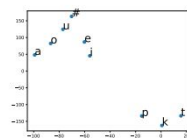


GOOD-excellent, fine, superior, wonderful, marvelous, qualified, suited, suitable, apt, proper, capable, generous, kindly, friendly, pleasant, satisfactory, well-behaved, obedient, honorable, reliable, top-notch, worthy, grand, salubrious, noble, great, beneficial, splendid, first-rate, genuine, ample, estimable, valid, helpful, expedient, righteous, advantageous, sterling, superb, respectable, edifying, trustworthy, gracious, obliging, agreeable, safe, profitable, beneficial.

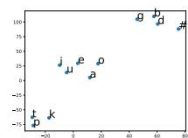
PSET, a Phonetics-Semantics Evaluation Testbed

		INTRINSIC			EXTRINSIC			OVERALL
	Model	Human Sim. (Pearson)	Art. Dist. (Pearson)	Retrieval (rank perc.)	Analogies (Acc@1)	Rhyme (accuracy)	Cognate (accuracy)	
Ours	Metric Learner	0.46	0.94	0.98	84%	83%	64%	0.78
	Triplet Margin	0.65	0.96	1.00	100%	77%	66%	0.84 +
	Count-based	0.82	0.10	0.84	13%	79%	68%	0.56
	Autoencoder	0.49	0.16	0.73	50%	61%	50%	0.50
Others'	Poetic Sound Sim.	0.74	0.12	0.78	35%	60%	57%	0.53
	phoneme2vec	0.77	0.09	0.80	17%	88%	64%	0.56
	Phon. Sim. Embd.	0.16	0.05	0.50	0%	51%	52%	0.29
Semantic	BPEmb	0.23	0.08	0.60	5%	54%	66%	0.36
	fastText	0.25	0.12	0.64	2%	58%	68%	0.38
	BERT	0.10	0.34	0.69	4%	58%	63%	0.40
	INSTRUCTOR	0.60	0.12	0.73	7%	54%	66%	0.45

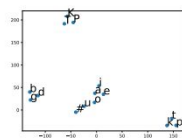
Table 1: Embedding method performance in our evaluation suite. Higher number is always better.



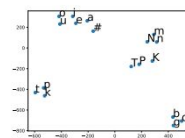
Language 1



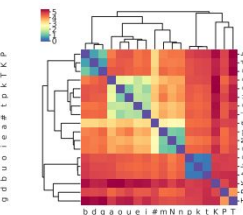
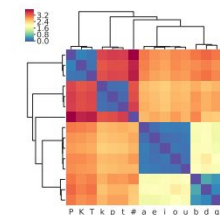
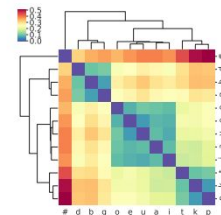
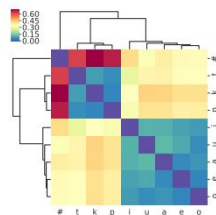
Language 2

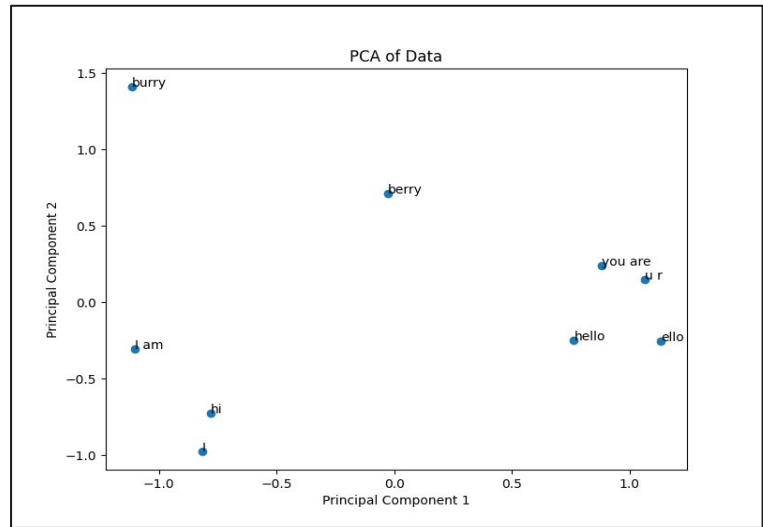
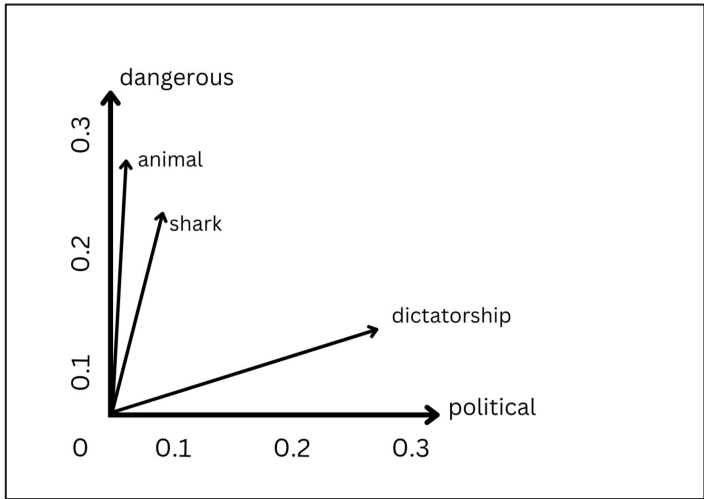


