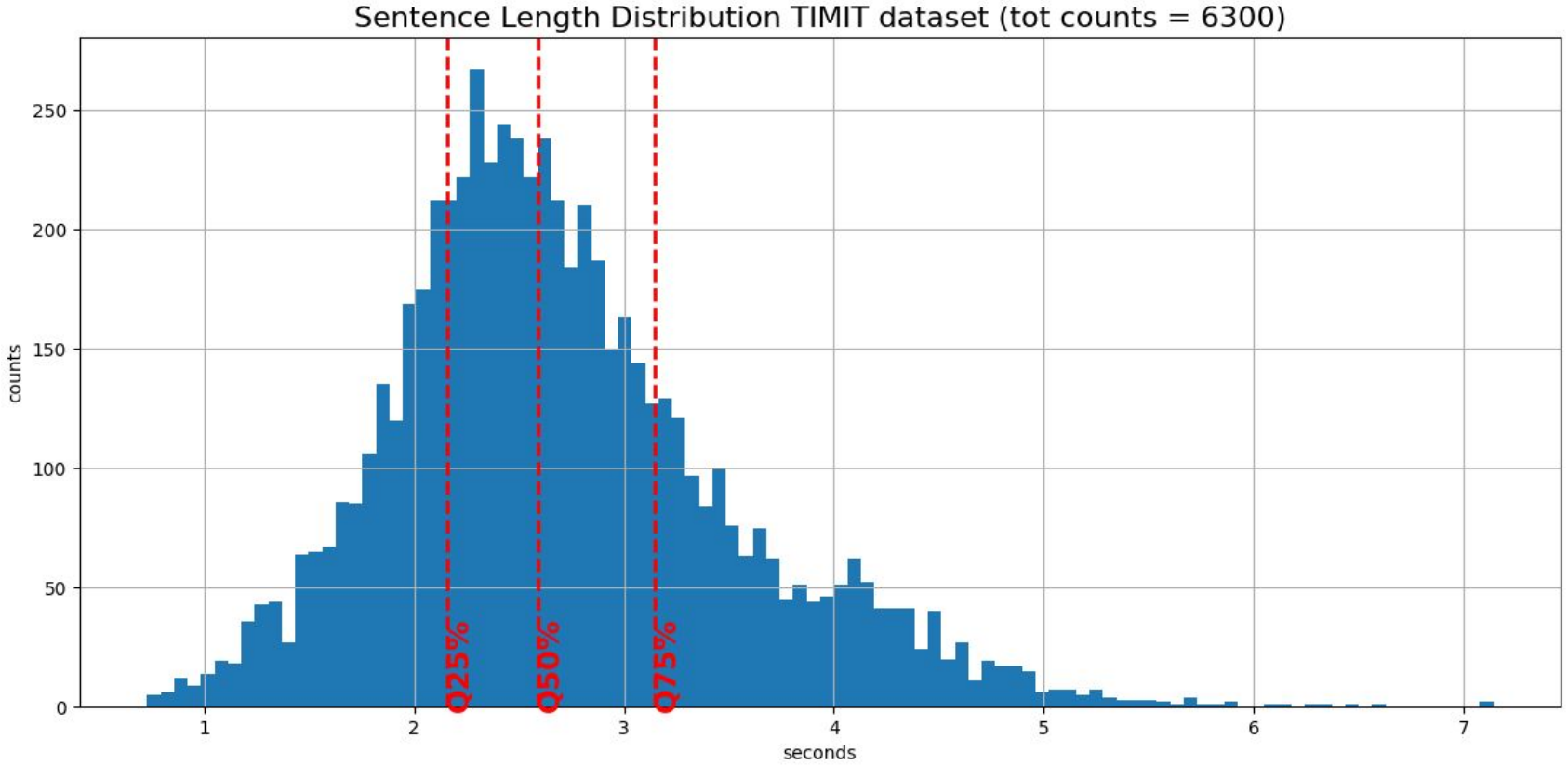
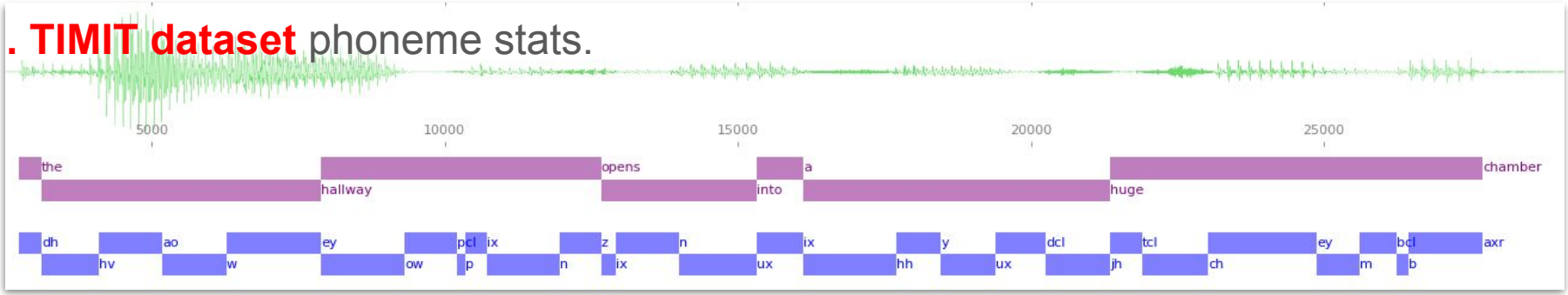
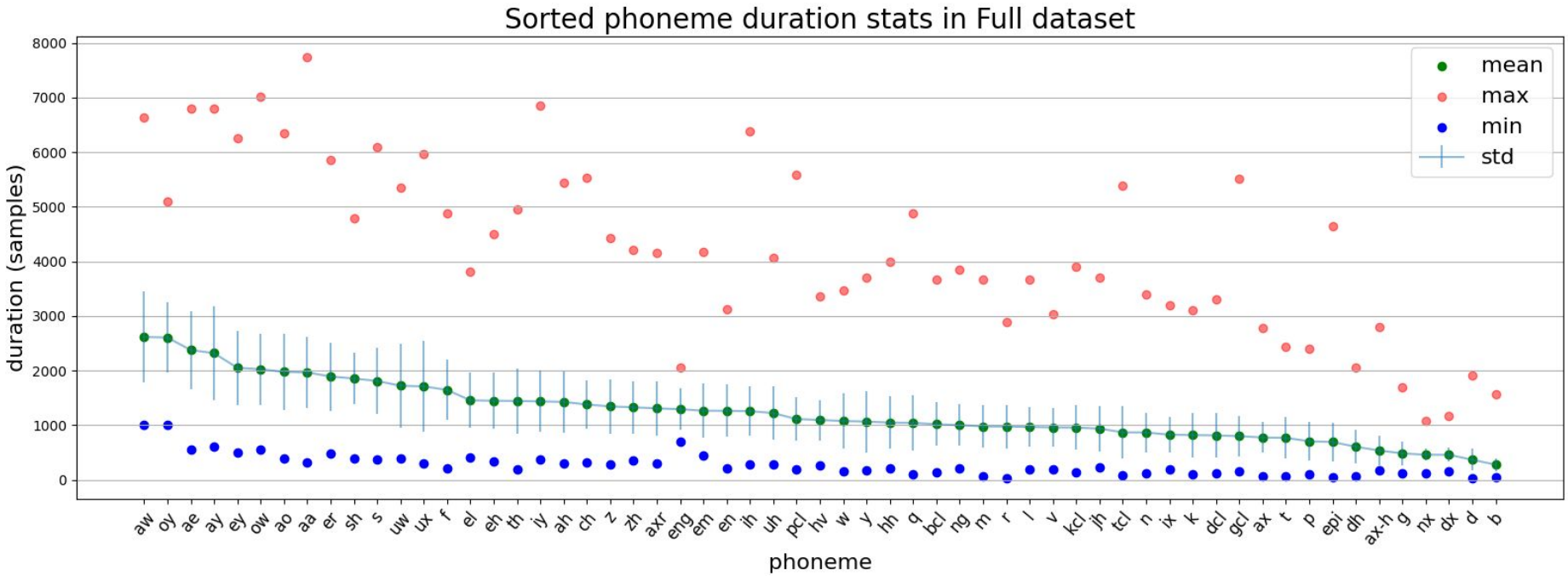
1. TIMIT dataset consists of 6300 sentences total; 10 each by 630 unique speakers. 2342 unique sentences. Word and phoneme are time-stamped.



