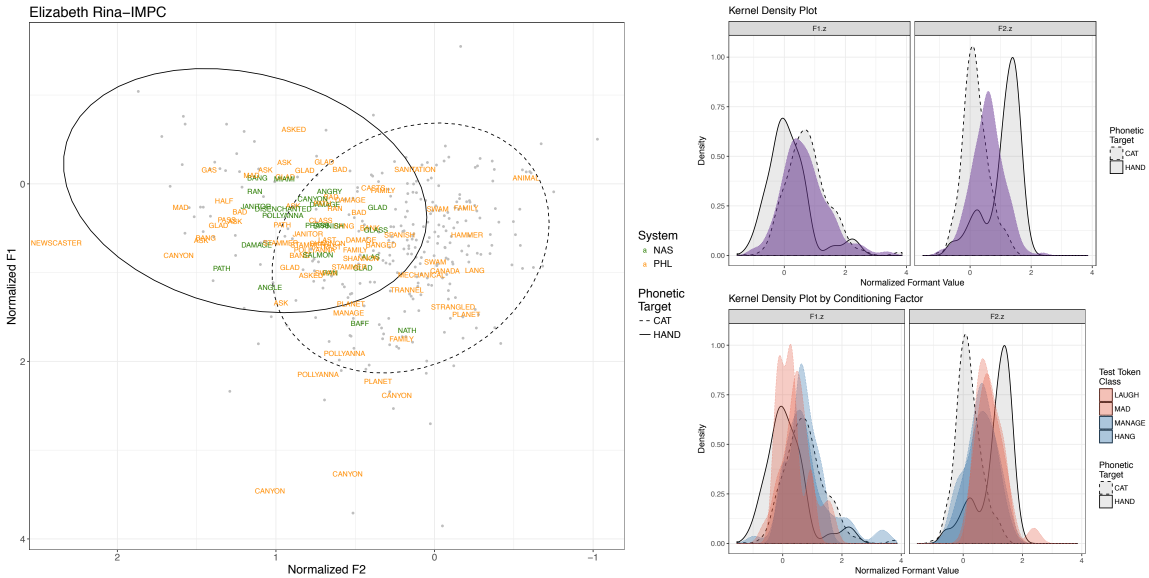

Figure D.34: Elizabeth Rina, competing grammars

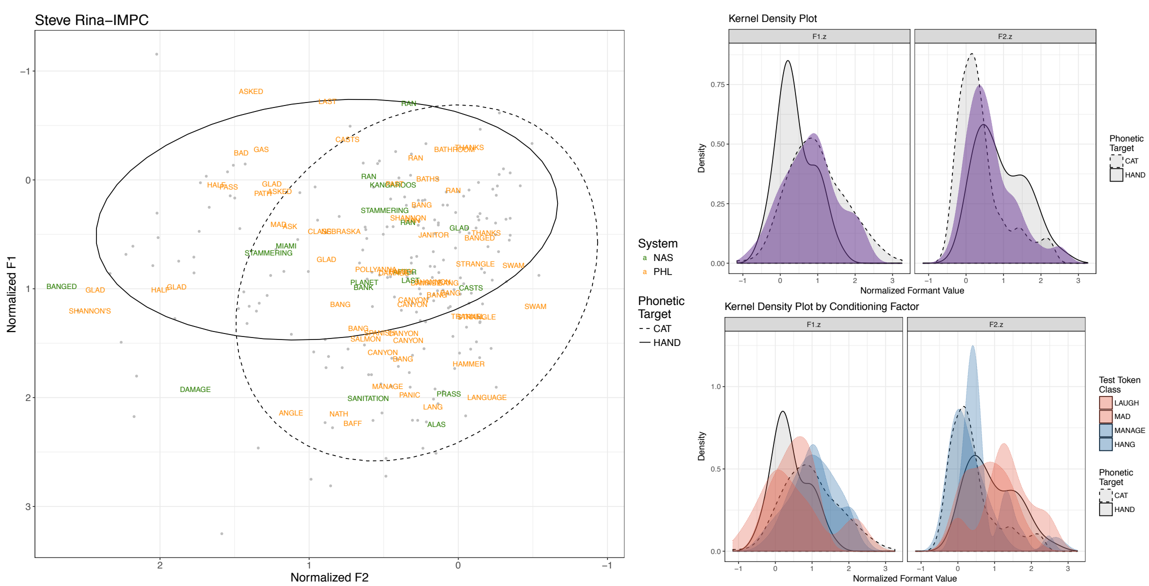

Figure D.35: Steve Rina, competing grammars