Language 3



Language 4





[ʃ]	“ <u>sh</u> ake”	[ʃeɪk]
[ʒ]	“g <u>en</u> re”	[ʒən.ɪə]
[ʤ]	“j <u>ud</u> ge”	[ʤʌʤ]
[tʃ]	“ <u>Ch</u> urch”	[tʃʌɪtʃ]
[h]	“ <u>h</u> at”	[hæt]
[l]	“l <u>o</u> ck”	[læk]
[ɹ]	“r <u>o</u> ck”	[ɹæk]
[j]	“y <u>o</u> u”	[ju]
[w]	“w <u>a</u> r”	[wɔɹ]
[ŋ]	“s <u>ing</u> ”	[sɪŋ]
[n]	“s <u>in</u> ”	[sɪn]
[m]	“s <u>a</u> m”	[sæm]
[ɹ]	“b <u>u</u> tter”	[bʌɹɪ]

ARPabet Symbol	IPA Symbol	Word	ARPabet Transcription
[iy]	[i]	l <u>il</u> y	[l ih l iy]
[ih]	[ɪ]	l <u>i</u> ly	[l ih l iy]
[ey]	[eɪ]	d <u>a</u> isy	[d ey z iy]
[eh]	[ɛ]	p <u>e</u> n	[p eh n]
[ae]	[æ]	<u>a</u> ster	[ae s t axr]
[aa]	[ɑ]	p <u>o</u> ppy	[p aa p iy]
[ao]	[ɔ]	<u>o</u> rchid	[ao r k ix d]
[uh]	[ʊ]	w <u>oo</u> d	[w uh d]
[ow]	[oo]	l <u>o</u> tus	[l ow dx ax s]
[uw]	[u]	t <u>u</u> lip	[t uw l ix p]
[ah]	[ʌ]	b <u>u</u> tt <u>e</u> rcup	[b ah dx axr k ah p]
[er]	[ɜ]	b <u>i</u> rd	[b er d]
[ay]	[aɪ]	<u>i</u> ris	[ay r ix s]
[aw]	[aʊ]	sun <u>f</u> low <u>e</u> r	[s ah n f l aw axr]
[oy]	[oɪ]	s <u>o</u> il	[s oy l]
Reduced and uncommon phones			
[ax]	[ə]	l <u>o</u> tus	[l ow dx ax s]
[axr]	[ɜr]	heath <u>e</u> r	[h eh dh axr]
[ix]	[ɪ]	t <u>u</u> l <u>i</u> p	[t uw l ix p]
[ux]	[ʊ]	d <u>u</u> d <u>e</u> ¹	[d ux d]

	syl	son	cons	cont	delrel	lat	nas	strid	voi	sg	cg	ant	cor	distr	lab	hi	lo	back	round	tense	long
/p/	-	-	+	-	-	-	-	0	-	-	-	+	-	0	+	-	-	-	-	0	-
/p ^h /	-	-	+	-	-	-	-	0	-	+	-	+	-	0	+	-	-	-	-	0	-
/p ⁱ /	-	-	+	-	-	-	-	0	-	-	-	+	-	0	+	+	-	-	-	0	-
/p ^{hɨ} /	-	-	+	-	-	-	-	0	-	+	-	+	-	0	+	+	-	-	-	0	-

