

k-Nearest Neighbour

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kNN

Method to STORE all available cases and CLASSIFIES new ones based on a SIMILARITY measure

kNN

also can be used to
INTERPOLATE and EXTRAPOLATE
quantitative data

Specification

(Moore 1991)

MDS Domain * Range

Exemplar-Set E

Exemplar member

Target domain vector d

$$\text{None-nearer}(E,d,d') \Leftrightarrow \forall (d'',r'') \in E \quad |d-d'| \leq |d-d''|$$

Lazy Learning

No query, no work

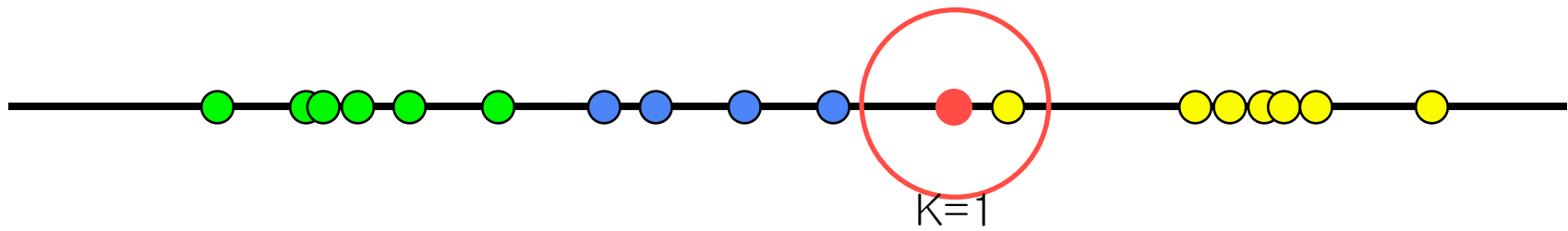
Visualization



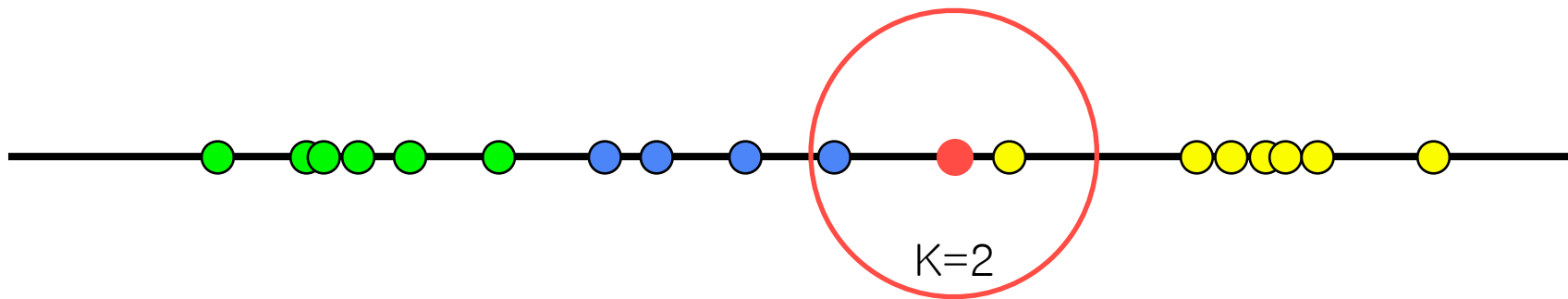
Visualization



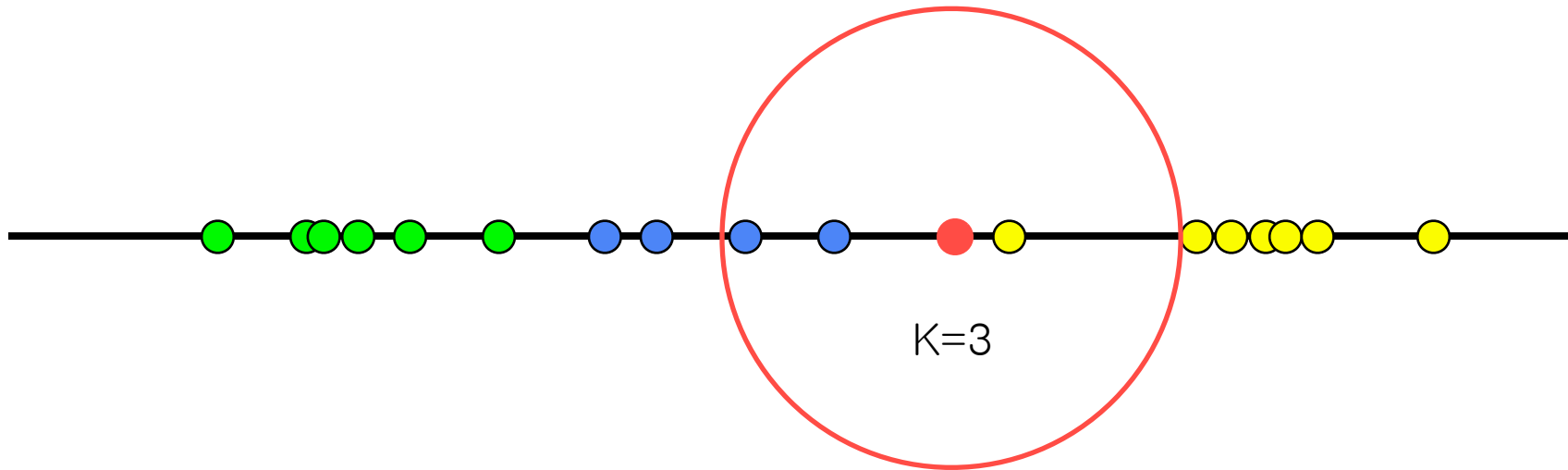
Visualization



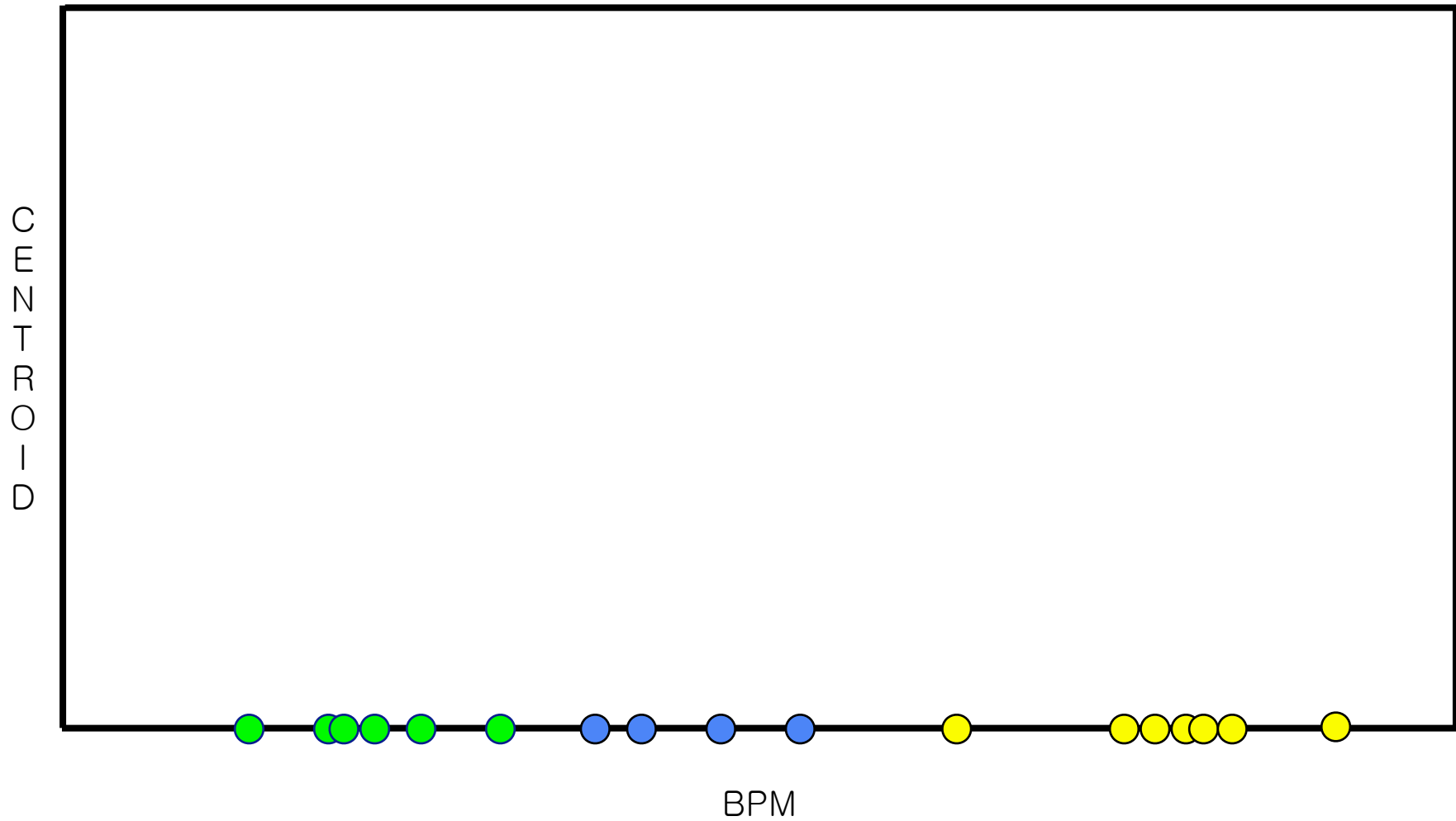
Visualization



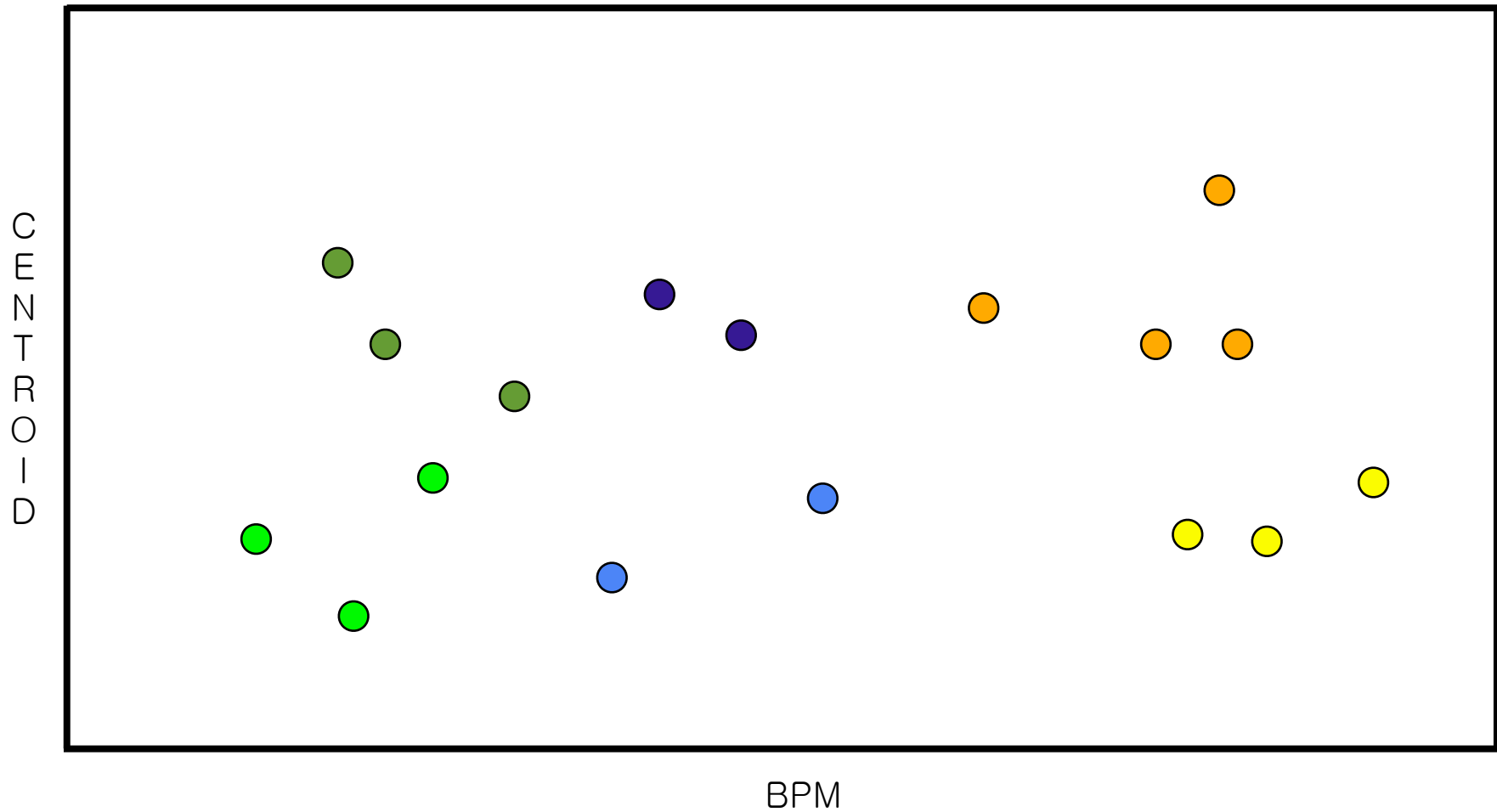
Visualization



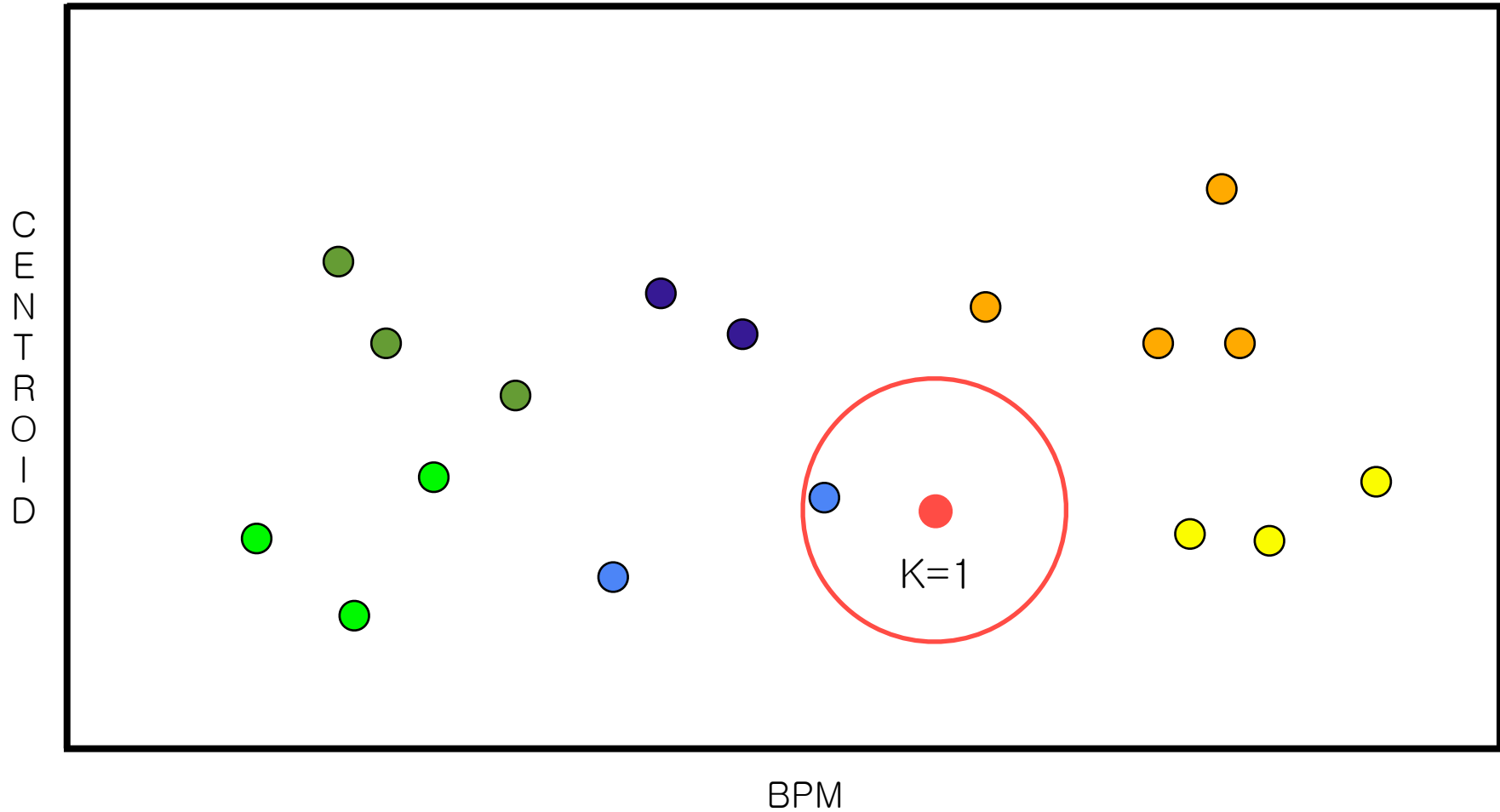
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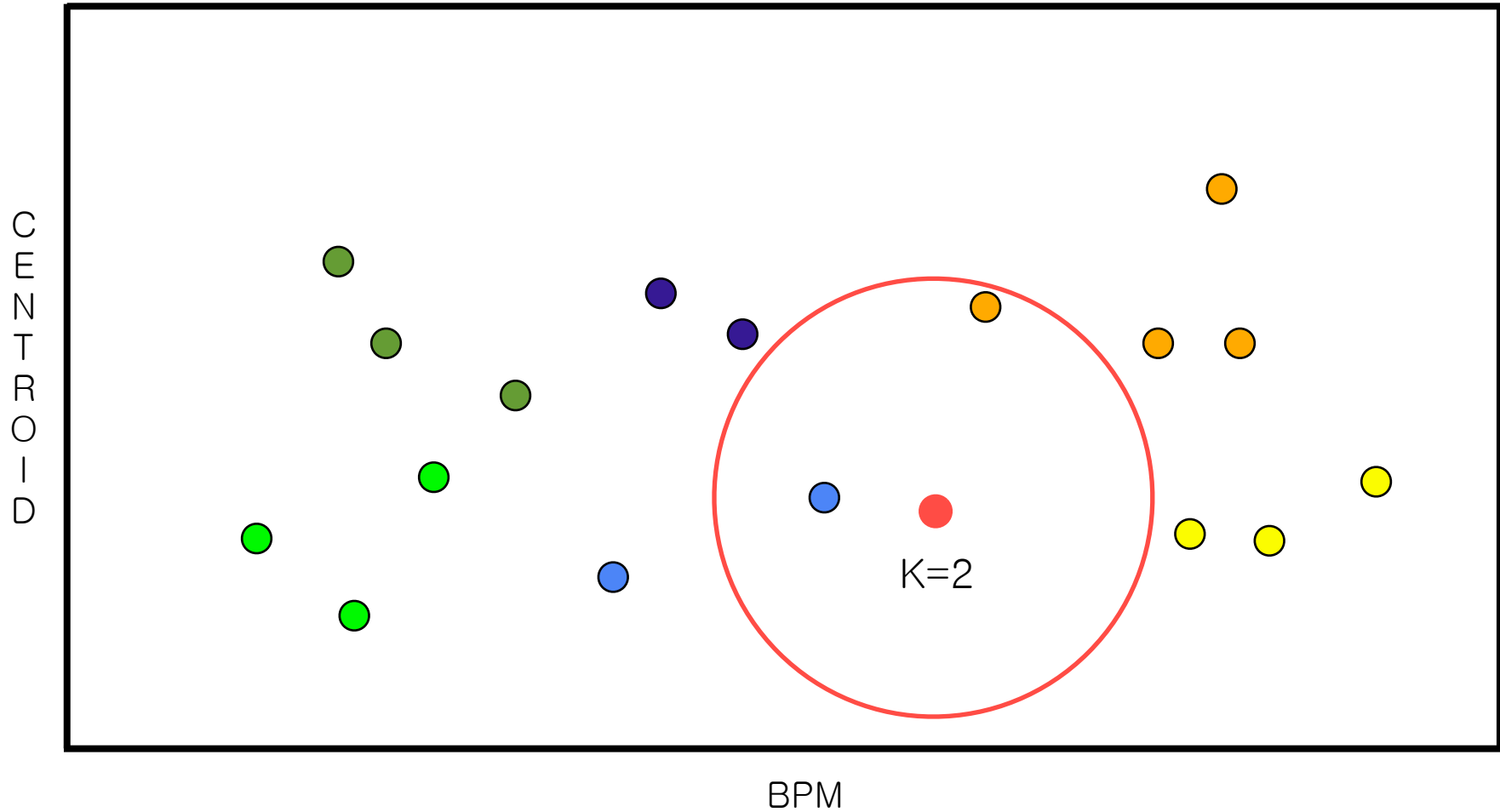
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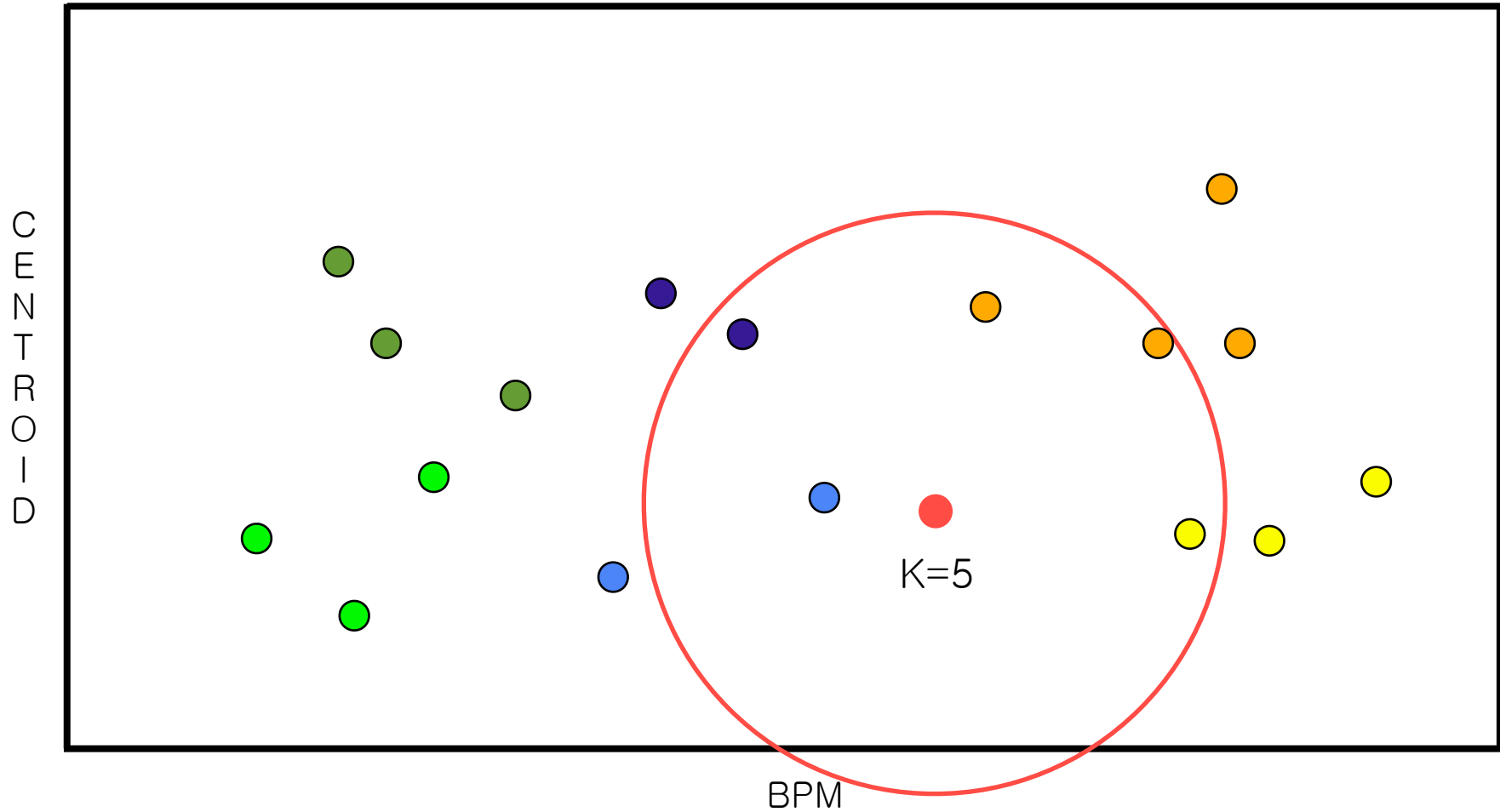
Visualization