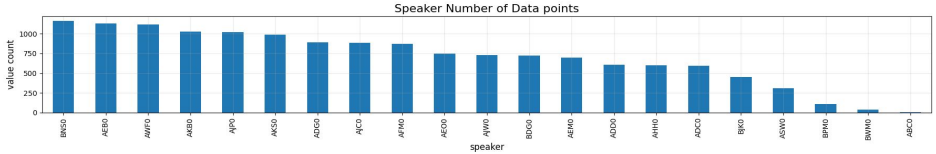
1. TIMIT dataset phoneme stats.

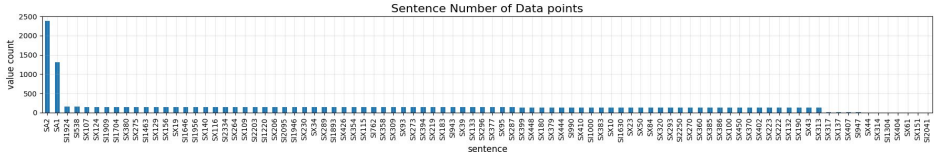


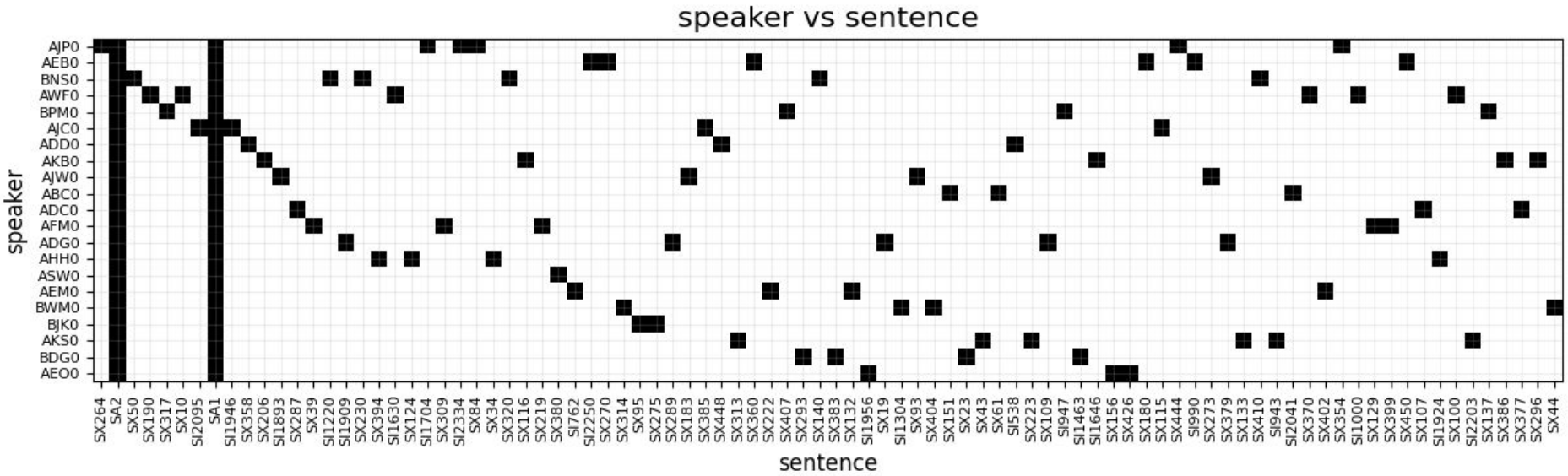


1. TIMIT dataset phoneme stats.

We looked at 21 speakers saying 90 sentences.





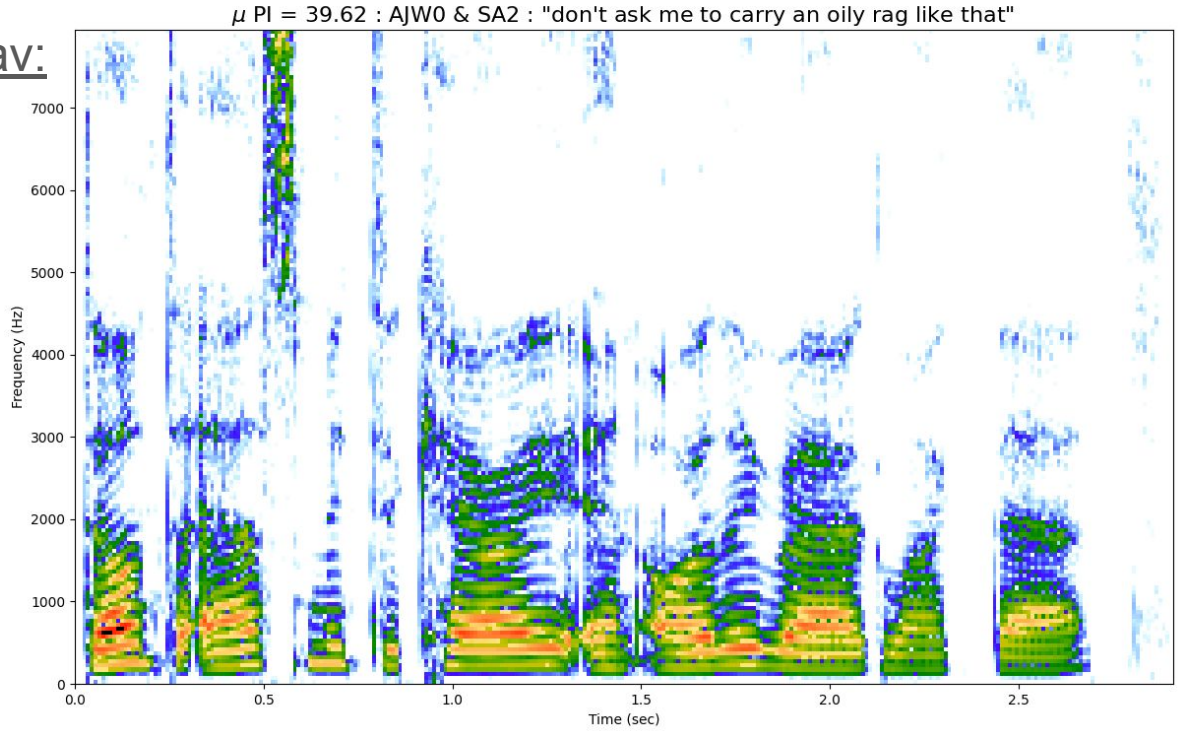


1. TIMIT dataset

“Predictive Information” (PI) : how much does past of signal tell you about its future?

