



Every Oil Well Tells a Story



قرارگاه نوآوری شهید طهرانی مقدم

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First Part Outline

- Keywords Definition
- Similarity
- Clustering
- Clustering Issues

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- Sample
 - Feature
 - Label
 - Data Set



Similarity

Words Similarity

- Man
- Dog
- King
- Kiwi
- Cat
- Three
- Woman
- Four
- Orange
- Five
- Queen
- Apple

Words Similarity

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- Man
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- Queen
- Cat
- Dog
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- Four
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- Kiwi
- Apple
- Orange



Clustering

Word Clustering

- Man
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-

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- Four
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- Apple
- Orange

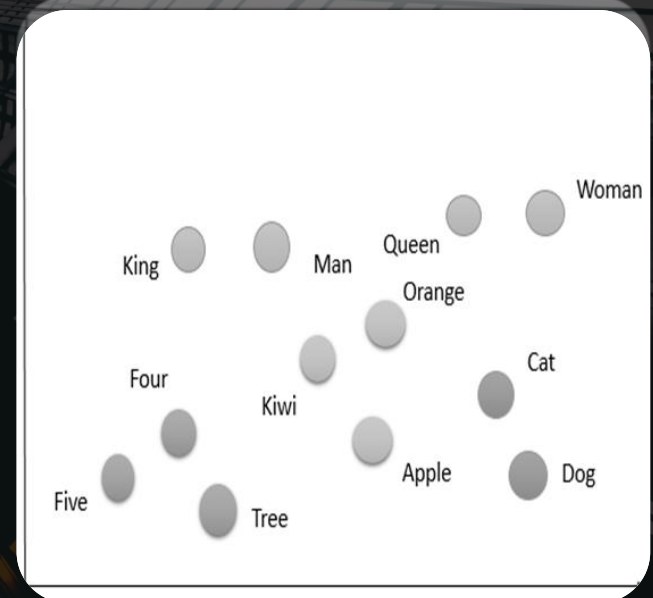
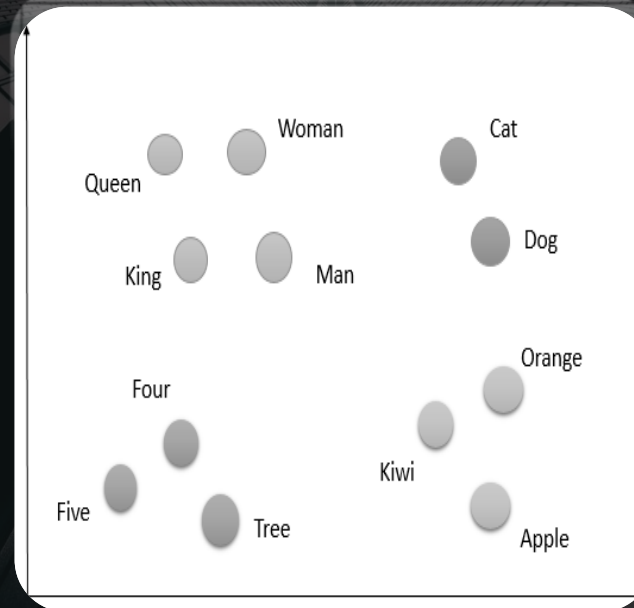
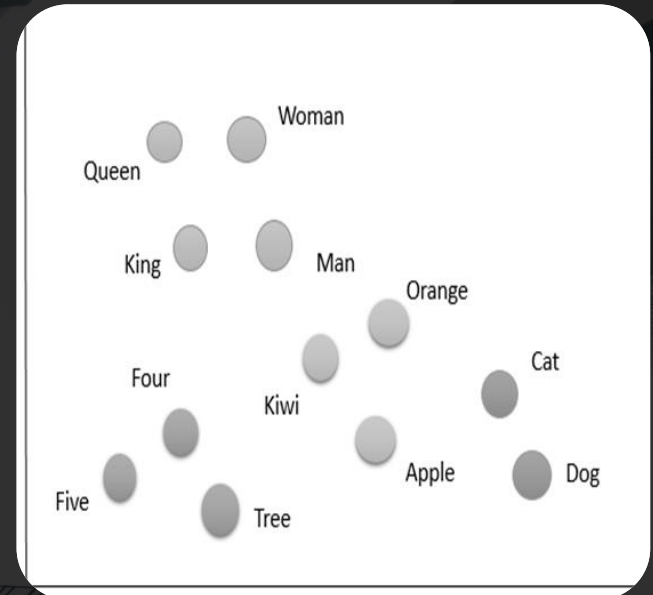
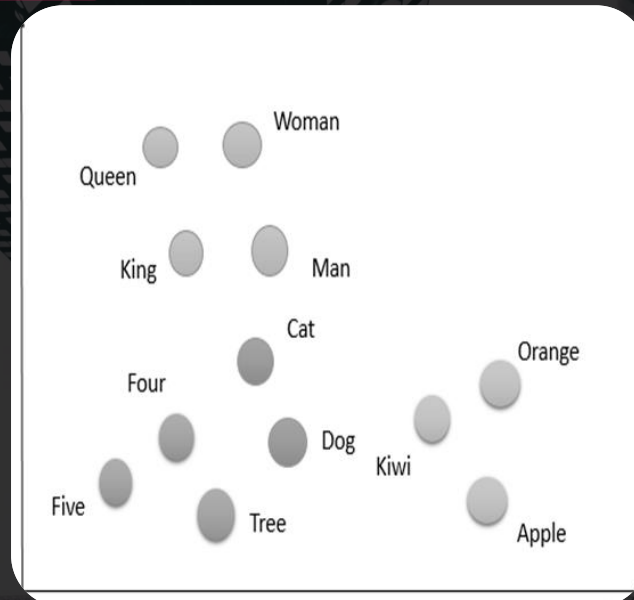
Word Clustering