Visualization

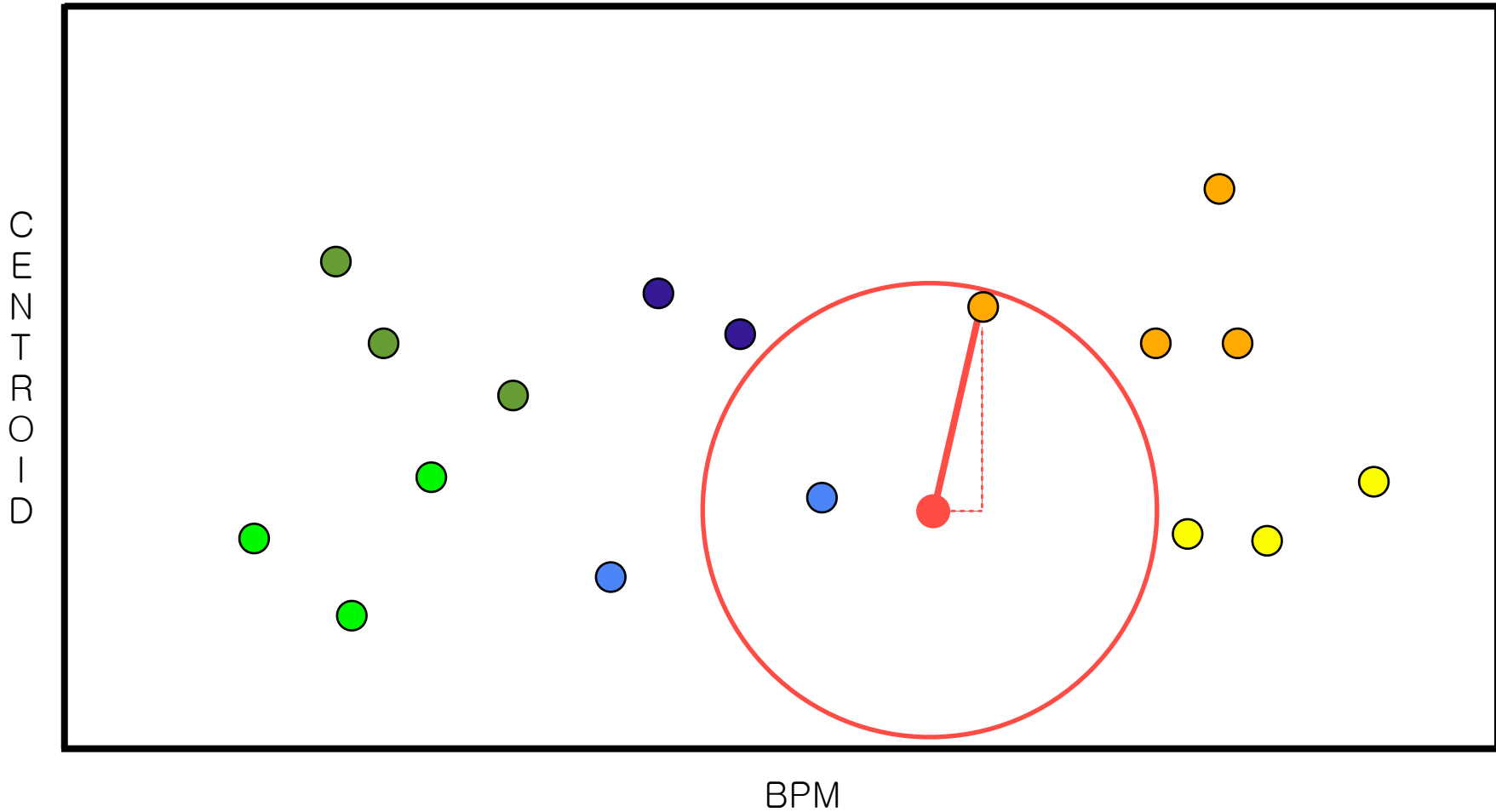


Visualization

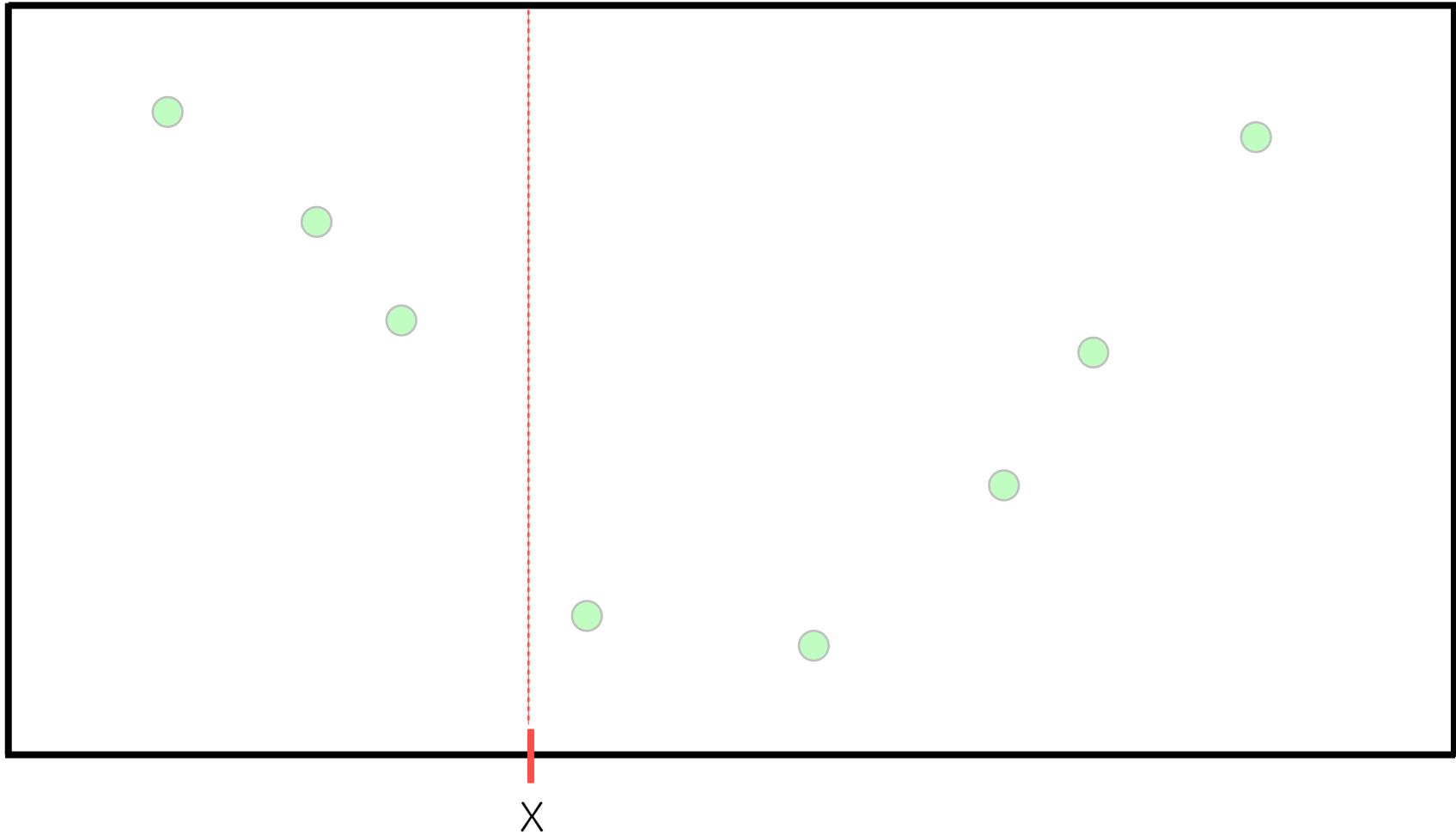


Distance Calculation

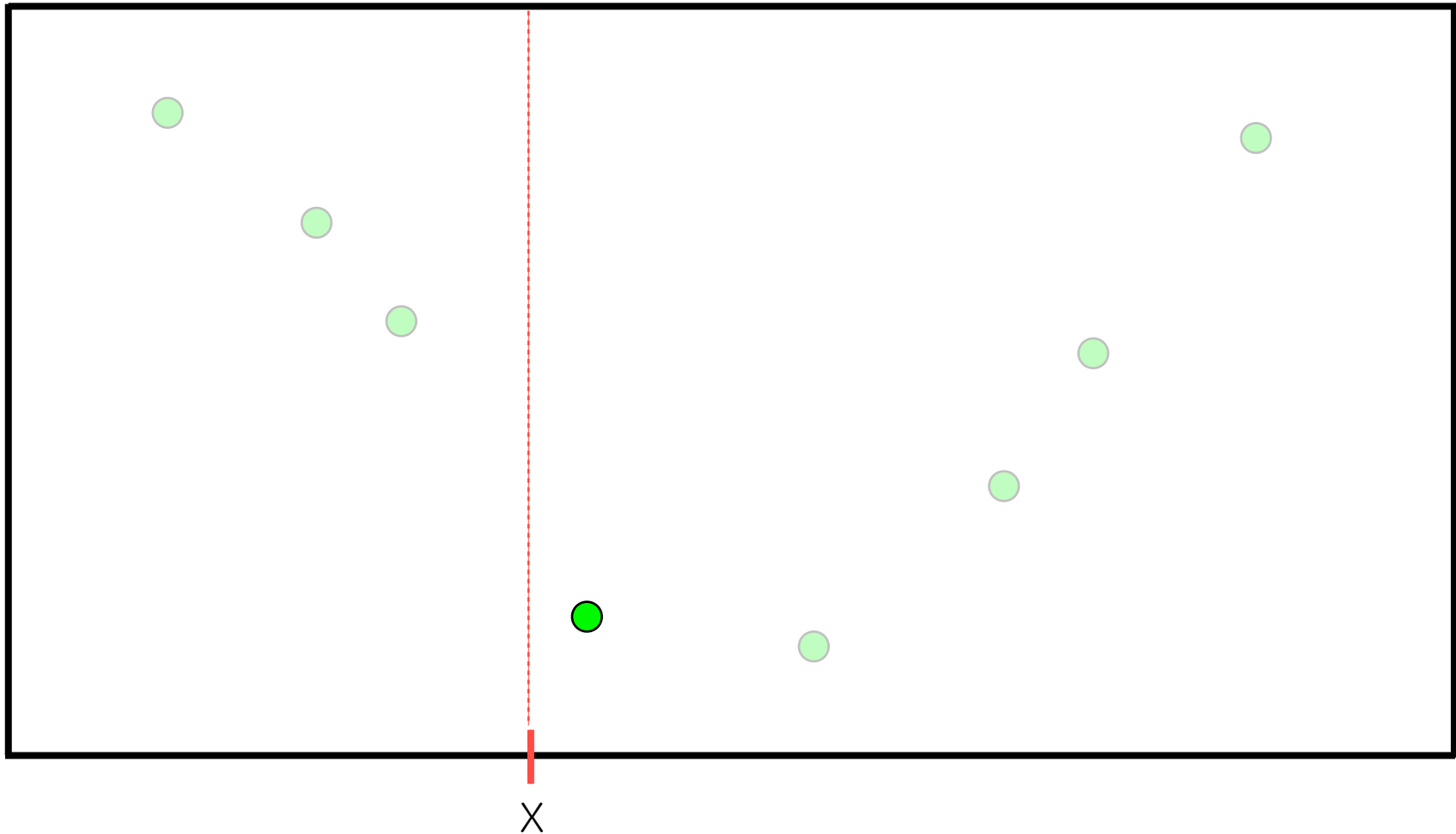
$$|d - d'| = \sqrt{\sum_{i=1}^{k_d} (d_i - d'_i)^2}$$



