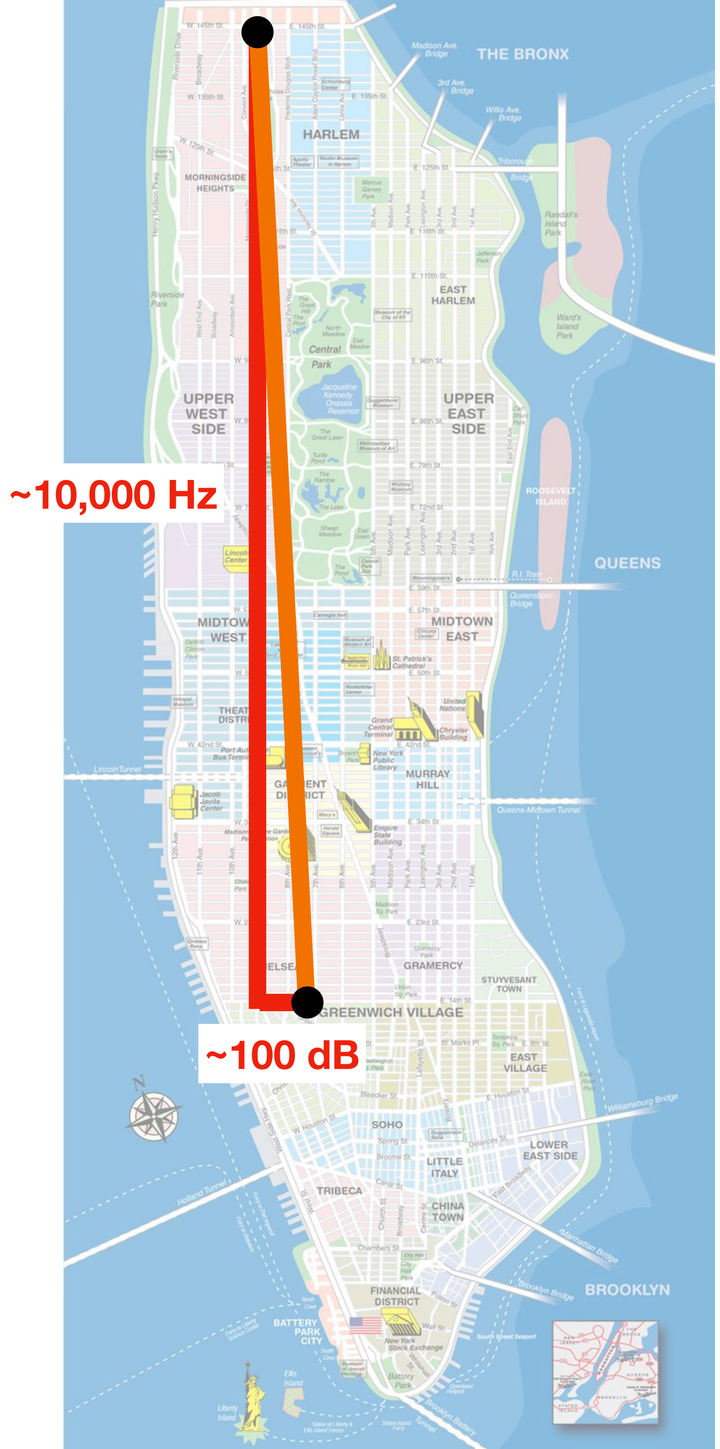
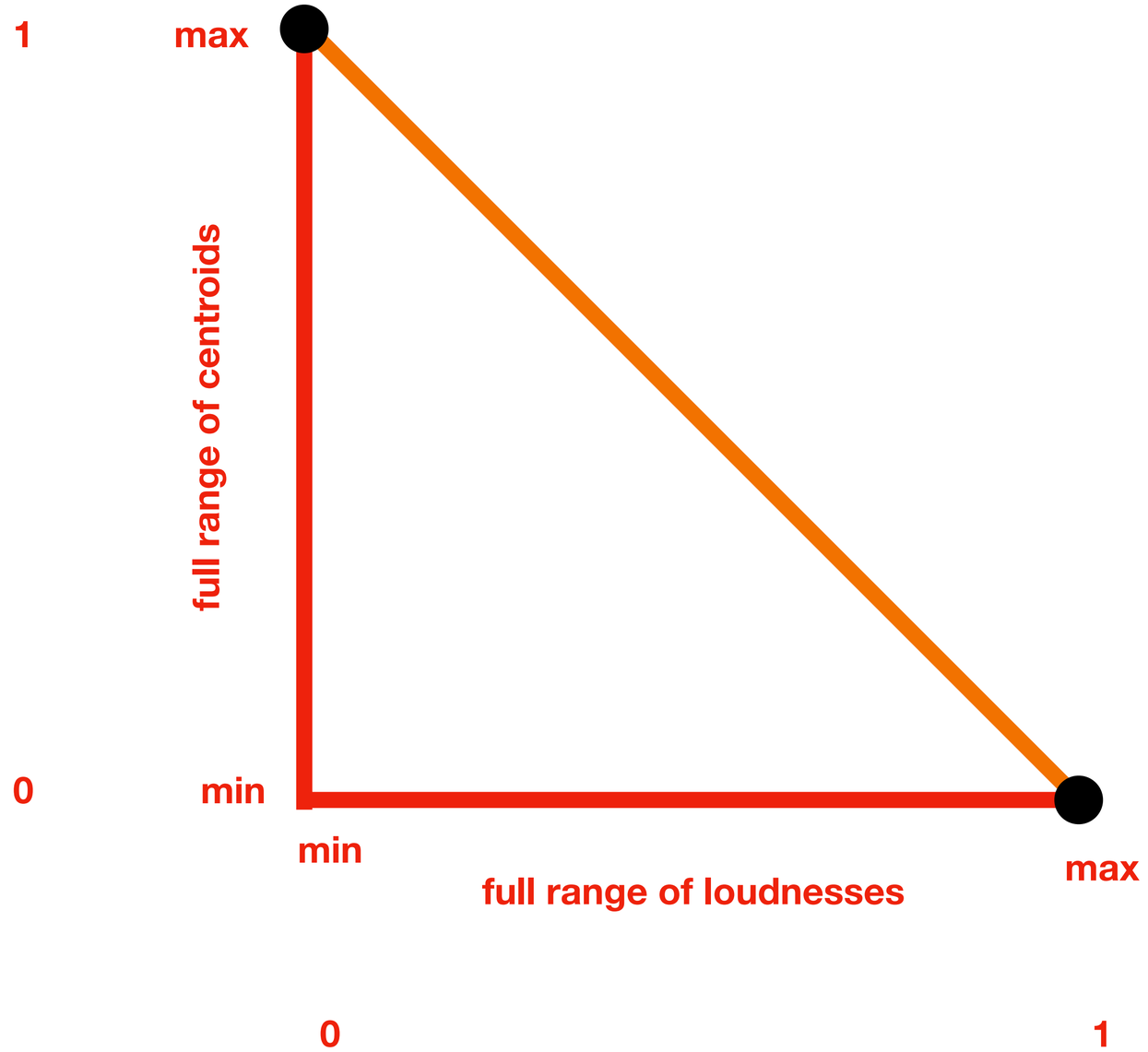
Scaling

“Proximity” as “Similarity”

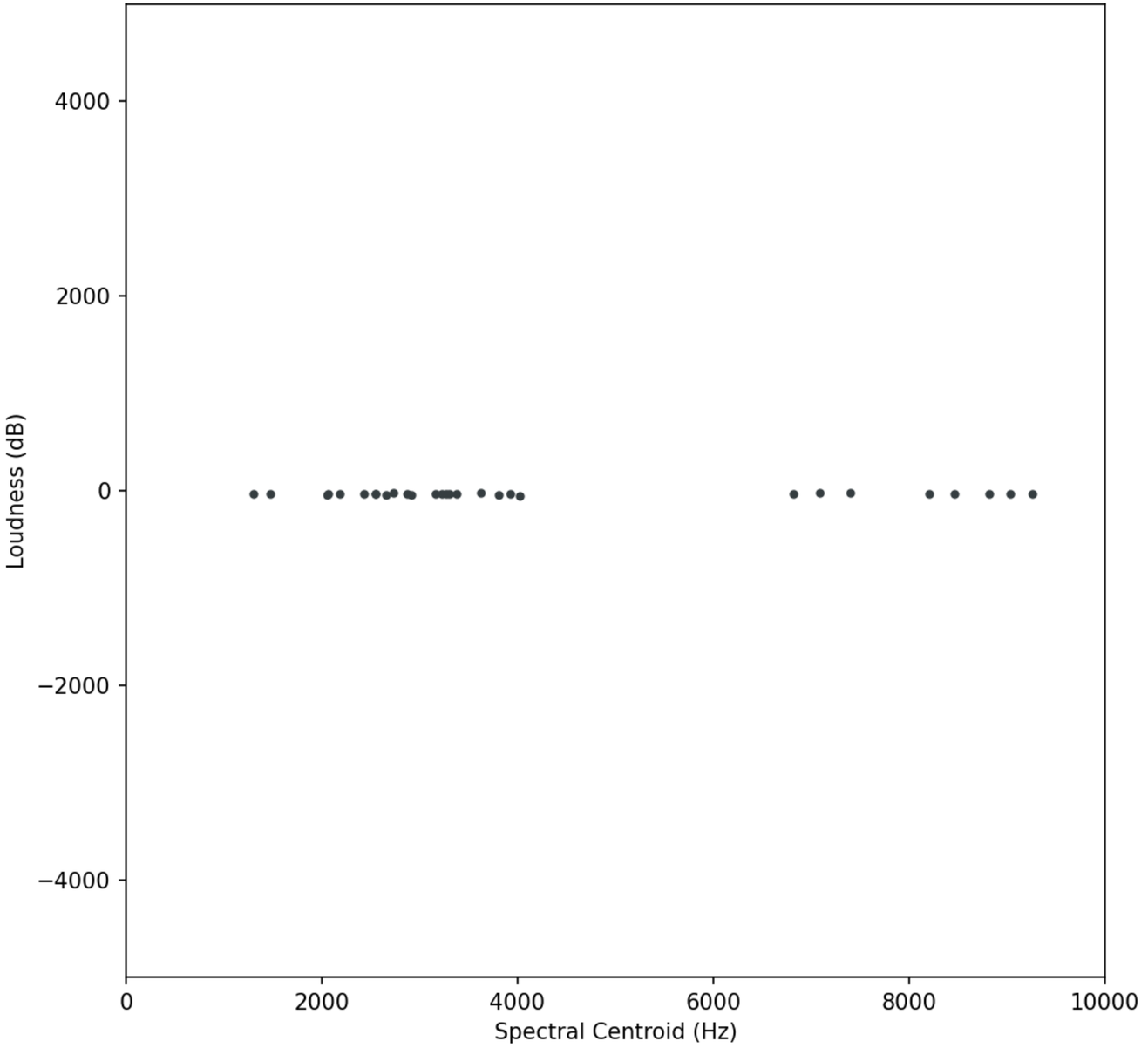
If 1 Hz = 1dB


~10,000 Hz
~100 dB
THE BRONX
HARLEM
MORNINGSIDE HEIGHTS
EAST HARLEM
Central Park
UPPER WEST SIDE
UPPER EAST SIDE
ROOSEVELT ISLAND
QUEENS
MIDTOWN WEST
MIDTOWN EAST
MURRAY HILL
GRAMERCY
STUYVESANT TOWN
GREENWICH VILLAGE
EAST VILLAGE
SOHO
LITTLE ITALY
LOWER EAST SIDE
TRIBECA
CHINA TOWN
FINANCIAL DISTRICT
BROOKLYN
BATTERY PARK CITY