- Man
 - Woman
 - King
 - Queen
-

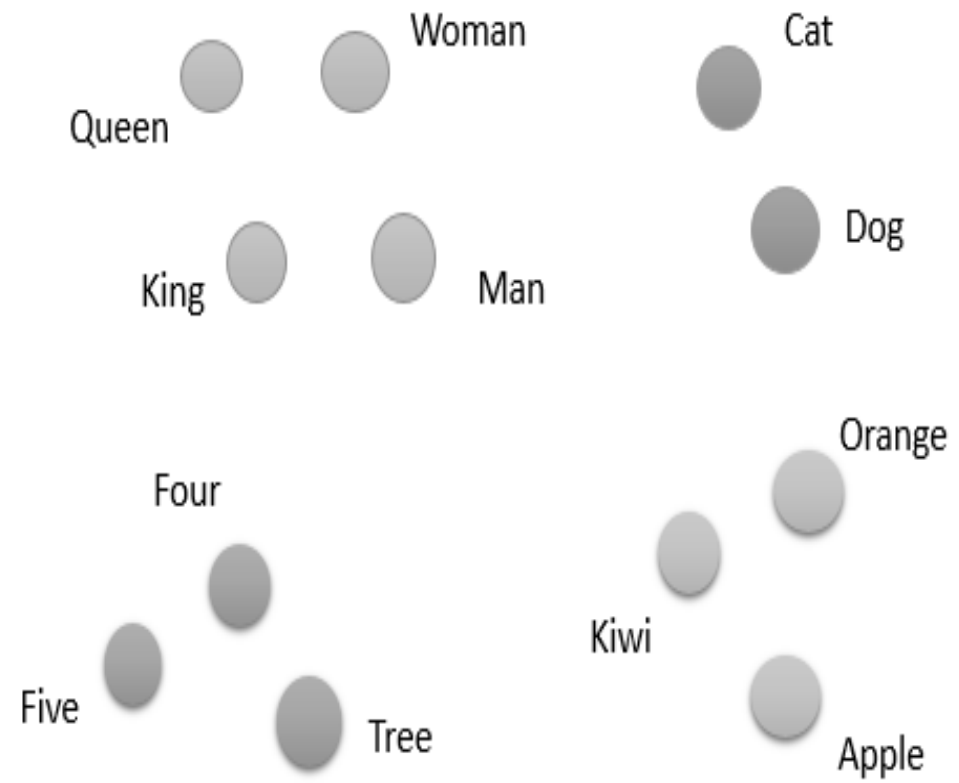
- Cat
 - Dog
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- Three
 - Four
 - Five
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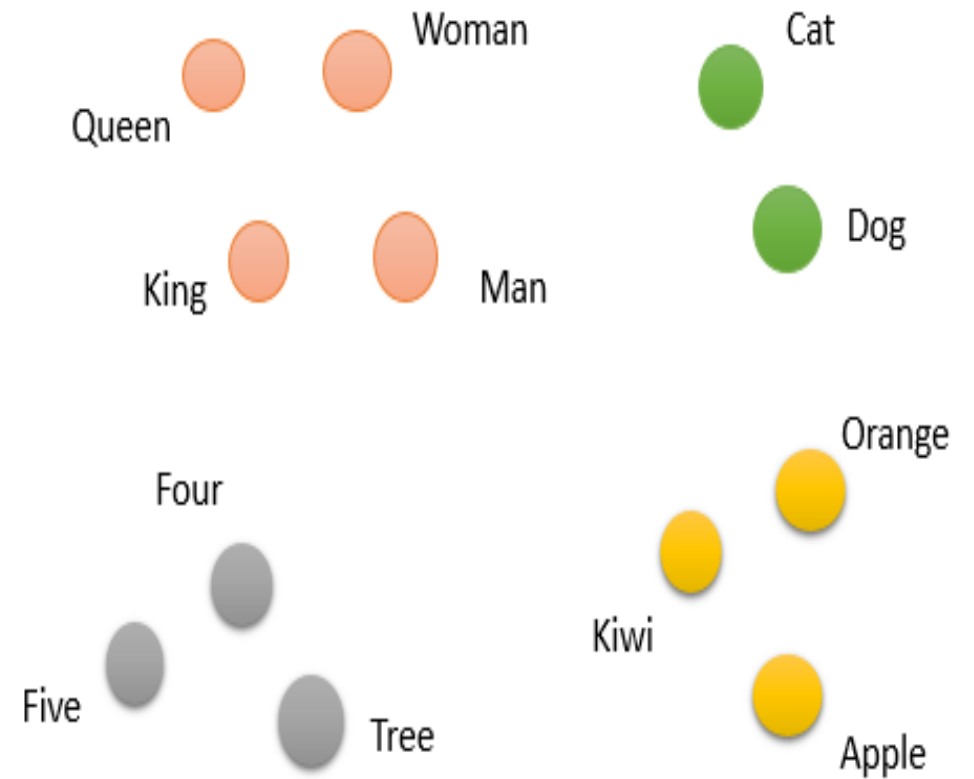
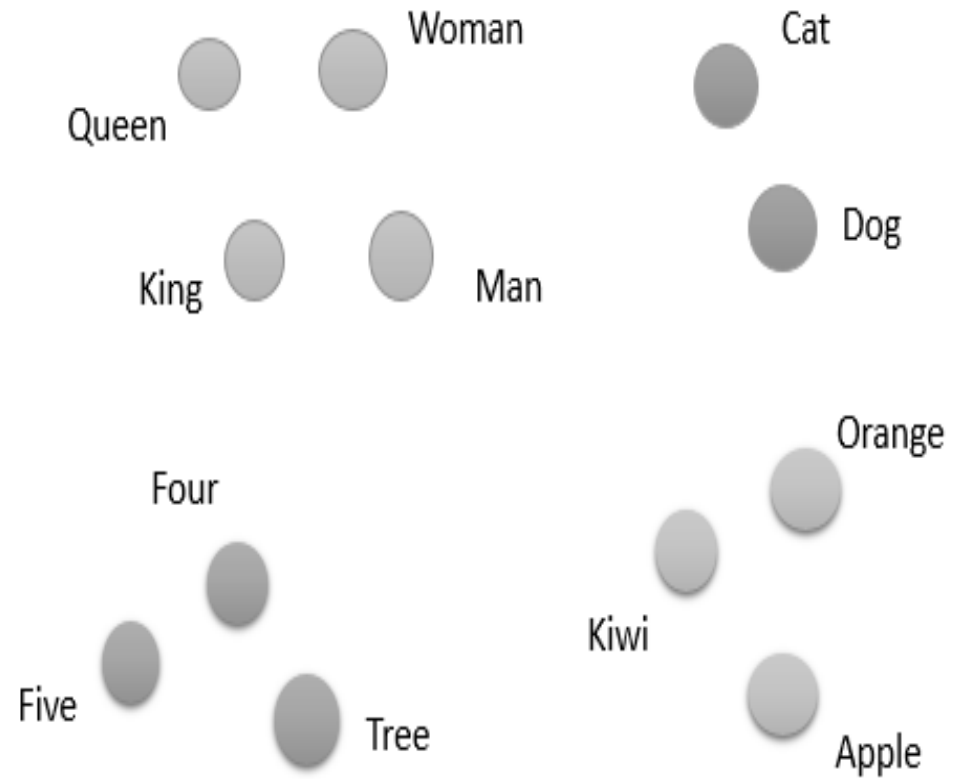
- Kiwi
- Apple
- Orange