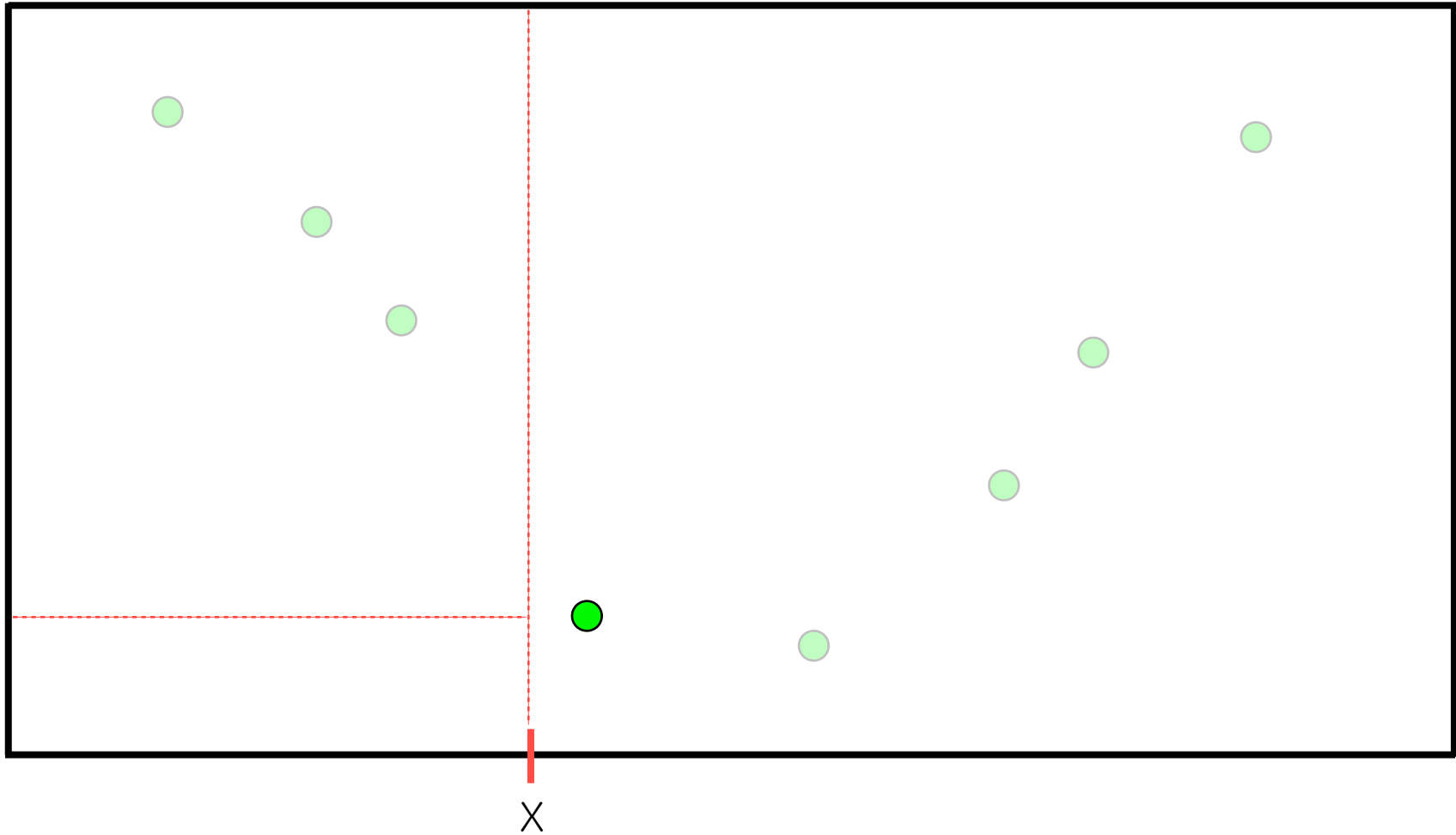
Interpolation



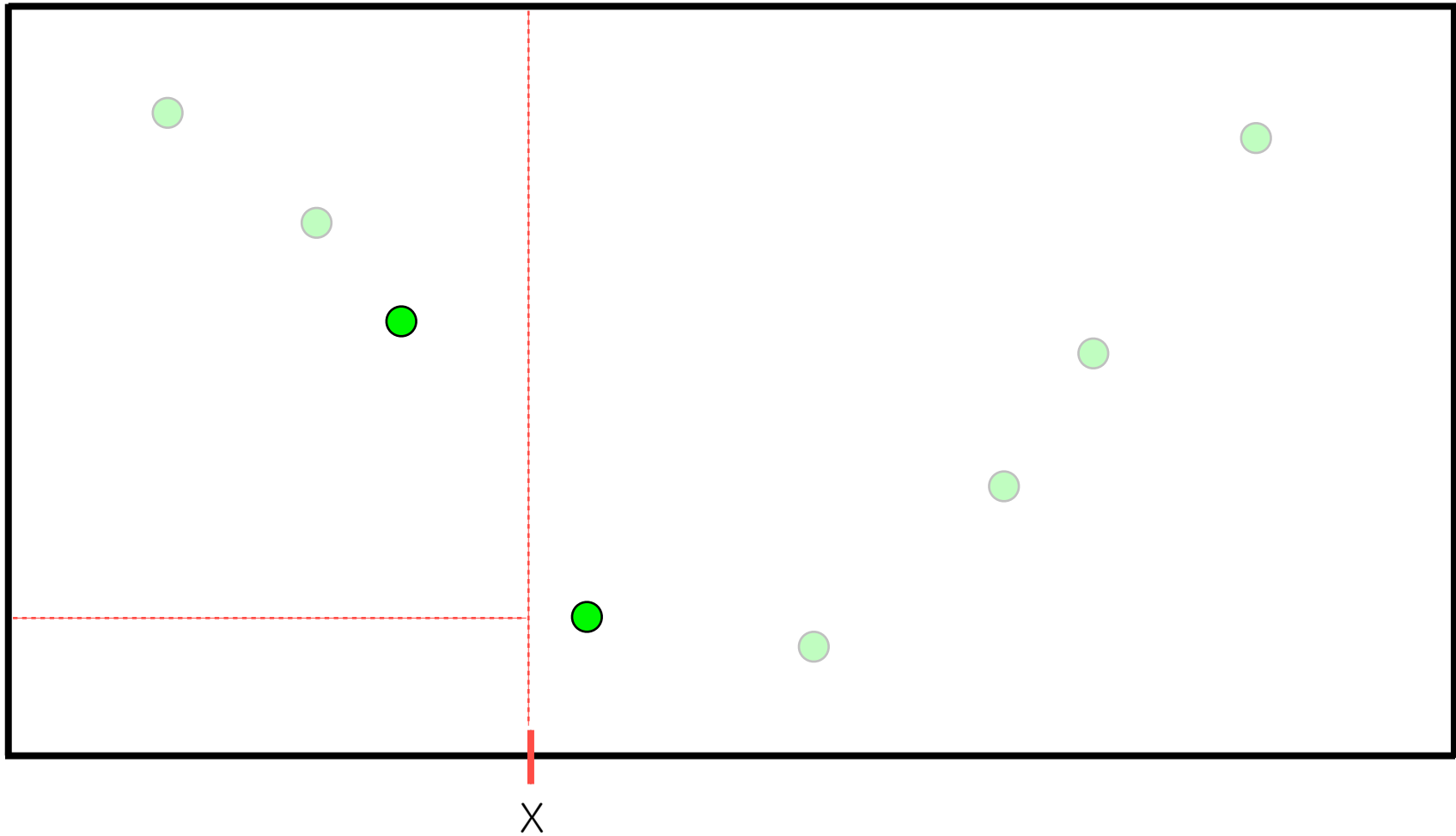
Interpolation



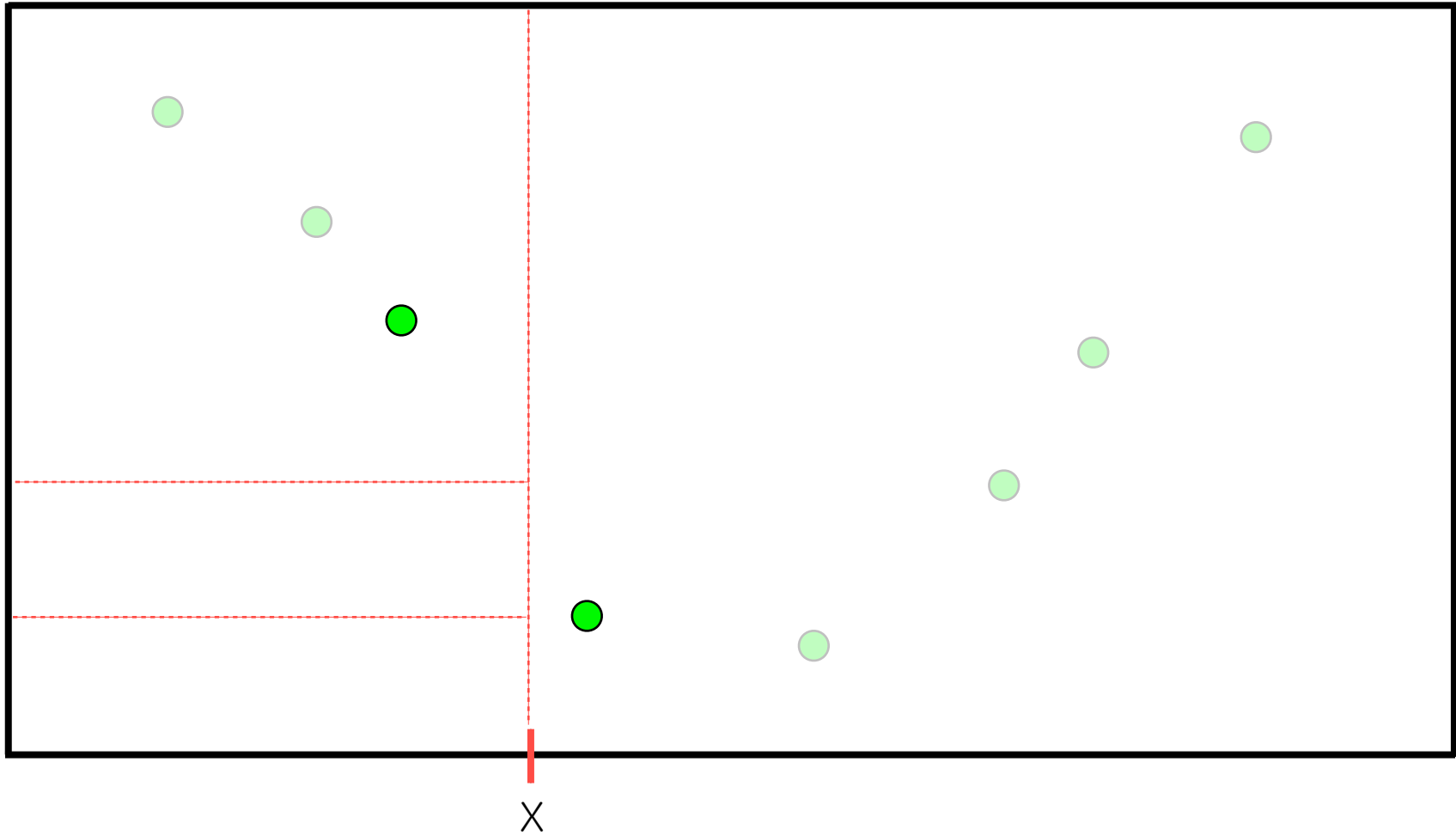
Interpolation



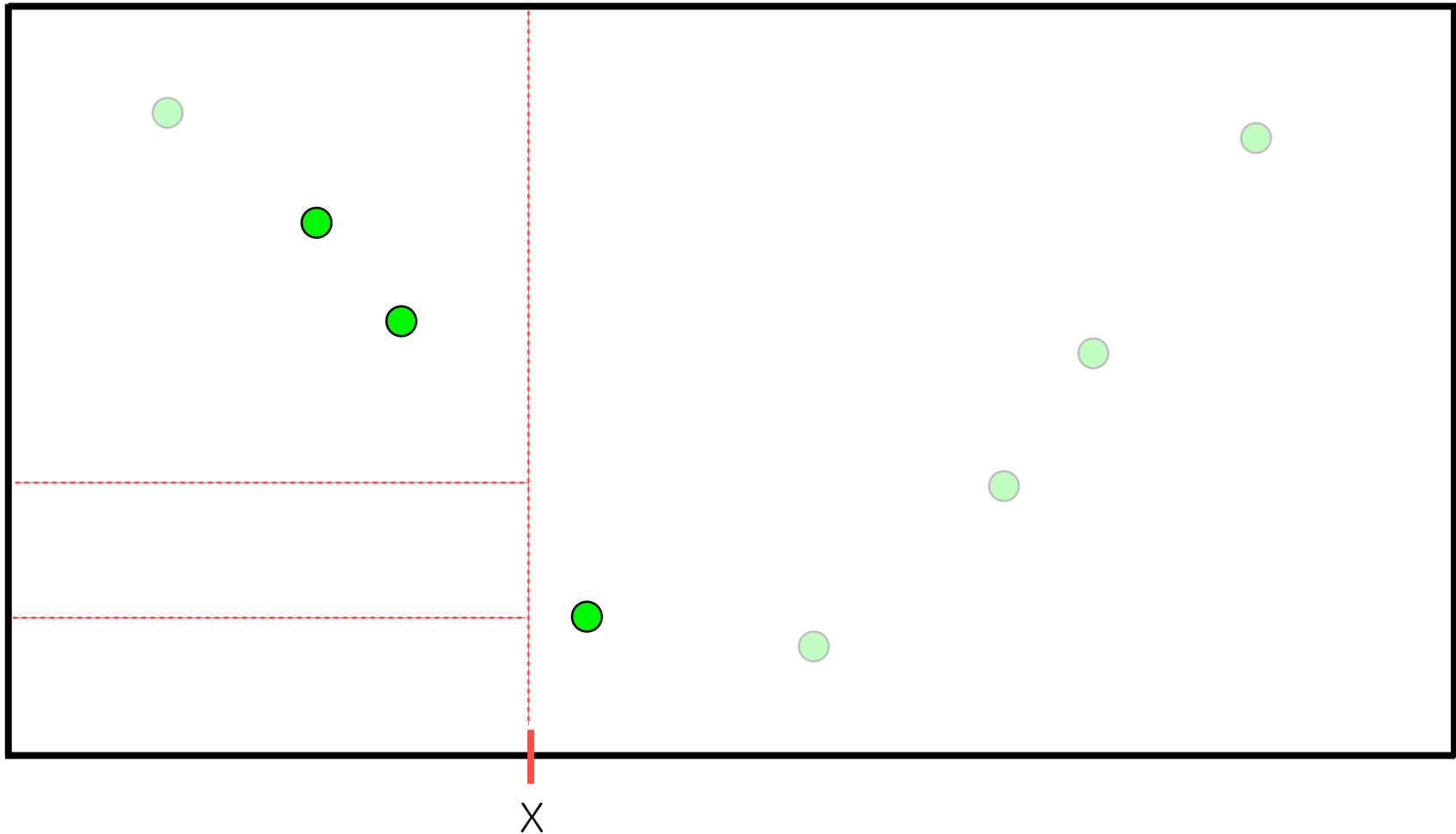
Interpolation



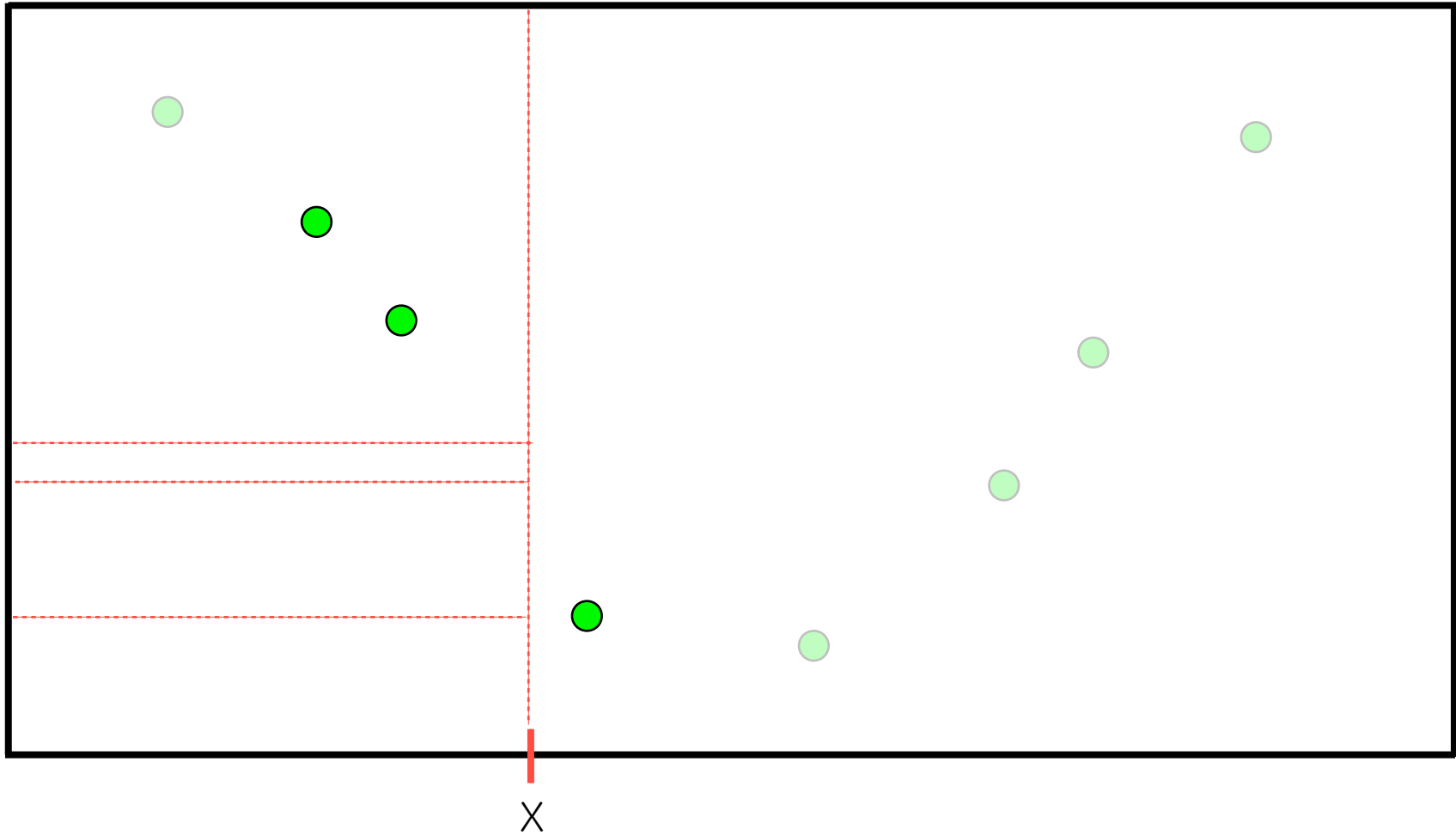
Interpolation



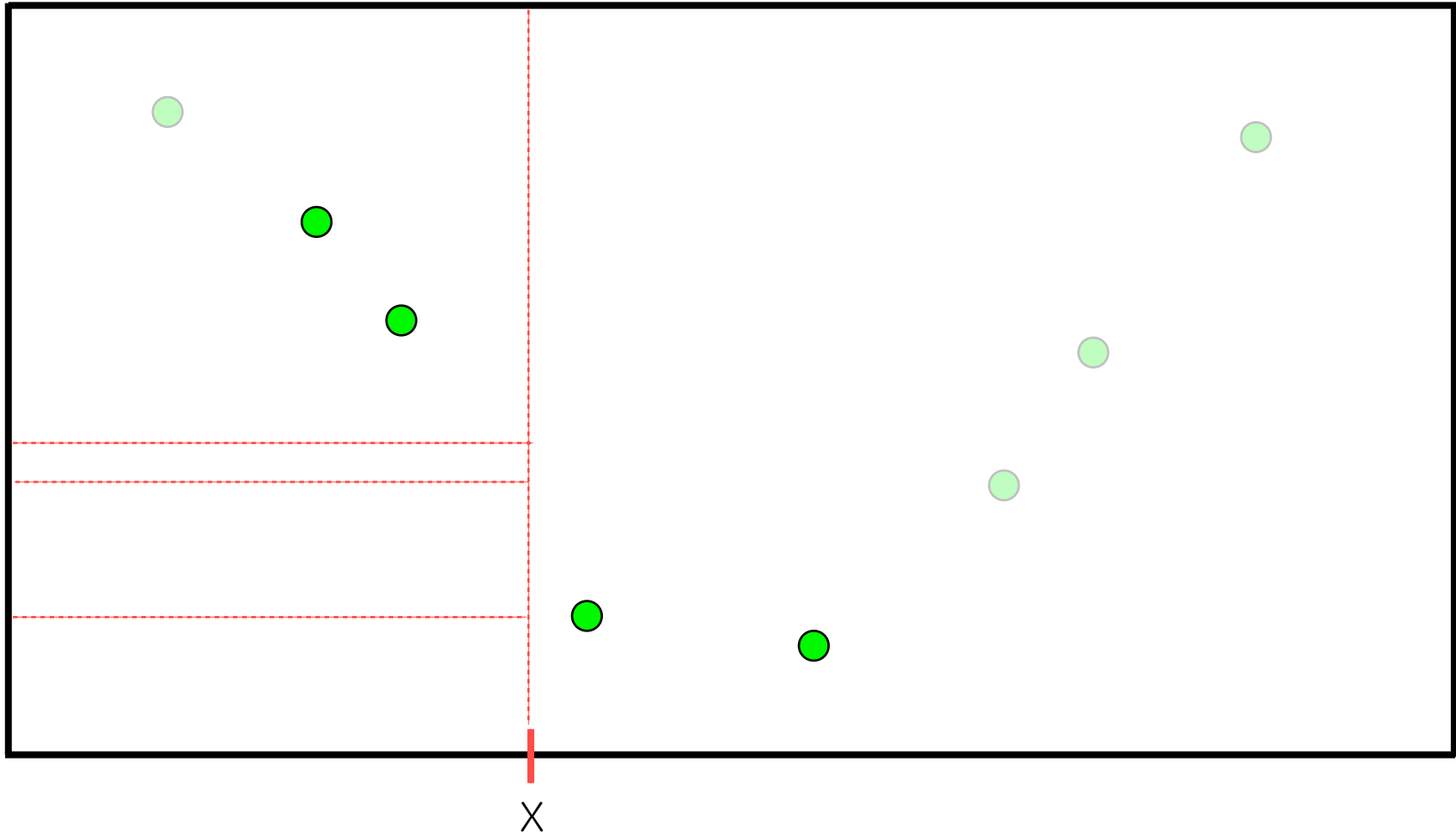