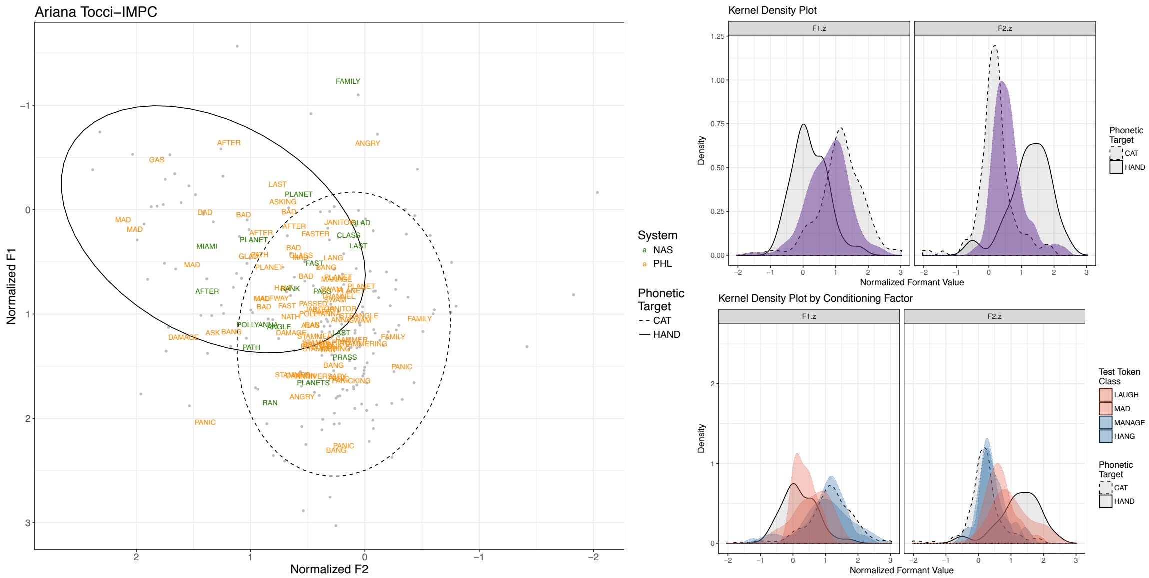

Figure D.36: Ariana Tocci, competing grammars

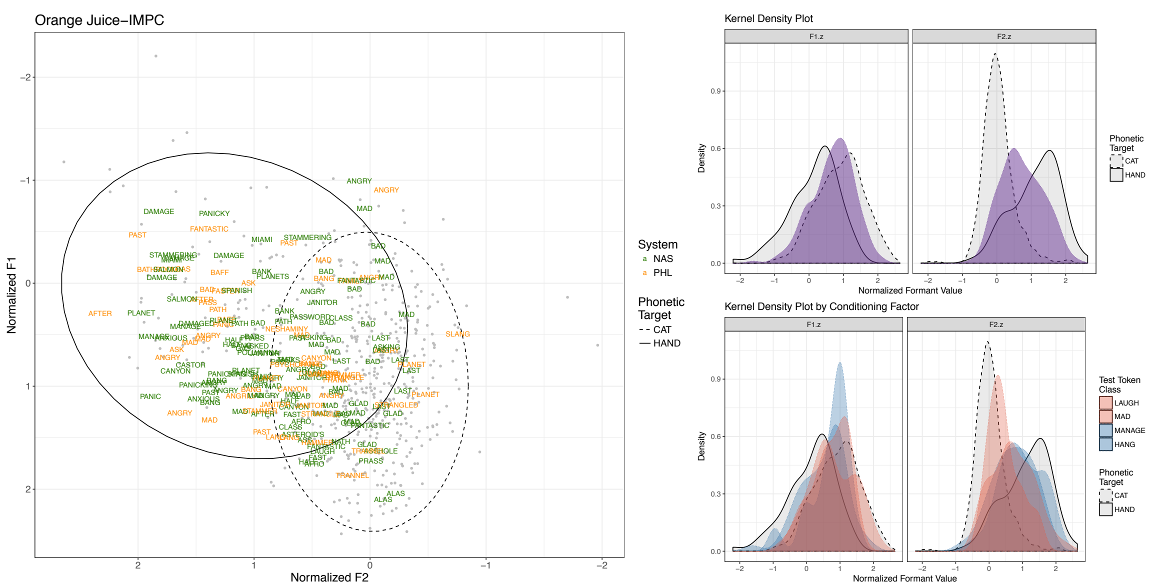

Figure D.37: Orange Juice, competing grammars