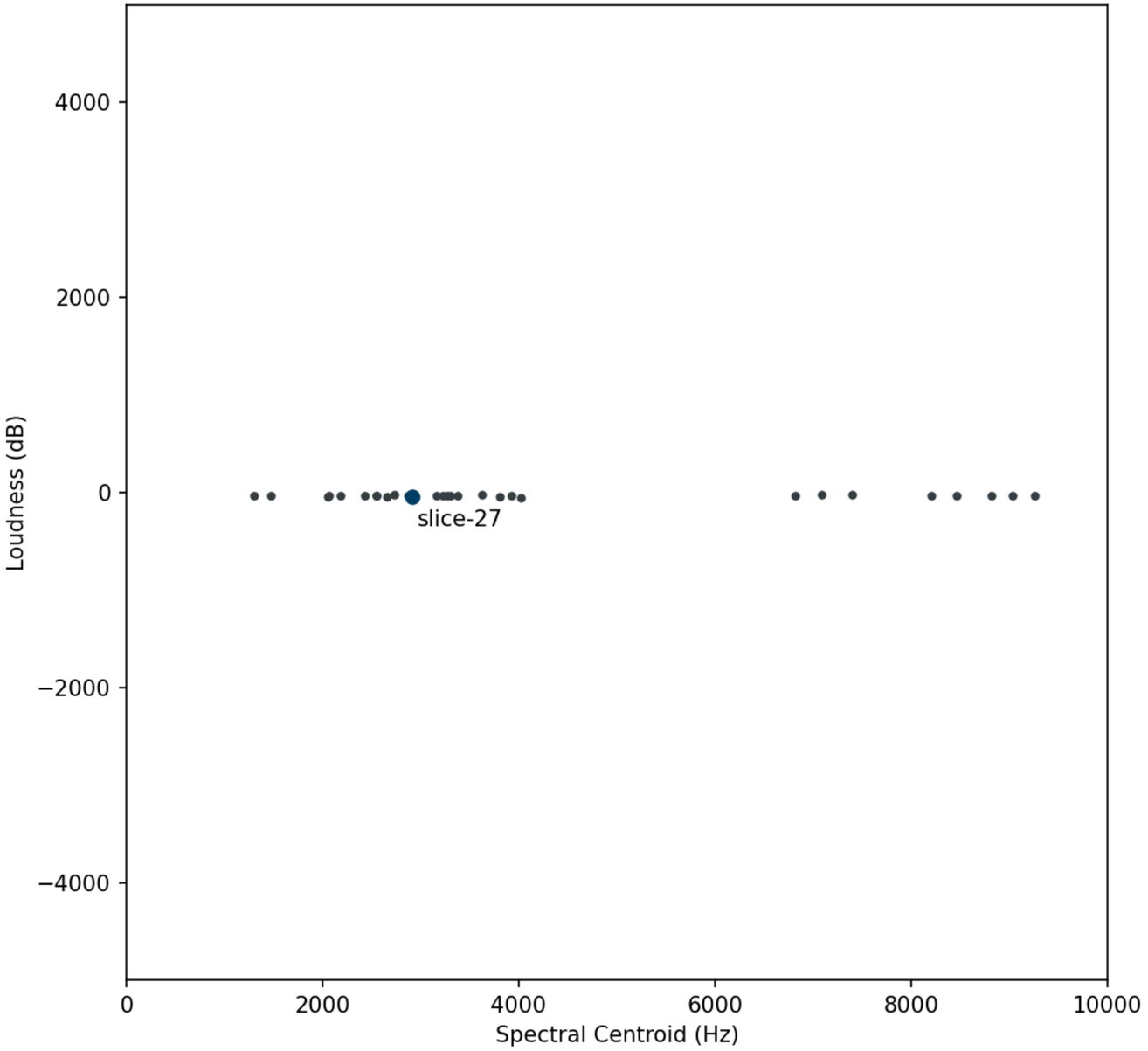
Normalization



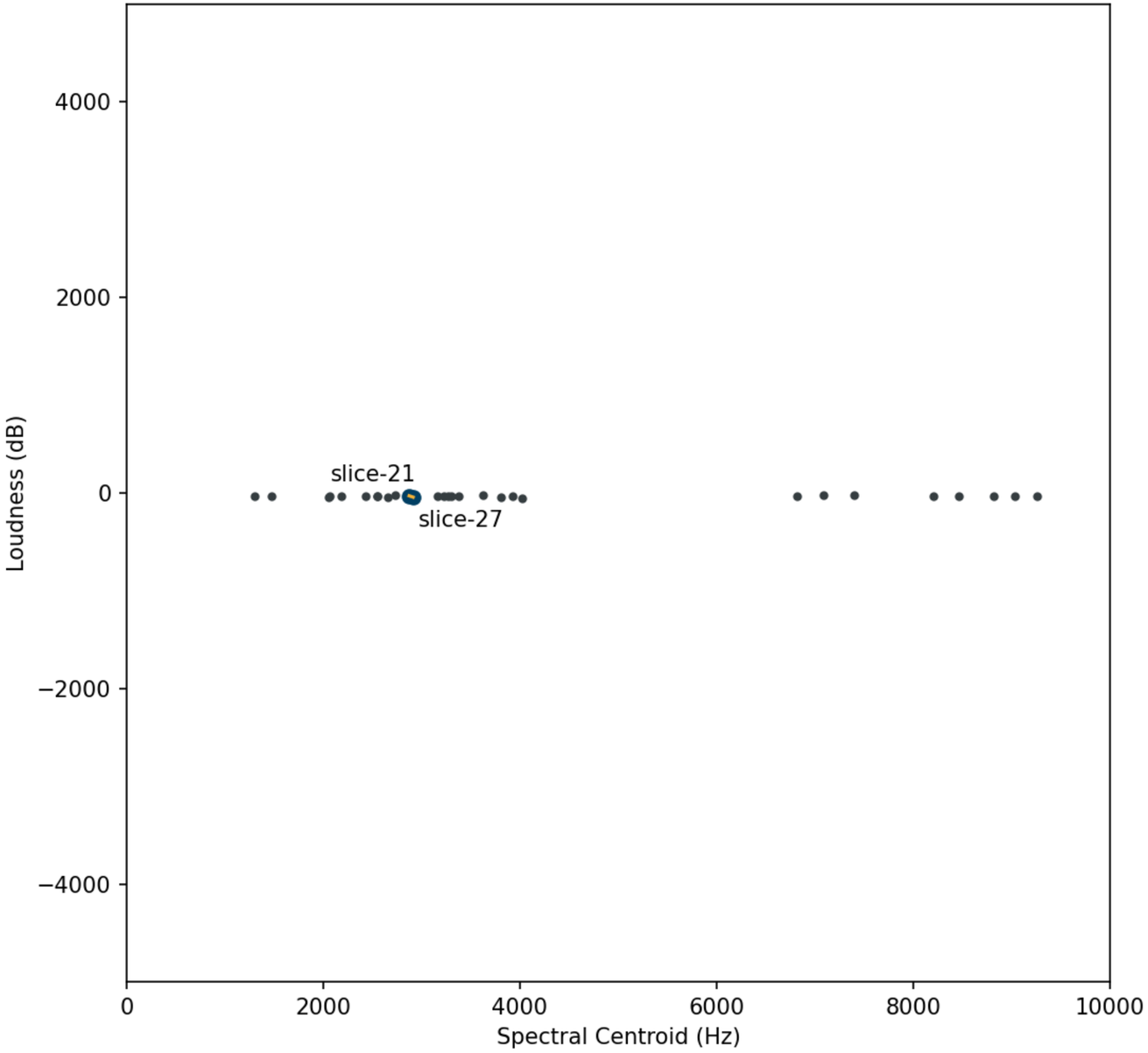
Raw scaling: 1 Hz = 1 dB



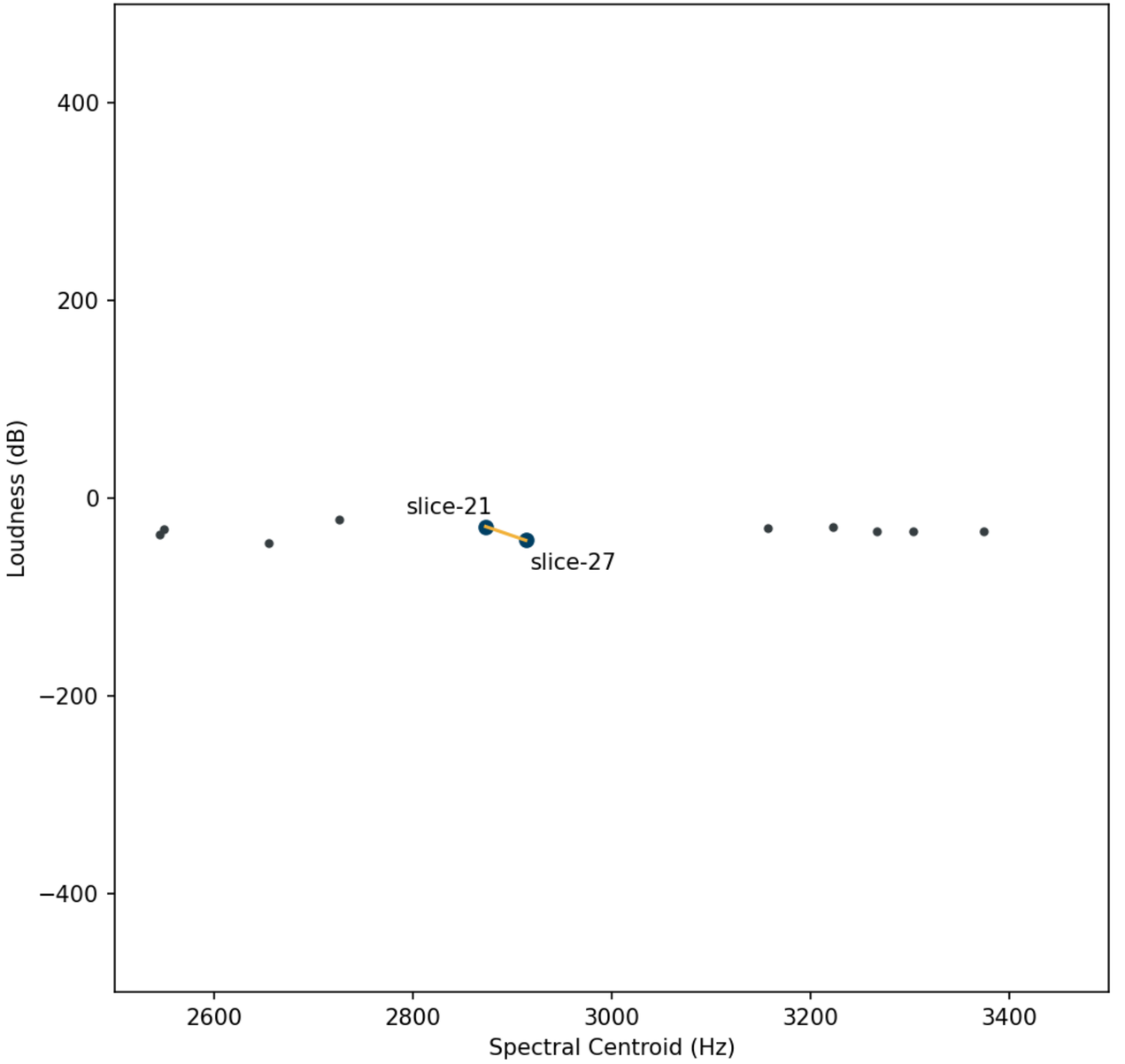
Raw scaling: 1 Hz = 1 dB



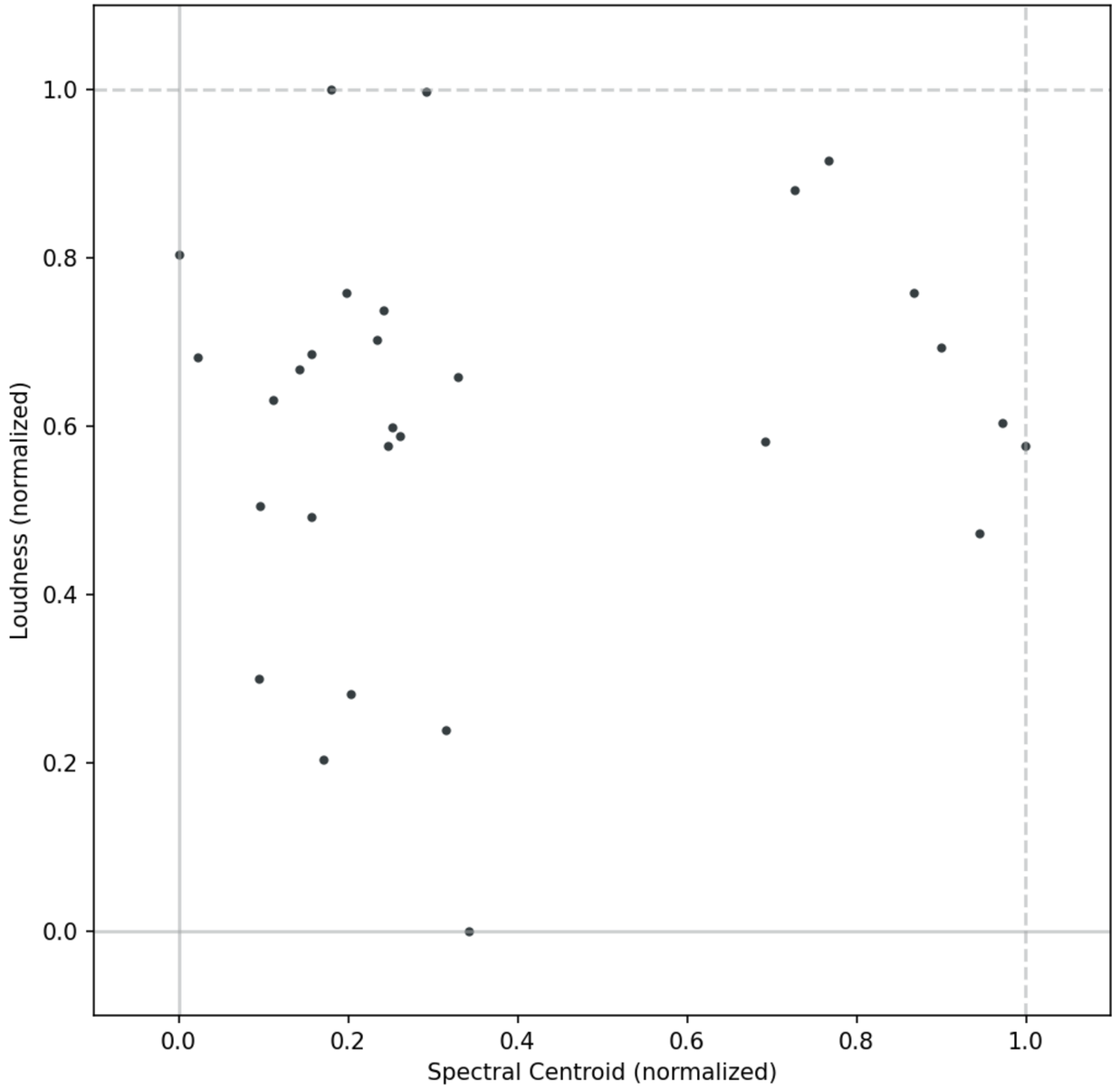