Interpolation



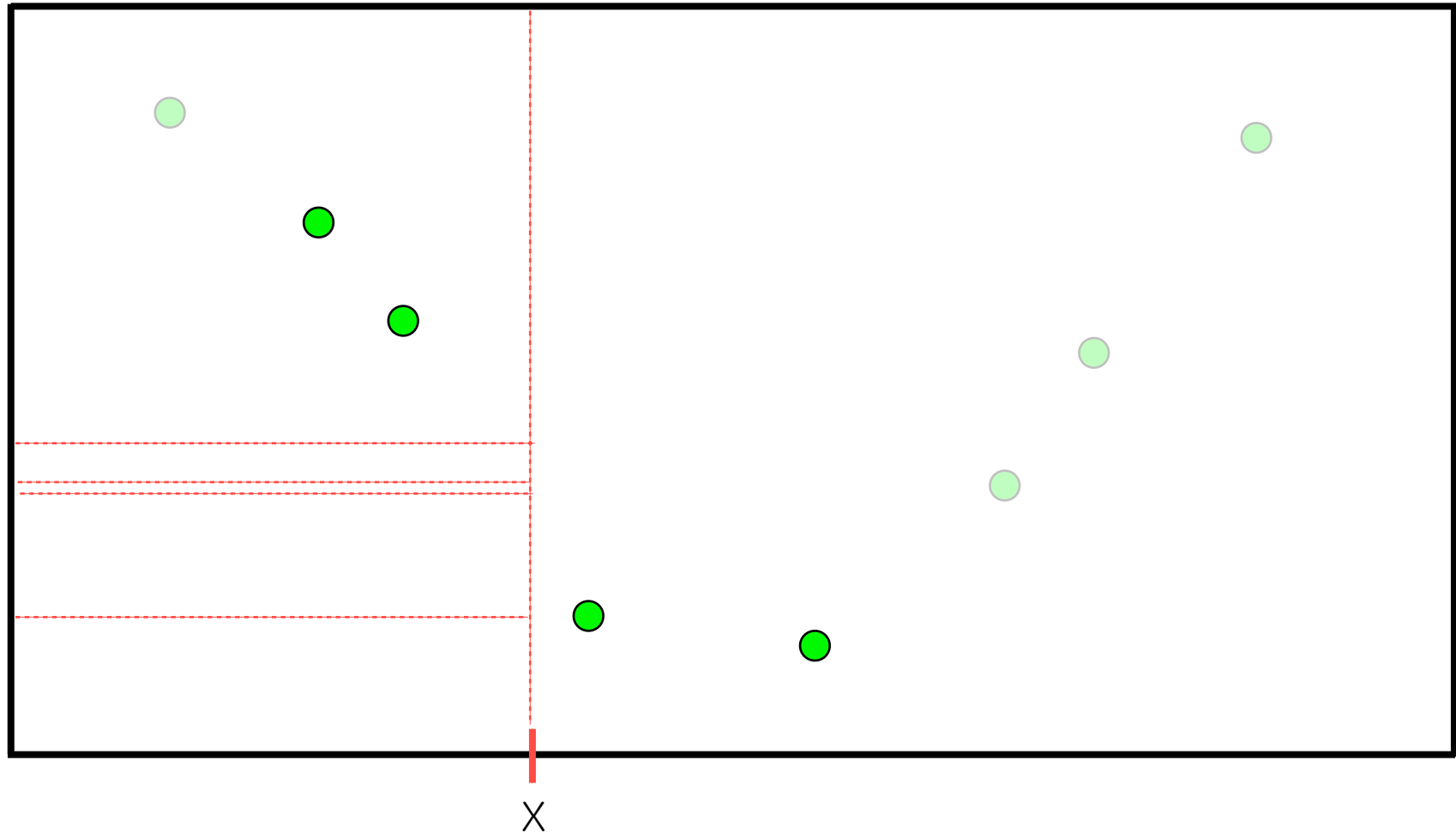
Interpolation



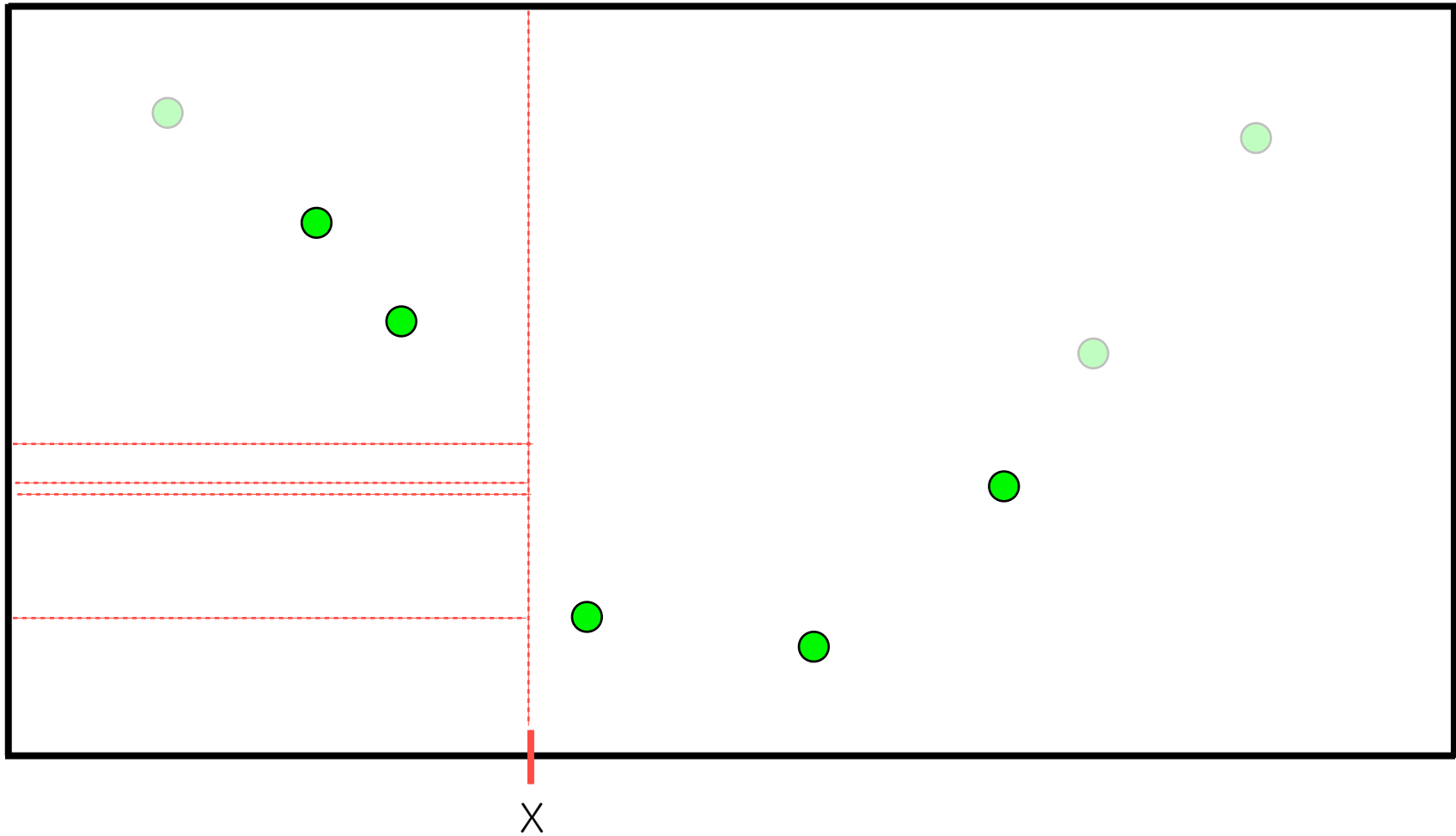
Interpolation



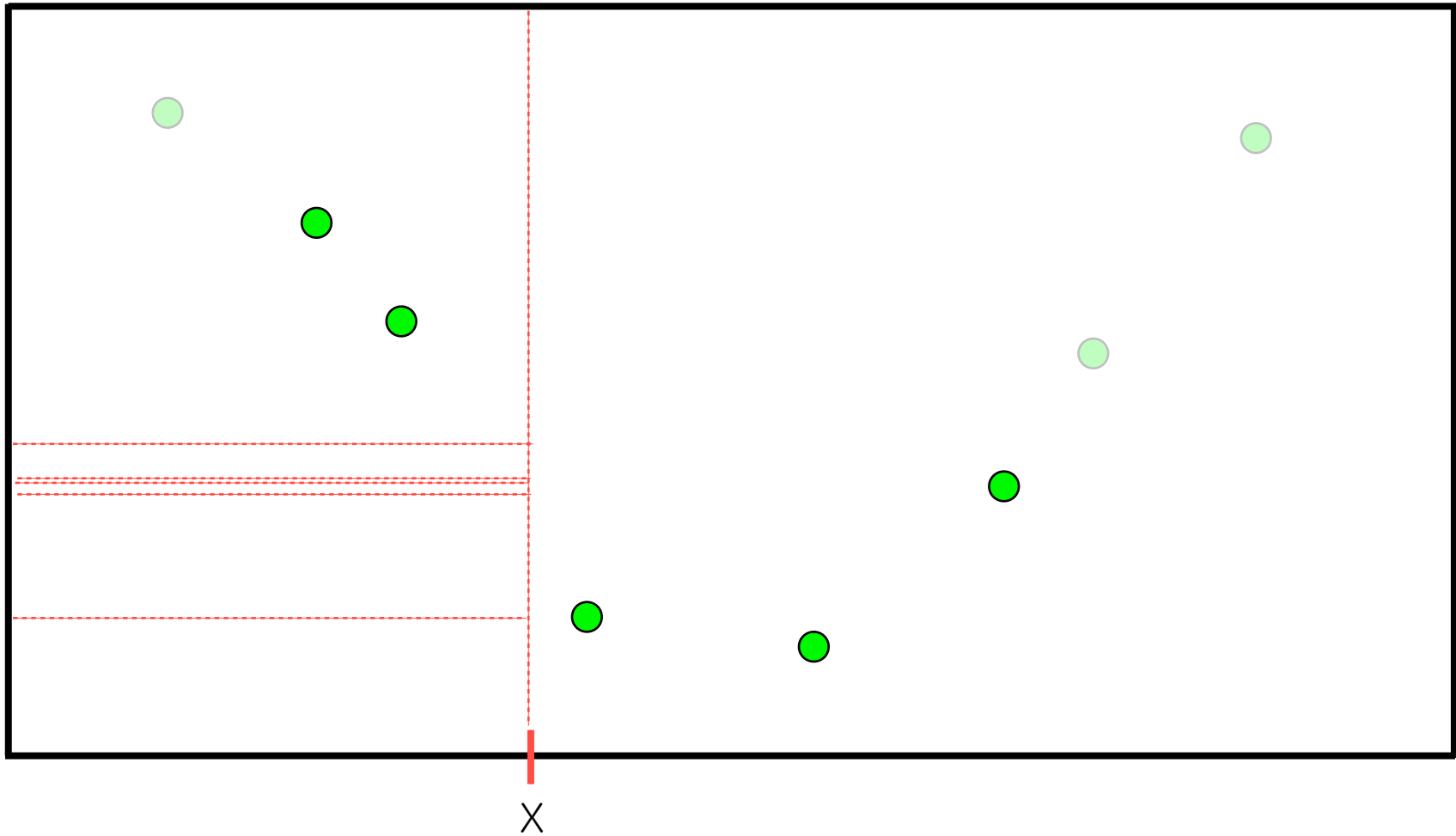
Interpolation



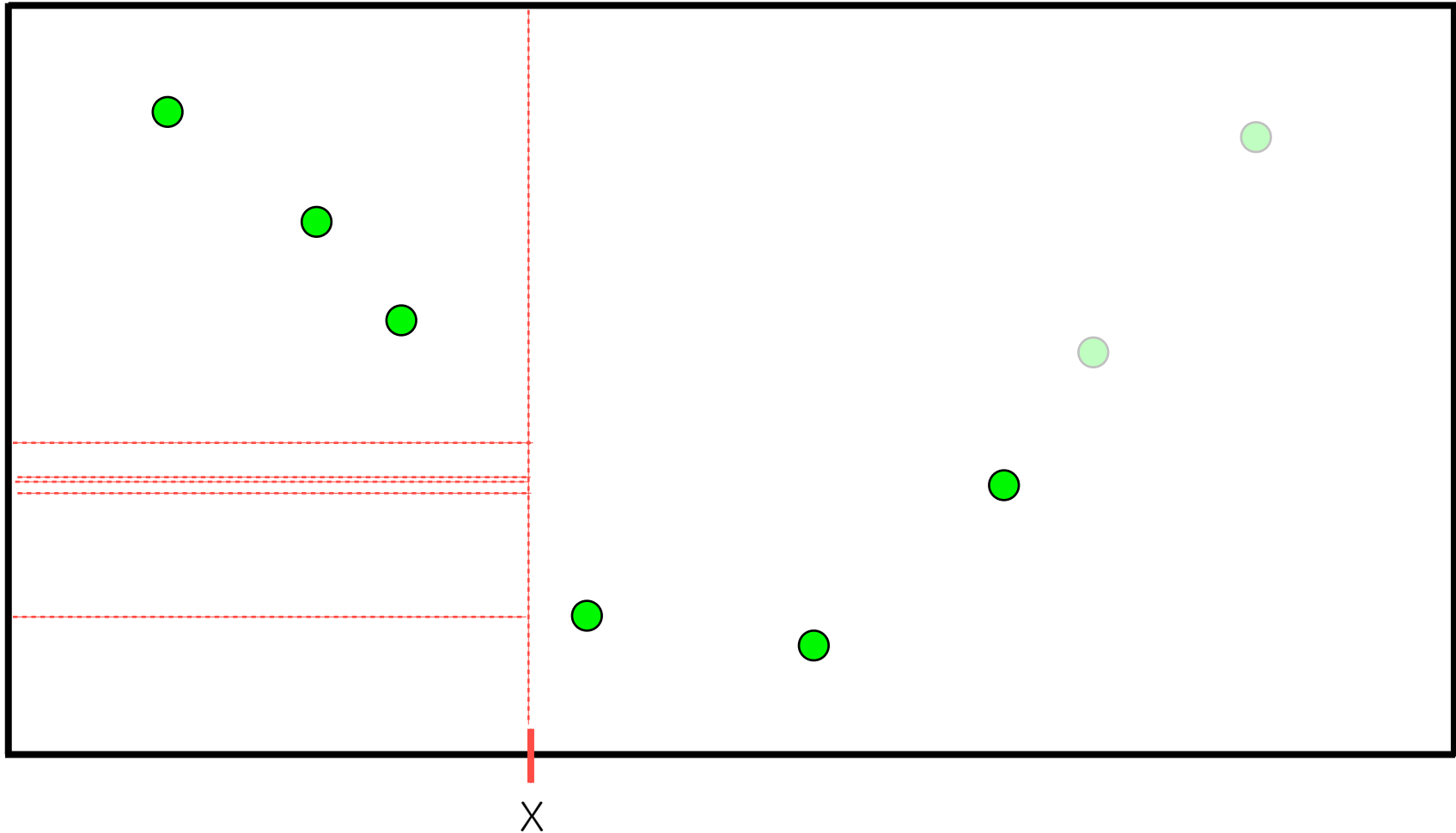
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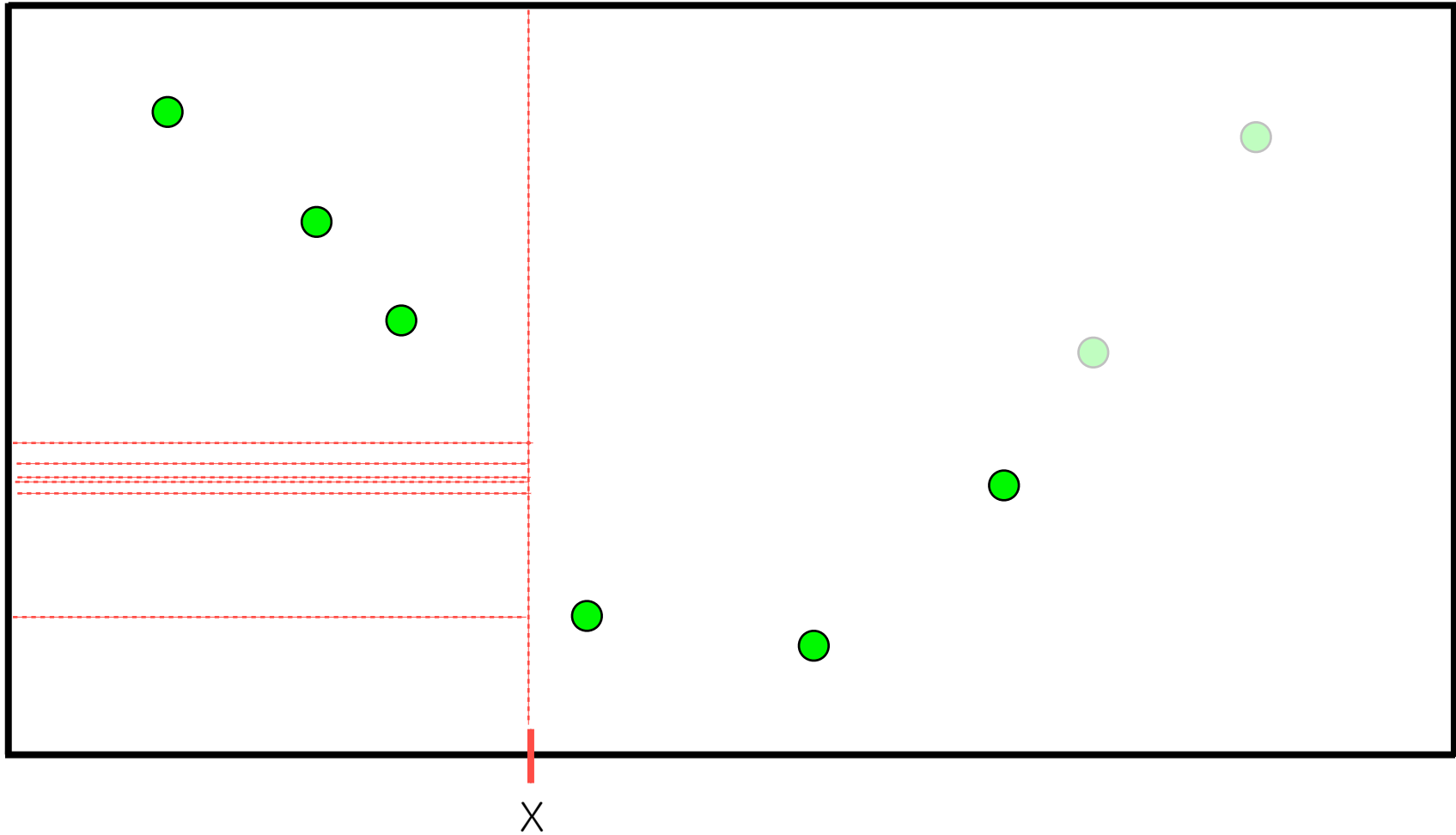
Interpolation