Table 1: Illustration of IPA segments and feature vectors from PanPhon

IPA Symbol	ARPabet Symbol	Word	IPA Transcription	ARPabet Transcription
[p]	[p]	<u>p</u> arsley	['parsli]	[p aa r s l iy]
[t]	[t]	<u>t</u> arragon	['tærəgən]	[t ae r ax g aa n]
[k]	[k]	<u>c</u> atnip	['kætnip]	[k ae t n ix p]
[b]	[b]	<u>b</u> ay	[beɪ]	[b ey]
[d]	[d]	<u>d</u> ill	[dɪl]	[d ih l]
[g]	[g]	<u>g</u> arlic	['garlik]	[g aa r l ix k]
[m]	[m]	<u>m</u> int	[mɪnt]	[m ih n t]
[n]	[n]	<u>n</u> utmeg	['nʌtmeg]	[n ah t m eh g]
[ŋ]	[ng]	<u>g</u> inseng	['dʒɪnsɪŋ]	[jh ih n s ix ng]
[f]	[f]	<u>f</u> ennel	['fenl]	[f eh n el]
[v]	[v]	<u>c</u> love	[klovv]	[k l ow v]
[θ]	[th]	<u>t</u> histle	['θɪsl]	[th ih s el]
[ð]	[dh]	<u>h</u> eather	['heðə]	[h eh dh axr]
[s]	[s]	<u>s</u> age	[seɪdʒ]	[s ey jh]
[z]	[z]	<u>h</u> azelnut	['heɪzlnʌt]	[h ey z el n ah t]
[ʃ]	[sh]	<u>s</u> quash	[skwɒʃ]	[s k w a sh]
[ʒ]	[zh]	<u>a</u> mbrosia	[æm'brouʒə]	[ae m b r ow zh ax]
[tʃ]	[ch]	<u>c</u> hicory	['tʃɪkəri]	[ch ih k axr iy]
[dʒ]	[jh]	<u>s</u> age	[seɪdʒ]	[s ey jh]
[l]	[l]	<u>l</u> icorice	['lɪkəriʃ]	[l ih k axr ix sh]
[w]	[w]	<u>k</u> iwi	['kiwi]	[k iy w iy]
[r]	[r]	<u>p</u> arsley	['parsli]	[p aa r s l iy]
[j]	[y]	<u>y</u> ew	[ju]	[y uw]
[h]	[h]	<u>h</u> orseradish	['hɔrsrædɪʃ]	[h ao r s r ae d ih sh]
[ʔ]	[q]	uh-oh	[ʔʌʔou]	[q ah q ow]
[ɹ]	[dx]	<u>b</u> utter	['bʌtə]	[b ah dx axr]
[ɹ]	[nx]	<u>w</u> intergreen	[wɪntəgrɪn]	[w ih nx axr g r i n]
[l]	[el]	<u>t</u> histle	['θɪsl]	[th ih s el]

VinAIResearch/ **XPhoneBERT**



XPhoneBERT: A Pre-trained Multilingual Model for
Phoneme Representations for Text-to-Speech
(INTERSPEECH 2023)

2

Contributors

1

Issue

278

Stars

34

Forks



RoBERTa + IPA



GOOD-excellent, fine, superior, wonderful, marvelous, qualified, suited, suitable, apt, proper, capable, generous, kindly, friendly, pleasant, satisfactory, well-behaved, obedient, honorable, reliable, top-notch, worthy, grand, salubrious, noble, great, beneficial, splendid, first-rate, genuine, ample, estimable, valid, helpful, expedient, righteous, advantageous, sterling, superb, respectable, edifying, trustworthy, gracious, obliging, agreeable, safe, profitable, beneficial.

Central word, called
Anchor



An homophone



A synonym

GOOD-excellent, fine, superior, wonderful, marvelous, qualified, suited, suitable, apt, proper, capable, generous, kindly, friendly, pleasant, satisfactory, well-behaved, obedient, honorable, reliable, top-notch, worthy, grand, salubrious, noble, great, beneficial, splendid, first-rate, genuine, ample, estimable, valid, helpful, expedient, righteous, advantageous, sterling, superb, respectable, edifying, trustworthy, gracious, obliging, agreeable, safe, profitable, beneficial.