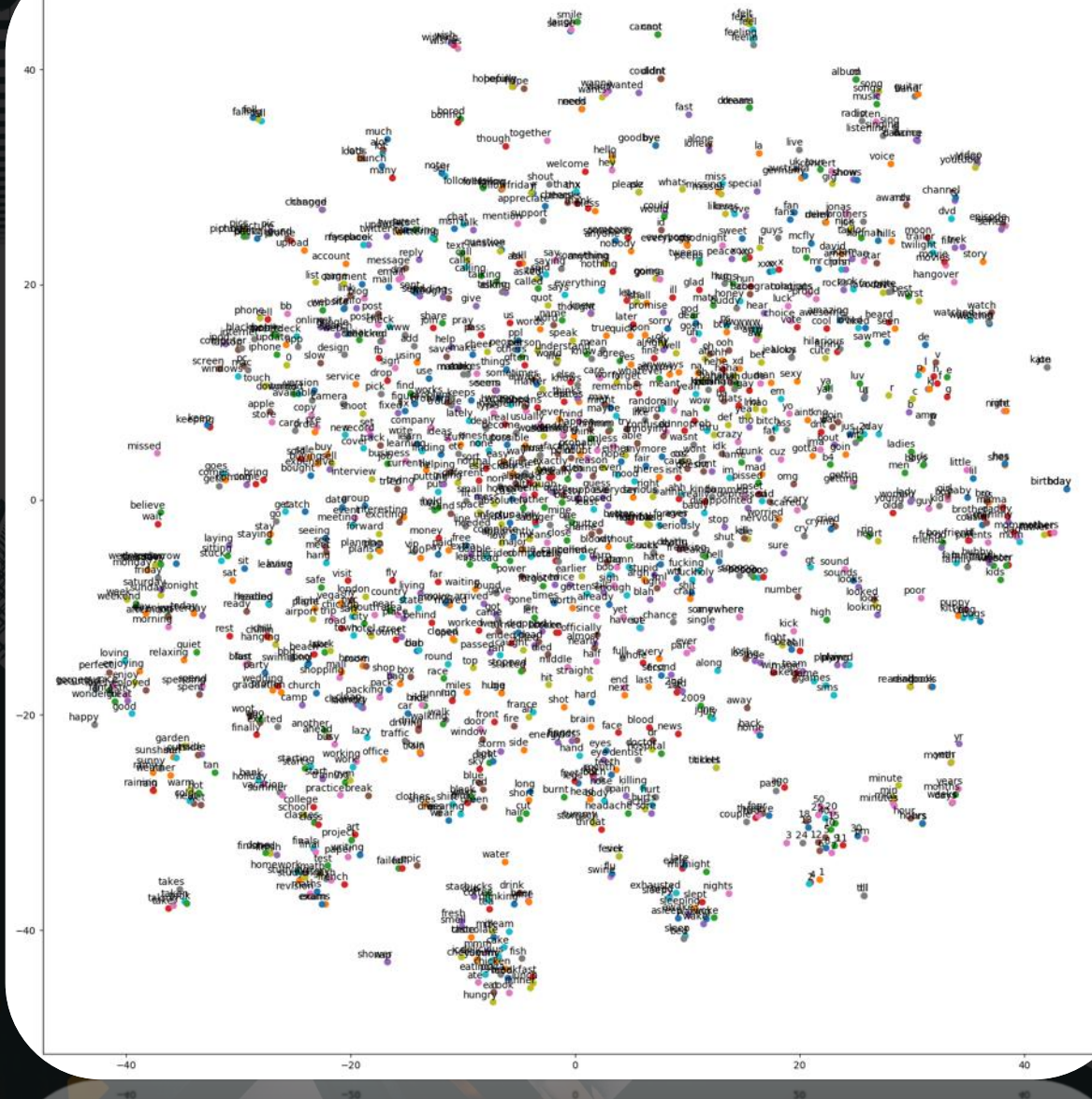
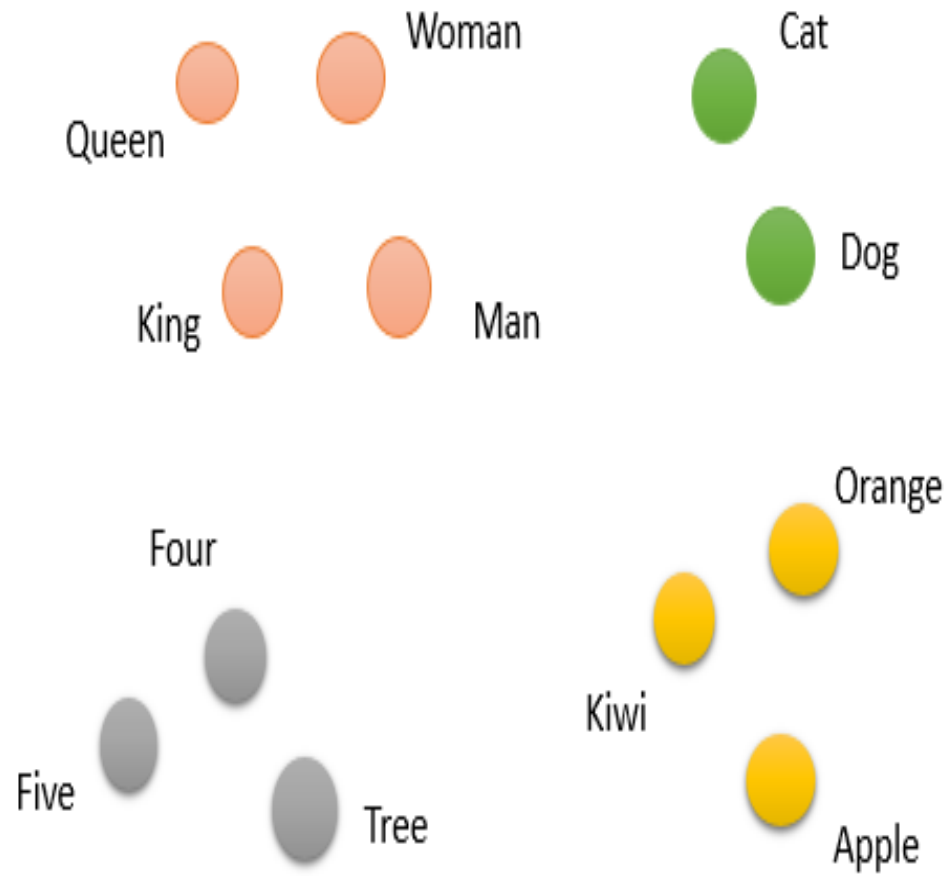
Word Clustering



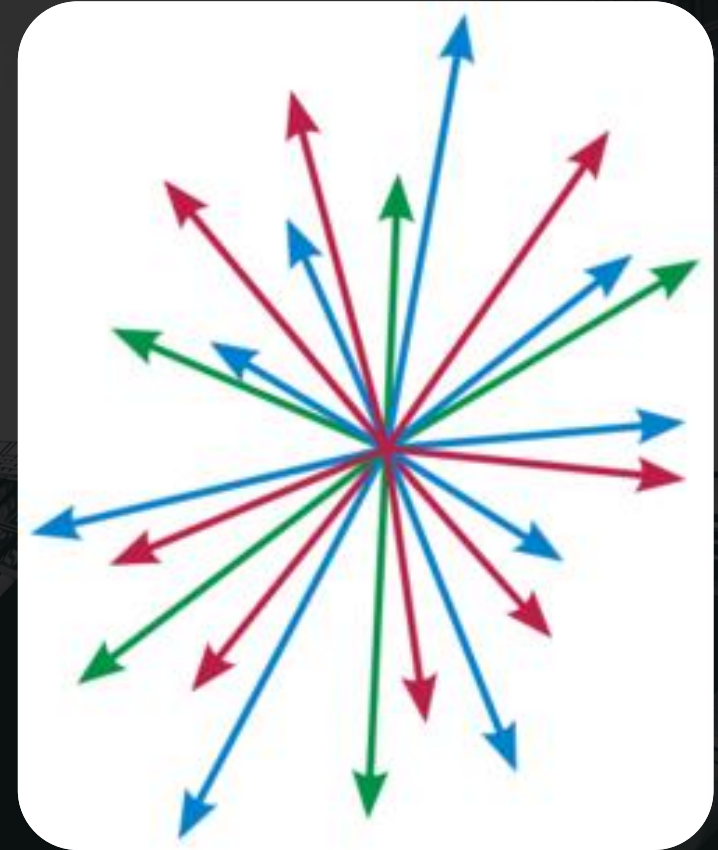
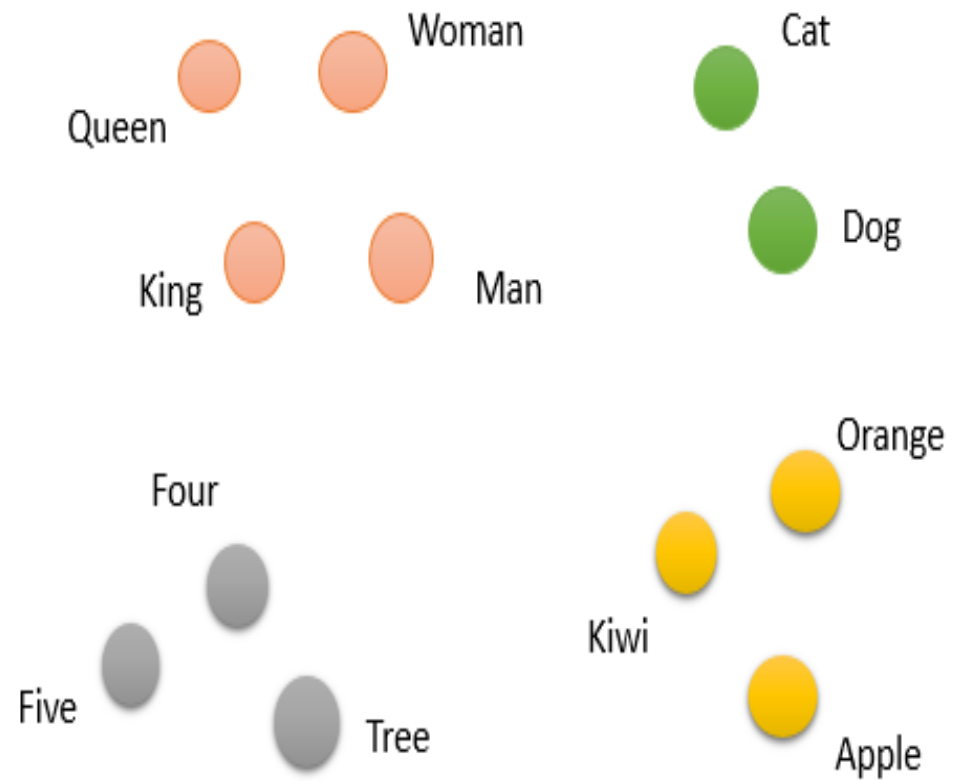
Word Clustering