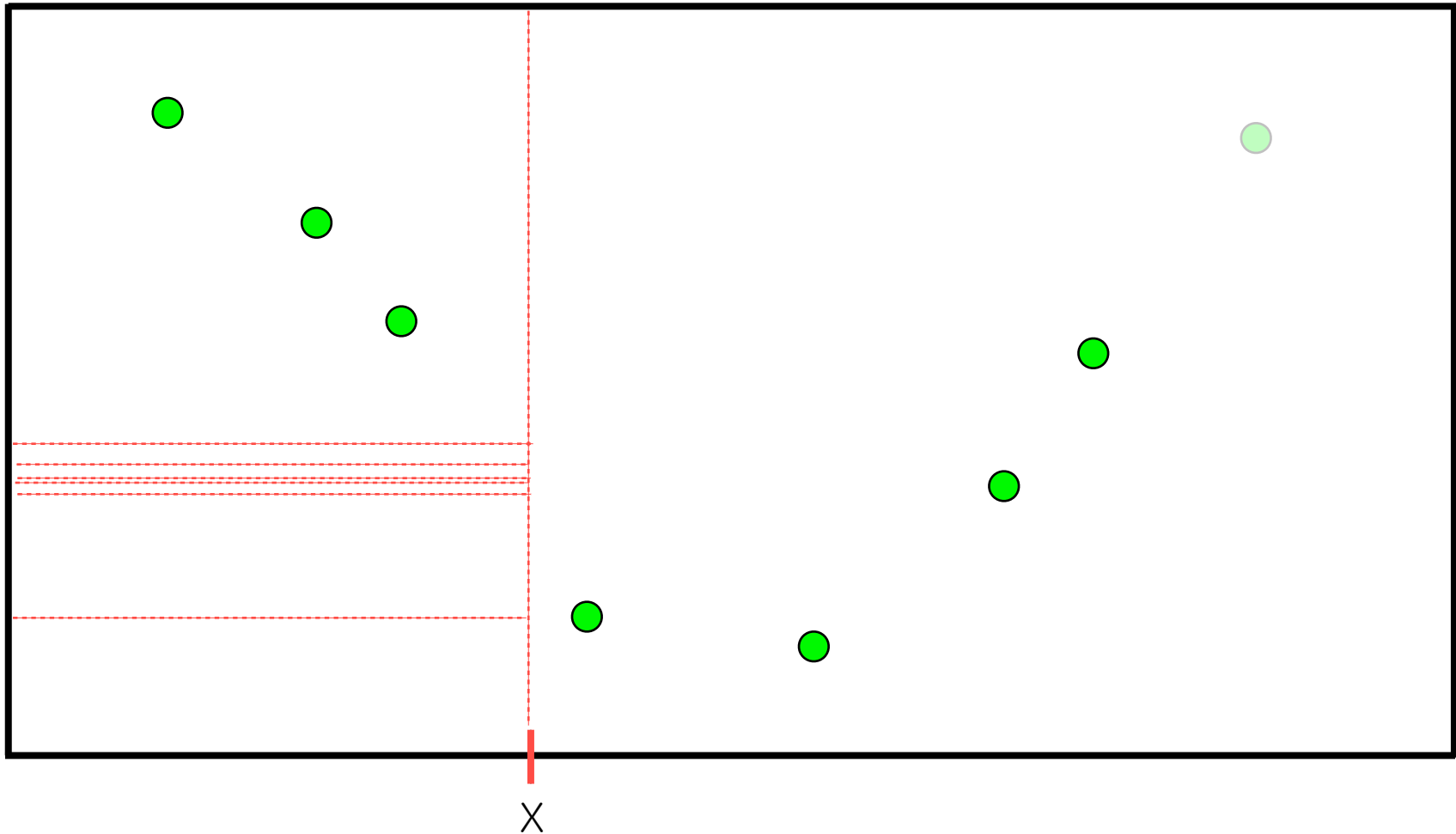
Interpolation



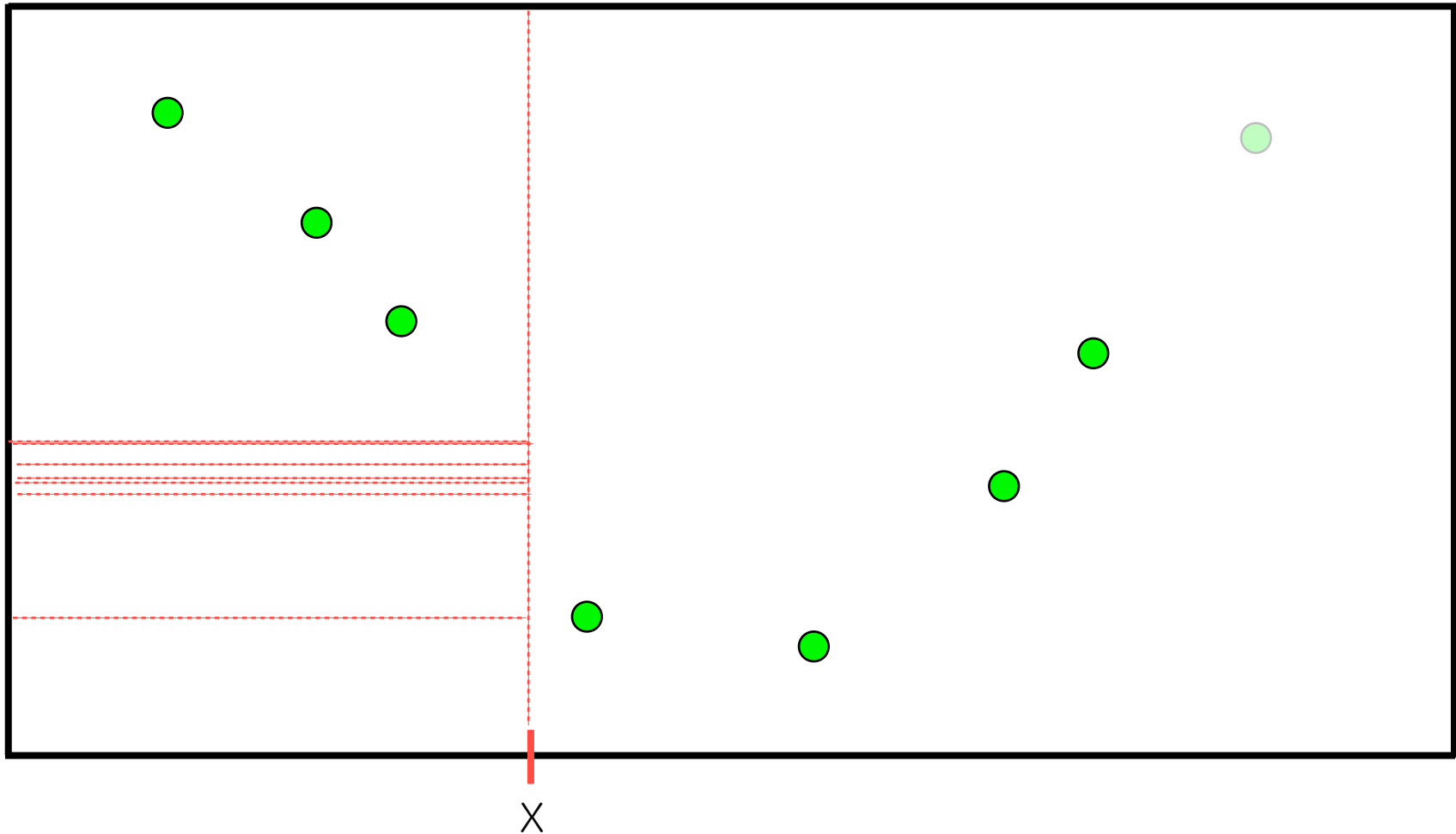
Interpolation



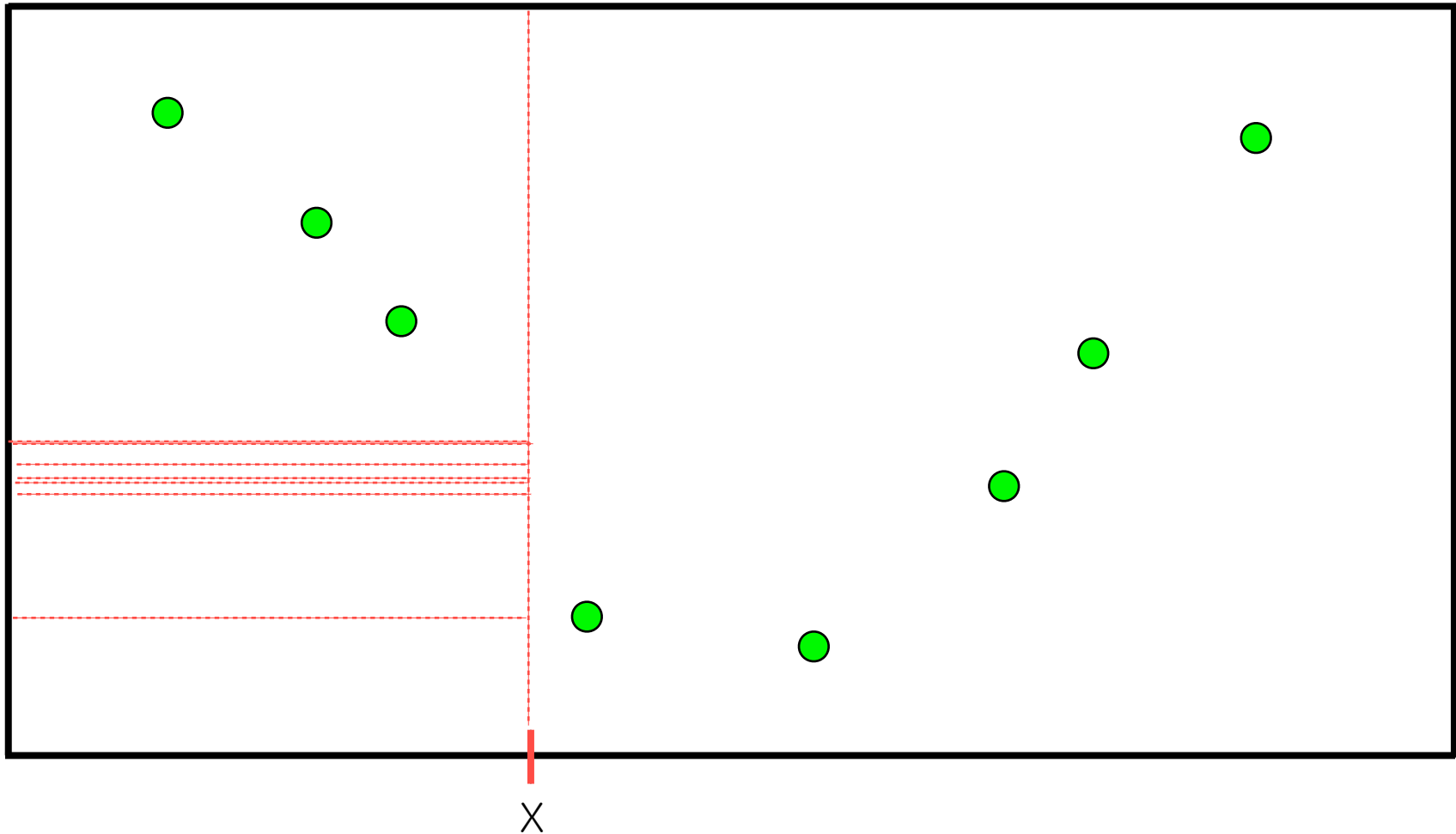
Interpolation



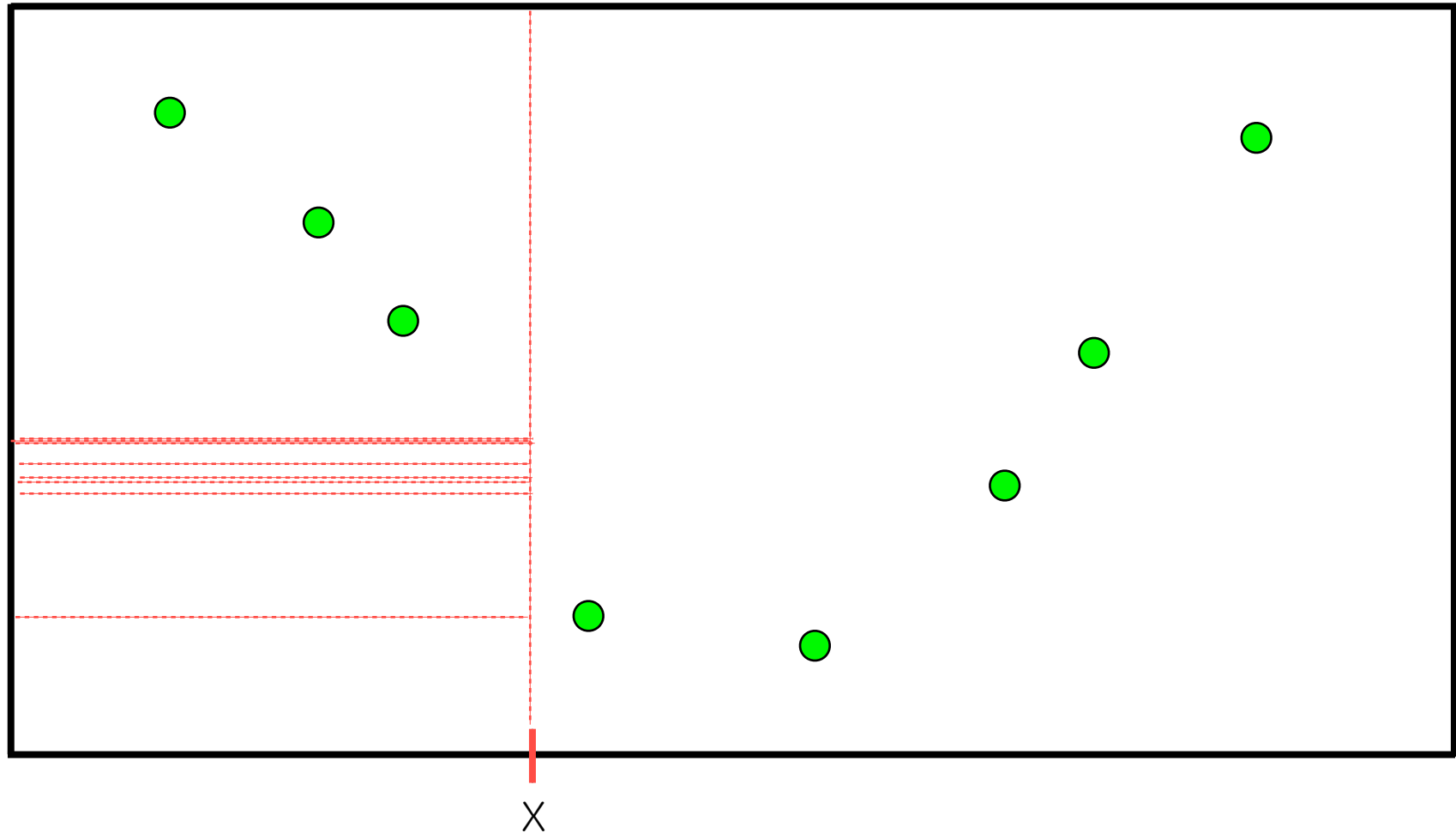
Interpolation



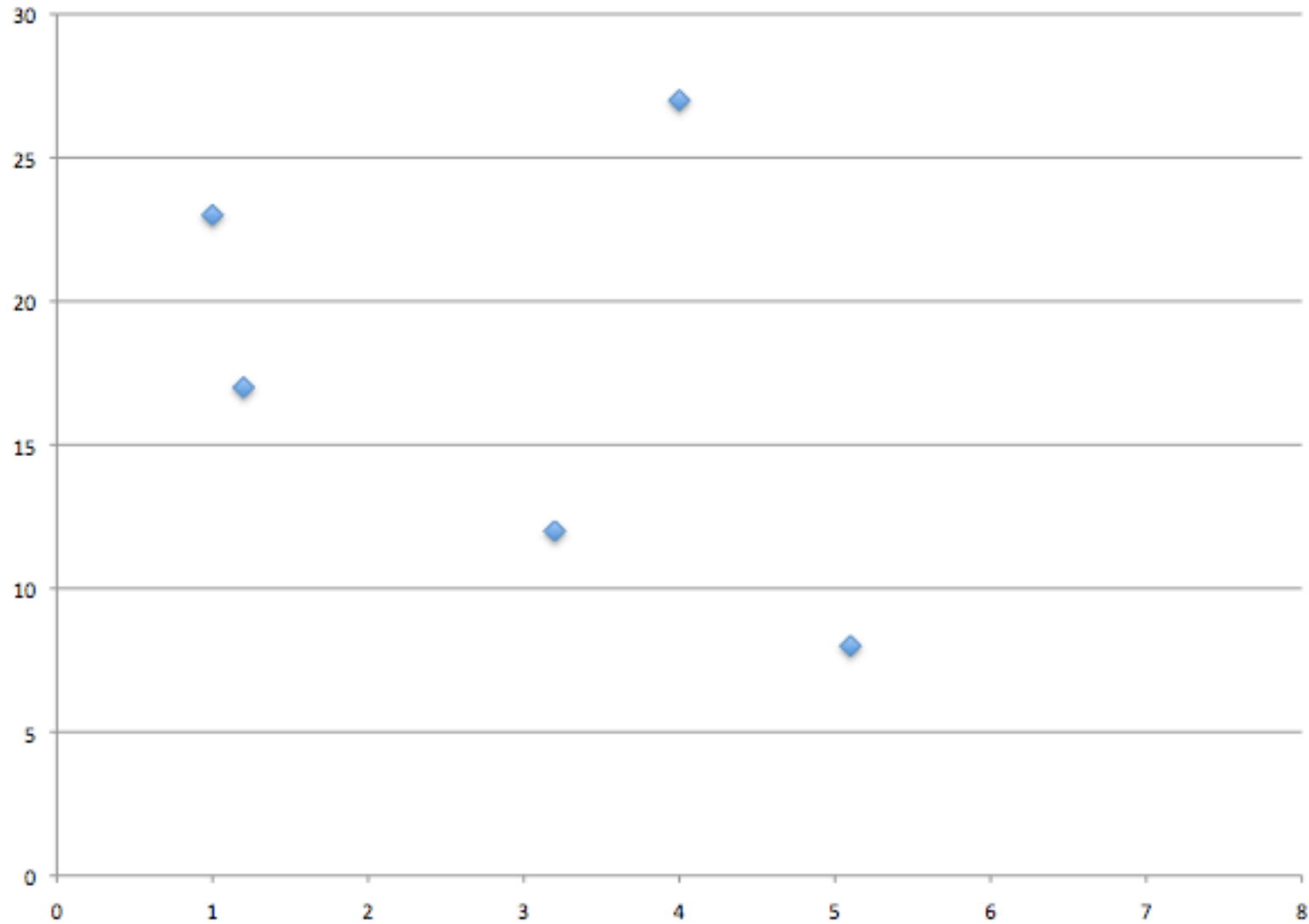
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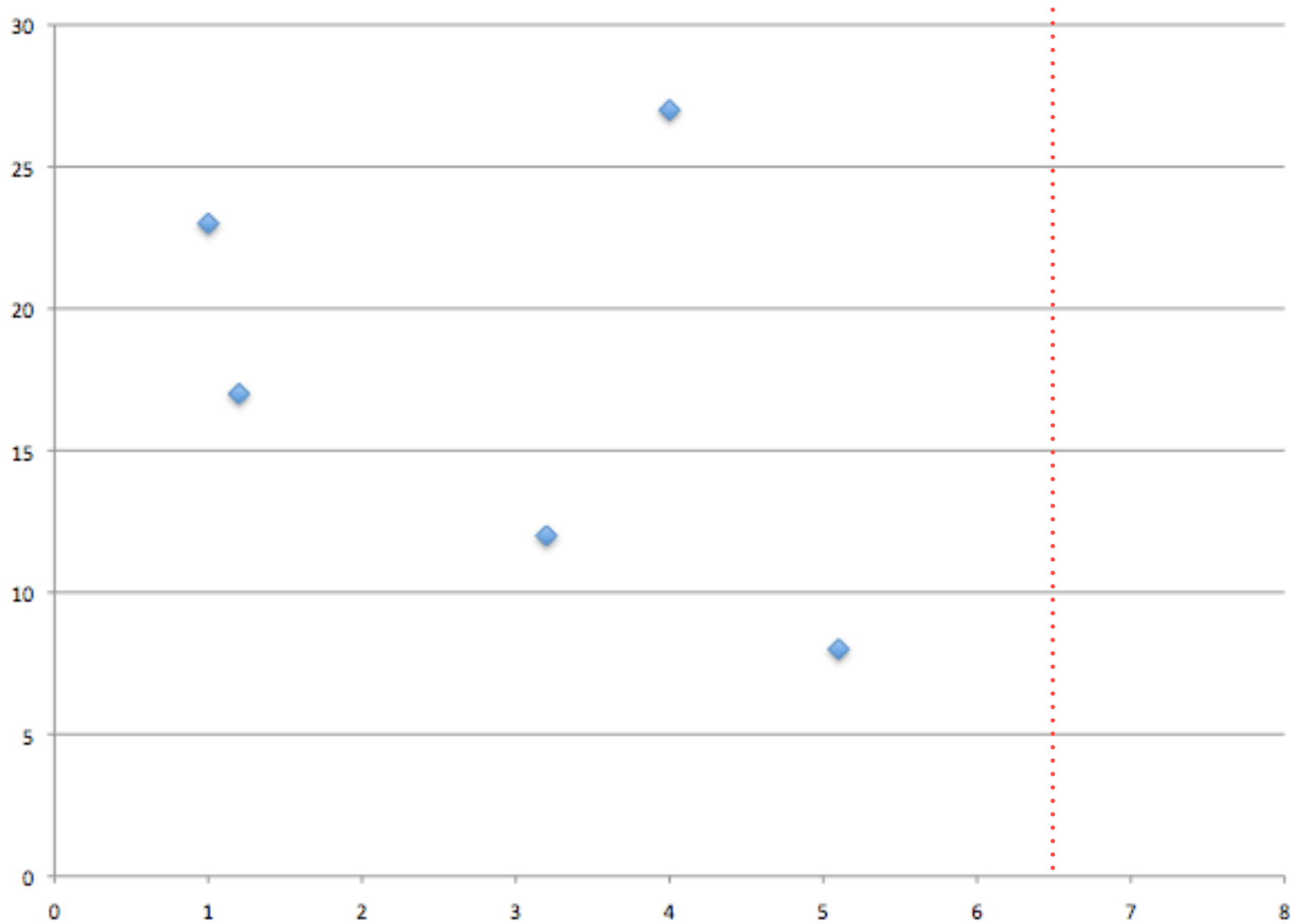
Interpolation