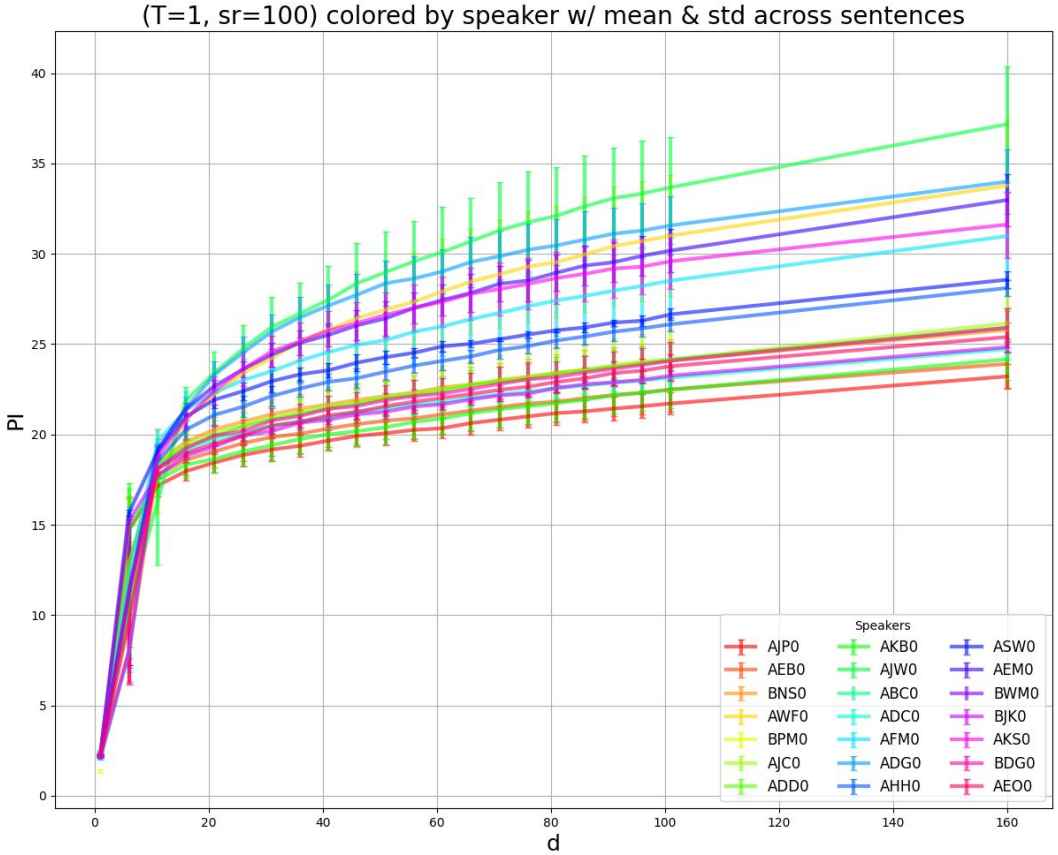
1. <u>Form spectrogram from wav:</u>
   - del f = 50Hz -> 160 freq bins
   - del t = 10ms*