Word Clustering Issues



Word Clustering Issues



Oil Well Clustering Issues

- 它的目的是
- 提供尽
- 可能精
- 精确且便
- 提供
- 古代原典
- 尤其先
- 秦两汉
- 文献
- 资料
- 提示
- 底本

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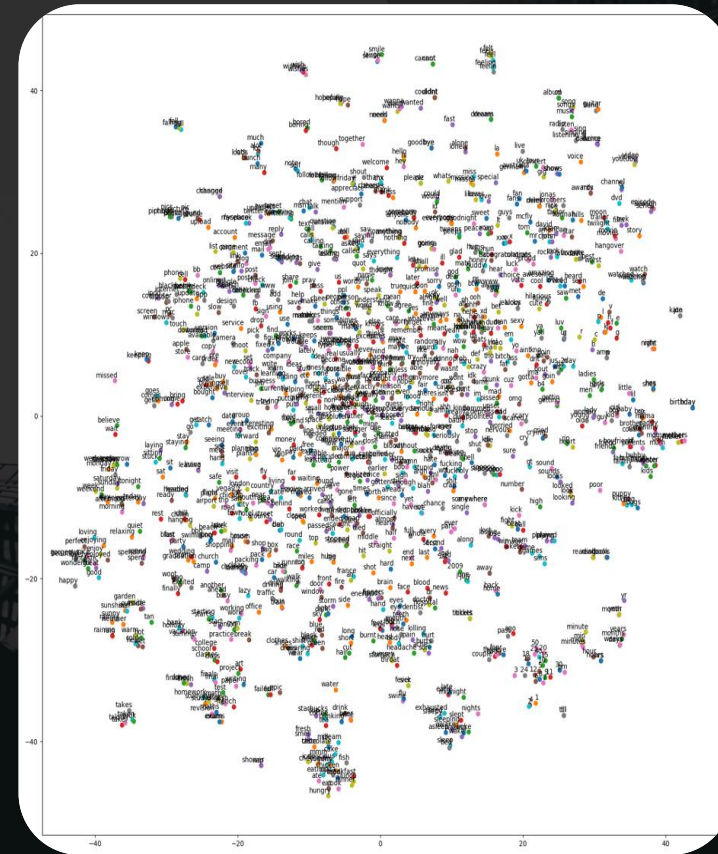
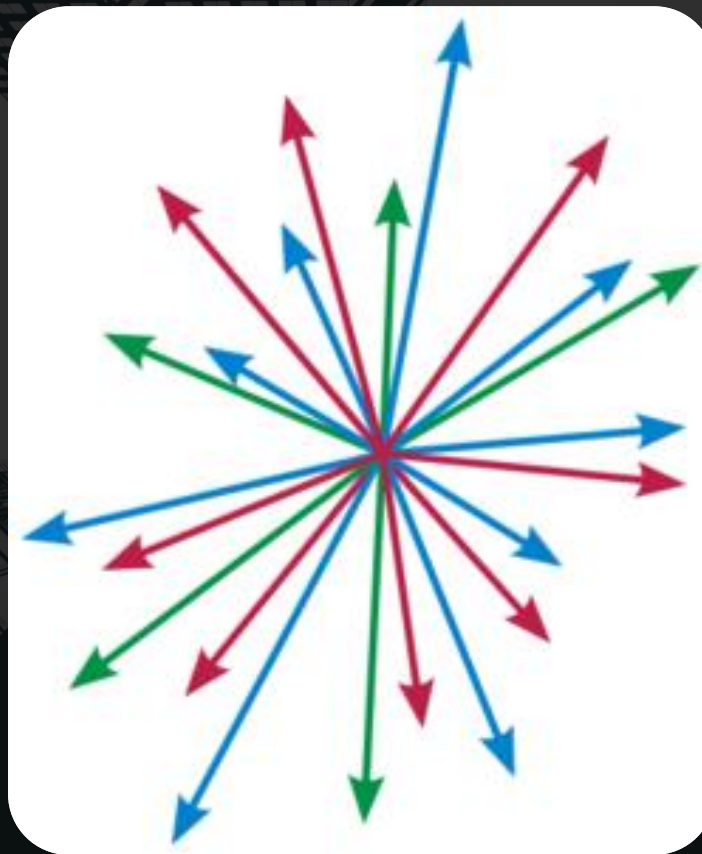
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Clustering Issues