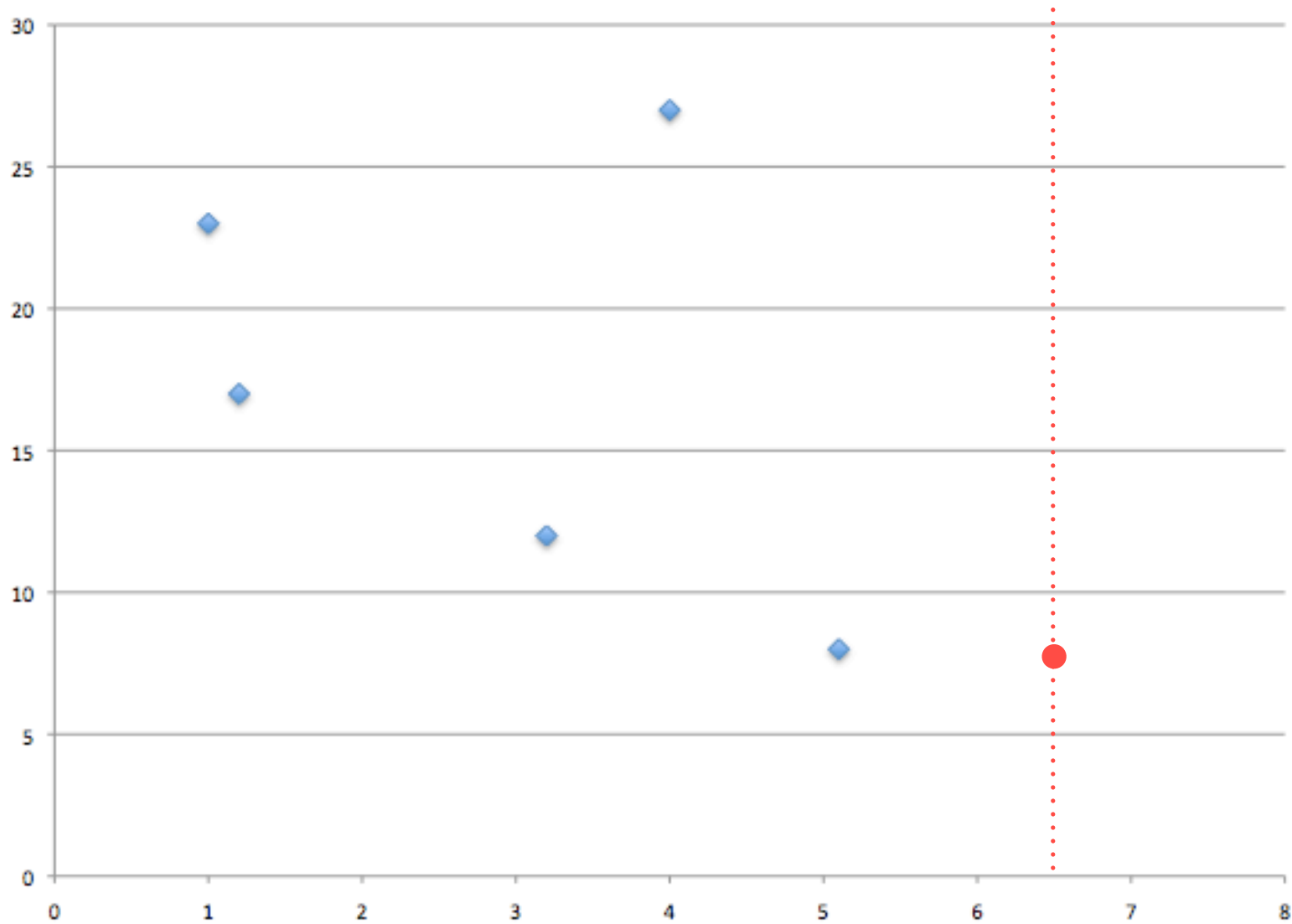
Extra-polation



Inter/Extra-polation

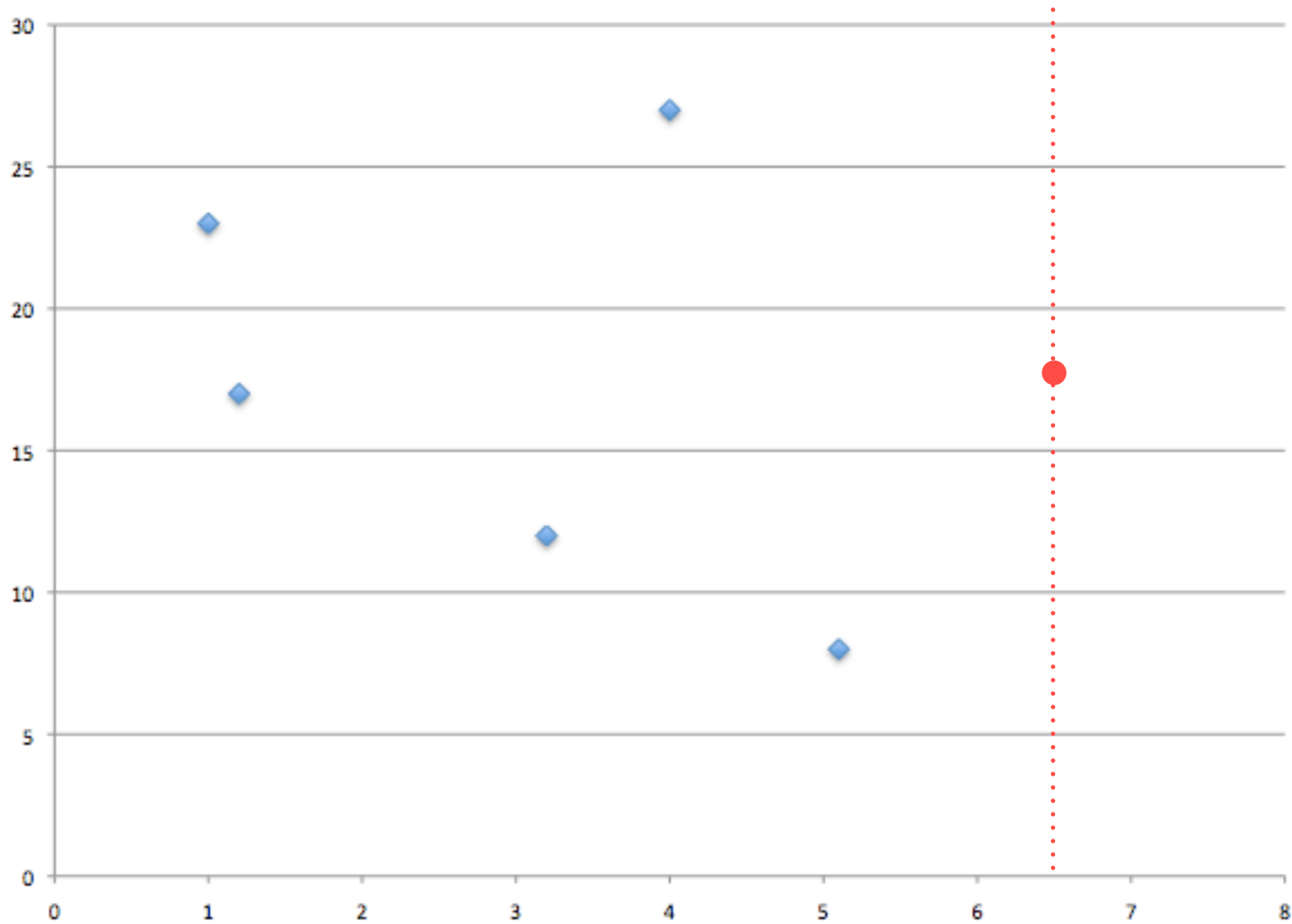


Inter/Extra-polation



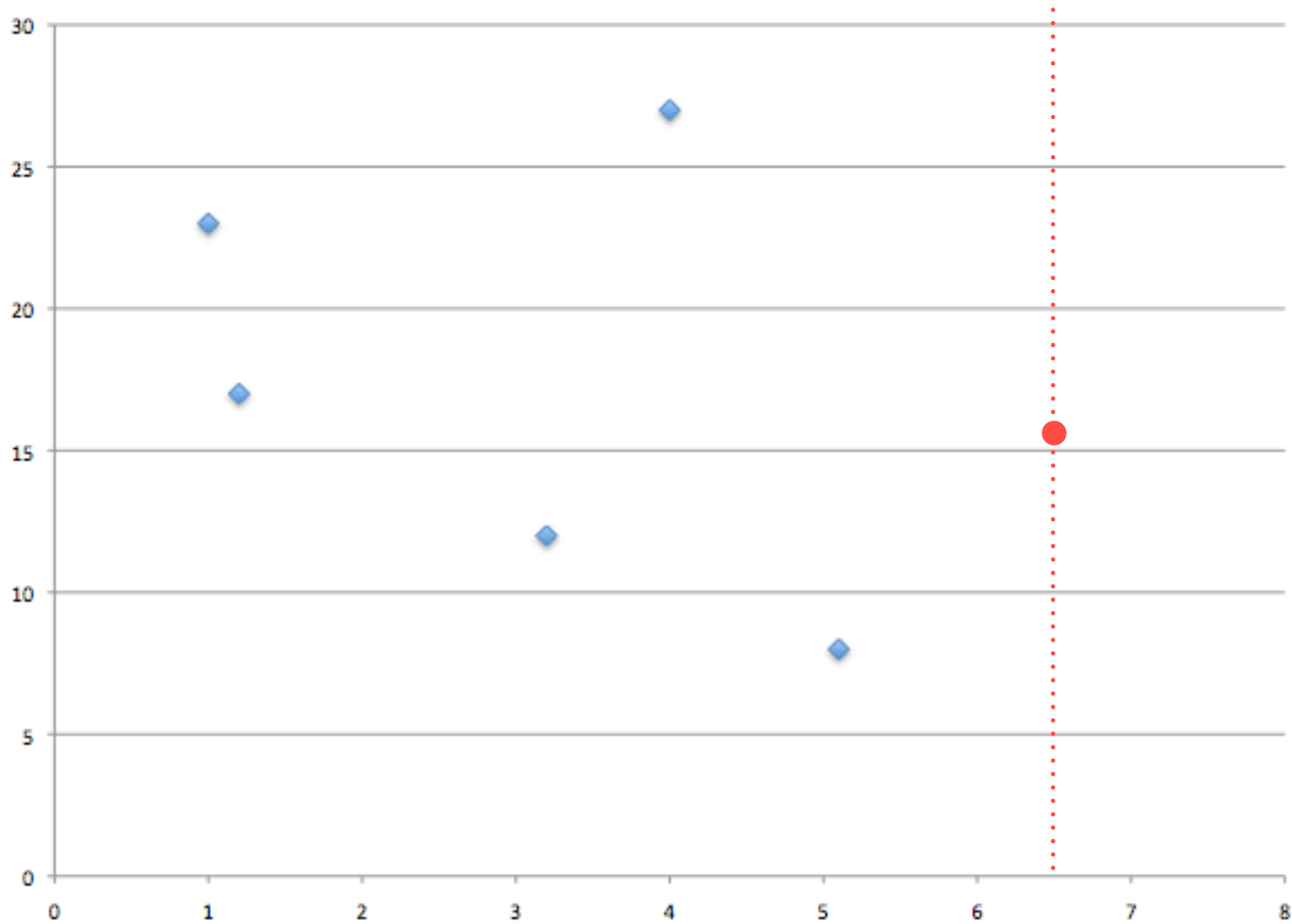
K=1

Inter/Extra-polation



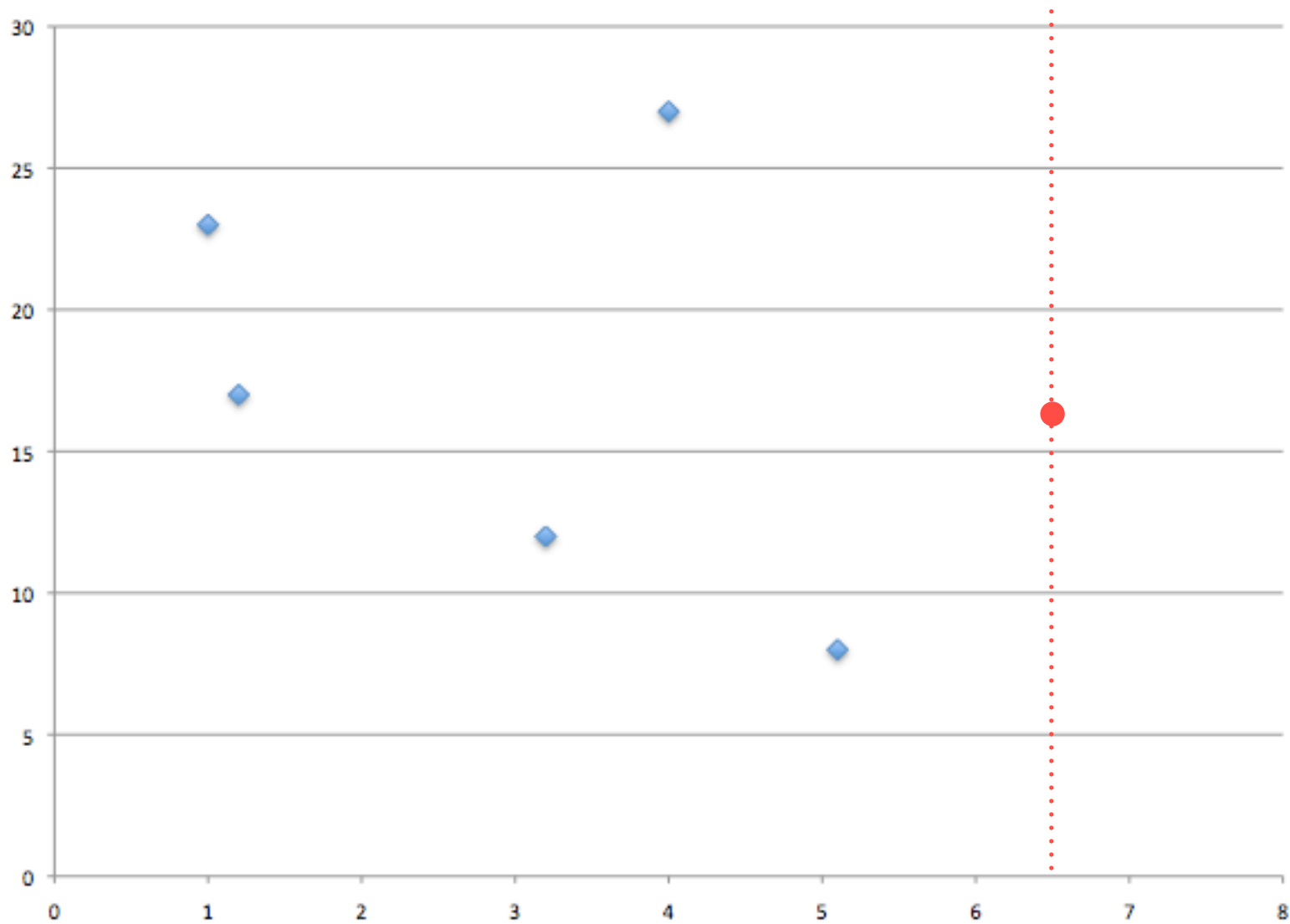
K=2

Inter/Extra-polation



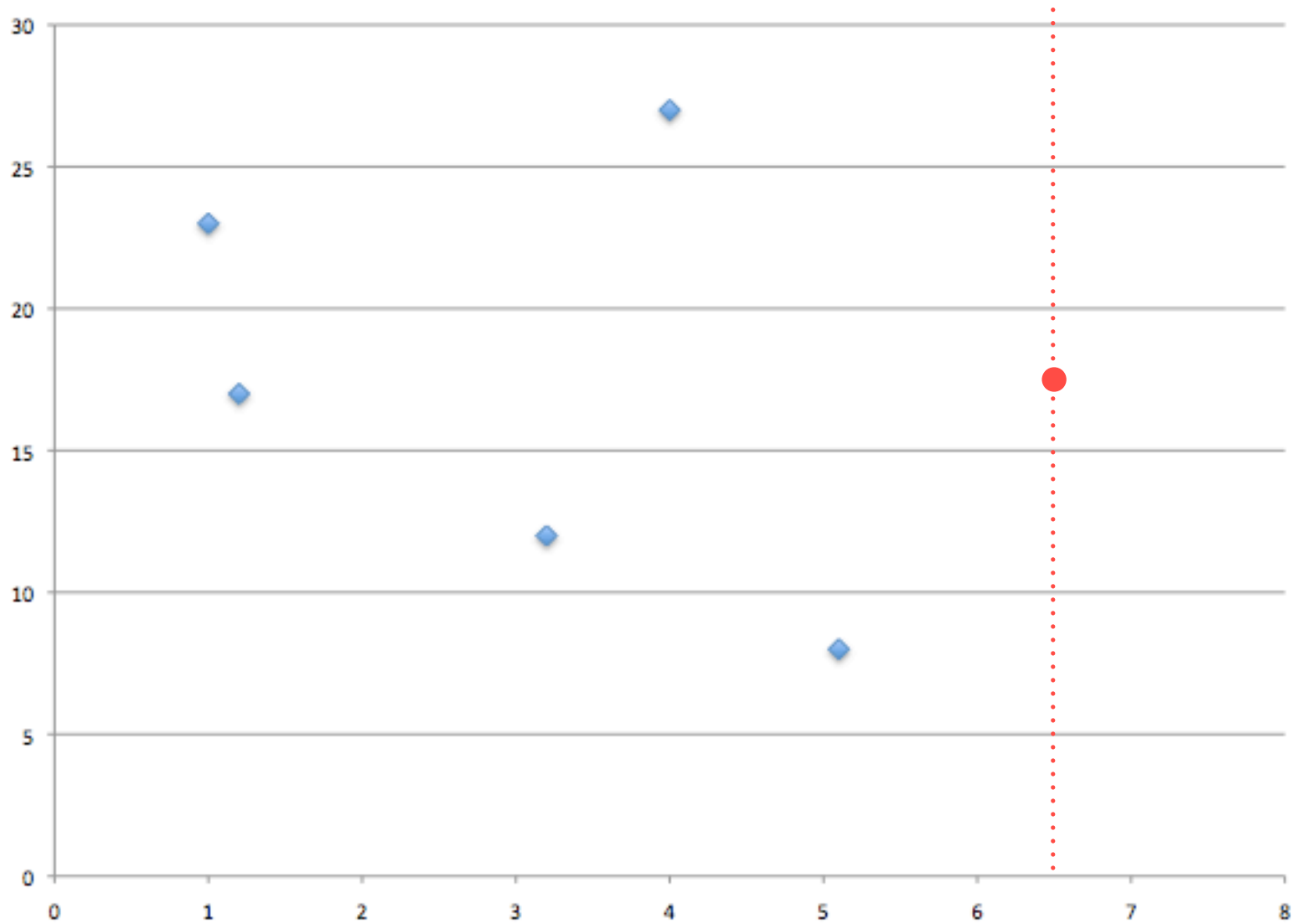
K=3

Inter/Extra-polation



K=4

Inter/Extra-polation



K=5

1st SC /kNN

Sound Classification

Sound Features

jAudio – Excel

Sound categories



Features

Spectral Centroid

13 MFCC

jAudio -> xml

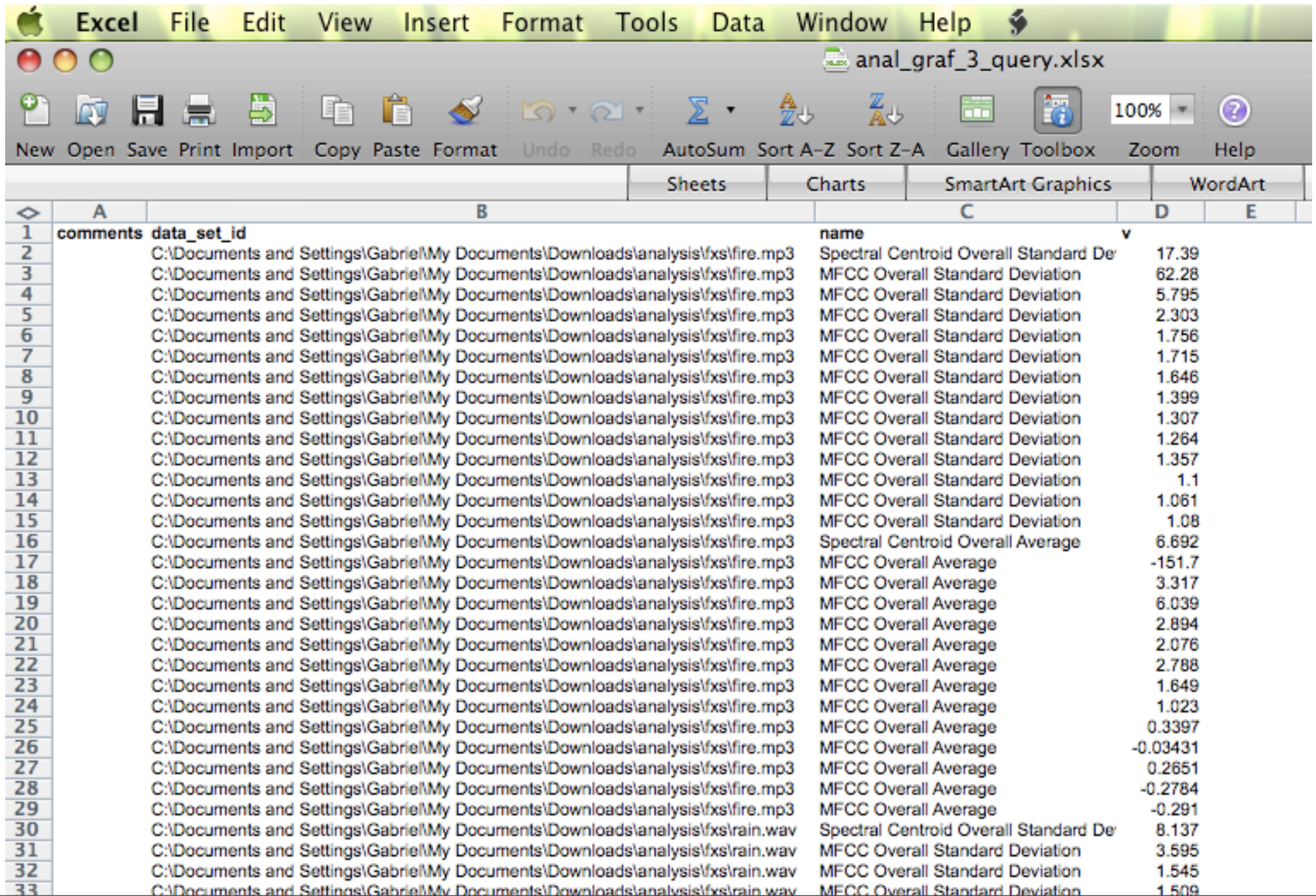
The screenshot shows the jAudioFE application window titled "jAudio Feature Extractor". The interface is divided into several sections:

- RECORDINGS:** A table listing audio files and their paths.
- FEATURES:** A list of features with checkboxes and dimensions.
- Buttons:** "Add Recordings", "Delete Recordings", "Alter Aggregators", and "Extract Features".
- Settings:** "Feature Values Save Path" (feature_values_1.xml), "Feature Definitions Save Path" (feature_definitions_1.xml), "Window Size (samples)" (512), "Window Overlap (fraction)" (0.0), "Save Features For Each Window" (unchecked), and "Save For Overall Recordings" (checked).

Name	Path
fire.mp3	/Volumes/XP/Documents and Settings/...
rain.wav	/Volumes/XP/Documents and Settings/...
water.wav	/Volumes/XP/Documents and Settings/...
wind.aif	/Volumes/XP/Documents and Settings/...
clarinet.aif	/Volumes/XP/Documents and Settings/...
piano.wav	/Volumes/XP/Documents and Settings/...
sax.mp3	/Volumes/XP/Documents and Settings/...
trumpet.aif	/Volumes/XP/Documents and Settings/...
djembe loop.wav	/Volumes/XP/Documents and Settings/...
electronic loop.wav	/Volumes/XP/Documents and Settings/...
electronic snare loop.wav	/Volumes/XP/Documents and Settings/...
shaker loop.aif	/Volumes/XP/Documents and Settings/...
female numbers.wav	/Volumes/XP/Documents and Settings/...
female vendetta.wav	/Volumes/XP/Documents and Settings/...
male nice one.mp3	/Volumes/XP/Documents and Settings/...
male_Sound_Must_be_Free.mp3	/Volumes/XP/Documents and Settings/...

Save	Feature	Dimensions
<input type="checkbox"/>	Strongest Frequency Via FFT Maximum	1
<input type="checkbox"/>	Derivative of Strongest Frequency Via FFT Maximum	1
<input type="checkbox"/>	Running Mean of Strongest Frequency Via FFT Maximum	1
<input type="checkbox"/>	Standard Deviation of Strongest Frequency Via FFT Maximum	1
<input type="checkbox"/>	Derivative of Running Mean of Strongest Frequency Via FFT...	1
<input type="checkbox"/>	Derivative of Standard Deviation of Strongest Frequency Vi...	1
<input checked="" type="checkbox"/>	MFCC	13
<input type="checkbox"/>	Derivative of MFCC	13
<input type="checkbox"/>	Running Mean of MFCC	13
<input type="checkbox"/>	Standard Deviation of MFCC	13
<input type="checkbox"/>	Derivative of Running Mean of MFCC	13
<input type="checkbox"/>	Derivative of Standard Deviation of MFCC	13
<input type="checkbox"/>	LPC	10
<input type="checkbox"/>	Derivative of LPC	10
<input type="checkbox"/>	Running Mean of LPC	10
<input type="checkbox"/>	Standard Deviation of LPC	10
<input type="checkbox"/>	Derivative of Running Mean of LPC	10
<input type="checkbox"/>	Derivative of Standard Deviation of LPC	10
<input type="checkbox"/>	Method of Moments	5
<input type="checkbox"/>	Derivative of Method of Moments	5
<input type="checkbox"/>	Running Mean of Method of Moments	5
<input type="checkbox"/>	Standard Deviation of Method of Moments	5
<input type="checkbox"/>	Derivative of Running Mean of Method of Moments	5
<input type="checkbox"/>	Derivative of Standard Deviation of Method of Moments	5
<input type="checkbox"/>	Peak Detection	variable
<input type="checkbox"/>	Partial Based Spectral Centroid	1

xml -> Excel



The screenshot shows the Microsoft Excel 2008 for Mac interface. The title bar indicates the file is named 'anal_graf_3_query.xlsx'. The menu bar includes Apple logo, Excel, File, Edit, View, Insert, Format, Tools, Data, Window, and Help. The toolbar contains icons for New, Open, Save, Print, Import, Copy, Paste, Format, Undo, Redo, AutoSum, Sort A-Z, Sort Z-A, Gallery, Toolbox, Zoom (set to 100%), and Help. The spreadsheet has columns A through E. Column A contains row numbers 1-33. Column B contains file paths for audio files. Column C contains analysis metrics. Column D contains numerical values. Column E is empty.