Raw scaling: 1 Hz = 1 dB



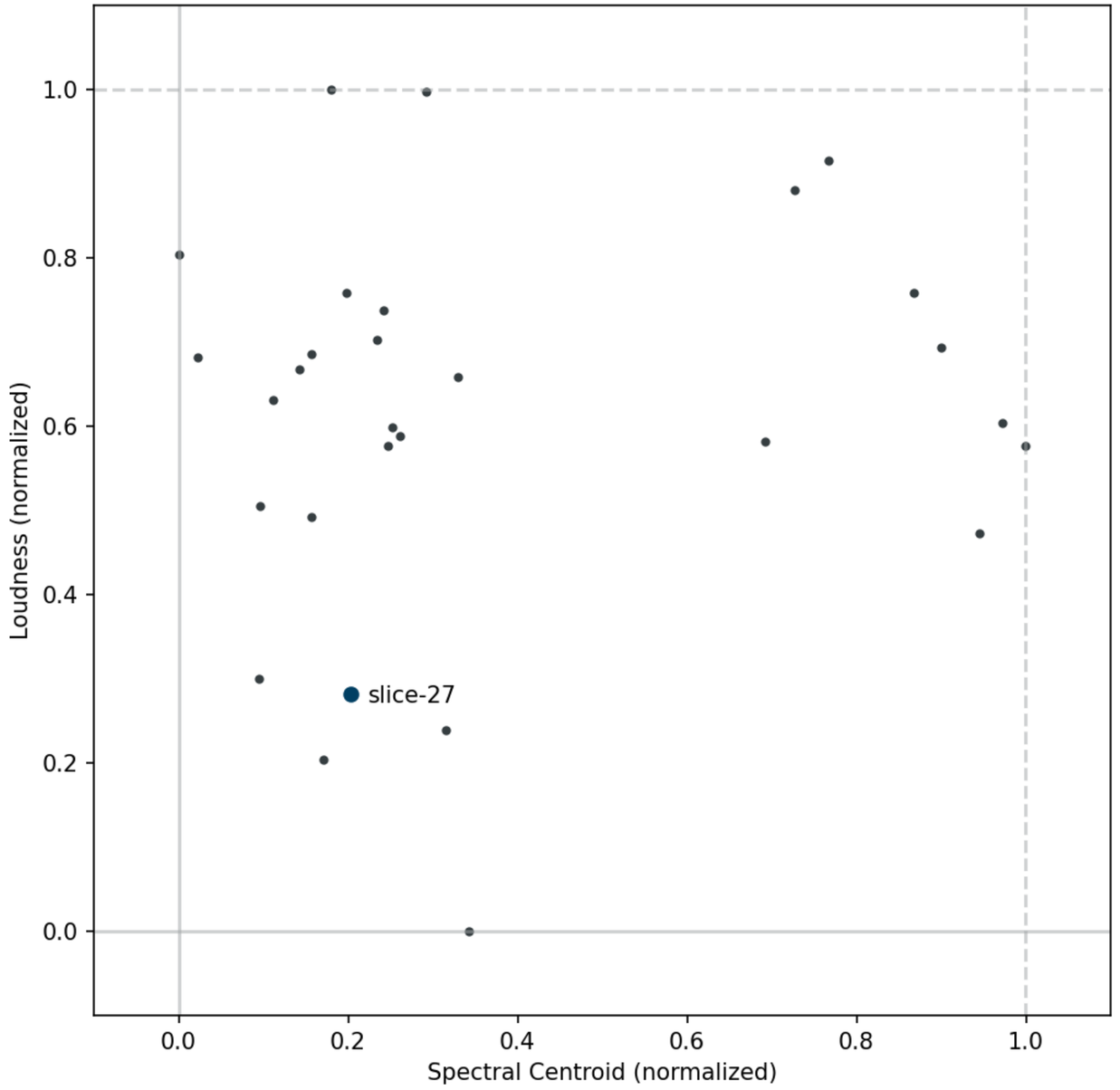
Raw scaling: 1 Hz = 1 dB



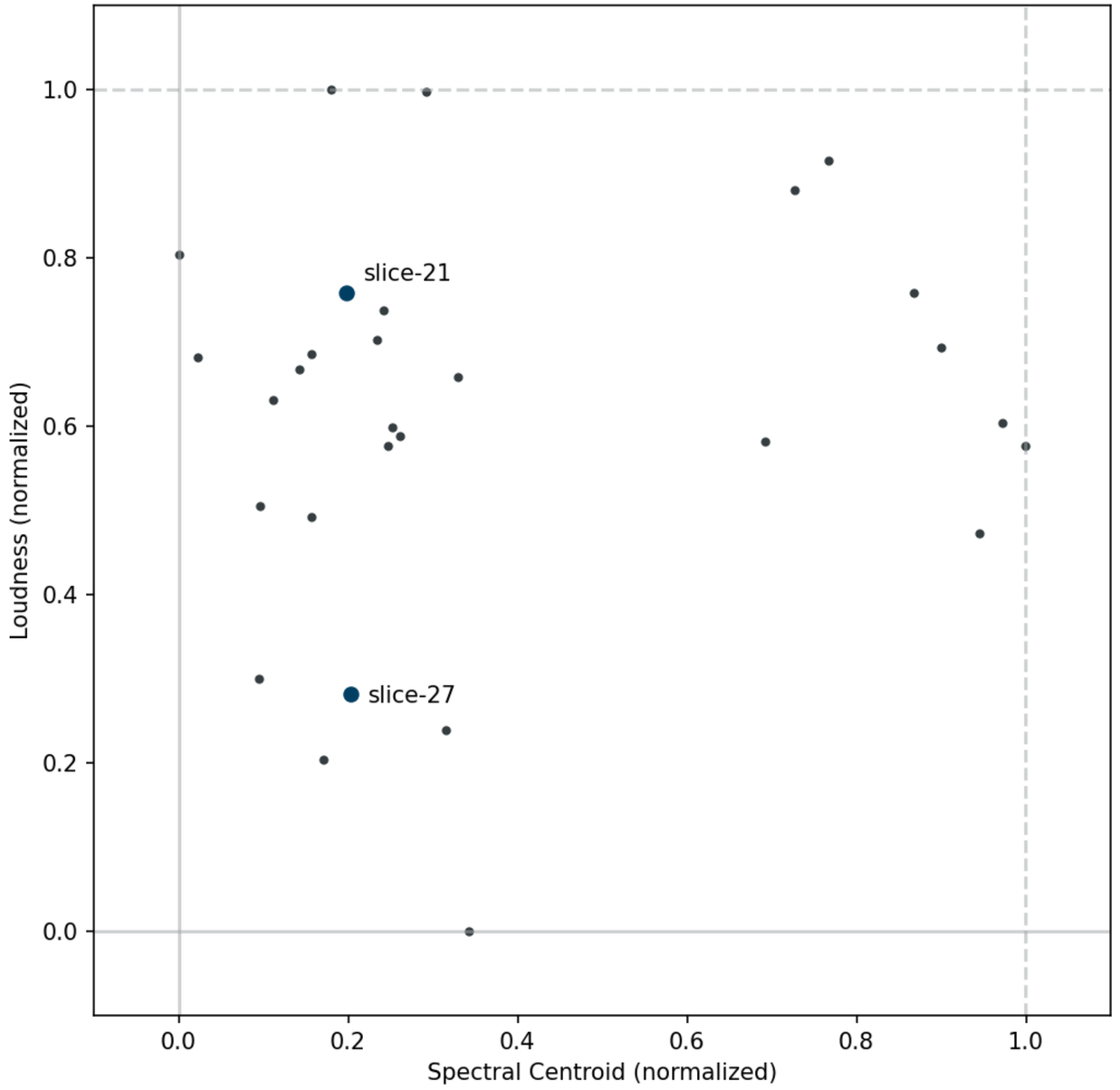
Normalized (min = 0, max = 1)



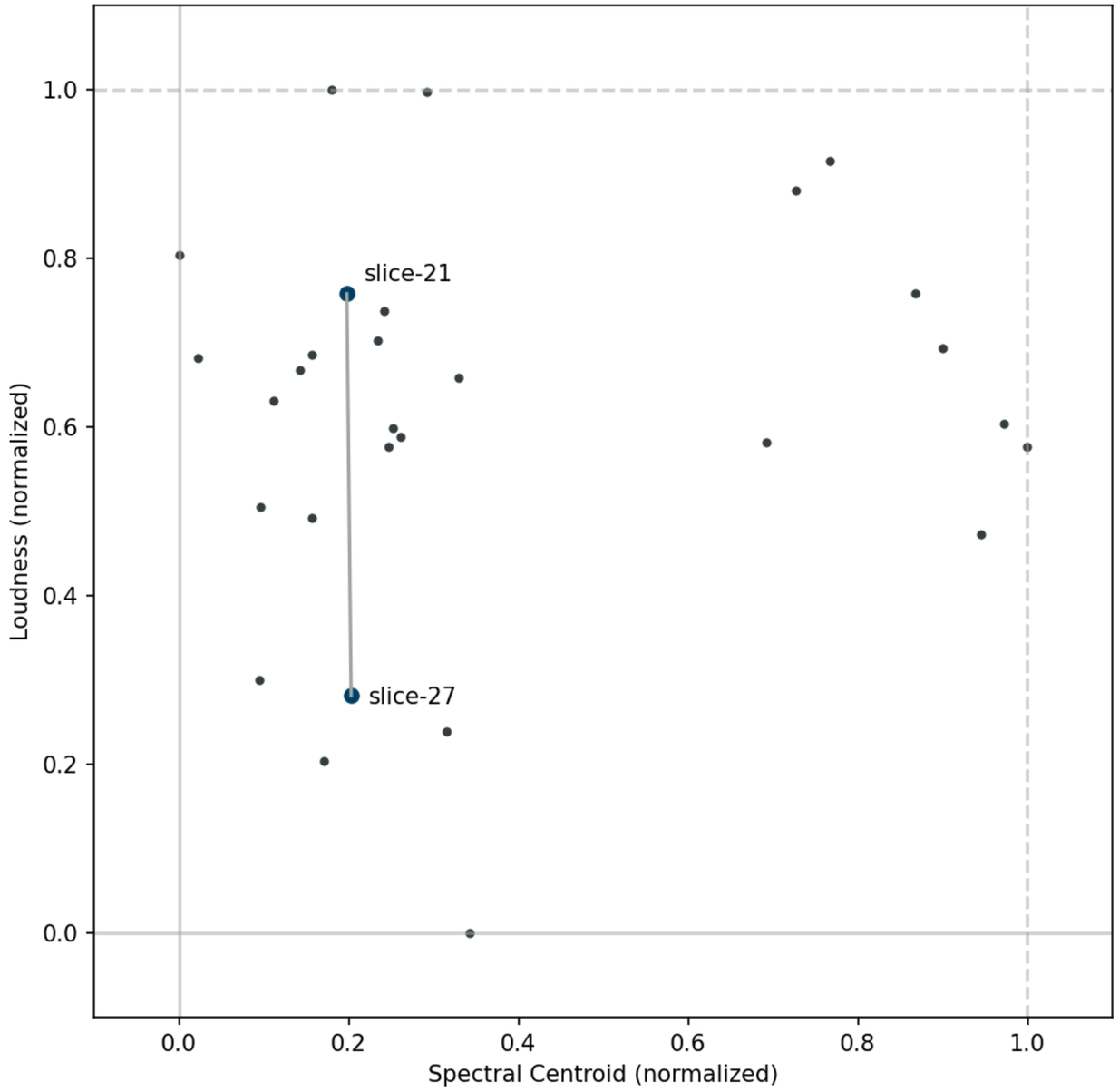
Normalized (min = 0, max = 1)