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Data Set

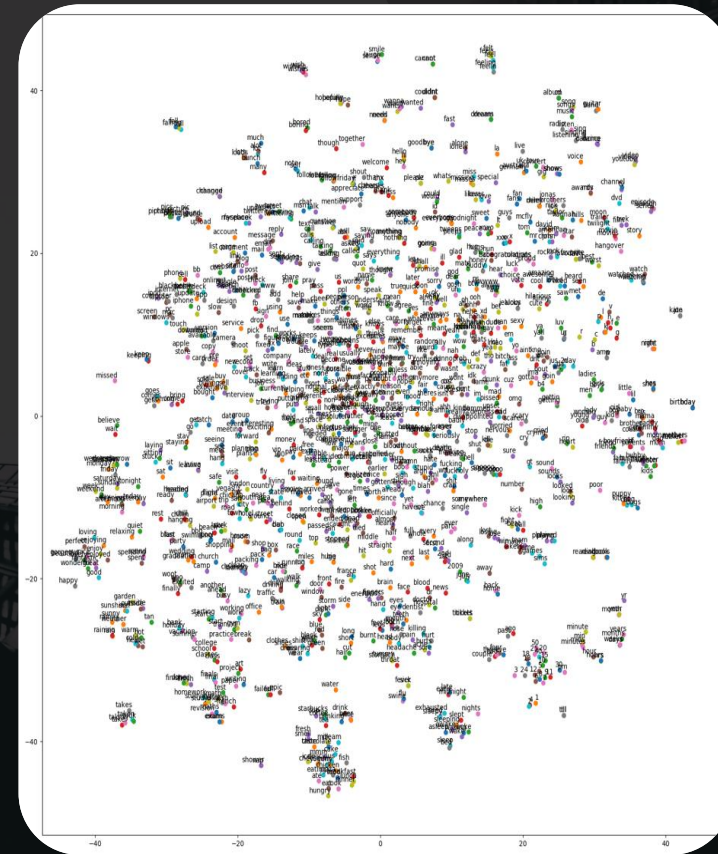
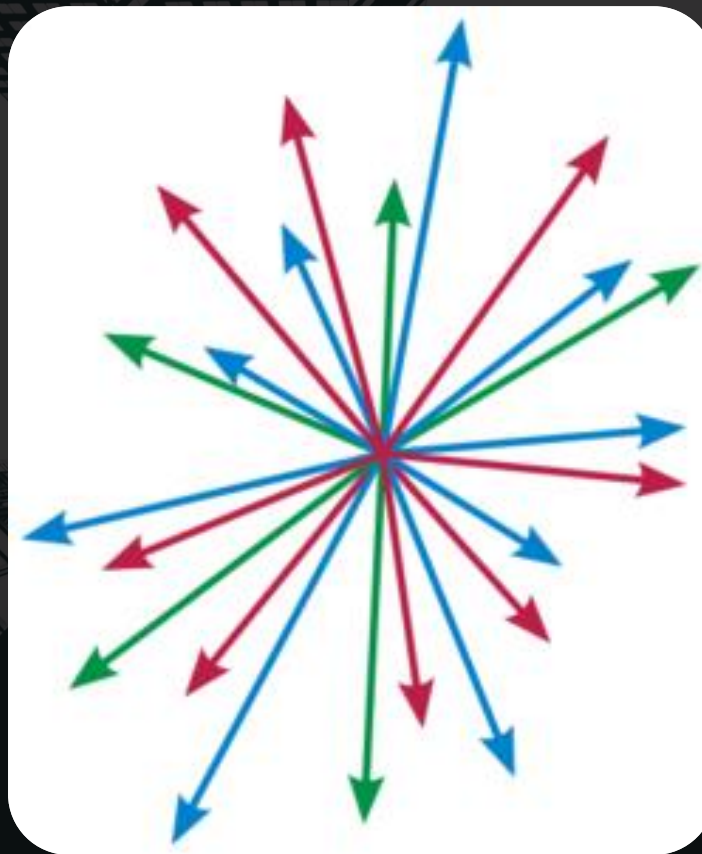
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
	Well location	Well Type	Well Configuration								Drilling Fluid		Perforation Intervals	Rock Properties			
	Well No.	Longitude	Latitude	Oil/Gas	Top MD (ft)	Bottom MD (ft)	Interval Length (ft)	Open/Cased	Column Volume	Radius (in)	Water/Oil-Based	Loss/Gain	Diameter	Shot Density	Carbonate/Sandstone	Porosity	Permeability (D)
1	1	3334.762469	3537.053393	Oil	8816.212301	8967.12308	150.9107791	Cased		4.5	Water-Based	No Loss		4	Carbonate	0.105185739	8.27419
2	1	3334.762469	3537.053393	Oil	8967.12308	9125.785817	158.6627365	Cased		4.5	Water-Based	No Loss		4	Carbonate	0.167290185	9.02618
3	1	3334.762469	3537.053393	Oil	9125.785817	9191.853363	66.06754636	Cased		4.5	Water-Based	No Loss		4	Carbonate	0.201910528	14.4450
4	1	3334.762469	3537.053393	Oil	9191.853363	9278.046567	86.19320383	Cased		4.5	Water-Based	No Loss		4	Carbonate	0.184887202	17.8487
5	1	3334.762469	3537.053393	Oil	9278.046567	9325.446879	47.40031181	Cased		4.5	Water-Based	No Loss		4	Carbonate	0.102393864	12.1430
6	2	4550.482775	9456.020793	Oil	7308.46534	7361.233067	52.7677278	Cased		4.5	Oil-Based	No Loss		4	Sandstone	0.199186378	201.103
7	2	4550.482775	9456.020793	Oil	7361.233067	7378.846021	17.61295364	Cased		4.5	Oil-Based	No Loss		4	Sandstone	0.19723803	266.70
8	2	4550.482775	9456.020793	Oil	7378.846021	7388.071962	9.225941207	Cased		4.5	Oil-Based	No Loss		4	Sandstone	0.197672935	102.242
9	2	4550.482775	9456.020793	Oil	7388.071962	7440.548719	52.47675674	Cased		4.5	Oil-Based	No Loss		4	Sandstone	0.177012938	253.382
10	2	4550.482775	9456.020793	Oil	7440.548719	7476.91259	36.36387084	Cased		4.5	Oil-Based	No Loss		4	Sandstone	0.21358746	189.136
11	3	7958.012283	3673.132135	Oil	7497.84777	7557.937581	60.08981059	Cased		2.875	Water-Based	No Loss		4	Carbonate	0.110356684	1.18402
12	3	7958.012283	3673.132135	Oil	7557.937581	7627.579223	69.64164216	Cased		2.875	Water-Based	No Loss		4	Carbonate	0.179204192	4.23505
13	3	7958.012283	3673.132135	Oil	7627.579223	7705.082787	77.50356385	Cased		2.875	Water-Based	No Loss		4	Carbonate	0.166863208	5.89510
14	3	7958.012283	3673.132135	Oil	7705.082787	7714.62039	9.537602845	Cased		2.875	Water-Based	No Loss		4	Carbonate	0.188757047	2.68803
15	3	7958.012283	3673.132135	Oil	7714.62039	7778.797633	64.1772428	Cased		2.875	Water-Based	No Loss		4	Carbonate	0.132871684	1.42891
16																	
17																	
18																	
19																	
20	4	8756.720147	5036.123793	Gas	11721.11856	11738.99503	17.87647024	Cased		2.875	Water-Based	No Loss		4	Carbonate	0.099005298	0.20461
21	4	8756.720147	5036.123793	Gas	11738.99503	11752.29066	13.29563393	Cased		2.875	Water-Based	No Loss		4	Carbonate	0.075835405	1.00848
22	4	8756.720147	5036.123793	Gas	11752.29066	11763.82978	11.53912196	Cased		2.875	Water-Based	No Loss		4	Carbonate	0.066200741	0.54898
23	4	8756.720147	5036.123793	Gas	11763.82978	11770.55661	6.726831255	Cased		2.875	Water-Based	No Loss		4	Carbonate	0.102244245	1.18144
24	4	8756.720147	5036.123793	Gas	11770.55661	11777.17488	6.618270114	Cased		2.875	Water-Based	No Loss		4	Carbonate	0.143815312	1.0634
25																	
26																	
27	5	31.5551019	509.1480307	Oil	8743.961933	8851.702312	107.7403784	Cased		2.375	Water-Based	No Loss		4	Carbonate	0.178308974	49.2798
28	5	31.5551019	509.1480307	Oil	8851.702312	8973.300715	121.5984031	Cased		2.375	Water-Based	No Loss		4	Carbonate	0.191445102	30.2522
29	5	31.5551019	509.1480307	Oil	8973.300715	9133.807489	160.5067741	Cased		2.375	Water-Based	No Loss		4	Carbonate	0.207295696	28.6082
30	5	31.5551019	509.1480307	Oil	9133.807489	9141.575349	7.767860539	Cased		2.375	Water-Based	No Loss		4	Carbonate	0.19877978	64.9384
31	5	31.5551019	509.1480307	Oil	9141.575349	9288.051947	146.4765975	Cased		2.375	Water-Based	No Loss		4	Carbonate	0.122108853	85.3364
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Sheet1

Go to Activate Windows

Oil Well Clustering Issues

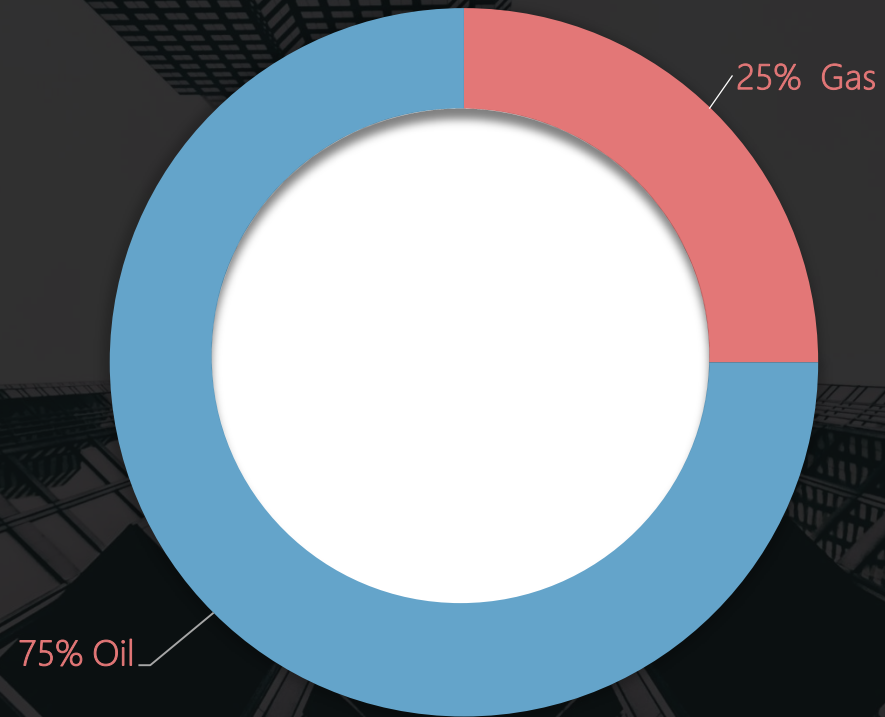
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Descriptive Analytics