2. <u>PI Calculation from spec:</u>
   - d - embedding dim.
   - T - time



3. Predictive Information (‘spectral complexity’, T=1)

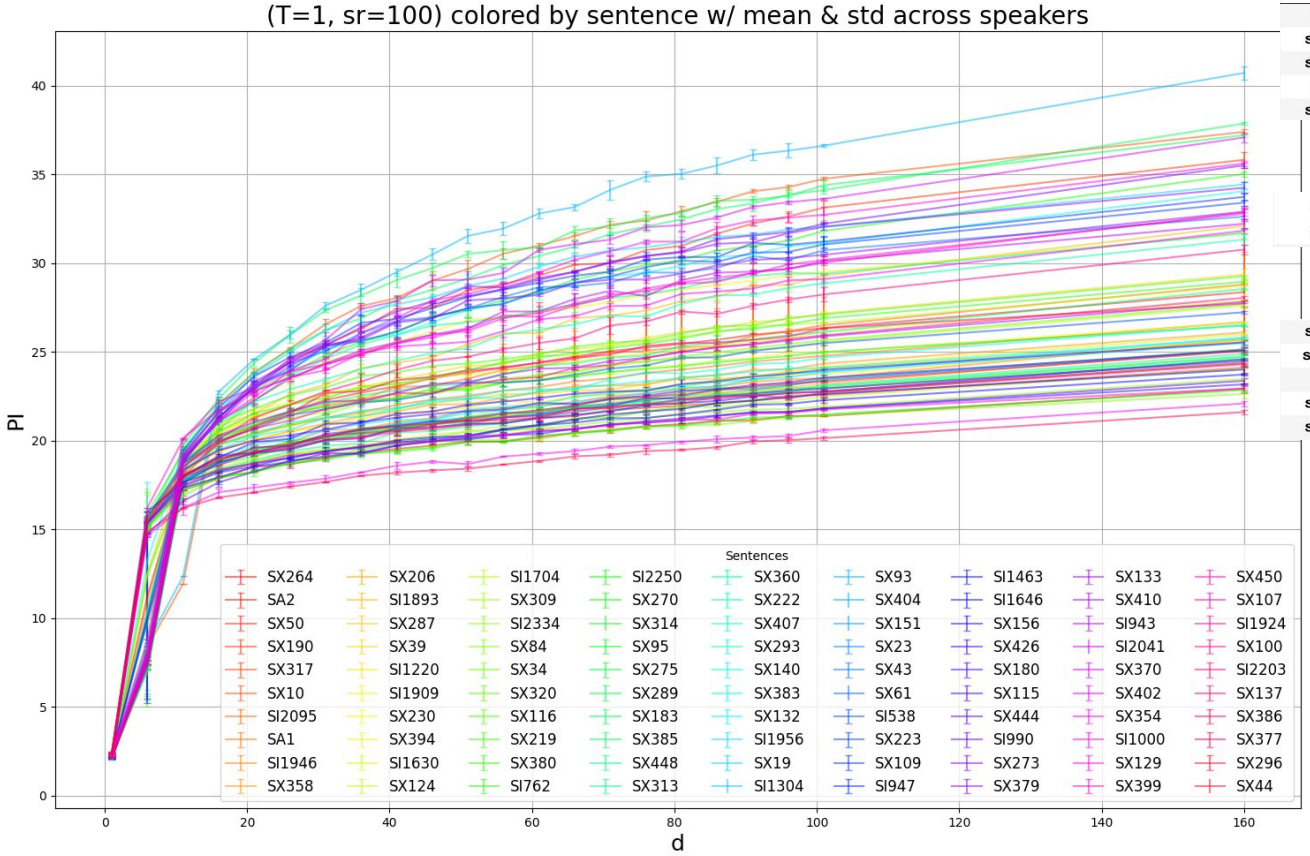
Focus on speakers



speaker	mean_PI	std_PI	gender	region
AJW0	26.987963	8.408806	F	DR2
ADG0	25.997941	7.683484	F	DR4
AWF0	25.097599	7.834589	F	DR5
AEM0	25.026930	6.969446	F	DR2
AKS0	24.663982	7.230527	F	DR1
AFM0	23.985566	6.368190	M	DR7
ASW0	23.235280	5.764388	F	DR5
AHH0	22.303342	5.844900	M	DR5
AJC0	21.021635	5.409567	M	DR8
ADD0	20.978068	5.243328	M	DR7
BNS0	20.870798	5.306509	M	DR4
BDG0	20.809567	5.455653	M	DR3
BJK0	20.596422	5.092813	M	DR2
AEO0	20.414152	5.203647	M	DR7
ADC0	20.377152	5.109528	M	DR3
AEB0	19.760179	4.747184	M	DR4
AKB0	19.656521	4.499694	M	DR3
BPM0	19.510550	13.296647	M	DR5
AJP0	19.264207	4.586141	M	DR6

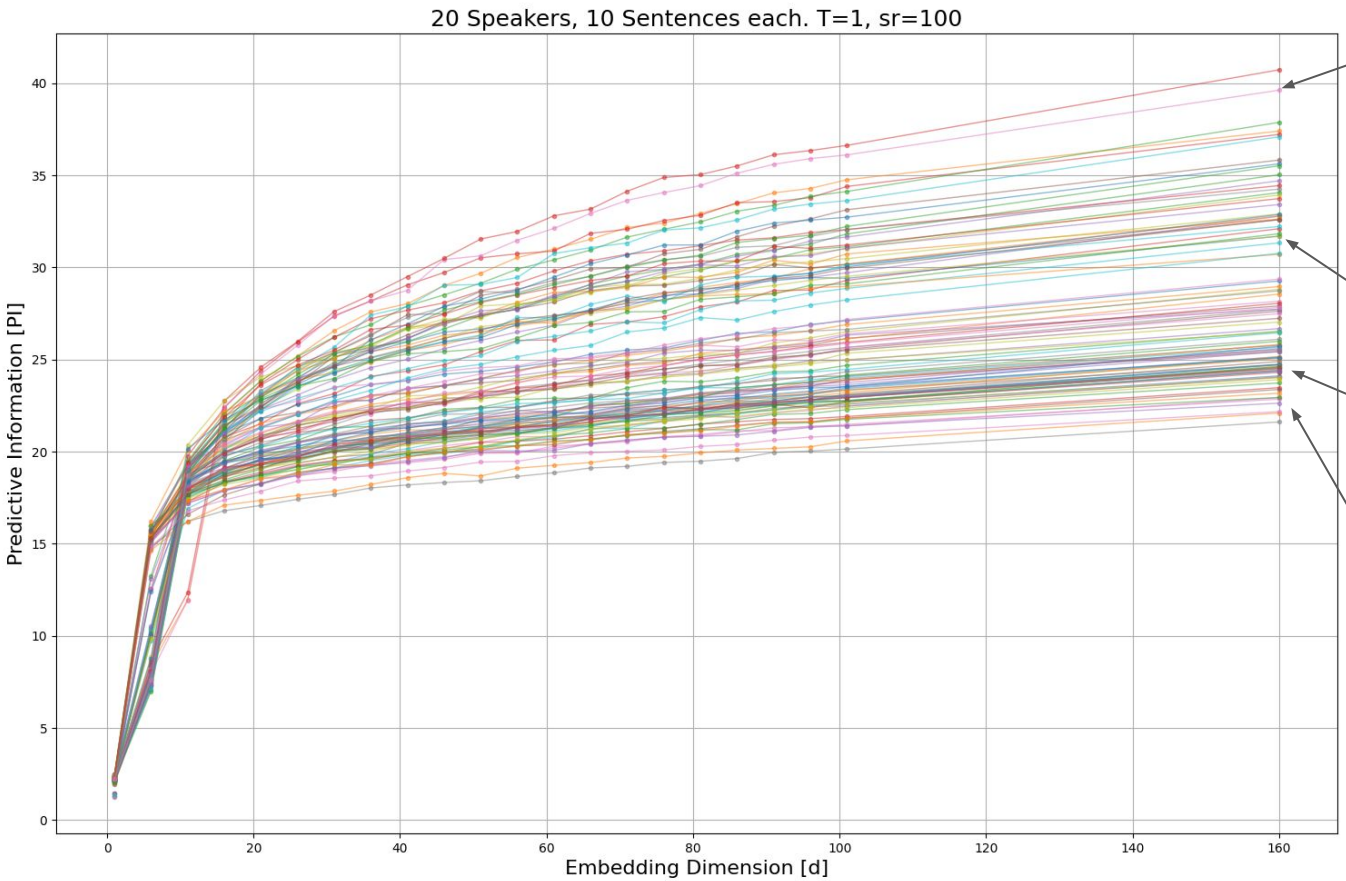
3. Predictive Information (‘spectral complexity’, T=1)

Focus on sentences



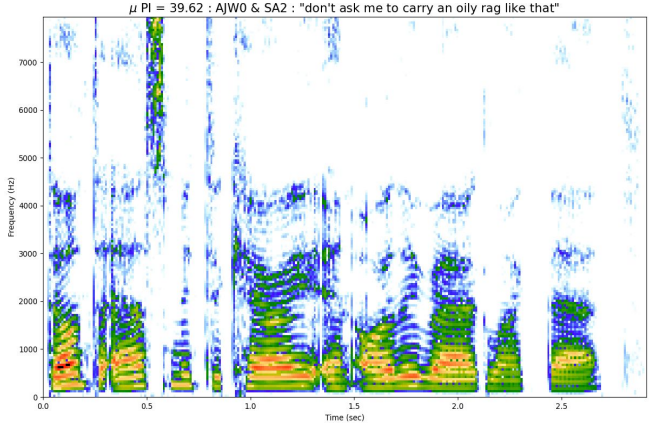
sentence	mean_PI	std_PI	words
SX93	28.702101	9.530722	cut a small corner off each edge
SX289	27.785507	8.300009	weatherproof galoshes are very useful in seattle
SX183	27.580578	7.586212	why else would danny allow others to go
SX10	27.229086	8.833528	are your grades higher or lower than nancy's
SX370	27.035883	8.186952	that noise problem grows more annoying each day
...			
SA2	22.595282	6.894170	don't ask me to carry an oily rag like that
SA1	21.584004	6.385448	she had your dark suit in greasy wash water al...
...			
SX264	19.011548	4.029727	we saw eight tiny icicles below our roof
SI2250	18.975302	4.048309	all your wishful thinking won't change that
SX84	18.957590	4.034051	cooperation along with understanding alleviate...
SX354	18.078239	3.823503	a lawyer was appointed to execute her will
SX386	17.788272	3.726060	which church do the smiths worship in