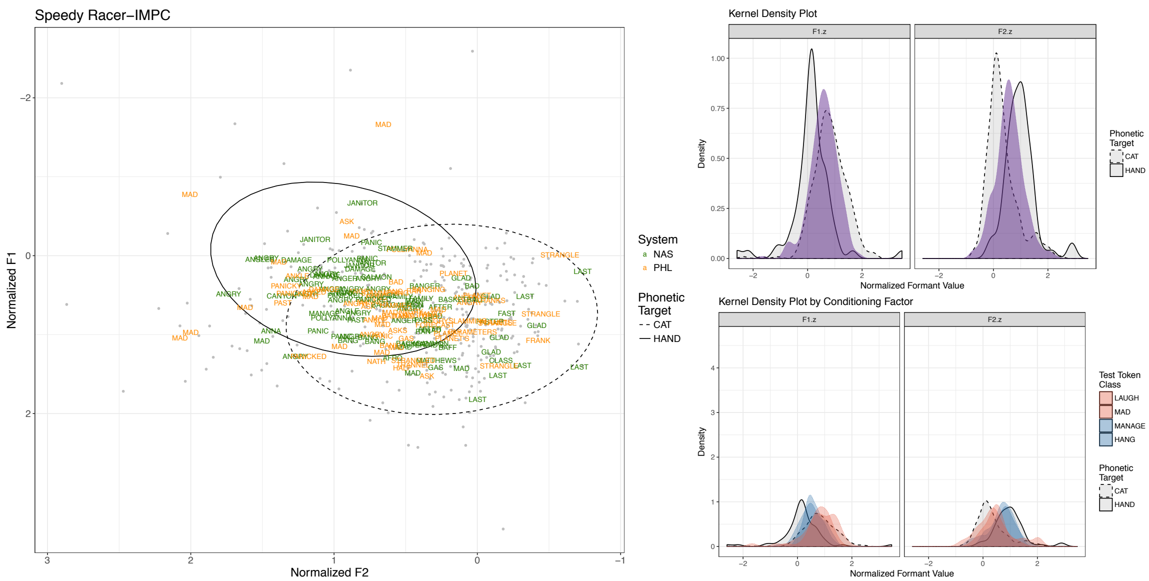

Figure D.38: Speedy Racer, competing grammars

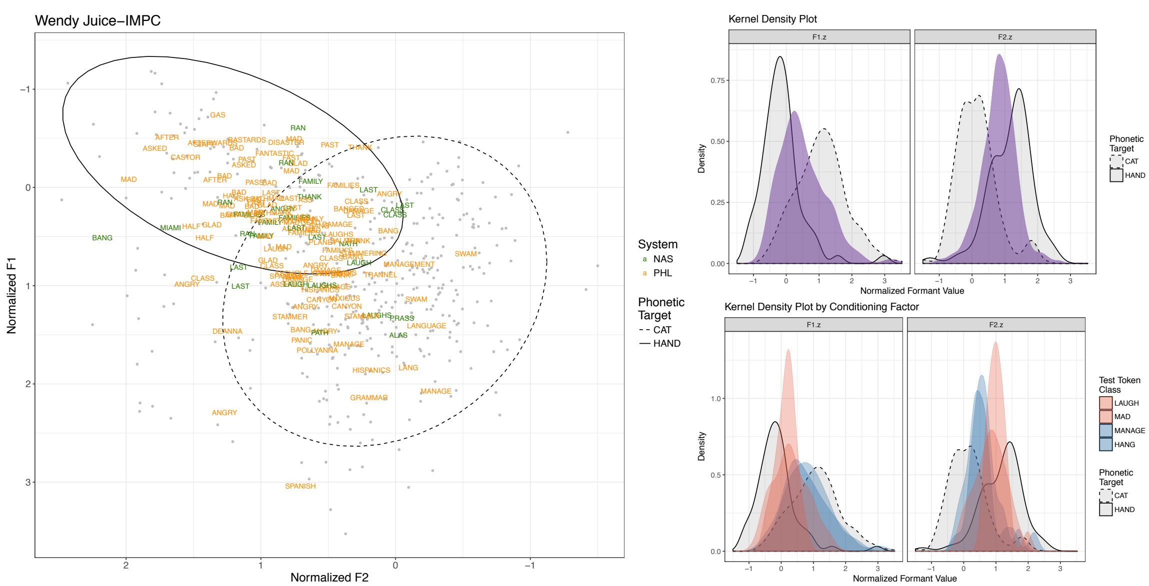

Figure D.39: Wendy Juice, competing grammars