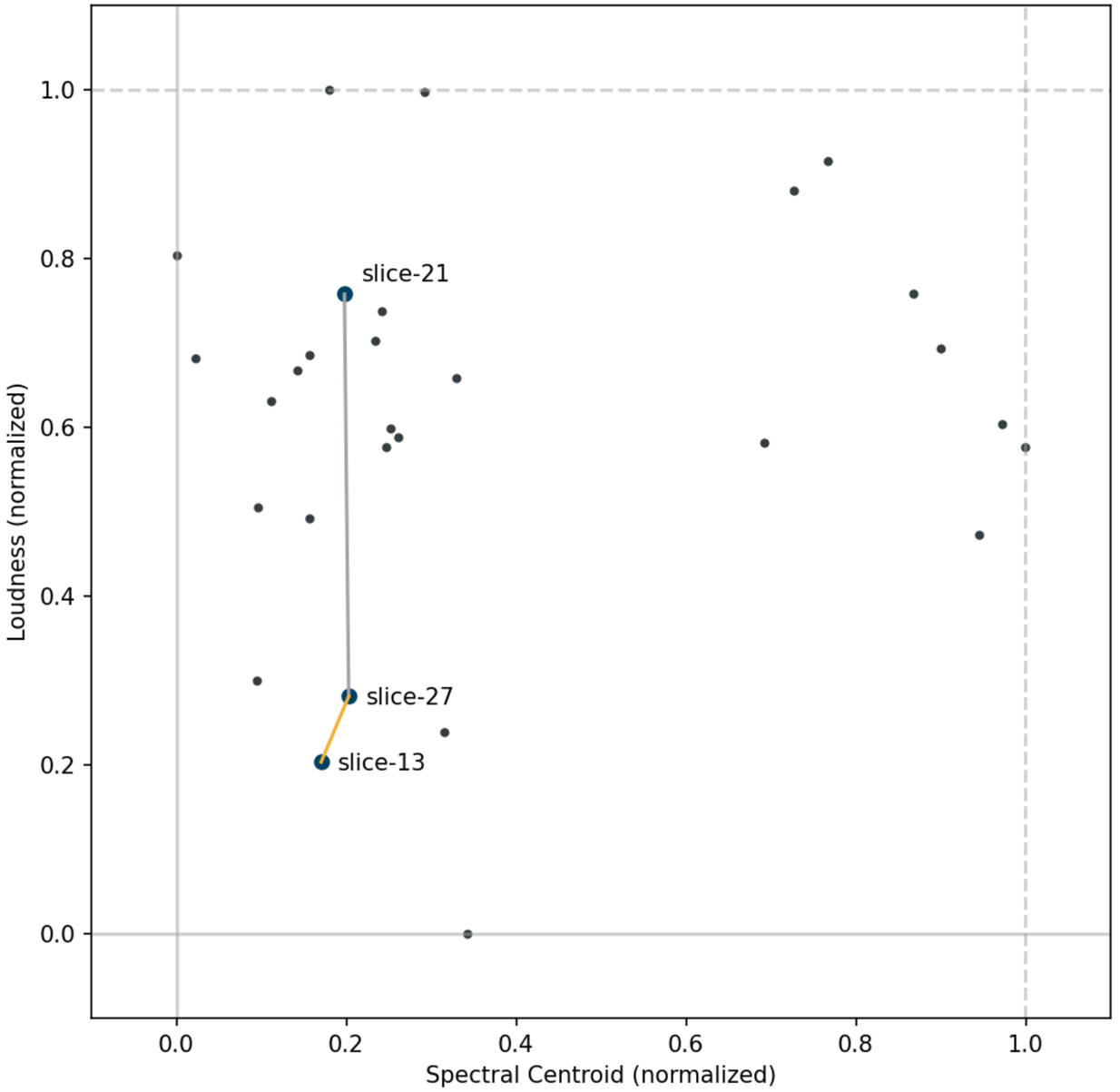
Normalized (min = 0, max = 1)



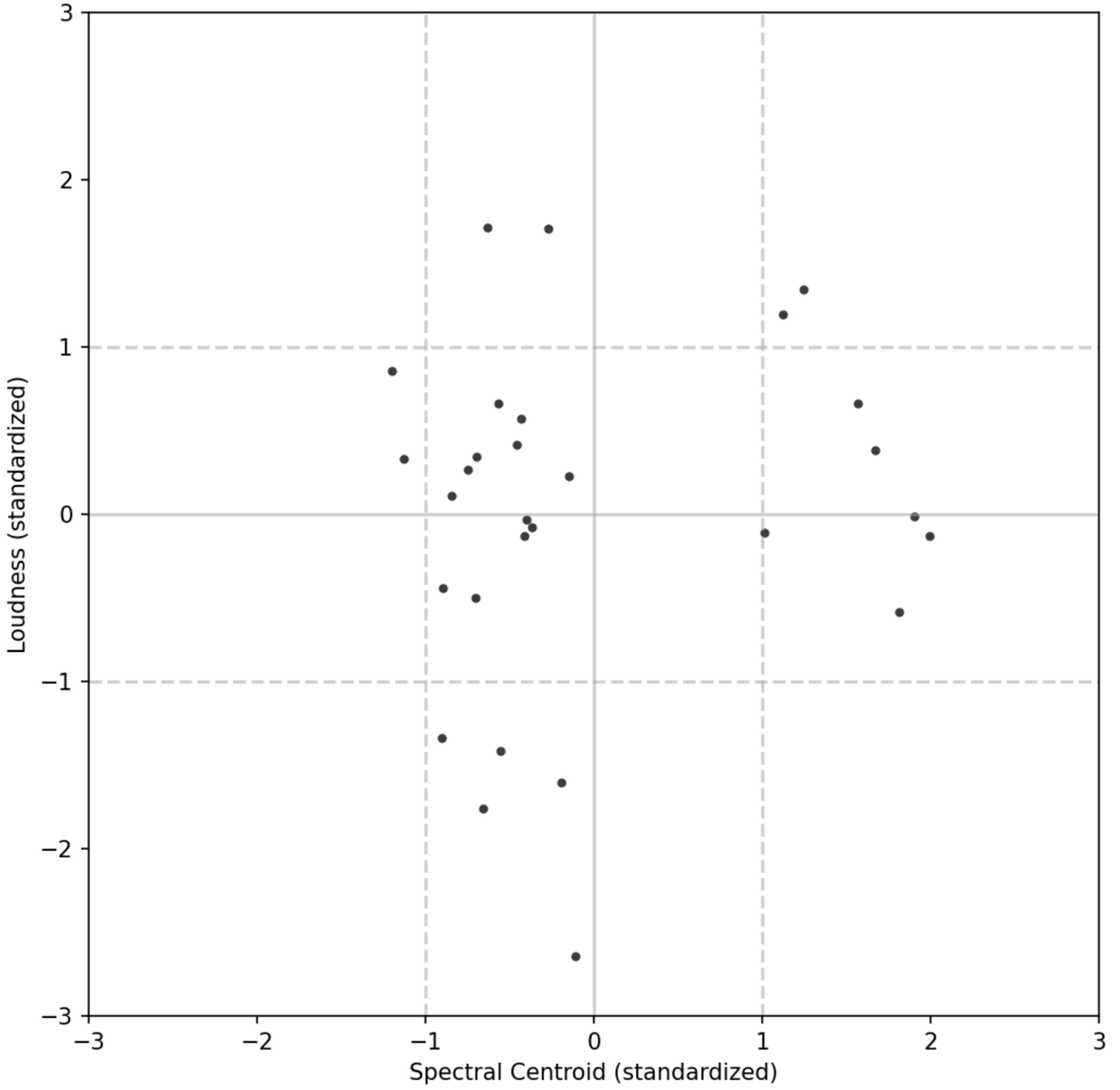
Normalized (min = 0, max = 1)



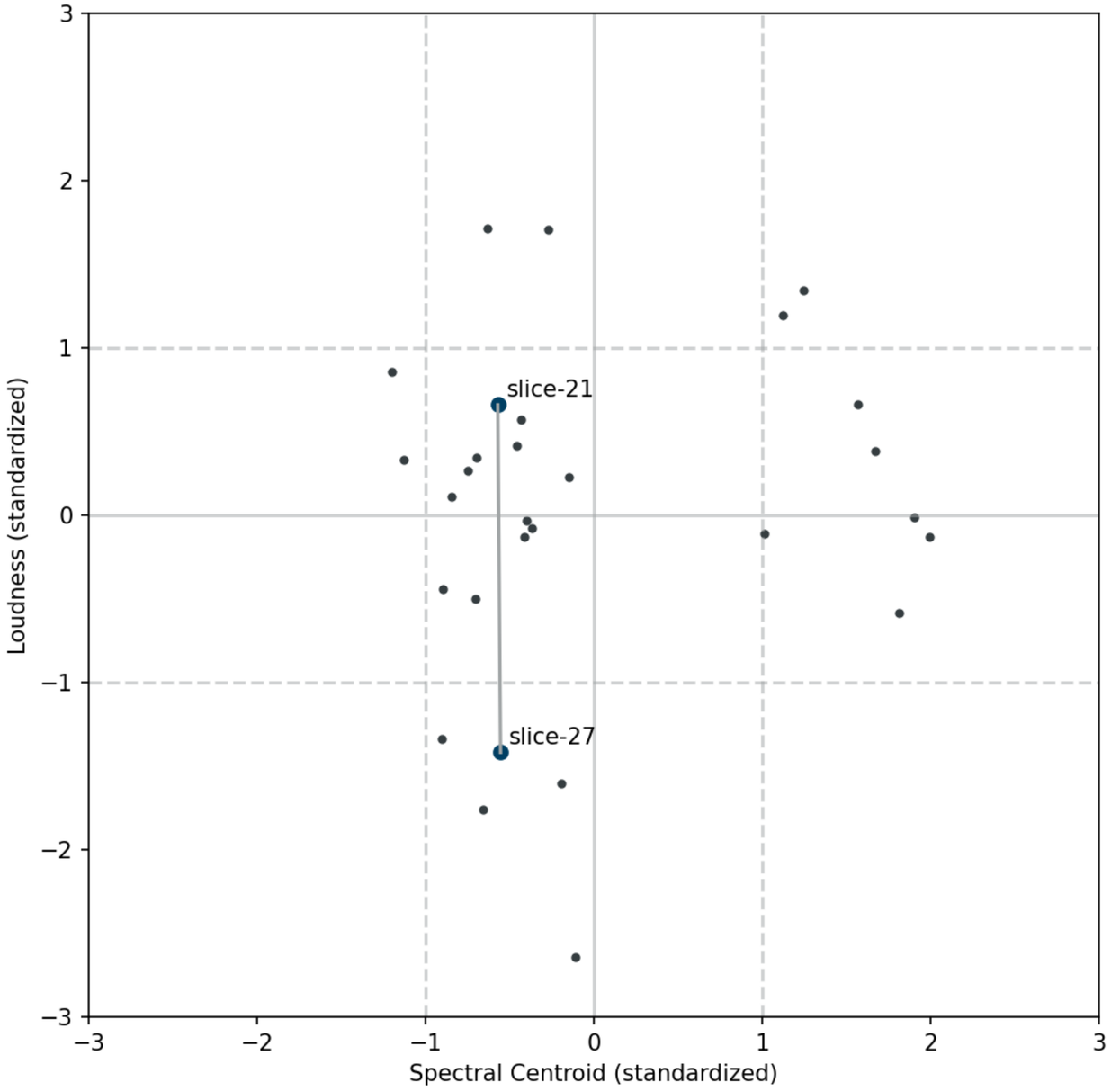
Normalized (min = 0, max = 1)