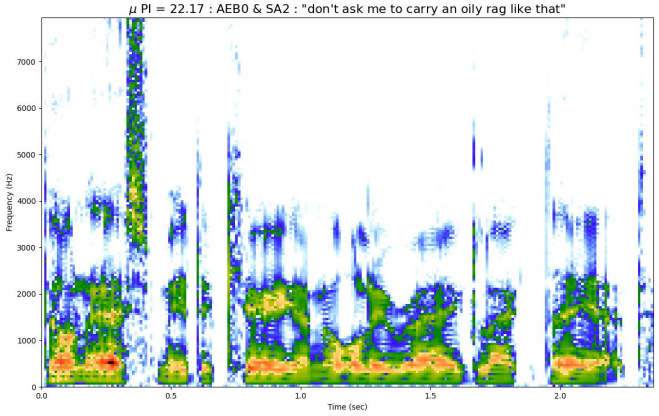
3. Predictive Information (‘spectral complexity’, T=1)

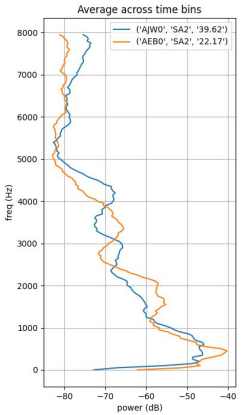


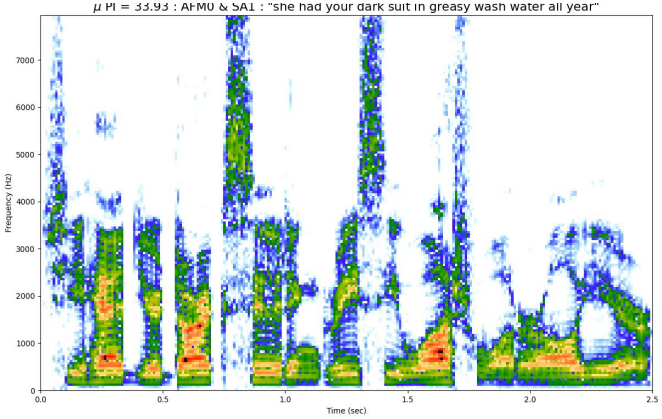
	speaker	sentence	
mean_PI	AJW0	SX93	40.727379
		SA2	39.622703
		SX183	37.875113
	AWF0	SX10	37.404498
	ADG0	SX289	37.218921
	AWF0	SX370	37.091253
		SX190	35.828554
		SI1000	35.623167
	AJW0	SX273	35.519663
	AEM0	SI762	35.032402
	AWF0	SA2	34.703730
	ADG0	SX19	34.441959
		SX379	34.251753
	AEM0	SX132	34.061213
	AFM0	SA1	33.929531
	...		
	AJP0	SA1	23.910953
	AKB0	SI1646	23.730834
	AJP0	SI2334	23.473560
		SX444	23.377297
	AEB0	SX180	23.175384
		SX450	22.943188
	AJP0	SX264	22.929486
	AEB0	SI2250	22.854789
	AJP0	SX84	22.633734
	AEB0	SA2	22.174048
	AJP0	SX354	22.100021
	AKB0	SX386	21.614242

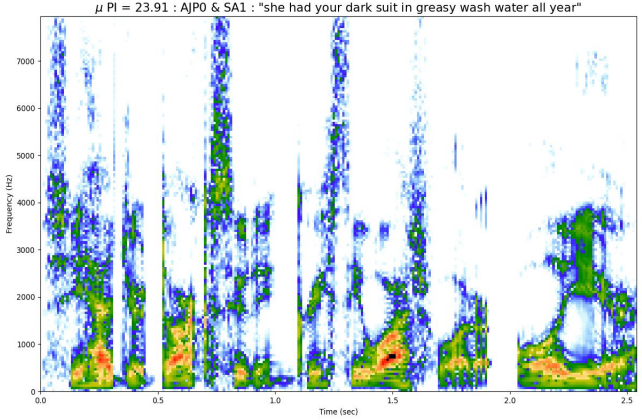
3. Predictive Information (‘spectral complexity’, T=1)