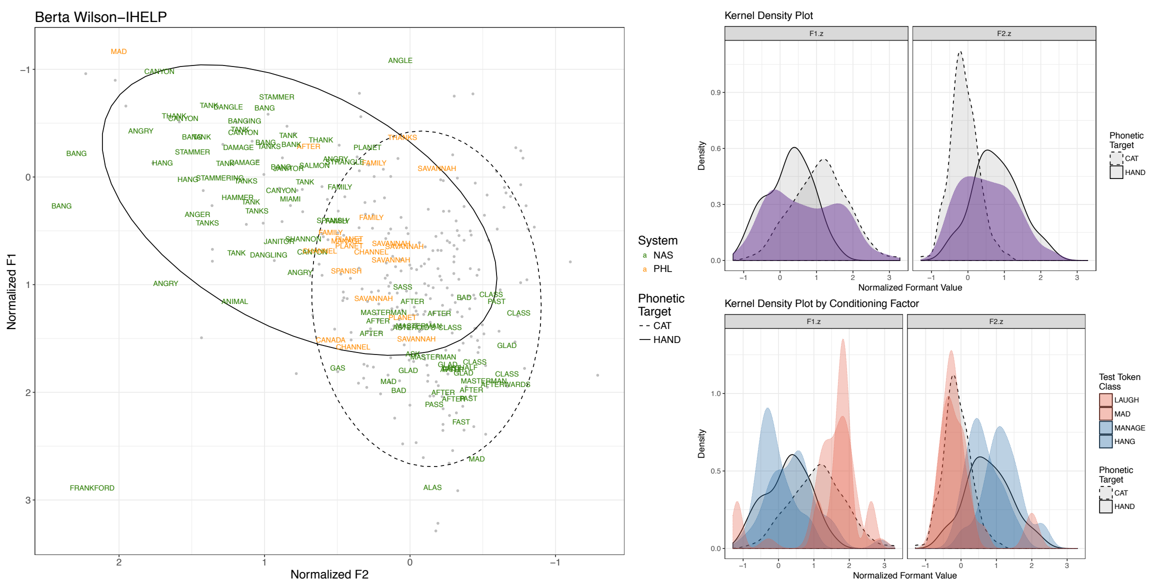

Figure D.40: Berta Wilson, possible NAS

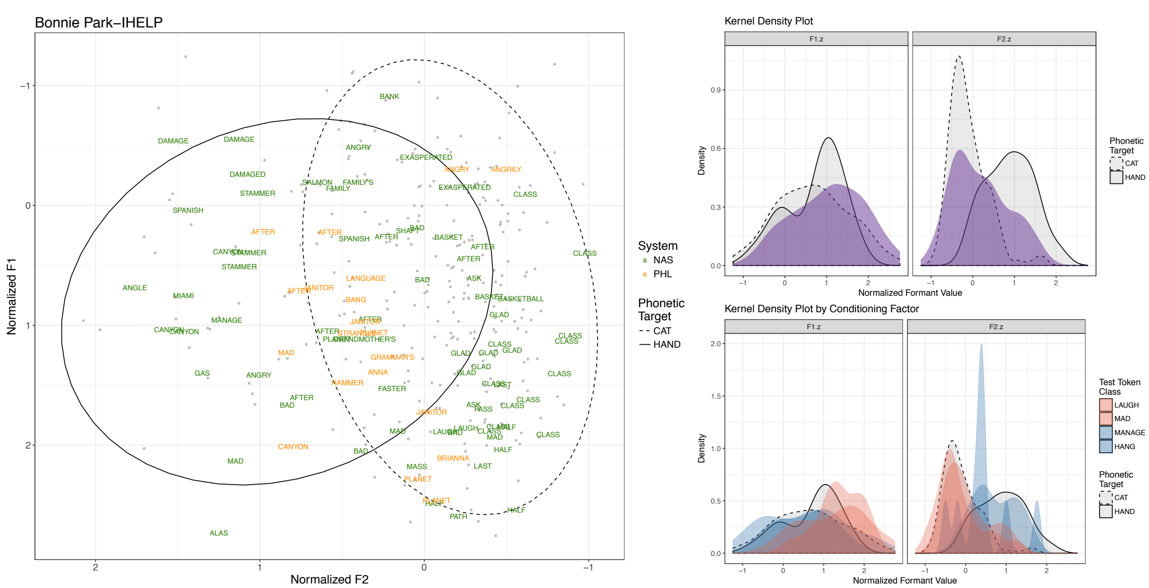

Figure D.41: Bonnie Park, possible NAS