Oil/Gas Feature



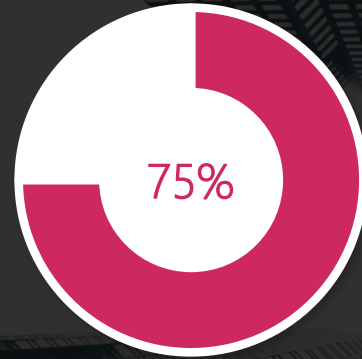
Carbonate Sandstone Distribution

Sandstone | 25%

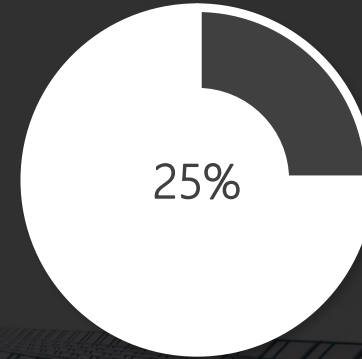


Carbonate | 75%

Open Cased Feature



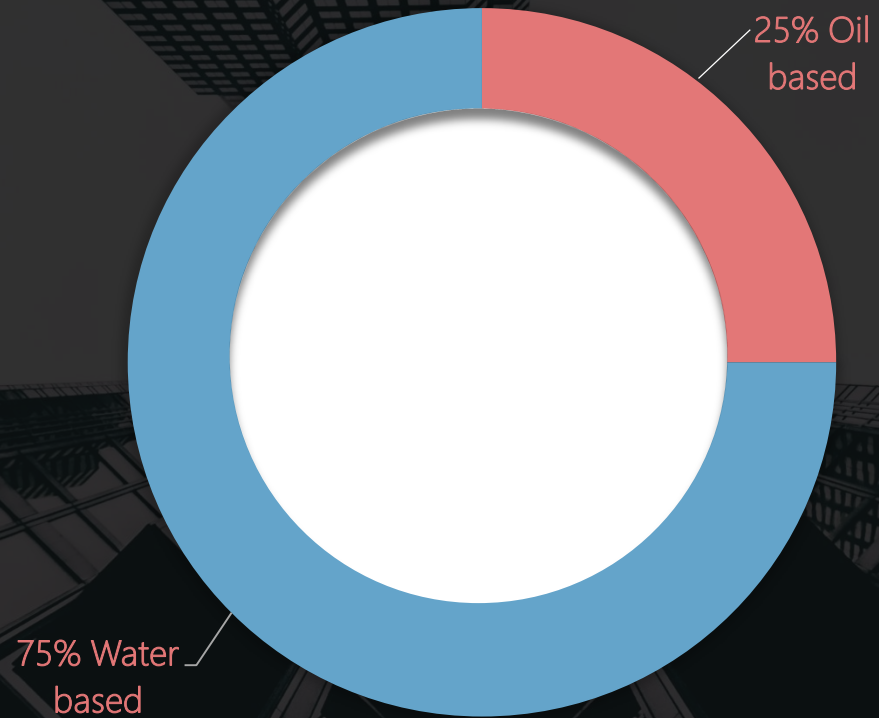
cased



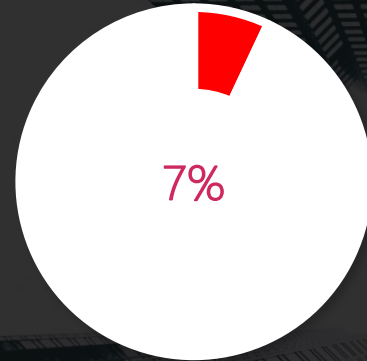
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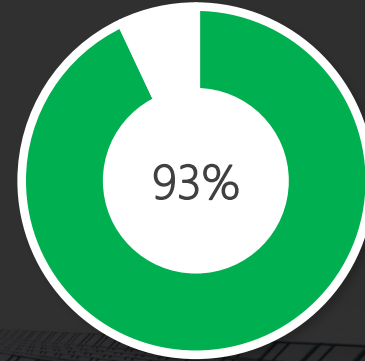
Oil/Water-Based Feature