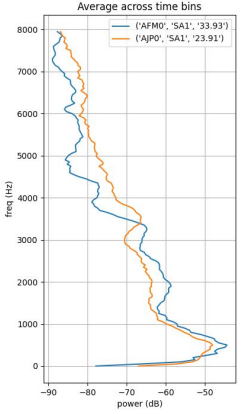




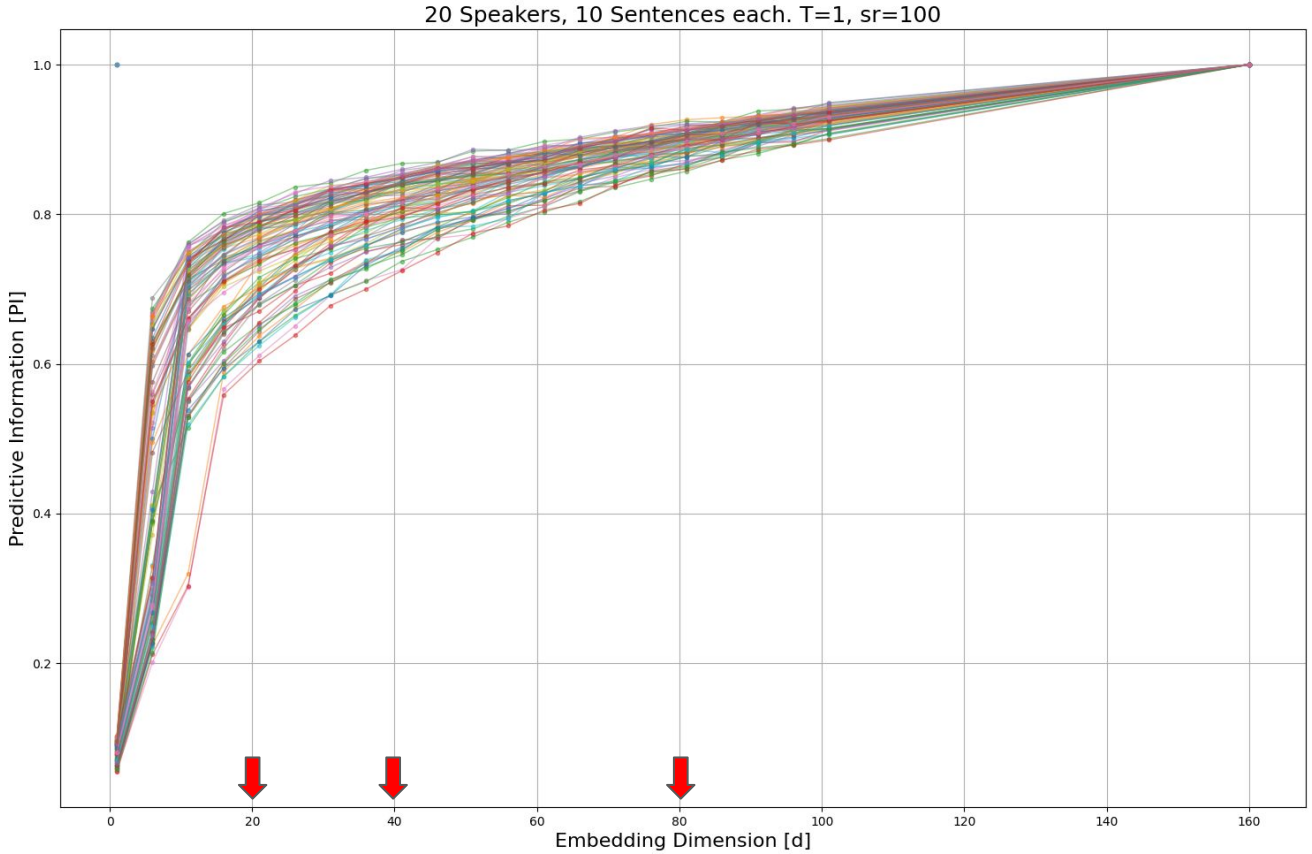








3. Predictive Information (‘temporal complexity’, fix d)



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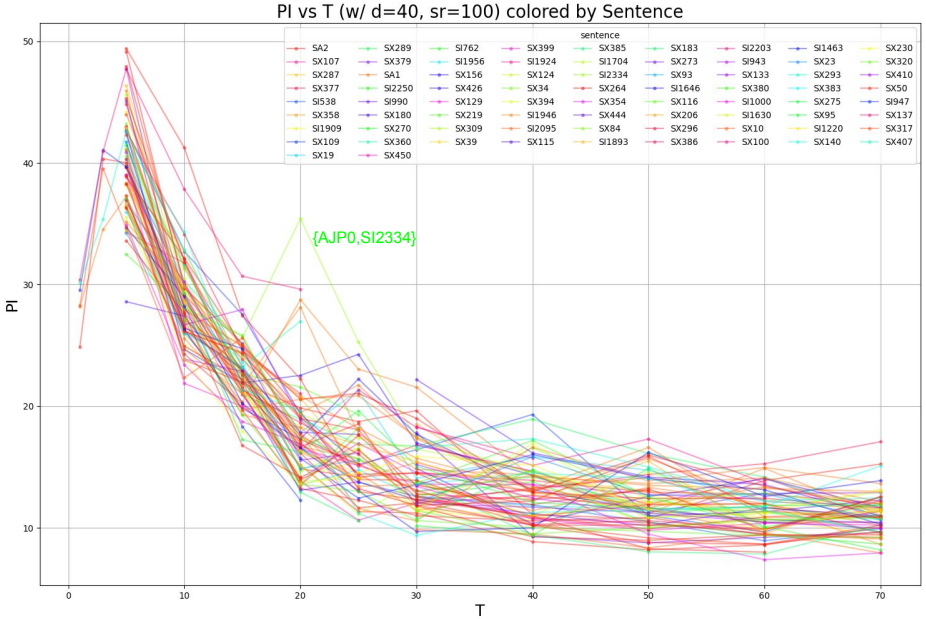