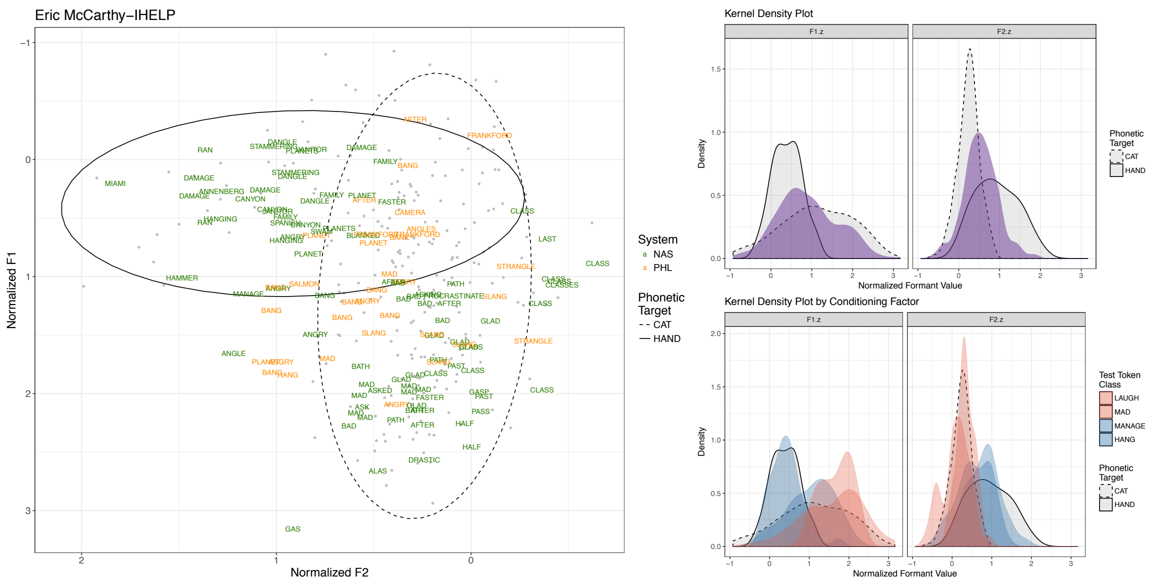

Figure D.42: Eric McCarthy, possible NAS

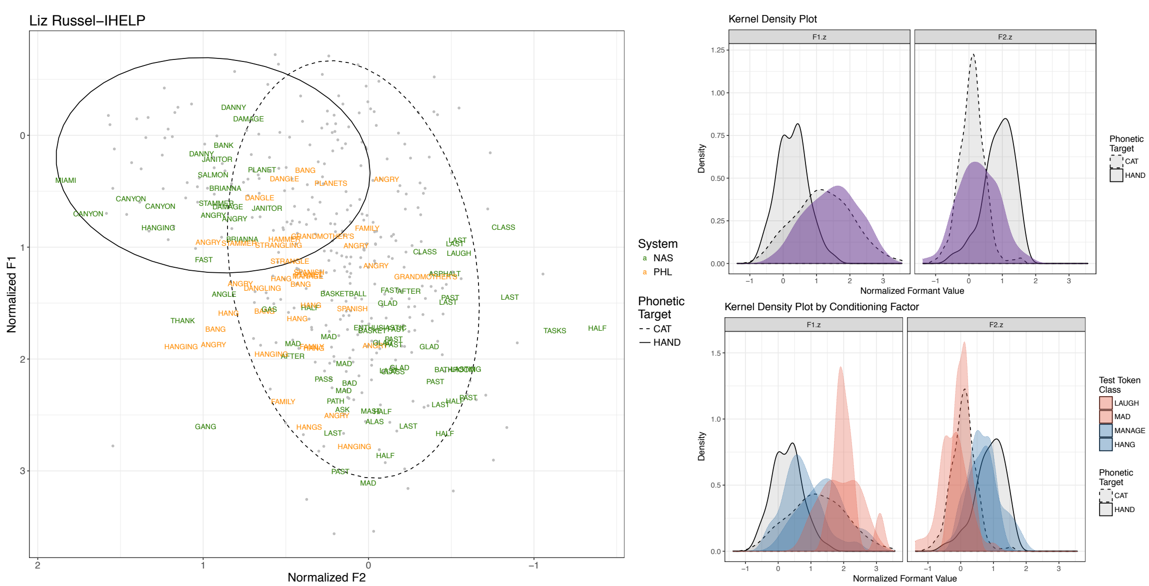

Figure D.43: Liz Russel, possible NAS