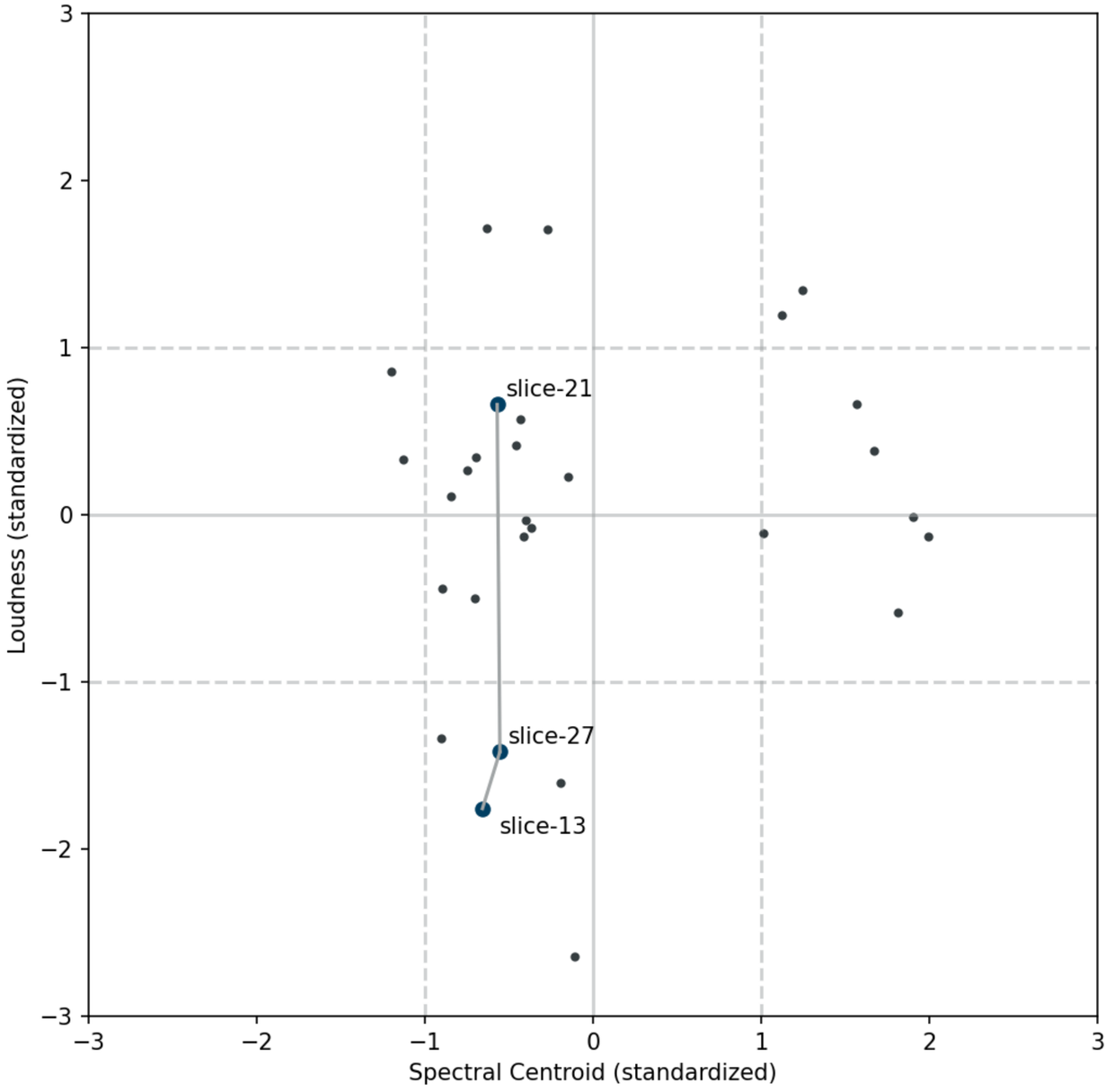
Standardized (mean = 0, standard deviation = 1)



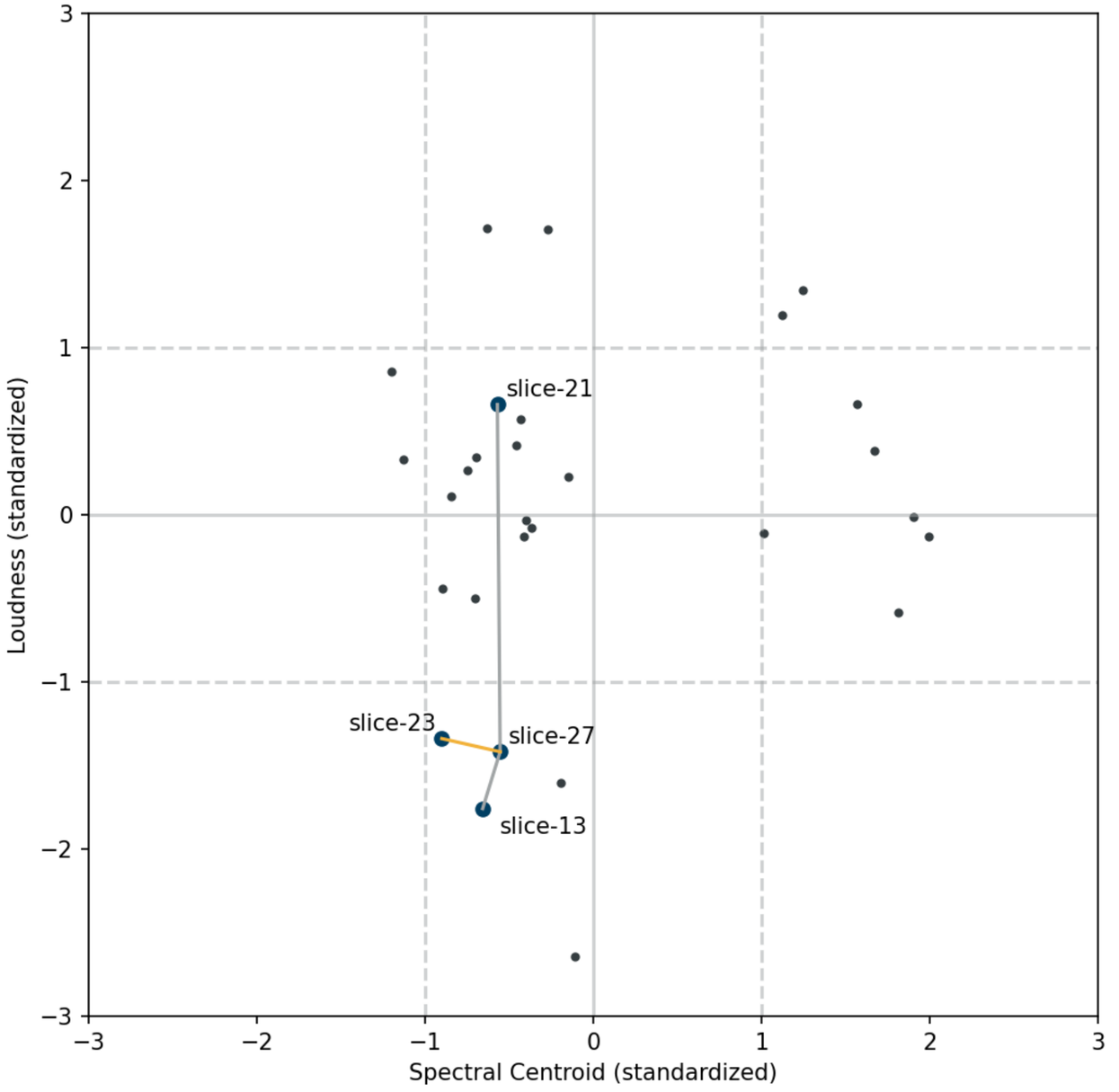
Standardized (mean = 0, standard deviation = 1)



Standardized (mean = 0, standard deviation = 1)



Standardized (mean = 0, standard deviation = 1)



quartet

Using FluCoMa *a workflow*

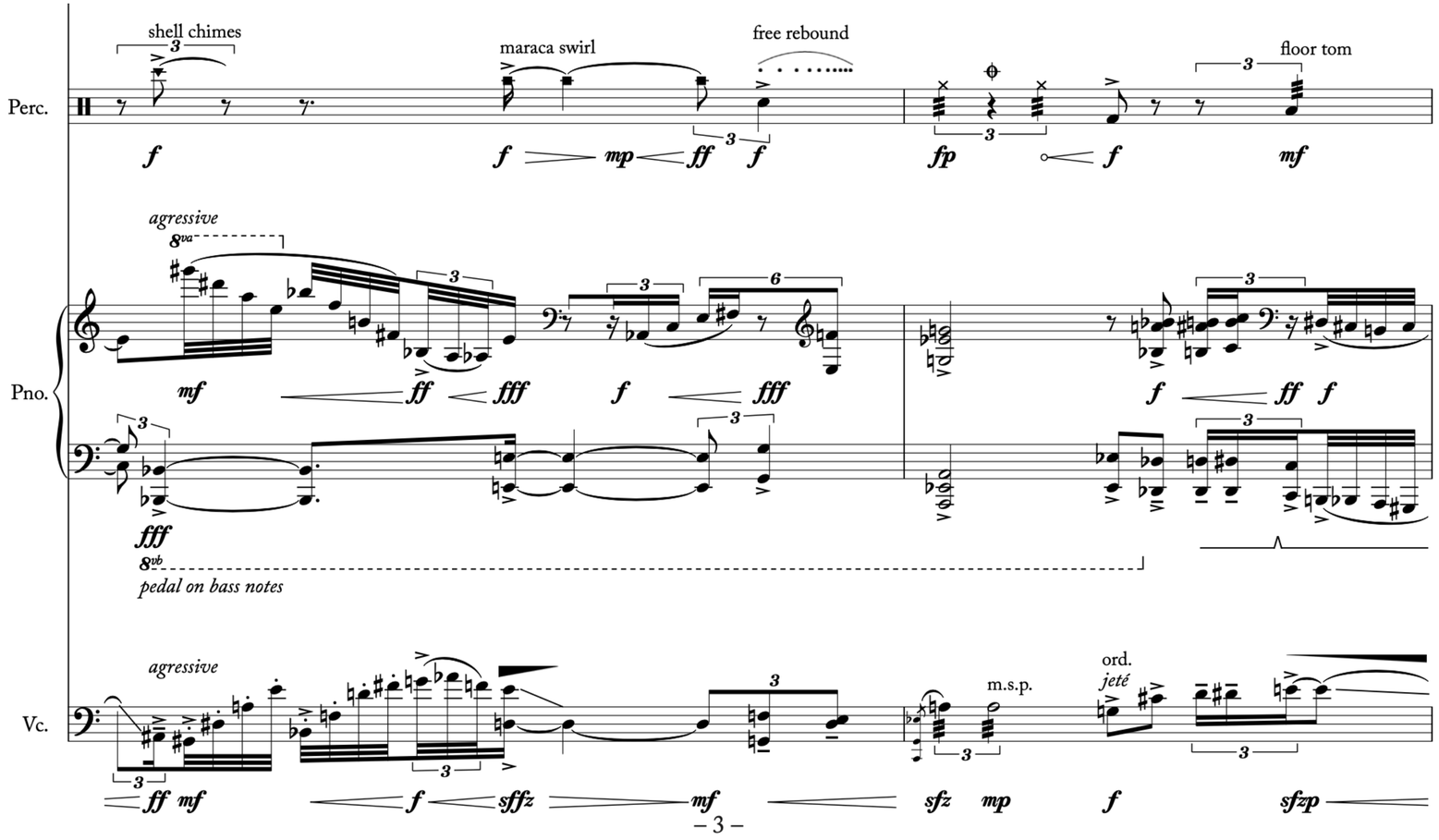
1. corpus curation

2. decomposition

3. analysis

4. pattern finding

5. creating



Using FluCoMa *a workflow*

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Using FluCoMa *a workflow*

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Using FluCoMa *a workflow*

1. corpus curation
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	spec cent	spec spread	spec skewness	spec kurtosis	spec rolloff	spec flatness	spec crest	loudness	true peak	pitch	pitch conf	mfcc 0	mfcc 1	mfcc 2	mfcc 3	mfcc 4	mfcc 5	mfcc 6
	0.276	0.362	0.891	0.135	0.772	0.843	0.869	0.372	0.523	0.041	0.053	0.270	0.103	0.759	0.370	0.901	0.689	0.698
	0.854	0.266	0.789	0.708	0.889	0.041	0.445	0.236	0.661	0.819	0.704	0.307	0.753	0.177	0.399	0.295	0.789	0.696
	0.566	0.366	0.772	0.133	0.581	0.904	0.203	0.553	0.838	0.697	0.659	0.981	0.072	0.503	0.588	0.964	0.764	0.982
	0.448	0.466	0.153	0.581	0.679	0.332	0.450	0.579	0.479	0.833	0.781	0.077	0.702	0.376	0.749	0.608	0.863	0.348
	0.854	0.520	0.015	0.768	0.278	0.359	0.350	0.221	0.629	0.387	0.047	0.703	0.631	0.438	0.170	0.019	0.097	0.973
	0.858	0.220	0.727	0.604	0.854	0.978	0.976	0.252	0.394	0.858	0.223	0.148	0.729	0.308	0.341	0.265	0.026	0.737
	0.661	0.076	0.065	0.848	0.990	0.976	0.249	0.899	0.557	0.276	0.458	0.186	0.995	0.699	0.421	0.621	0.120	0.635
	0.159	0.331	0.874	0.059	0.834	0.650	0.889	0.635	0.714	0.752	0.182	0.820	0.477	0.559	0.305	0.700	0.744	0.859
	0.057	0.032	0.334	0.208	0.842	0.438	0.010	0.789	0.148	0.471	0.791	0.308	0.381	0.332	0.026	0.379	0.370	0.282
	0.427	0.304	0.637	0.269	0.560	0.810	0.455	0.869	0.828	0.397	0.149	0.055	0.259	0.758	0.203	0.584	0.401	0.770
	0.355	0.180	0.043	0.989	0.167	0.263	0.600	0.114	0.332	0.839	0.121	0.611	0.303	0.180	0.142	0.976	0.117	0.163
	0.400	0.348	0.094	0.837	0.286	0.872	0.850	0.817	0.231	0.567	0.965	0.603	0.669	0.941	0.242	0.859	0.593	0.838
	0.941	0.817	0.018	0.783	0.094	0.661	0.744	0.473	0.449	0.311	0.647	0.861	0.496	0.328	0.340	0.395	0.107	0.439
	0.075	0.817	0.177	0.187	0.096	0.990	0.179	0.605	0.403	0.359	0.828	0.394	0.723	0.456	0.701	0.356	0.496	0.779
	0.669	0.216	0.782	0.567	0.032	0.263	0.951	0.412	0.293	0.415	0.546	0.175	0.094	0.641	0.432	0.166	0.119	0.897