	A	B	C	D	E
1	comments	data_set_id	name	v	
2		C:\Documents and Settings\Gabriel\My Documents\Downloads\analysis\fxs\fire.mp3	Spectral Centroid Overall Standard De	17.39	
3		C:\Documents and Settings\Gabriel\My Documents\Downloads\analysis\fxs\fire.mp3	MFCC Overall Standard Deviation	62.28	
4		C:\Documents and Settings\Gabriel\My Documents\Downloads\analysis\fxs\fire.mp3	MFCC Overall Standard Deviation	5.795	
5		C:\Documents and Settings\Gabriel\My Documents\Downloads\analysis\fxs\fire.mp3	MFCC Overall Standard Deviation	2.303	
6		C:\Documents and Settings\Gabriel\My Documents\Downloads\analysis\fxs\fire.mp3	MFCC Overall Standard Deviation	1.756	
7		C:\Documents and Settings\Gabriel\My Documents\Downloads\analysis\fxs\fire.mp3	MFCC Overall Standard Deviation	1.715	
8		C:\Documents and Settings\Gabriel\My Documents\Downloads\analysis\fxs\fire.mp3	MFCC Overall Standard Deviation	1.646	
9		C:\Documents and Settings\Gabriel\My Documents\Downloads\analysis\fxs\fire.mp3	MFCC Overall Standard Deviation	1.399	
10		C:\Documents and Settings\Gabriel\My Documents\Downloads\analysis\fxs\fire.mp3	MFCC Overall Standard Deviation	1.307	
11		C:\Documents and Settings\Gabriel\My Documents\Downloads\analysis\fxs\fire.mp3	MFCC Overall Standard Deviation	1.264	
12		C:\Documents and Settings\Gabriel\My Documents\Downloads\analysis\fxs\fire.mp3	MFCC Overall Standard Deviation	1.357	
13		C:\Documents and Settings\Gabriel\My Documents\Downloads\analysis\fxs\fire.mp3	MFCC Overall Standard Deviation	1.1	
14		C:\Documents and Settings\Gabriel\My Documents\Downloads\analysis\fxs\fire.mp3	MFCC Overall Standard Deviation	1.061	
15		C:\Documents and Settings\Gabriel\My Documents\Downloads\analysis\fxs\fire.mp3	MFCC Overall Standard Deviation	1.08	
16		C:\Documents and Settings\Gabriel\My Documents\Downloads\analysis\fxs\fire.mp3	Spectral Centroid Overall Average	6.692	
17		C:\Documents and Settings\Gabriel\My Documents\Downloads\analysis\fxs\fire.mp3	MFCC Overall Average	-151.7	
18		C:\Documents and Settings\Gabriel\My Documents\Downloads\analysis\fxs\fire.mp3	MFCC Overall Average	3.317	
19		C:\Documents and Settings\Gabriel\My Documents\Downloads\analysis\fxs\fire.mp3	MFCC Overall Average	6.039	
20		C:\Documents and Settings\Gabriel\My Documents\Downloads\analysis\fxs\fire.mp3	MFCC Overall Average	2.894	
21		C:\Documents and Settings\Gabriel\My Documents\Downloads\analysis\fxs\fire.mp3	MFCC Overall Average	2.076	
22		C:\Documents and Settings\Gabriel\My Documents\Downloads\analysis\fxs\fire.mp3	MFCC Overall Average	2.788	
23		C:\Documents and Settings\Gabriel\My Documents\Downloads\analysis\fxs\fire.mp3	MFCC Overall Average	1.649	
24		C:\Documents and Settings\Gabriel\My Documents\Downloads\analysis\fxs\fire.mp3	MFCC Overall Average	1.023	
25		C:\Documents and Settings\Gabriel\My Documents\Downloads\analysis\fxs\fire.mp3	MFCC Overall Average	0.3397	
26		C:\Documents and Settings\Gabriel\My Documents\Downloads\analysis\fxs\fire.mp3	MFCC Overall Average	-0.03431	
27		C:\Documents and Settings\Gabriel\My Documents\Downloads\analysis\fxs\fire.mp3	MFCC Overall Average	0.2651	
28		C:\Documents and Settings\Gabriel\My Documents\Downloads\analysis\fxs\fire.mp3	MFCC Overall Average	-0.2784	
29		C:\Documents and Settings\Gabriel\My Documents\Downloads\analysis\fxs\fire.mp3	MFCC Overall Average	-0.291	
30		C:\Documents and Settings\Gabriel\My Documents\Downloads\analysis\fxs\rain.wav	Spectral Centroid Overall Standard De	8.137	
31		C:\Documents and Settings\Gabriel\My Documents\Downloads\analysis\fxs\rain.wav	MFCC Overall Standard Deviation	3.595	
32		C:\Documents and Settings\Gabriel\My Documents\Downloads\analysis\fxs\rain.wav	MFCC Overall Standard Deviation	1.545	
33		C:\Documents and Settings\Gabriel\My Documents\Downloads\analysis\fxs\rain.wav	MECC Overall Standard Deviation	1.509	

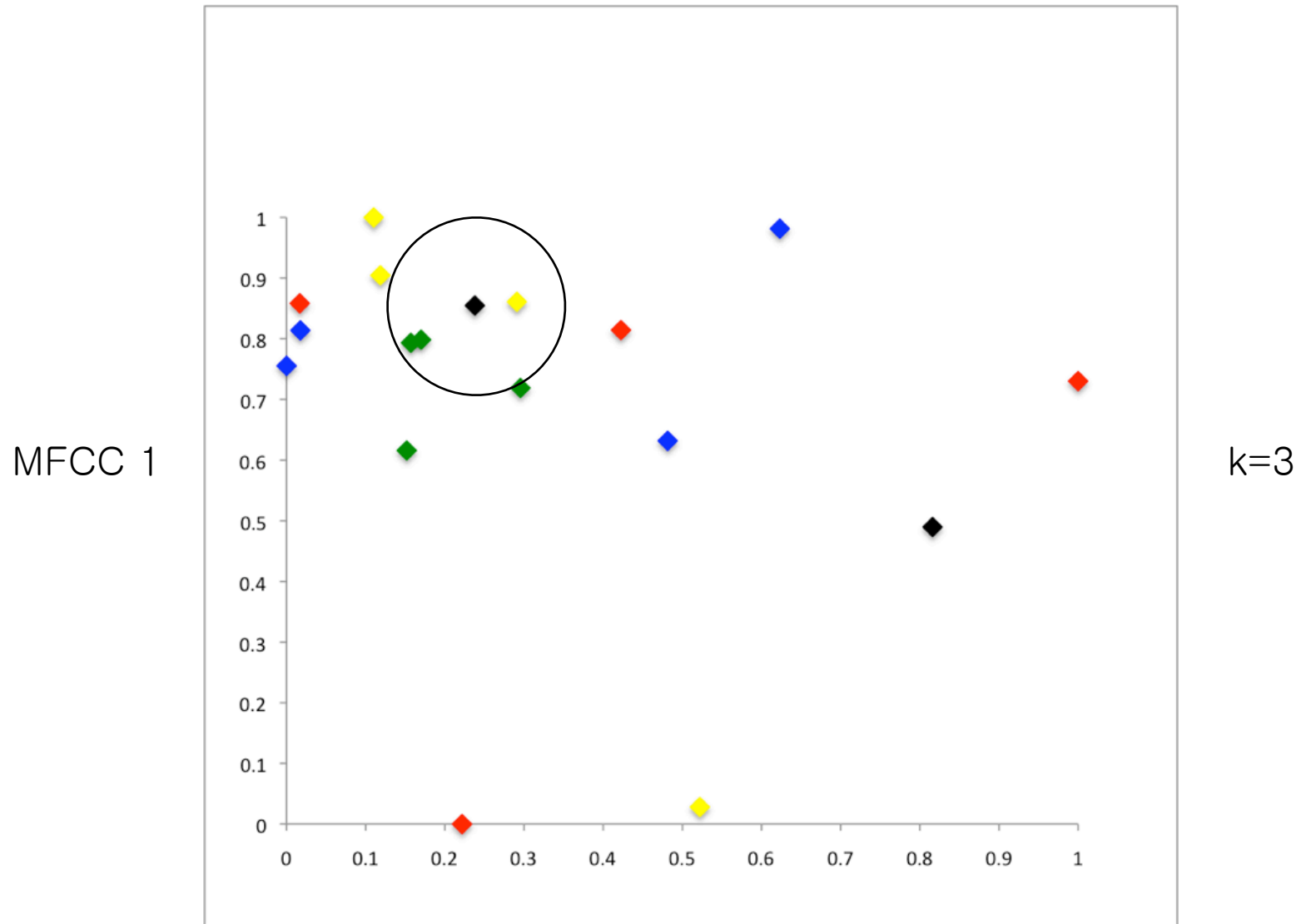
Ordered

name	fire	rain	water	wind	piano	sax	trumpet	clarinet	djembe	electronic	snare	shaker	fem num	fem vend	male nice	male free
Spectral Centroid Overall Standard De	17.39	8.137	48.39	4.404	5.066	14.01	36.35	2.949	4.93	34.25	31.28	23.67	23.37	67.58	37.73	38.12
MFCC Overall Standard Deviation	62.28	3.595	50.48	112	13.43	29.59	344.4	7.498	19.15	28.66	369	24.2	22.04	99.53	165.5	152.9
MFCC Overall Standard Deviation	5.795	1.545	8.412	4.662	2.936	7.732	10.89	3.377	3.273	3.943	4.78	2.6	10.72	8.863	9.565	9.678
MFCC Overall Standard Deviation	2.303	1.509	6.941	2.756	2.203	4.552	3.236	1.292	4.305	3.373	2.696	1.999	6.532	6.204	5.473	6.085
MFCC Overall Standard Deviation	1.756	1.473	5.196	3.254	3.178	3.081	2.767	3.569	2.447	2.074	2.656	1.988	4.304	3.058	4.499	5.422
MFCC Overall Standard Deviation	1.715	1.43	3.68	2.357	2.699	2.46	3.605	3.807	2.52	1.919	1.759	1.486	2.381	3.128	2.946	4.282
MFCC Overall Standard Deviation	1.646	1.331	3.318	1.579	2.2	3.533	2.883	4.932	2.152	1.568	1.476	1.673	2.286	2.605	2.429	2.763
MFCC Overall Standard Deviation	1.399	1.402	3.328	1.472	2.067	4.773	4.938	4.571	2.258	1.907	1.379	1.384	3.069	2.229	1.614	2.21
MFCC Overall Standard Deviation	1.307	1.245	2.537	1.564	1.923	3.38	5.221	1.738	2.138	1.436	1.003	1.482	1.911	2.081	2.79	3.02
MFCC Overall Standard Deviation	1.264	1.176	2.702	1.872	2.589	3.983	6.373	4.086	1.987	1.606	1.763	1.249	2.143	1.586	1.747	2.226
MFCC Overall Standard Deviation	1.357	1.171	2.12	1.418	2.362	5.286	4.457	4.196	1.758	1.199	1.56	1.255	1.995	1.971	1.757	1.921
MFCC Overall Standard Deviation	1.1	1.061	1.997	1.487	2.755	5.647	6.897	2.95	1.248	1.18	0.9551	1.221	2.763	1.643	1.251	1.997
MFCC Overall Standard Deviation	1.061	1.065	2.063	1.257	2.768	4.847	5.83	2.338	1.456	1.382	1.322	1.291	2.861	1.7	1.287	1.662
MFCC Overall Standard Deviation	1.08	1.052	1.887	1.185	1.961	6.503	3.172	5.629	1.501	0.9836	1.262	1.101	2.481	2	1.083	1.226
Spectral Centroid Overall Average	6.692	88.38	69.27	4.343	20.33	43.58	74.76	19.19	6.591	61.32	34.24	139.2	27.26	44.19	24.81	25.52
MFCC Overall Average	-151.7	-119	-187.2	-163.1	-134	-142.5	-304.9	-115.4	-143	-151.6	-310.4	-168	-154.7	-170.2	-190.3	-155.7
MFCC Overall Average	3.317	-10.73	-3.722	12.1	9.902	-11.65	-19.74	-1.75	12.99	-8.766	-0.3105	-10.76	9.9	5.799	6.397	9.072
MFCC Overall Average	6.039	-2.44	0.4847	-3.387	-2.785	-1.751	-2.384	-4.638	-4.436	1.494	2.342	0.83	4.202	5.819	8.172	7.34
MFCC Overall Average	2.894	-1.168	0.8538	-5.971	-1.385	-0.3065	-4.128	0.4007	-2.174	1.157	-4.621	-1.236	-6.244	0.5014	1.045	0.9084
MFCC Overall Average	2.076	0.2791	-1.003	-3.183	-3.823	-1.957	-0.2204	-1.506	-3.497	-0.2269	0.4827	0.1407	-7.418	-0.2531	1.026	1.478
MFCC Overall Average	2.788	-0.5914	-0.2119	-0.4327	-1.797	-1.242	1.296	-6.32	-1.409	1.009	1.145	-0.6327	3.265	2.121	0.2149	-0.02195
MFCC Overall Average	1.649	-1.339	0.2892	0.1324	0.3895	4.6	0.6498	-10.16	-1.168	0.2287	0.3788	0.0654	-5.348	0.165	0.8109	-0.1794
MFCC Overall Average	1.023	0.3403	-0.861	-0.6493	2.067	6.555	-0.9873	-6.426	-0.2094	0.436	0.1924	0.1709	2.391	0.302	0.209	-0.4256
MFCC Overall Average	0.3397	-0.3888	0.6136	-1.636	1.868	4.359	-1.225	-5.321	1.432	-0.1814	-2.394	-0.197	-3.256	-0.8859	-1.508	-0.3424
MFCC Overall Average	-0.03431	-0.6919	0.475	-1.347	-1.951	-2.75	0.1803	-2.773	1.013	-1.201	-1.751	-0.7641	2.08	1.17	-0.8064	-0.454
MFCC Overall Average	0.2651	-0.1874	-0.7319	0.5336	-2.334	-7.767	-0.5475	2.032	-0.4514	-0.488	-0.6609	-0.04709	-1.779	-1.386	0.3591	-0.5013
MFCC Overall Average	-0.2784	-0.5661	-0.172	1.179	-1.725	-4.691	-2.239	2.88	-0.5157	-0.2104	1.048	-0.3109	-0.4405	0.2095	-1.129	-0.2333
MFCC Overall Average	-0.291	-0.235	-0.6956	1.265	-0.7022	1.638	0.1647	4.315	0.03571	-0.03586	0.5892	-0.837	-2.2	-0.2011	-0.1452	-0.2907

Normalized

name	fire	rain	water	wind	piano	sax	trumpet	clarinet	djembe	electronic	snare	shaker	fem num	fem vend	male nice	male free
Spectral Centroid Overa	0.223438	0.080271	0.703084	0.022512	0.032755	0.171141	0.516795	0	0.030651	0.484303	0.43835	0.320605	0.315963	1	0.538147	0.544182
MFCC Overall Standard	0.160603	0	0.12831	0.296671	0.026915	0.07114	0.932677	0.010681	0.042569	0.068595	1	0.056389	0.050478	0.262544	0.443084	0.408601
MFCC Overall Standard	0.454789	0	0.734831	0.333547	0.14885	0.662065	1	0.196041	0.184912	0.256608	0.346174	0.112895	0.981808	0.783093	0.858213	0.870305
MFCC Overall Standard	0.17897	0.038414	1	0.259161	0.161267	0.577093	0.344132	0	0.533369	0.368384	0.24854	0.125155	0.927598	0.869534	0.740131	0.848469
MFCC Overall Standard	0.071664	0	0.94277	0.451	0.431755	0.407192	0.327678	0.530767	0.246645	0.15219	0.29957	0.130413	0.71689	0.401367	0.76627	1
MFCC Overall Standard	0.085818	0	0.677507	0.279133	0.382114	0.310148	0.654923	0.715748	0.328214	0.147245	0.099067	0.016862	0.28636	0.511292	0.456489	0.858777
MFCC Overall Standard	0.087476	0	0.551791	0.06887	0.241322	0.611497	0.430991	1	0.227992	0.065815	0.040267	0.094974	0.265204	0.353791	0.304915	0.397667
MFCC Overall Standard	0.00562	0.006462	0.547626	0.026131	0.193313	0.953639	1	0.896881	0.246979	0.148356	0	0.001405	0.474852	0.238831	0.06603	0.233493
MFCC Overall Standard	0.072072	0.057373	0.363679	0.133001	0.218113	0.563537	1	0.174253	0.269085	0.102655	0	0.113561	0.215268	0.255571	0.423661	0.478189
MFCC Overall Standard	0.016933	0	0.293631	0.133923	0.271888	0.540119	1	0.559938	0.156052	0.08274	0.11295	0.014047	0.186069	0.078892	0.109871	0.20204
MFCC Overall Standard	0.0452	0	0.23062	0.060024	0.289429	1	0.798542	0.735115	0.142649	0.006804	0.094532	0.020413	0.200243	0.194411	0.142406	0.18226
MFCC Overall Standard	0.024386	0.017823	0.175348	0.089517	0.302917	0.78963	1	0.335734	0.049294	0.03785	0	0.04475	0.304263	0.115771	0.049799	0.175348
MFCC Overall Standard	0	0.000839	0.210107	0.041099	0.357937	0.793877	1	0.267771	0.082827	0.06731	0.054728	0.048228	0.377438	0.13399	0.047389	0.126022
MFCC Overall Standard	0.017466	0.012393	0.163677	0.036489	0.177084	1	0.396492	0.841649	0.093742	0	0.05044	0.02127	0.271298	0.18415	0.018009	0.043918
Spectral Centroid Overa	0.017418	0.623156	0.481451	0	0.118548	0.290953	0.522161	0.110094	0.01667	0.422499	0.221694	1	0.169936	0.295476	0.151768	0.157033
MFCC Overall Average	0.813846	0.981538	0.631795	0.755385	0.904615	0.861026	0.028205	1	0.858462	0.814359	0	0.730256	0.798462	0.718974	0.615897	0.793333
MFCC Overall Average	0.704461	0.275283	0.489398	0.972808	0.905652	0.247174	0	0.549649	1	0.335289	0.59363	0.274366	0.905591	0.780293	0.798564	0.880293
MFCC Overall Average	0.833489	0.171585	0.399899	0.097658	0.144653	0.225371	0.175956	0	0.015769	0.478689	0.544887	0.426854	0.690086	0.816315	1	0.935051
MFCC Overall Average	1	0.555483	0.776735	0.029875	0.531736	0.649759	0.231561	0.72715	0.445393	0.809915	0.17761	0.548041	0	0.73817	0.797658	0.78271
MFCC Overall Average	0.785927	0.637177	0.531043	0.350579	0.297599	0.45207	0.595828	0.489404	0.324586	0.59529	0.654031	0.62572	0	0.593121	0.699007	0.736424
MFCC Overall Average	0.952655	0.617231	0.654898	0.632983	0.497568	0.552655	0.804566	0.048635	0.536079	0.776079	0.789578	0.613132	1	0.886452	0.697261	0.673752
MFCC Overall Average	0.800068	0.597629	0.70794	0.697317	0.714736	1	0.732371	0	0.609214	0.703841	0.714011	0.692778	0.326016	0.699526	0.743286	0.676192
MFCC Overall Average	0.514256	0.467125	0.384191	0.398806	0.586331	0.896168	0.375471	0	0.429175	0.473731	0.456914	0.45543	0.608699	0.46448	0.45806	0.414249
MFCC Overall Average	0.584783	0.509525	0.613079	0.380682	0.742665	1	0.42314	0	0.697624	0.53095	0.302376	0.529339	0.213326	0.458171	0.393905	0.514318
MFCC Overall Average	0.614318	0.494363	0.707224	0.374863	0.264684	0.118935	0.653466	0.114739	0.805363	0.401496	0.301167	0.481193	1	0.834002	0.473477	0.53776
MFCC Overall Average	0.819686	0.773508	0.717941	0.847086	0.554444	0	0.736759	1	0.746566	0.742831	0.725186	0.787826	0.611083	0.651189	0.829278	0.741474
MFCC Overall Average	0.571063	0.533829	0.584832	0.759674	0.383849	0	0.317329	0.979811	0.540352	0.579863	0.74272	0.566856	0.550084	0.634205	0.460981	0.576899
MFCC Overall Average	0.593863	0.598801	0.558187	0.731064	0.557605	0.763954	0.634045	1	0.622671	0.61636	0.671475	0.545719	0.425536	0.60179	0.606719	0.593889