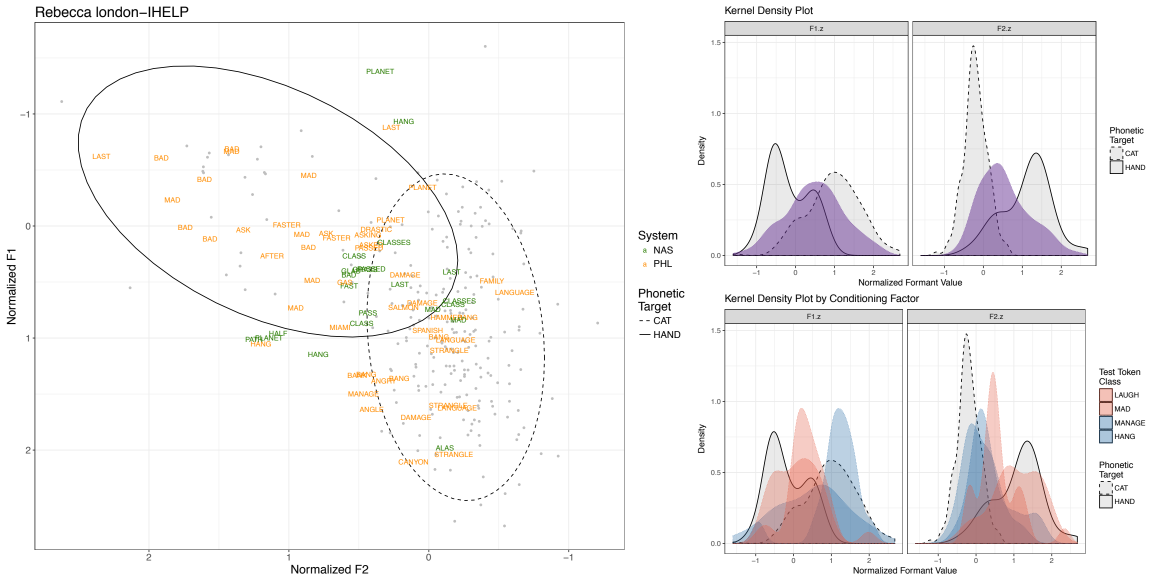

Figure D.44: Rebecca London, possible PHL

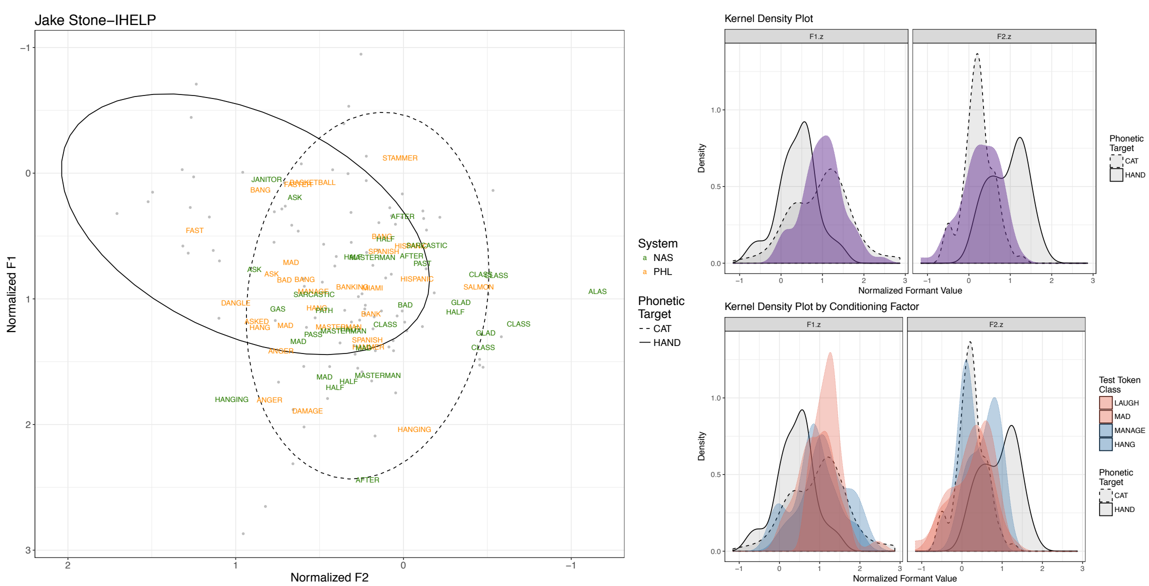

Figure D.45: Jake Stone, phonetic mitigation of tense PHL