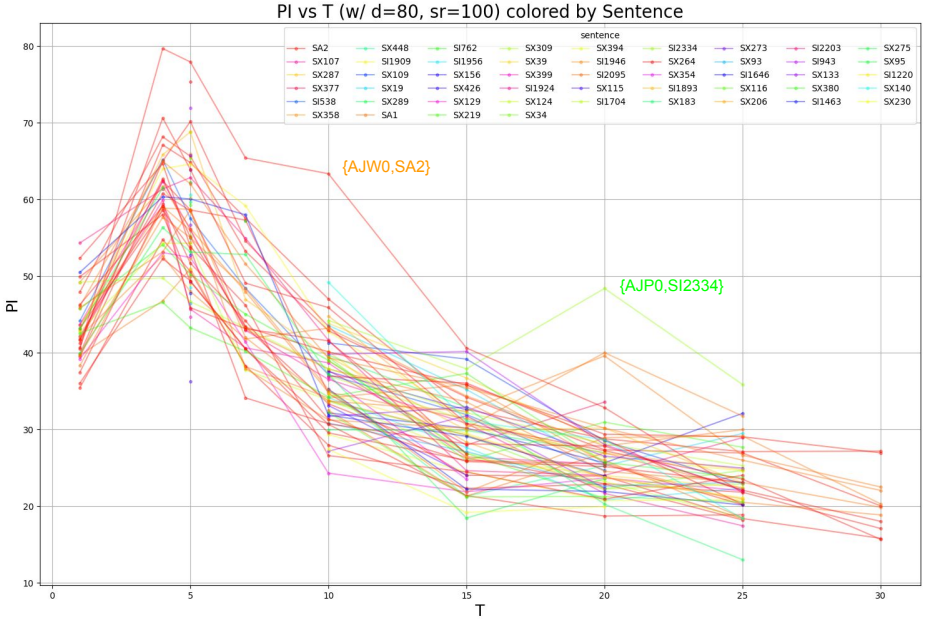

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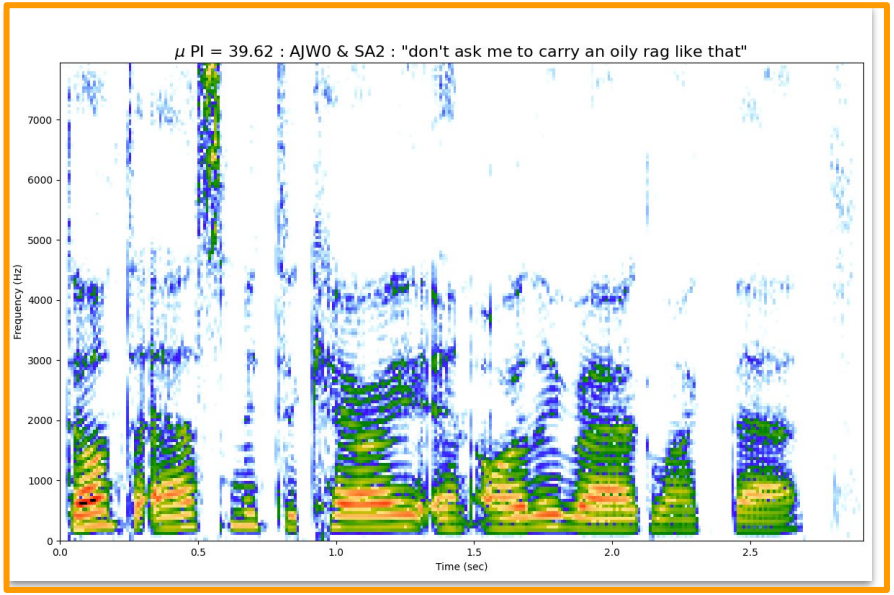
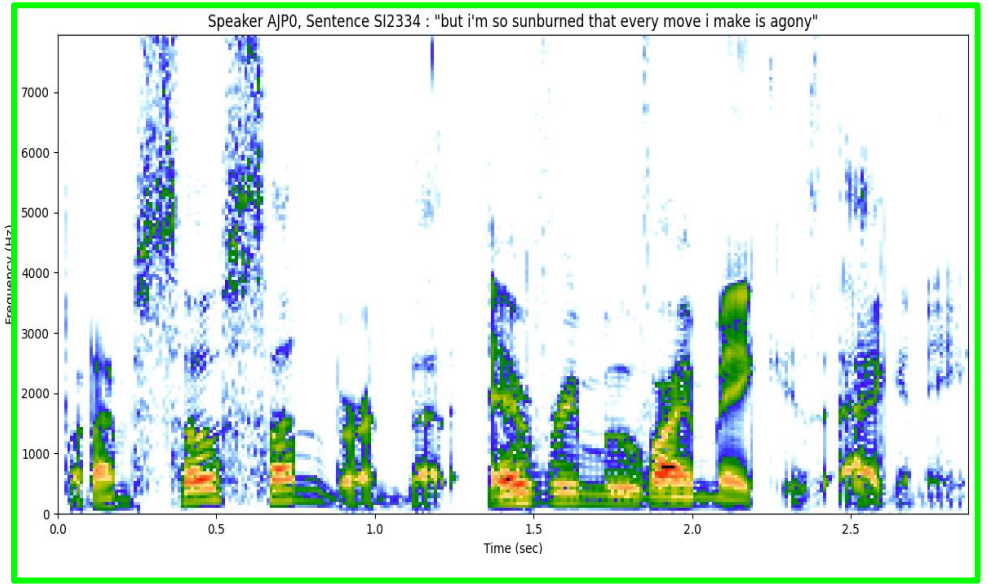
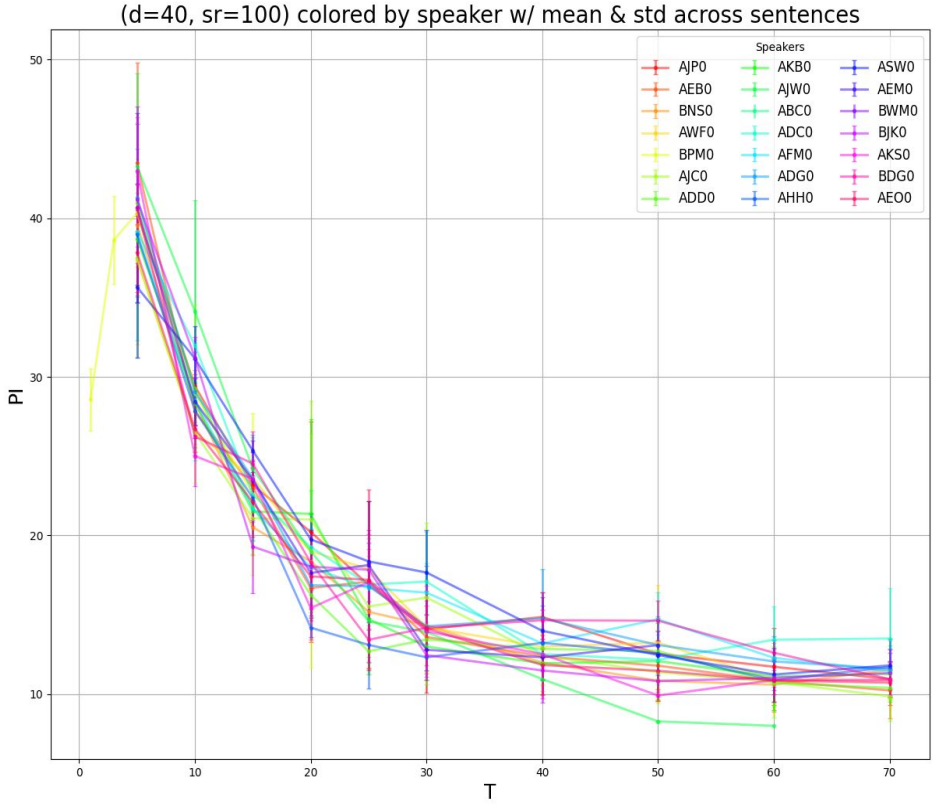
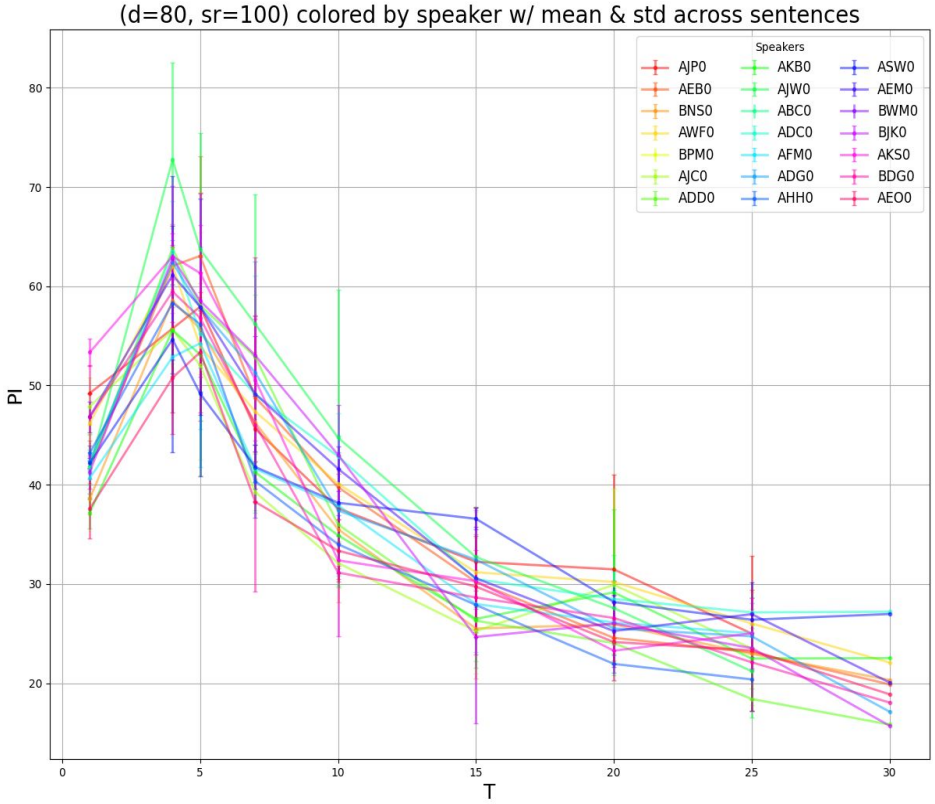