Visualization



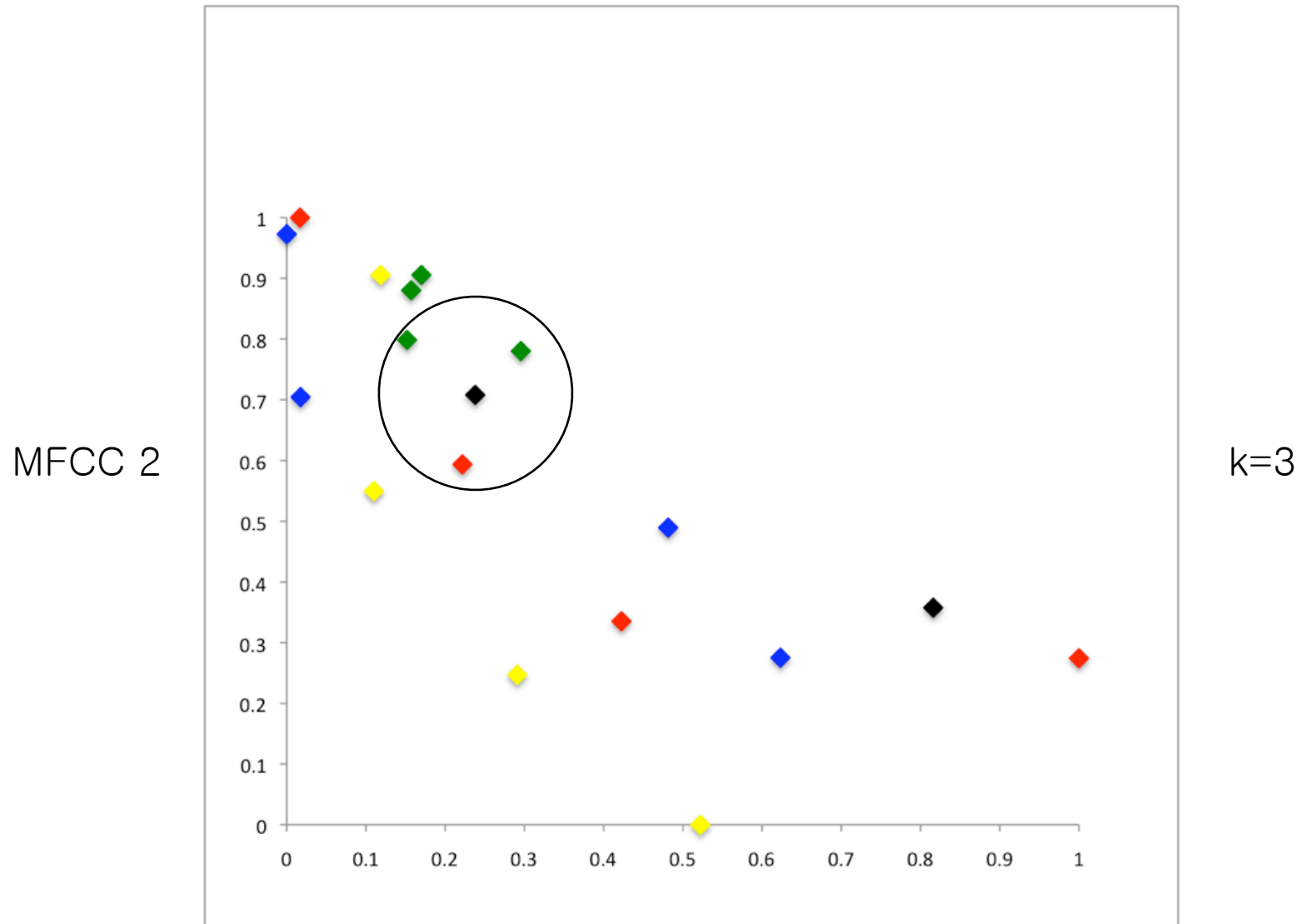
Nature

Harmonic

Percussion

Vocal

Visualization



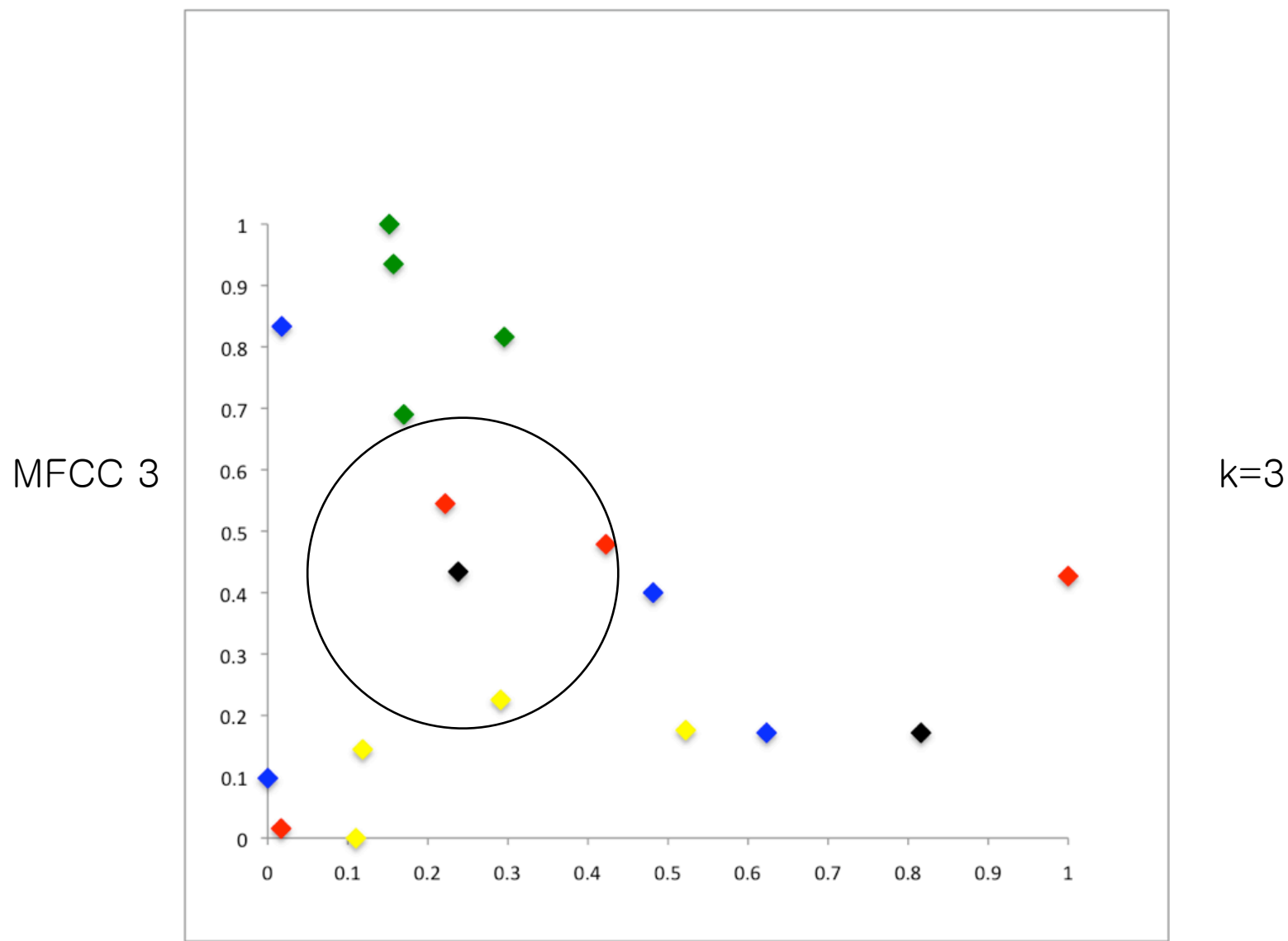
Nature

Harmonic

Percussion

Vocal

Visualization



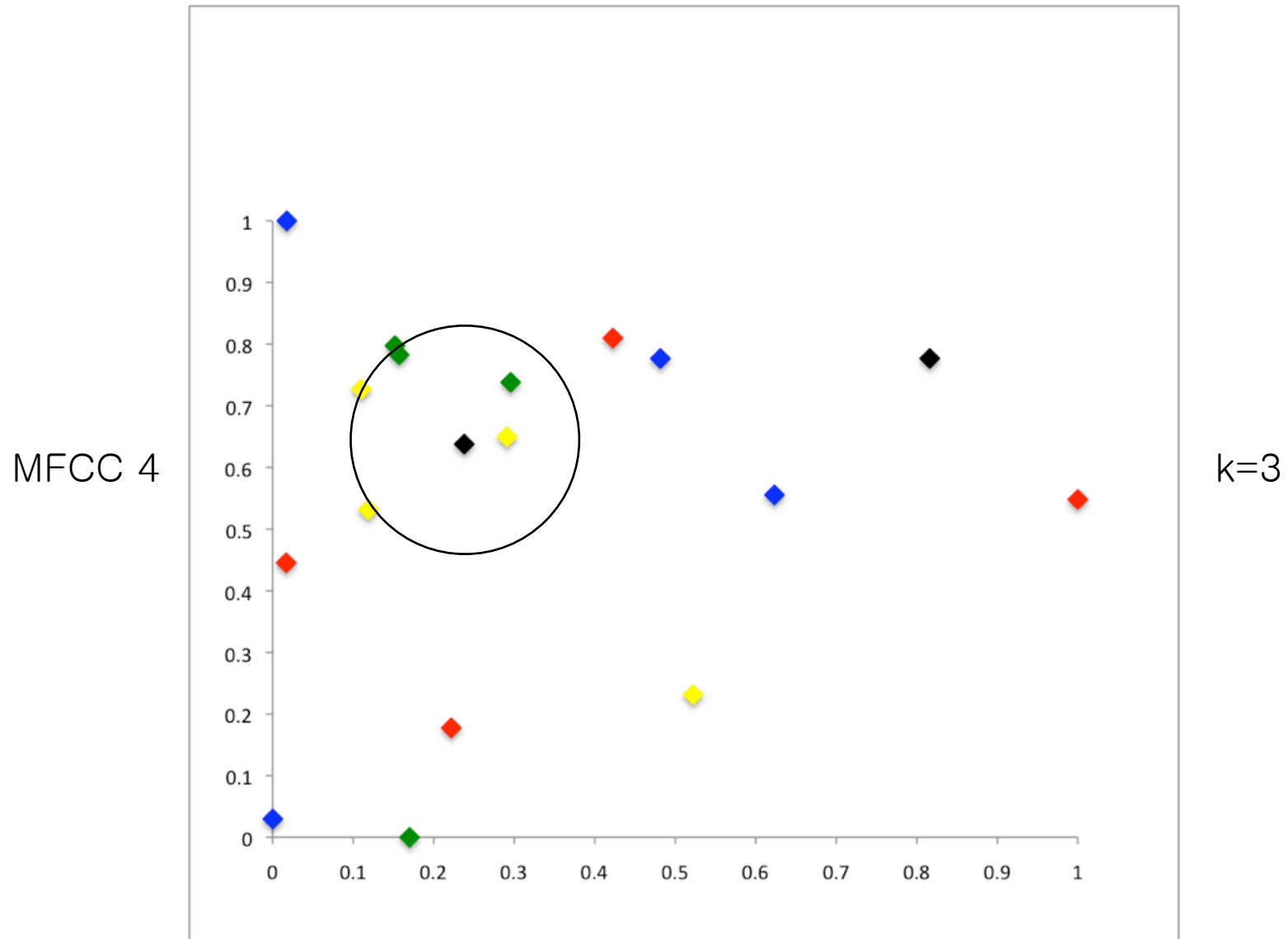
Nature

Harmonic

Percussion

Vocal

Visualization



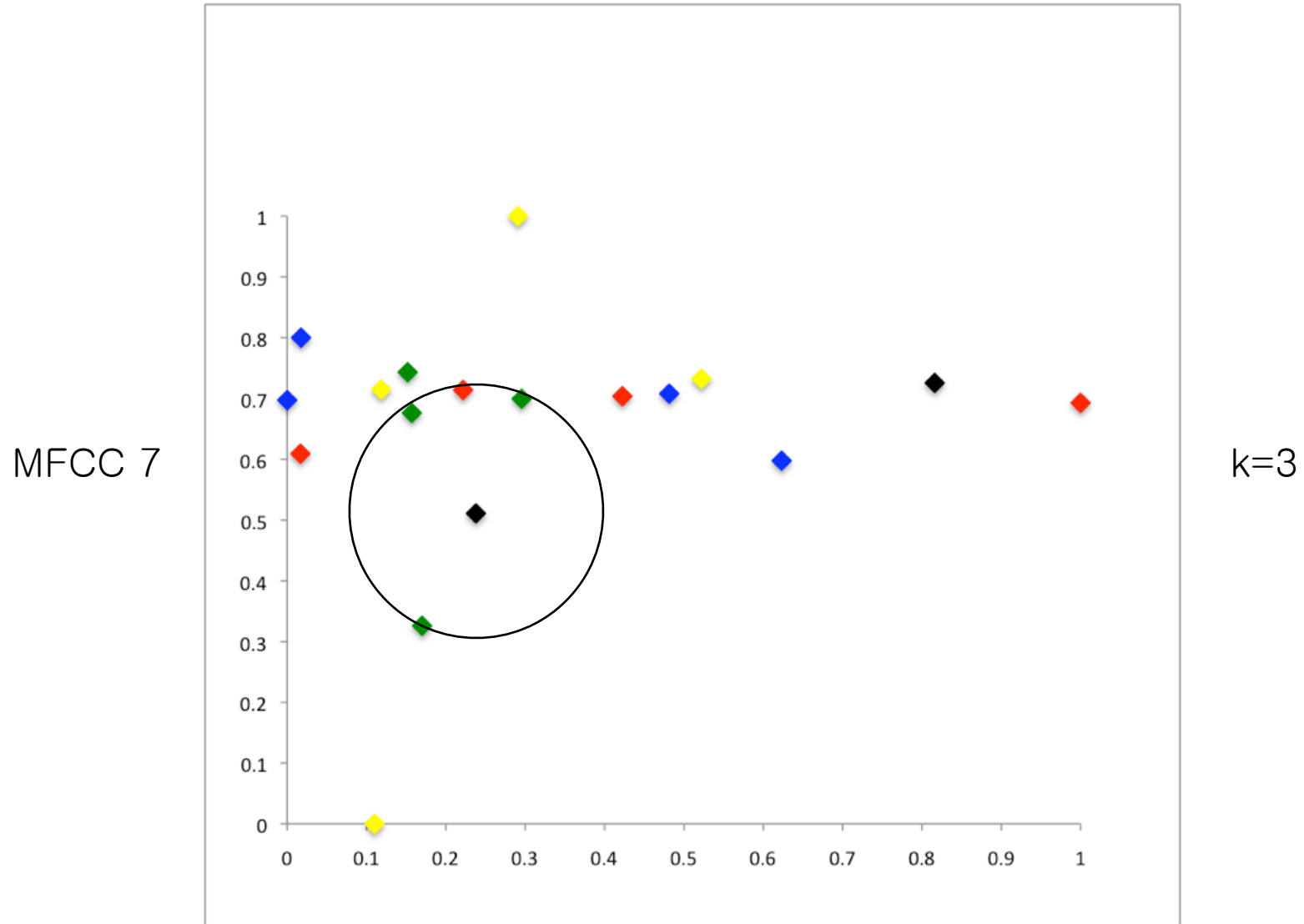
Nature

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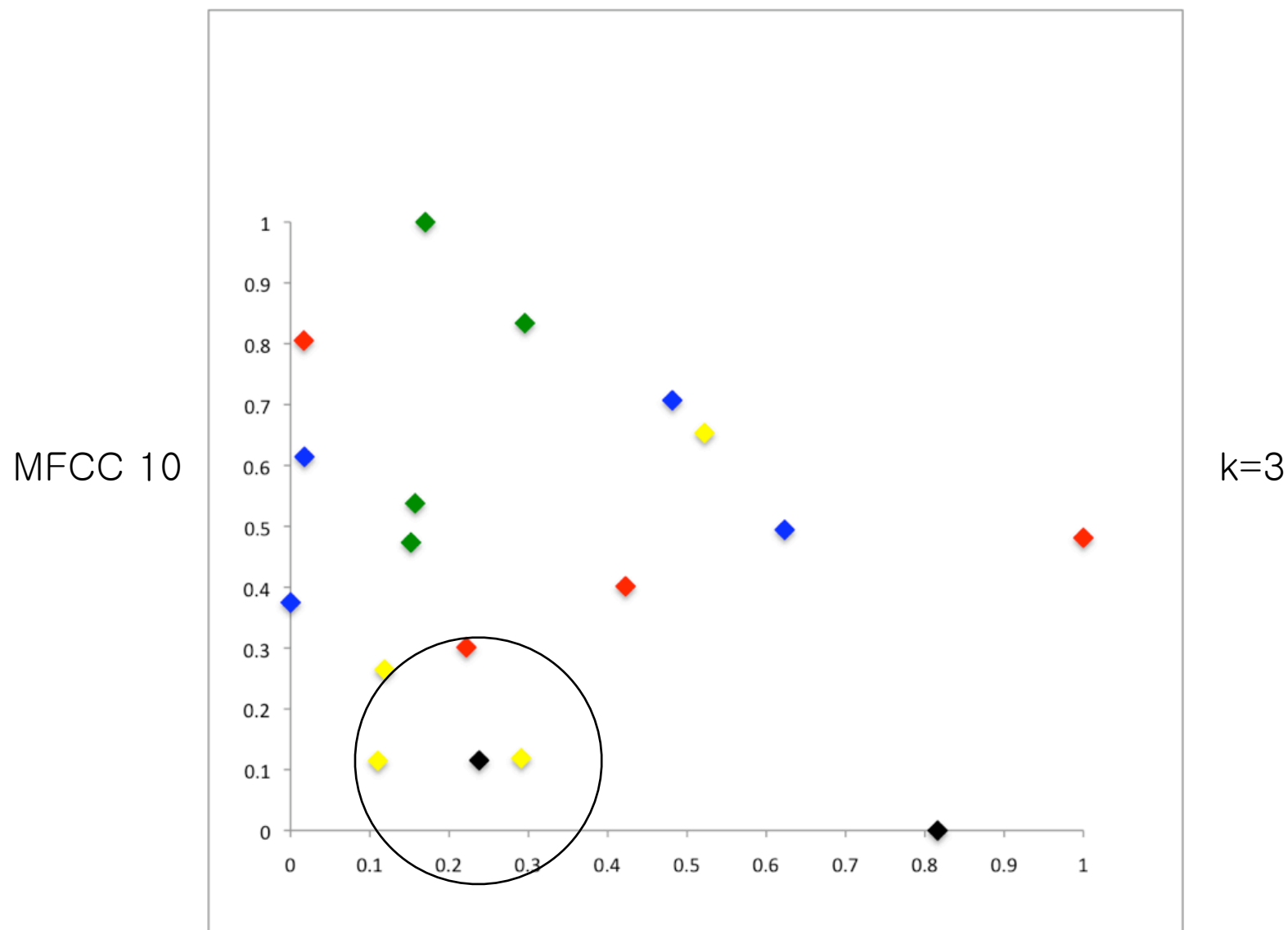
Nature

Harmonic

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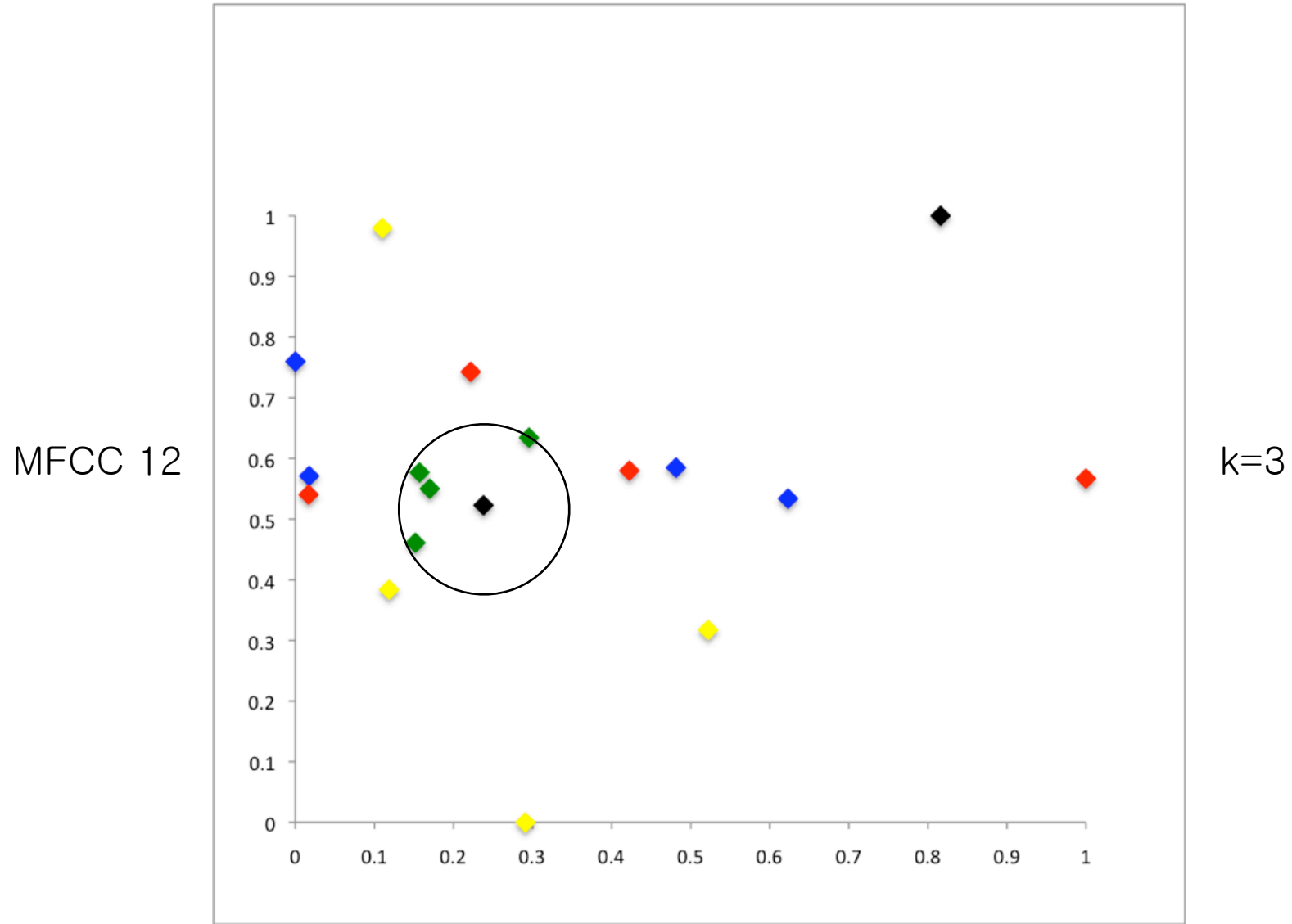
Nature

Harmonic

Percussion

Vocal

Visualization



Nature

Harmonic

Percussion

Vocal

kNN Classification

	fire	rain	water	wind	piano	sax	trumpet	clarinet
k 3								
voice 13 MFCC	1.142746	0.894612	0.904429	0.964122	0.826126	1.50784	1.453826	1.091309
					2			
voice 7 MFCC	0.645248	0.674863	0.605731	0.808231	0.632374	1.325041	1.250543	0.841709
	djembe	electronic	snare	shaker	fem num	fem vend	male nice	male free
	1.06503	0.797576	1.153617	1.094187	1.452403	1.048918	0.92196	0.887217
		1						3
	0.636224	0.583452	1.026869	0.965161	0.70116	0.36898	0.458311	0.420688
						1	3	2

Summary

Conceptually simple
solves complex problems

Work with relatively little information

No learning costs

Memory and CPU cost

Feature selection problem

Sensitive to representation

Bibliography

http://www.music.mcgill.ca/~gabriel/courses/mumt621/presentations/3_kNN/annotated_bibliography.html

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Thanks !