Ferry

Central word, called
Anchor



Fairy

An homophone



Boat

A synonym

GOOD-excellent, fine, superior, wonderful, marvelous, qualified, suited, suitable, apt, proper, capable, generous, kindly, friendly, pleasant, satisfactory, well-behaved, obedient, honorable, reliable, top-notch, worthy, grand, salubrious, noble, great, beneficial, splendid, first-rate, genuine, ample, estimable, valid, helpful, expedient, righteous, advantageous, sterling, superb, respectable, edifying, trustworthy, gracious, obliging, agreeable, safe, profitable, beneficial.

97 instance by now...

We state that phonetic embeddings should only primarily capture phonetic features.

Ferry


Fairy

Boat


Central word, called
Anchor

An homophone


A synonym



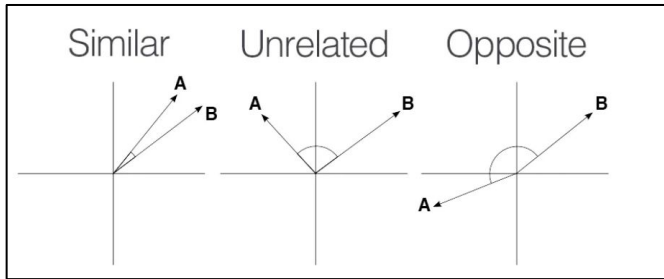
8	2	1	9
6	5	4	0
7	1	6	2
1	3	5	8
0	4	9	1



8	2	1	9
6	5	4	0
7	1	6	2
1	3	5	8
0	4	9	1



8	2	1	9
6	5	4	0
7	1	6	2
1	3	5	8
0	4	9	1



Ferry

Central word, called
Anchor

Fairy

An homophone

Boat

A synonym



Personification of a NLP phoneme based
model...

Ferry

Fairy

Boat

Central word, called
Anchor

An homophone

A synonym



Personification of a NLP semantic based
model...(? I guess)

Some examples from the dataset:

anchors, homophones, synonyms

bait, bate, torment

bawl, ball, holler

band, banned, ensemble

bare, bear, nude

cash, cache, money

cantor, canter, chanter

- We made sure that each homophone had **no semantic spheres** in common with anchors. We chose the **synonym that seemed most close** to the word anchor.

we averaged the last hidden layer of the same word in 10 different contexts (data taken from wikitext)

we averaged the last hidden layer of the same word in 10 different contexts (data taken from wikitext) because automatic IPA transcription is computationally expensive

	Homophone	
Models	Homophone	Synonym
Articulatory Phonemes	1	0
P2V	0,6	0,4
Word2Vec	0,04	0,96
BERT	0,07	0,93
<u>XPhoneBert</u>	//	//

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<u>XPhoneBert</u>	//	//
ChatGpt (semantics - prompting)	0	1
ChatGpt (phonetics - prompting)	1	0
Gemini (semantics - prompting)	0	1
Gemini (phonetics - prompting)	0.03	0.97

I'll give you word triplets. Each of these triplets is made up of a reference word, called the anchor word, a homophone of the word anchor and a synonym of the word anchor. Select the word most **semantically** similar to the anchor word for each of the triplets. I'll give you an example: bait, bate, torment. In this case the most similar word to bait is torment.

I'll give you word triplets. Each of these triplets is made up of a reference word, called the anchor word, a homophone of the word anchor and a synonym of the word anchor. Select the word most **phonetically** similar to the anchor word for each of the triplets. I'll give you an example: bait, bate, torment. In this case the most similar word to bait is bate.



Here, **bawl** is the closest sounding word to **ball**. [Both involve making a loud noise, though bawling is more about crying while balling can be a general shout.]

Absolutely! Here's the completed list with the most phonetically similar word identified for each anchor word:

- bare, bear, **nude**
- cash, cache, **money**
- cantor, canter, **chanter** (all relatively close phonetically)
- cell, sell, **cage**
- cue, queue, **hint**
- earn, urn, **acquire**
- new, knew, **recent**
- know, no, **learn**

some glimpse of phonetic knowledge, but doesn't answer correctly.

θæŋks!!!