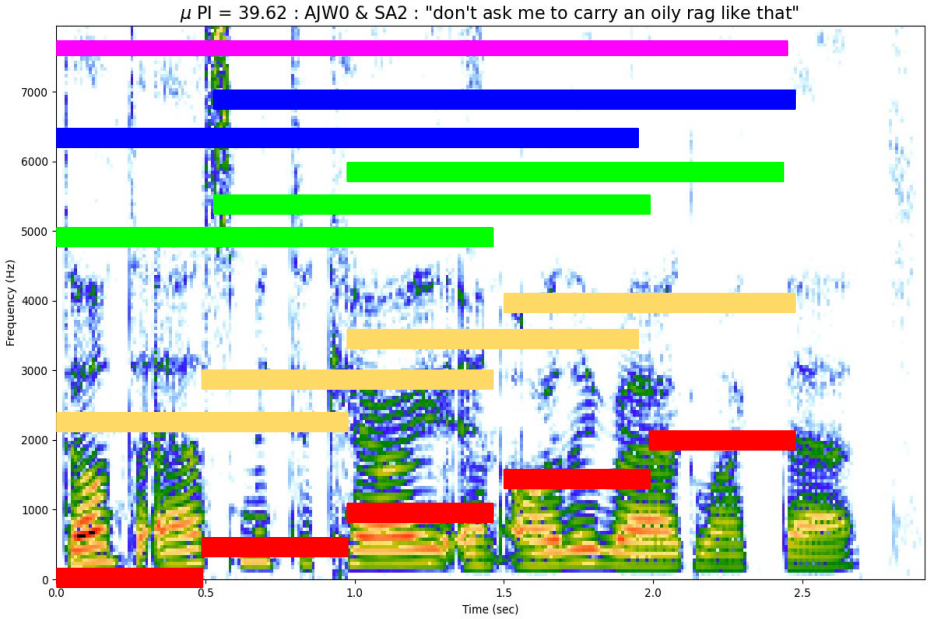


3. Predictive Information (‘temporal complexity’, fix d)

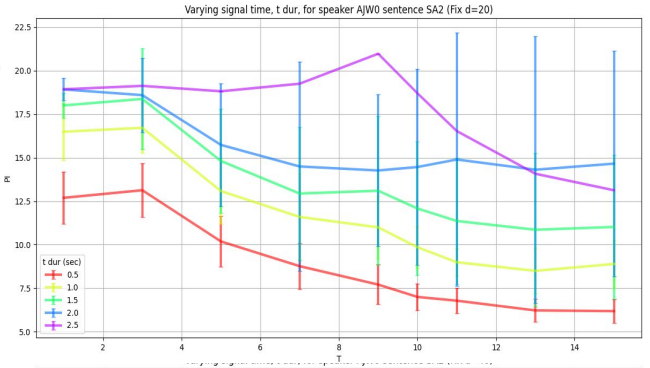




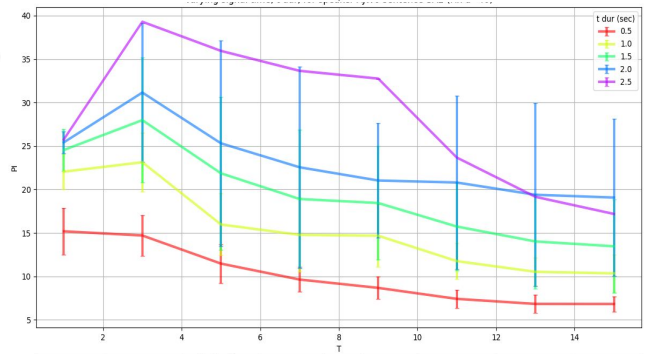
4. Vary signal time (t dur)



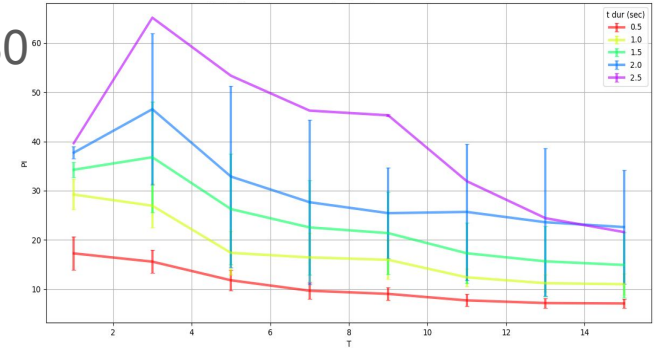
d=20



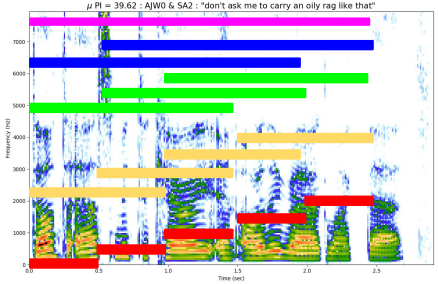
d=40

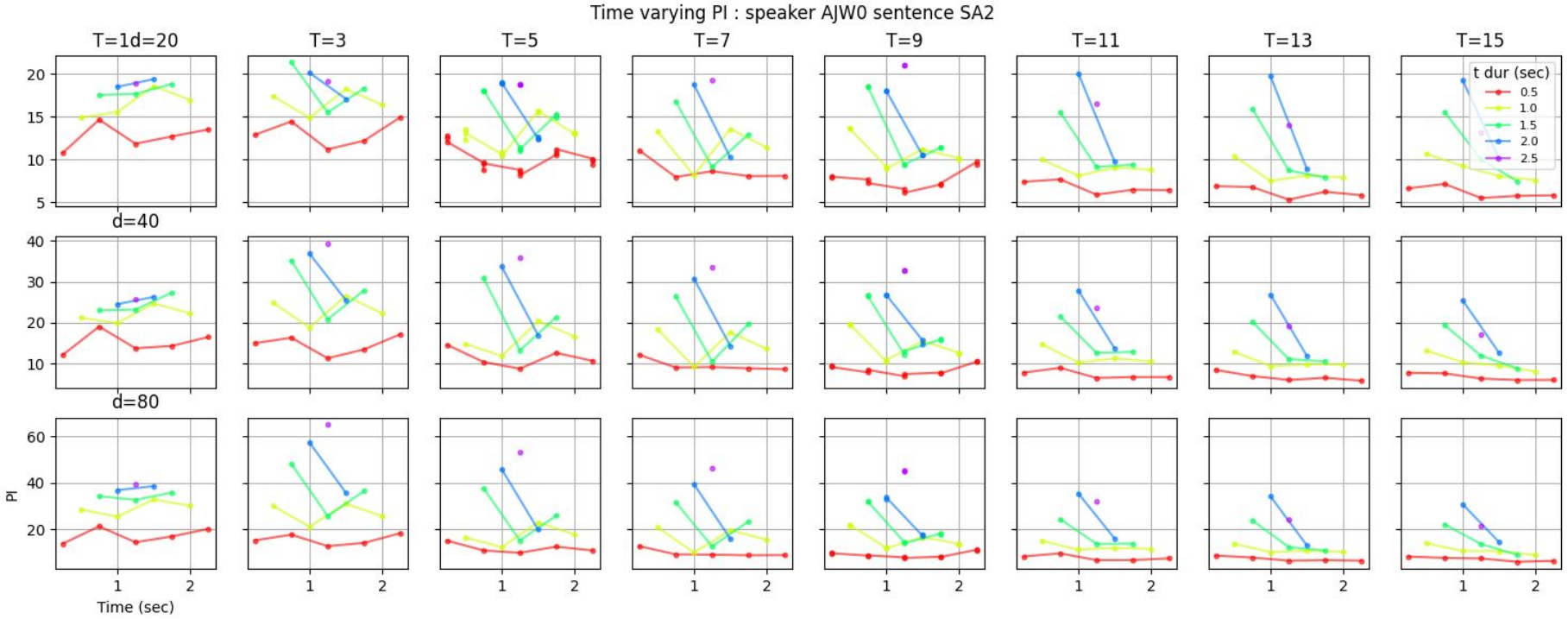


d=80



4. Vary signal time (t dur) - Sliding window analysis





5. Speed up computation