Using FluCoMa *a workflow*

1. corpus curation
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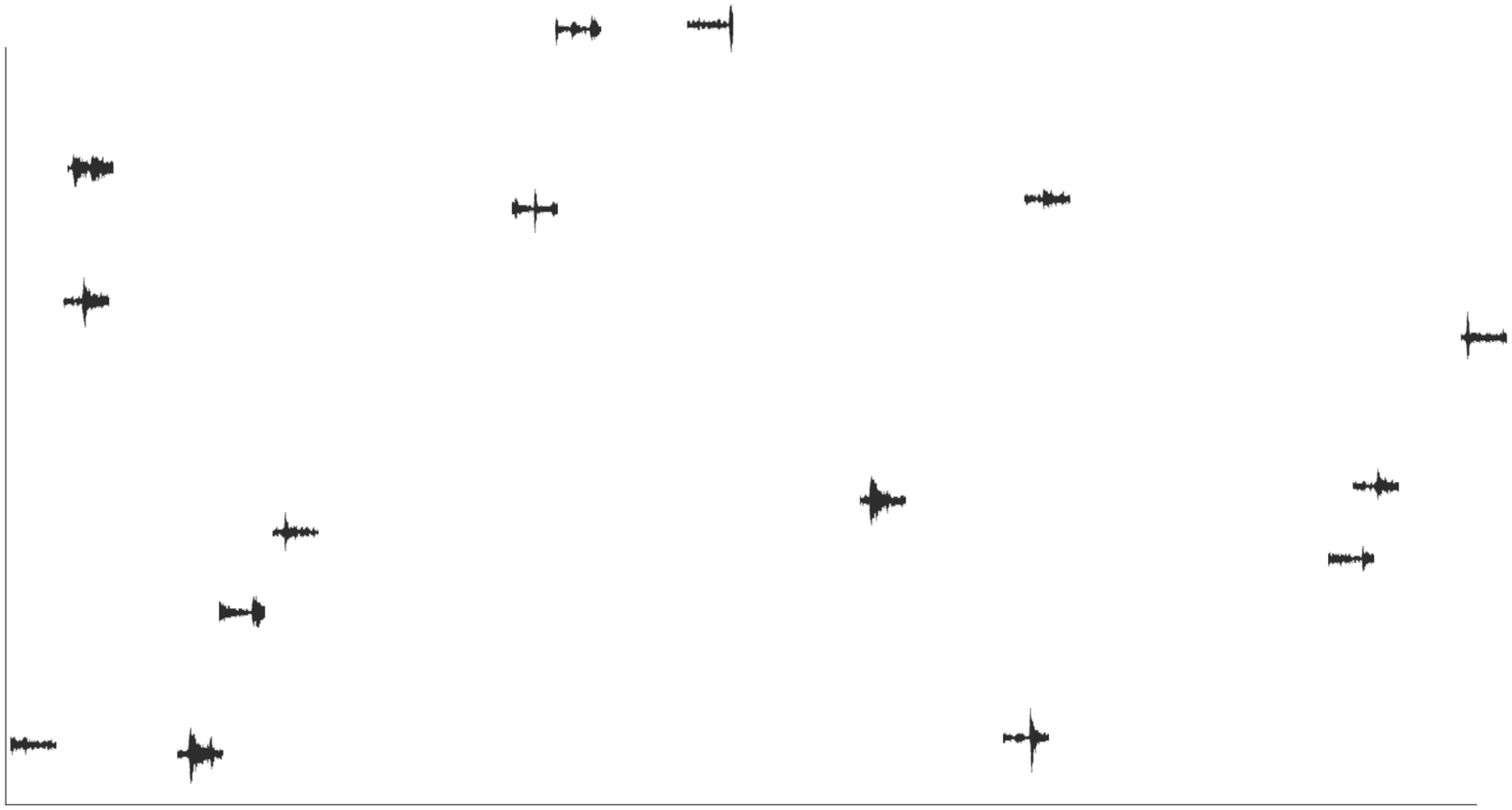

Using FluCoMa *a workflow*

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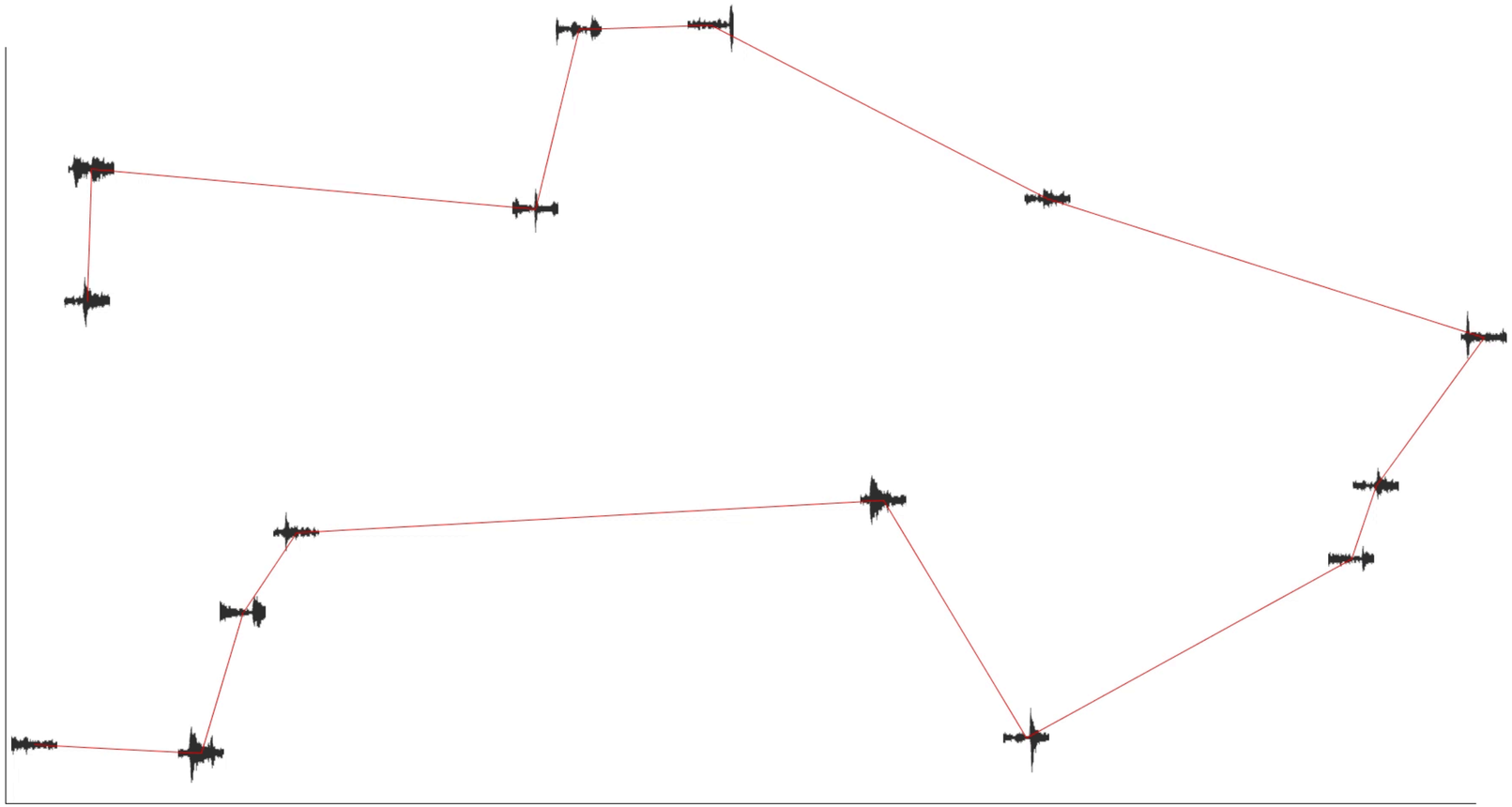
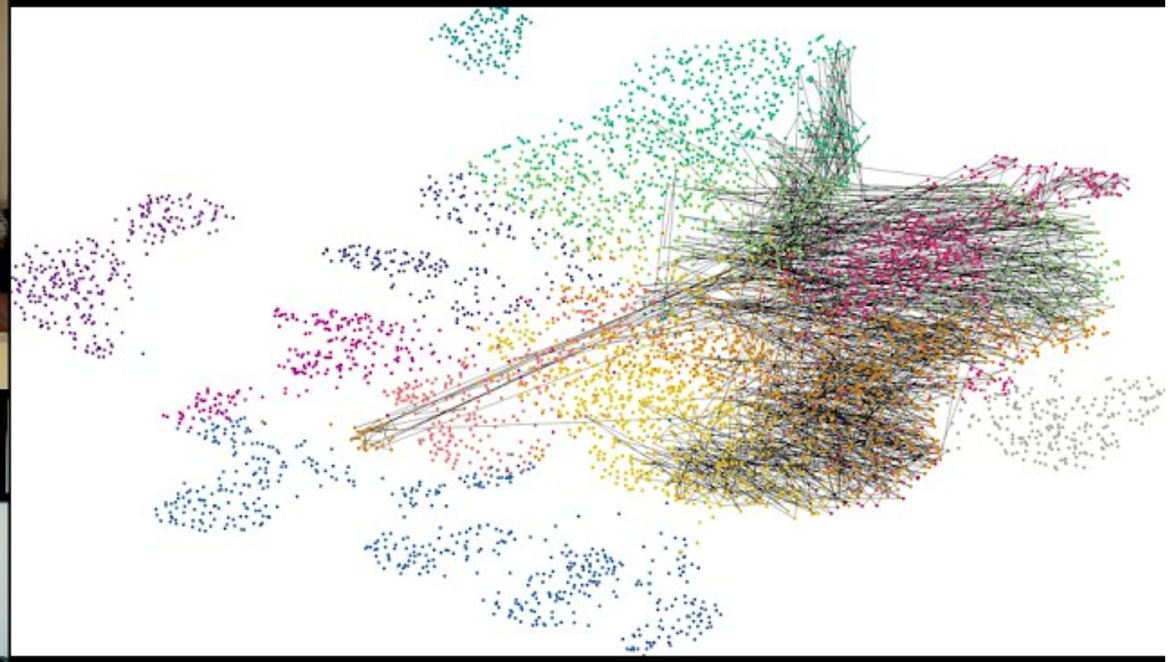
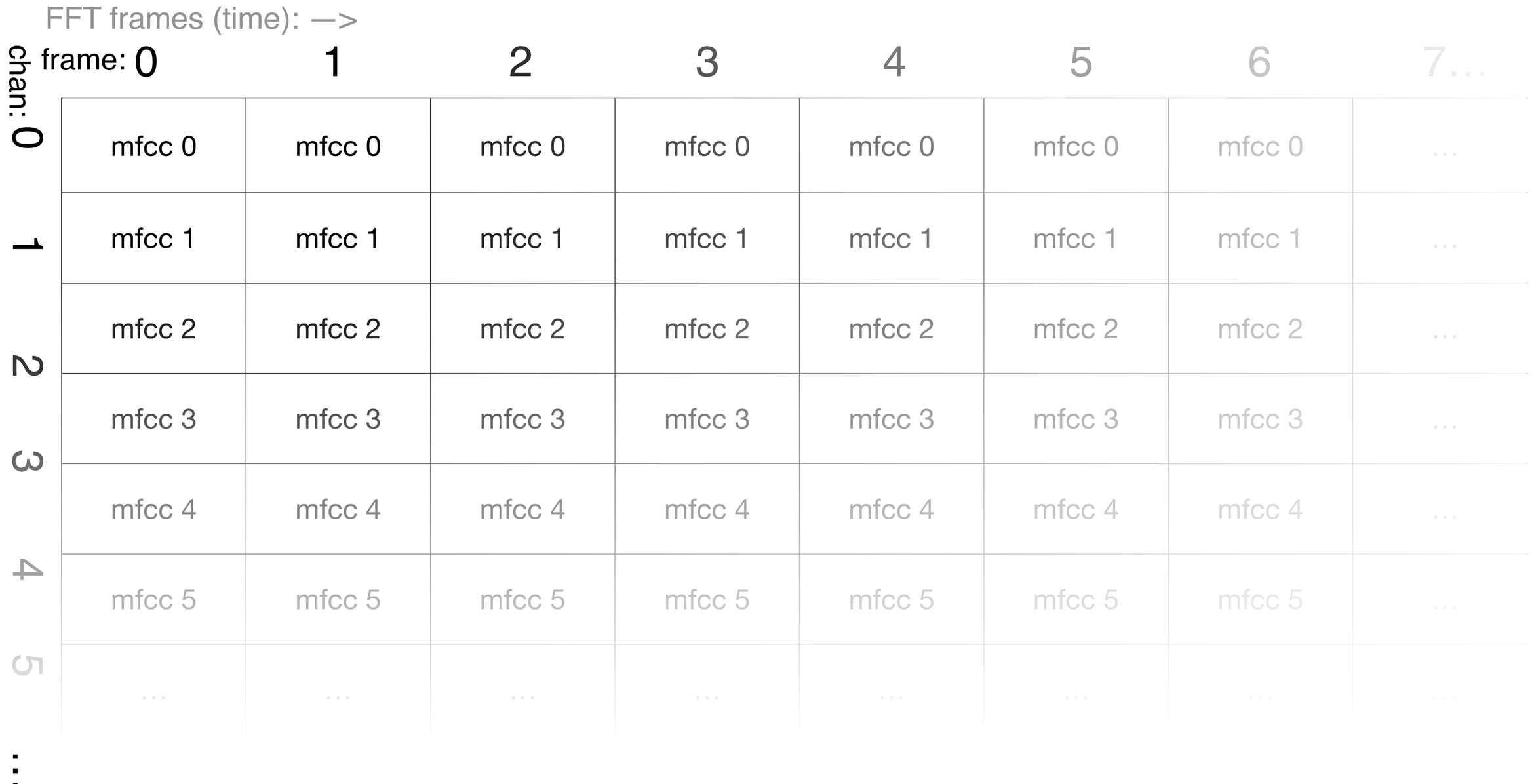