Loss/No Loss Feature



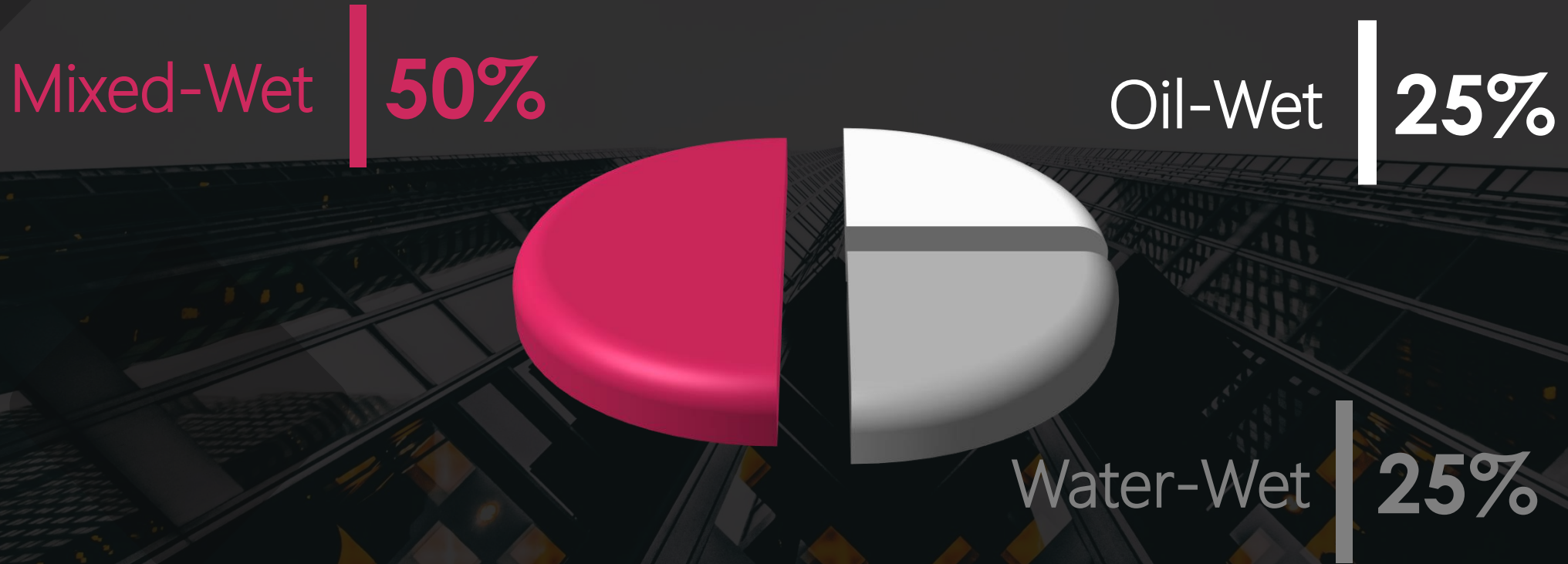
Loss



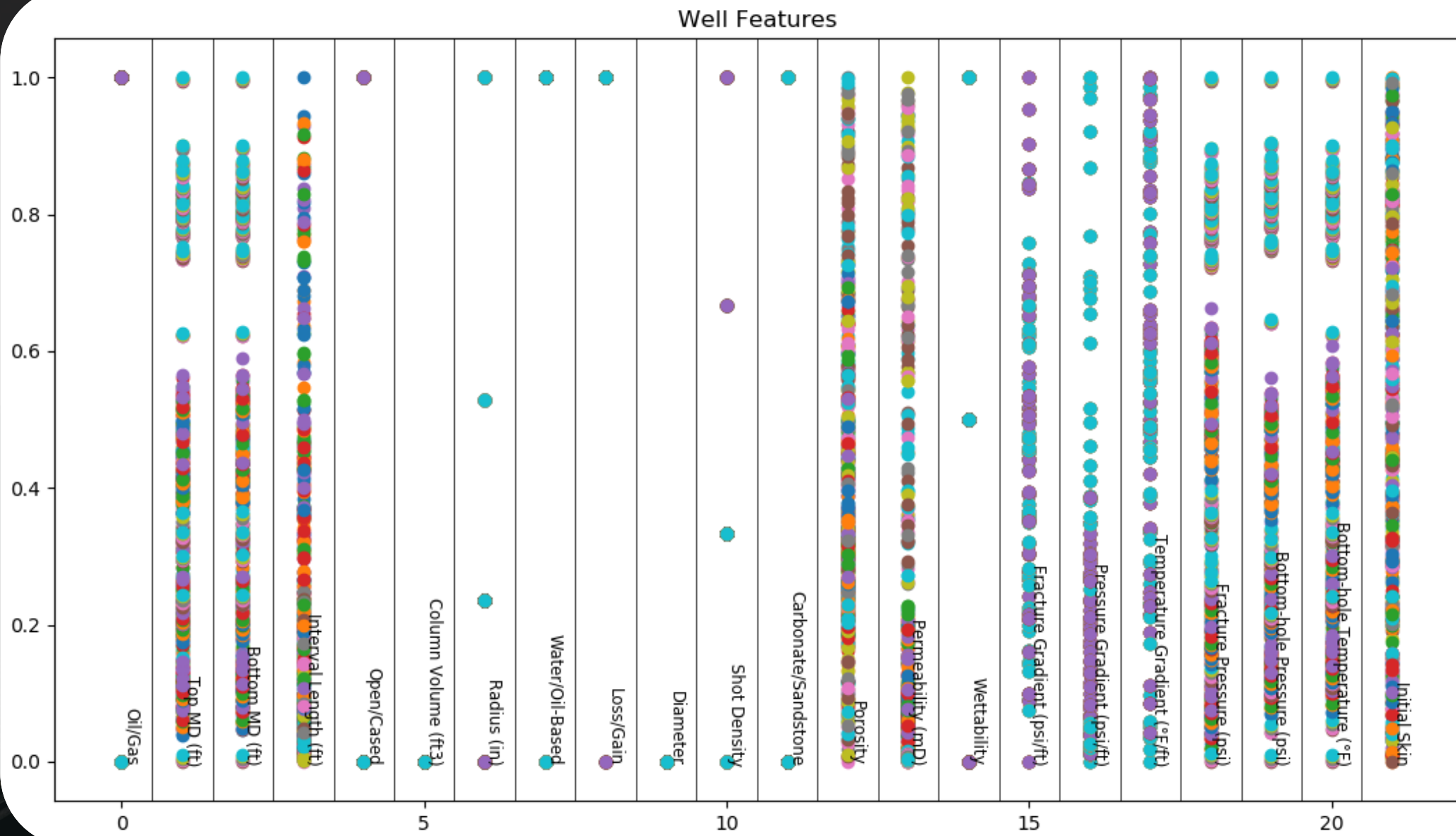
No Loss



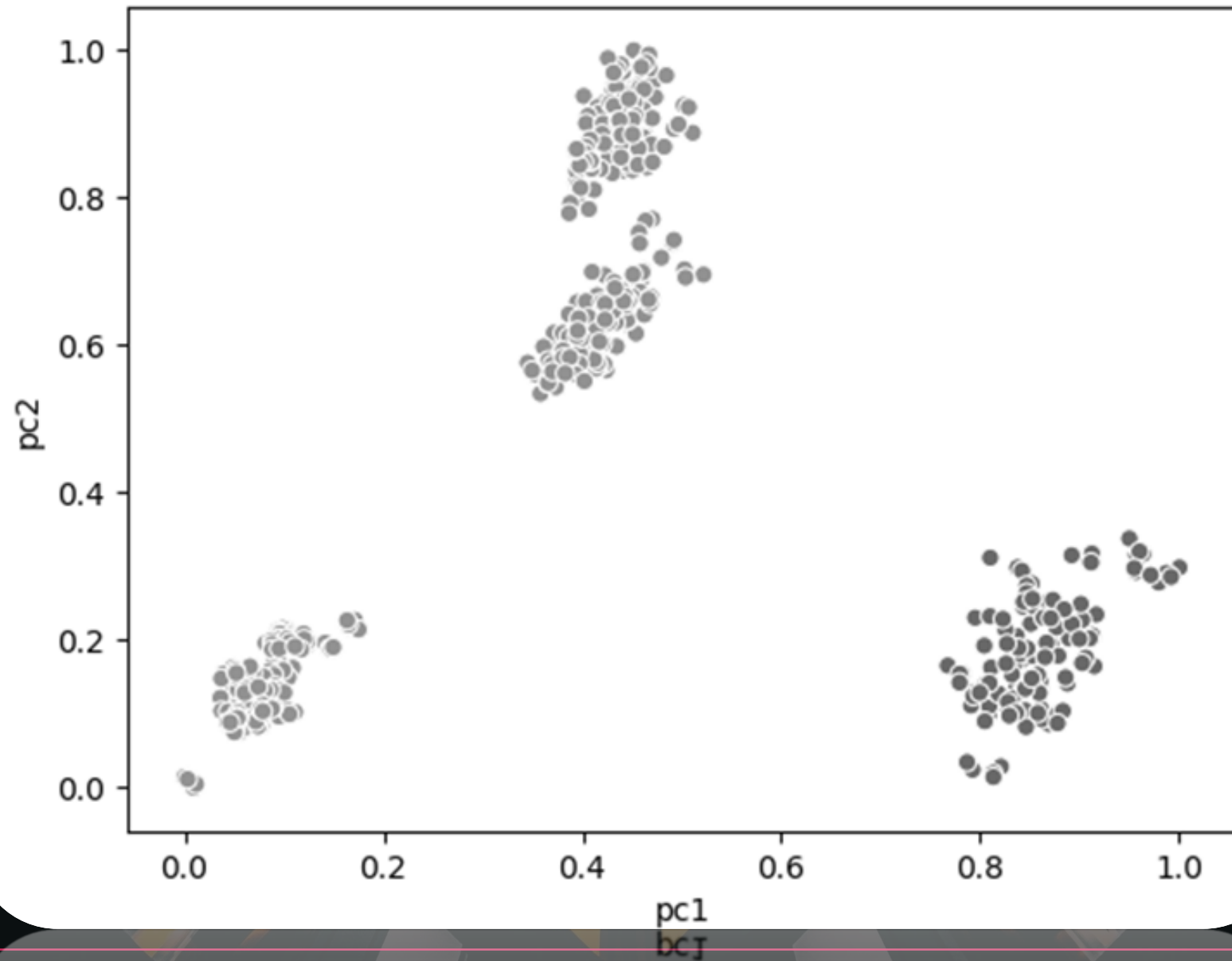