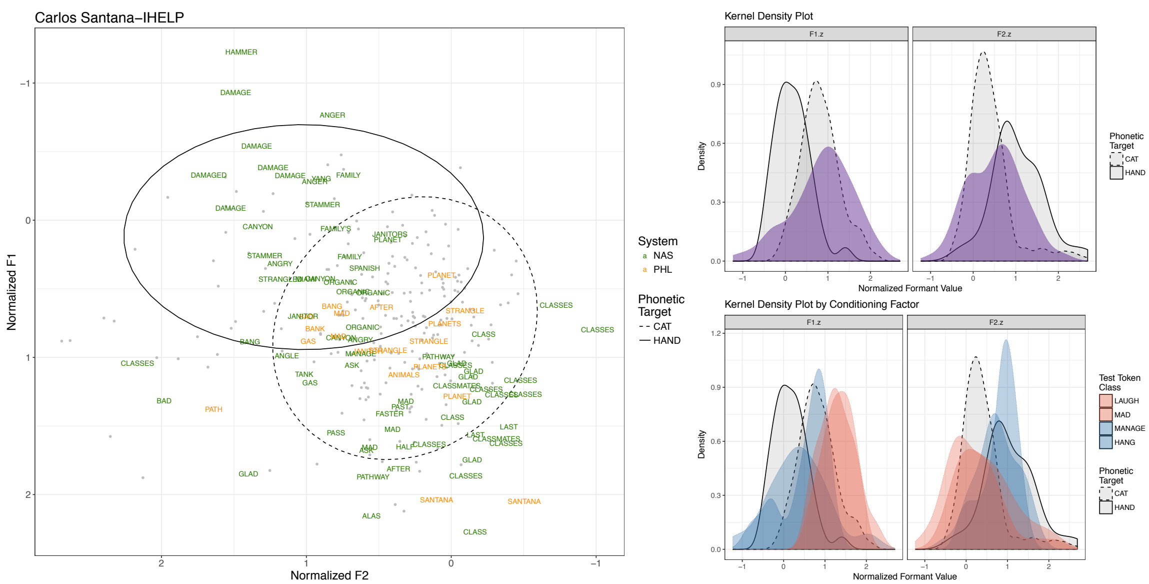

Figure D.46: Carlos Santana, competing grammars plus phonetic mitigation of tense PHL

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