Traveling Salesperson Route: UMAP



UMAP in 1 dimension

FluidBufMFCC writes the analysis to a buffer



Dimensionality Reduction

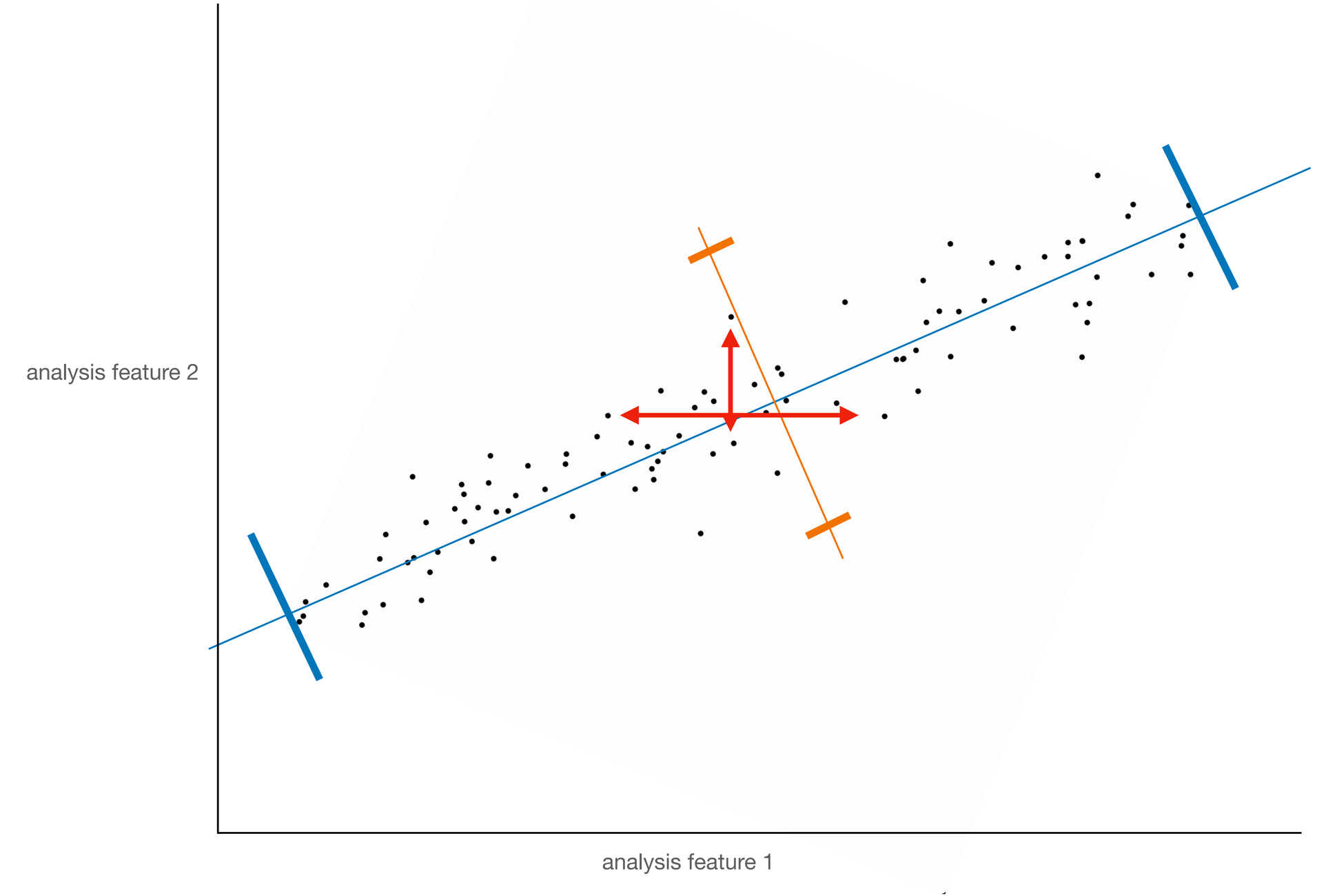
PCA & UMAP

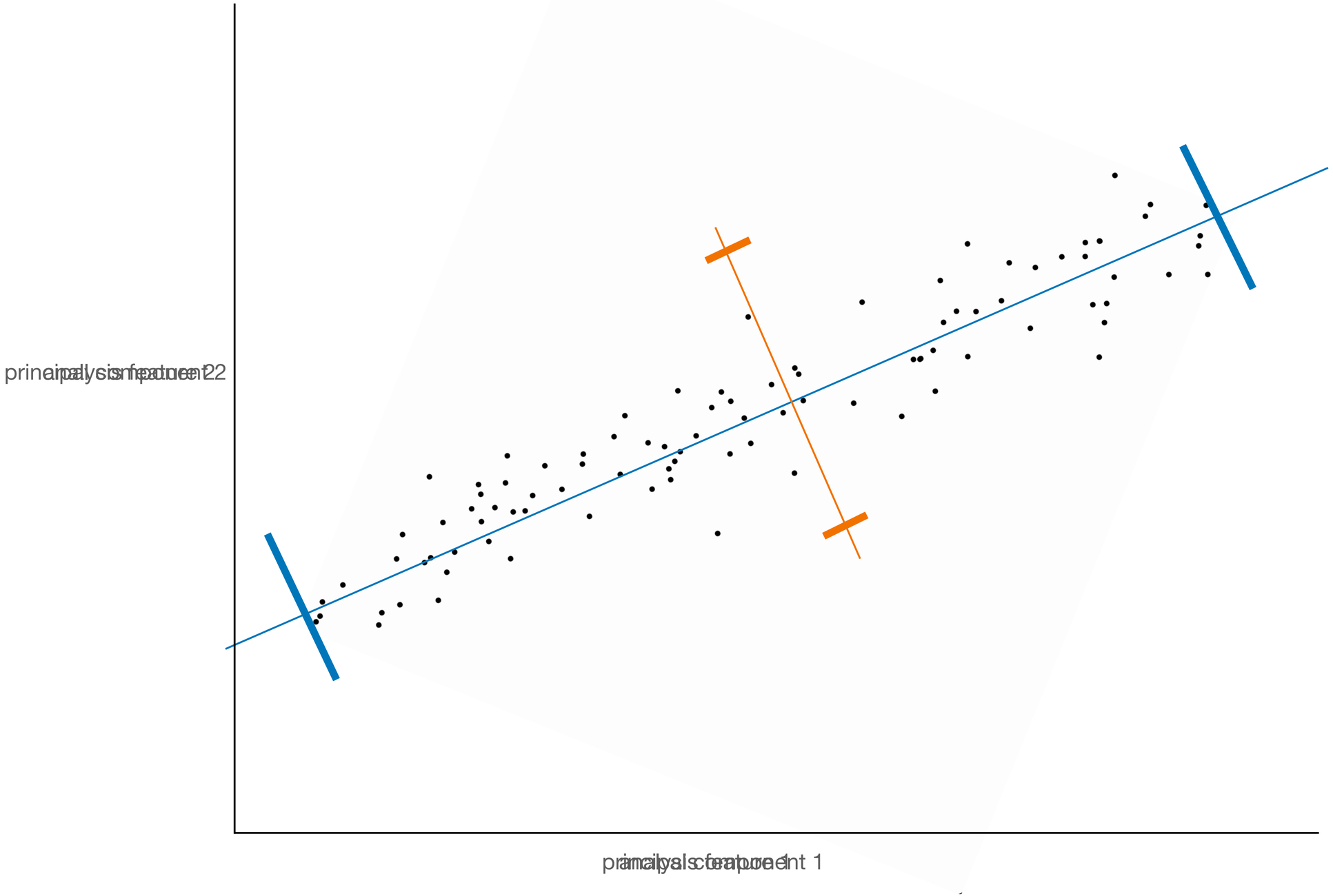
PCA

Principal Component Analysis (PCA)

1. analyze (or “fit to”) a dataset
2. use that analysis to transform the data to show more of the “variance” (or “differences”) between data points

- can help remove redundancy
- can help remove noise
- can offer dimensionality reduction


analysis feature 2
analysis feature 1


principal component 2
principal component 1

13 dimensions in —> 13 PCs out

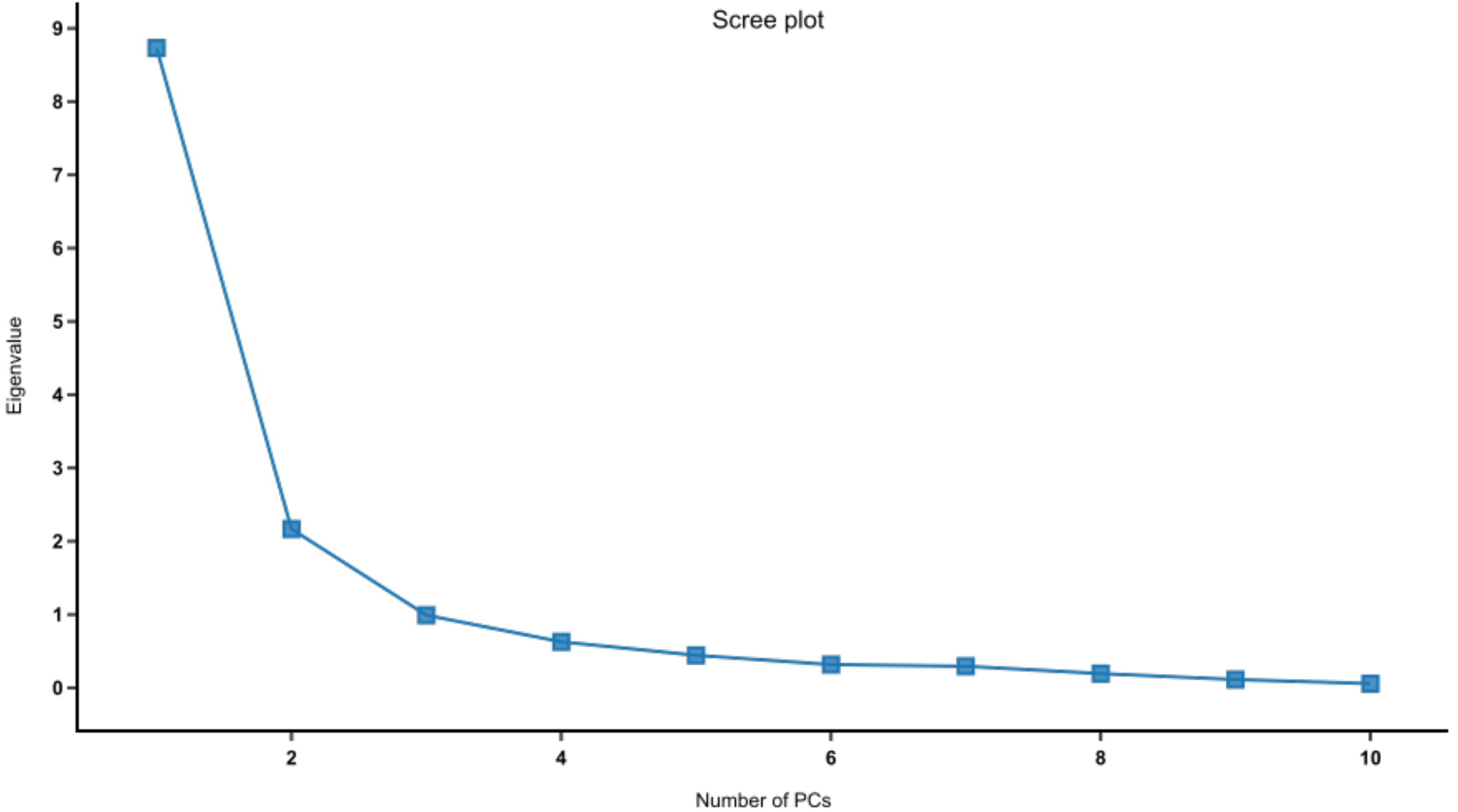
dimensions

data points	1	2	3	4	5	6	7	8…
0	mfcc 0	mfcc 1	mfcc 2	mfcc 3	mfcc 4	mfcc 5	mfcc 6	…
1	mfcc 0	mfcc 1	mfcc 2	mfcc 3	mfcc 4	mfcc 5	mfcc 6	…
2	mfcc 0	mfcc 1	mfcc 2	mfcc 3	mfcc 4	mfcc 5	mfcc 6	…
3	mfcc 0	mfcc 1	mfcc 2	mfcc 3	mfcc 4	mfcc 5	mfcc 6	…
4	mfcc 0	mfcc 1	mfcc 2	mfcc 3	mfcc 4	mfcc 5	mfcc 6	…
5	mfcc 0	mfcc 1	mfcc 2	mfcc 3	mfcc 4	mfcc 5	mfcc 6	…
…	…	…	…	…	…	…	…	…

13 dimensions in —> 13 PCs out

principal components

data points	1	2	3	4	5	6	7	8…
0	PC 1	PC 2	PC 3	PC 4	PC 5	PC 6	PC 7	…
1	PC 1	PC 2	PC 3	PC 4	PC 5	PC 6	PC 7	…
2	PC 1	PC 2	PC 3	PC 4	PC 5	PC 6	PC 7	…
3	PC 1	PC 2	PC 3	PC 4	PC 5	PC 6	PC 7	…
4	PC 1	PC 2	PC 3	PC 4	PC 5	PC 6	PC 7	…
5	…	…	…	…	…	…	…	…
…								



https://blog.bioturing.com/wp-content/uploads/2018/11/screeplot.png

13 dimensions in —> 13 PCs out

principal components

data points	1	2	3	4	5	6	7	8…
0	PC 1	PC 2	PC 3	PC 4	PC 5	PC 6	PC 7	…
1	PC 1	PC 2	PC 3	PC 4	PC 5	PC 6	PC 7	…
2	PC 1	PC 2	PC 3	PC 4	PC 5	PC 6	PC 7	…
3	PC 1	PC 2	PC 3	PC 4	PC 5	PC 6	PC 7	…
4	PC 1	PC 2	PC 3	PC 4	PC 5	PC 6	PC 7	…
5	…	…	…	…	…	…	…	…
…								

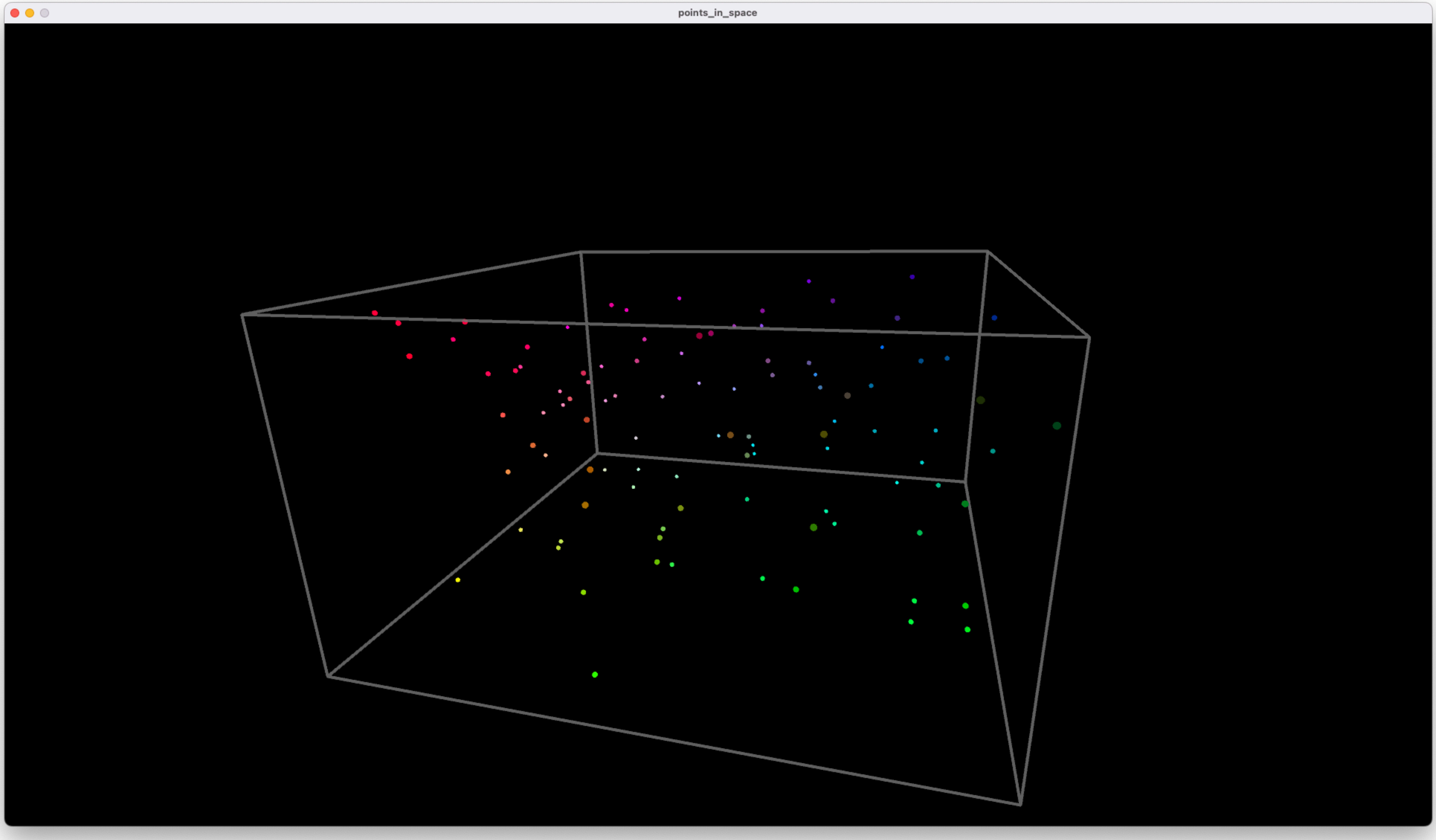
13 dimensions in —> 13 PCs out

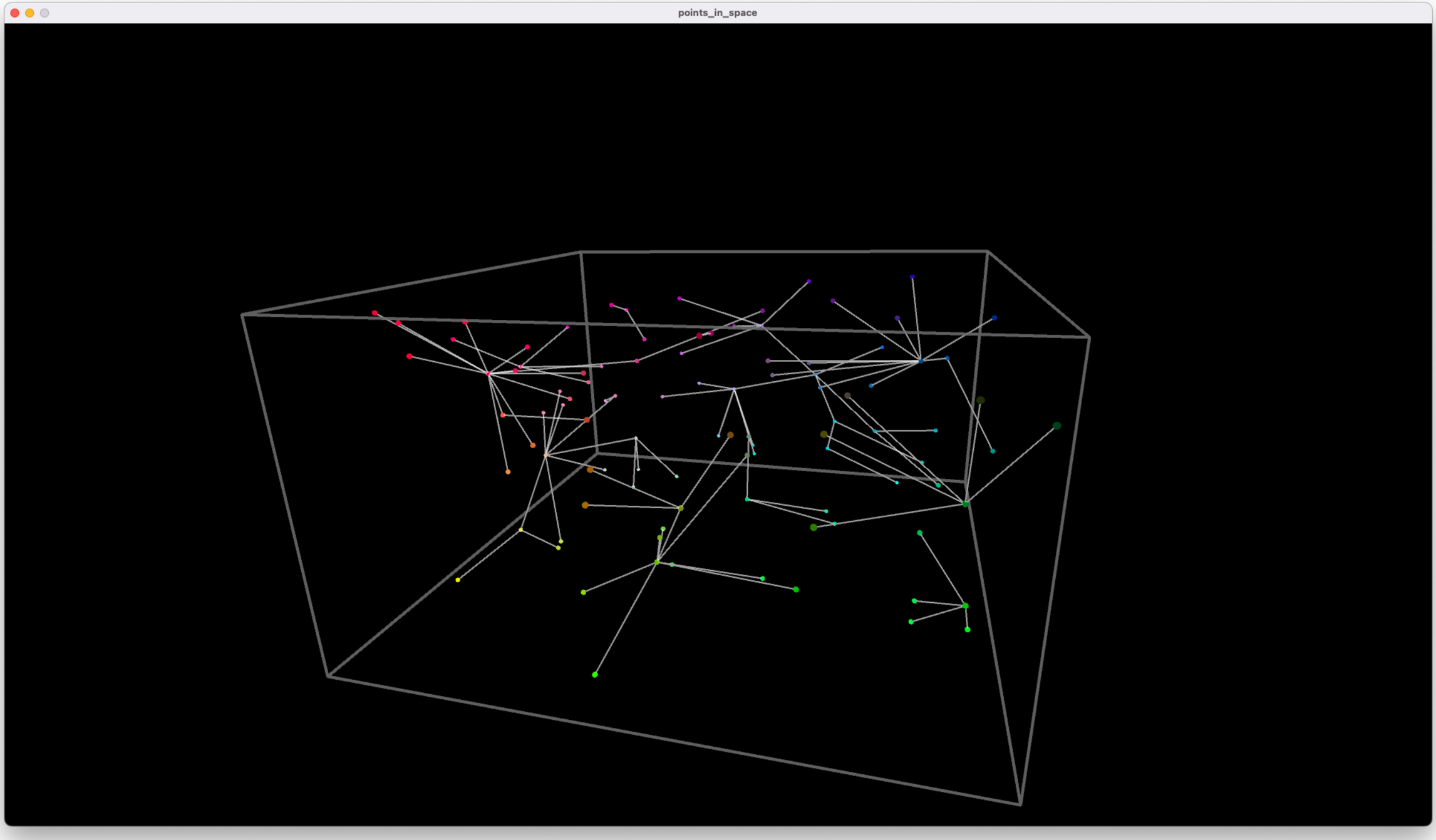
principal components

data points	1	2	3	4	5	6	7	8…
0	PC 1	PC 2	PC 3	PC 4	PC 5	PC 6	PC 7	…
1	PC 1	PC 2	PC 3	PC 4	PC 5	PC 6	PC 7	…
2	PC 1	PC 2	PC 3	PC 4	PC 5	PC 6	PC 7	…
3	PC 1	PC 2	PC 3	PC 4	PC 5	PC 6	PC 7	…
4	PC 1	PC 2	PC 3	PC 4	PC 5	PC 6	PC 7	…
5	PC 1	PC 2	PC 3	PC 4	PC 5	PC 6	PC 7	…
…	…	…	…	…	…	…	…	…

UMAP

Uniform Manifold Approximation and Projection (UMAP)


points_in_space


points_in_space

Uniform Manifold Approximation and Projection (UMAP)