Wettability Distribution



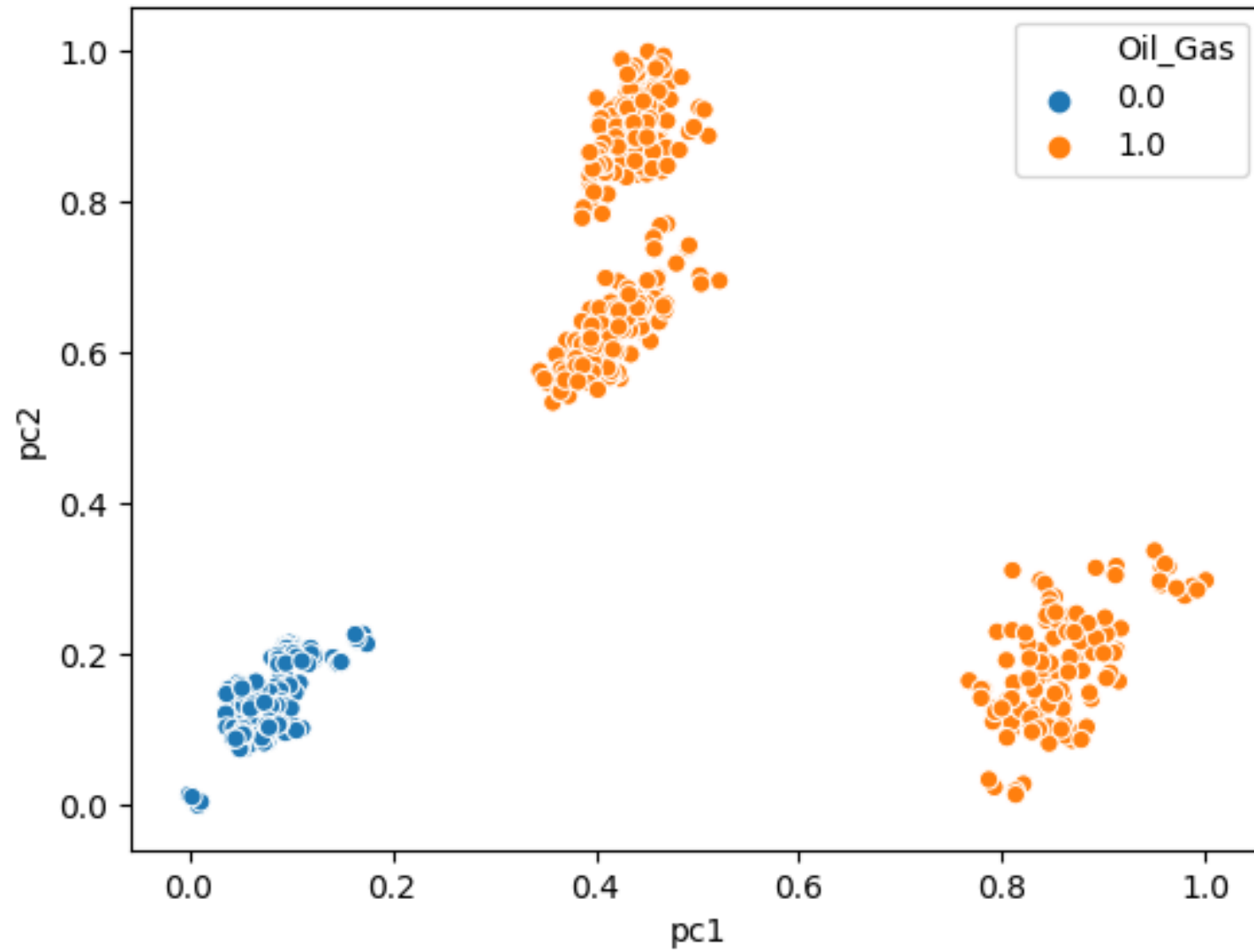
Distribution of features



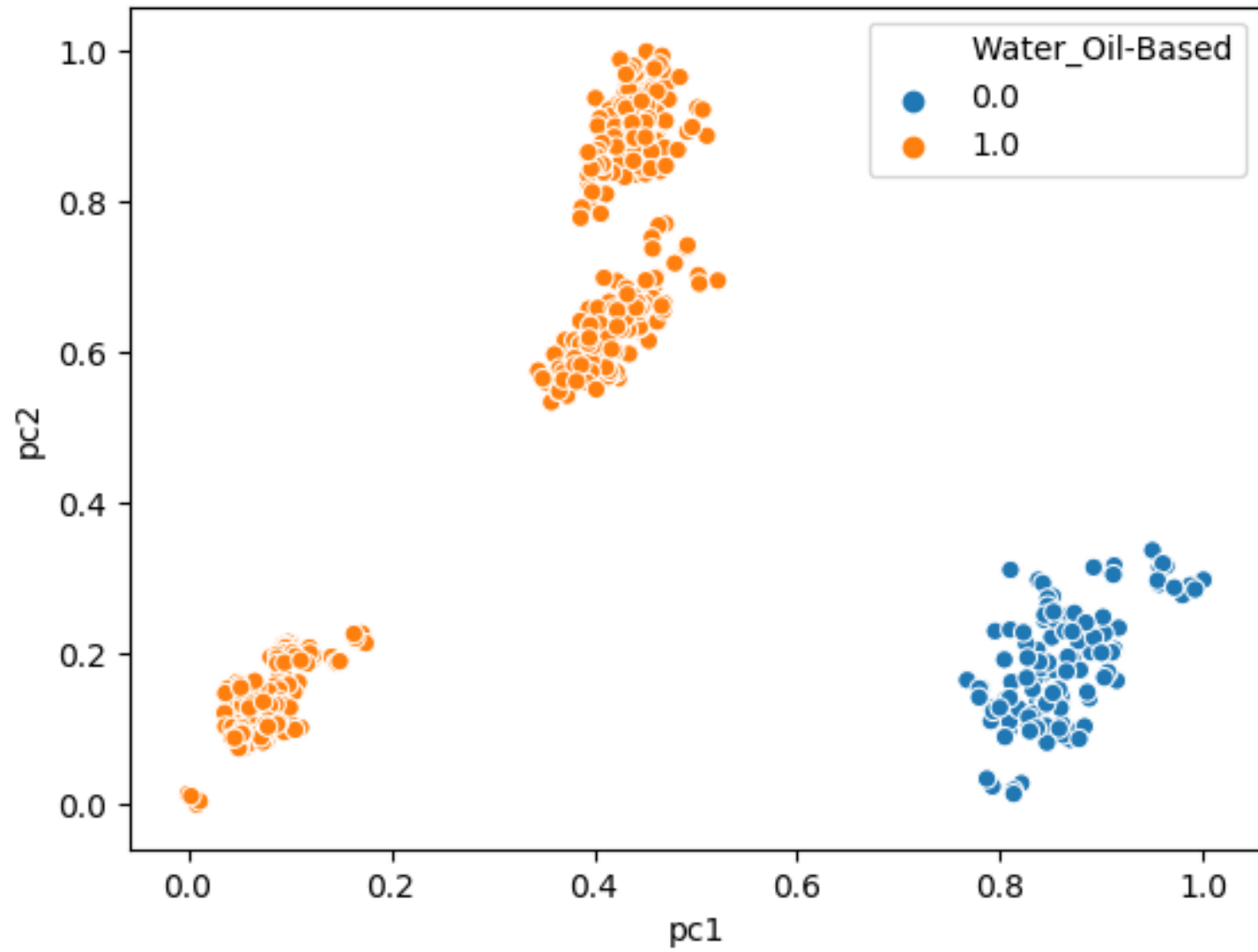
Distribution of features



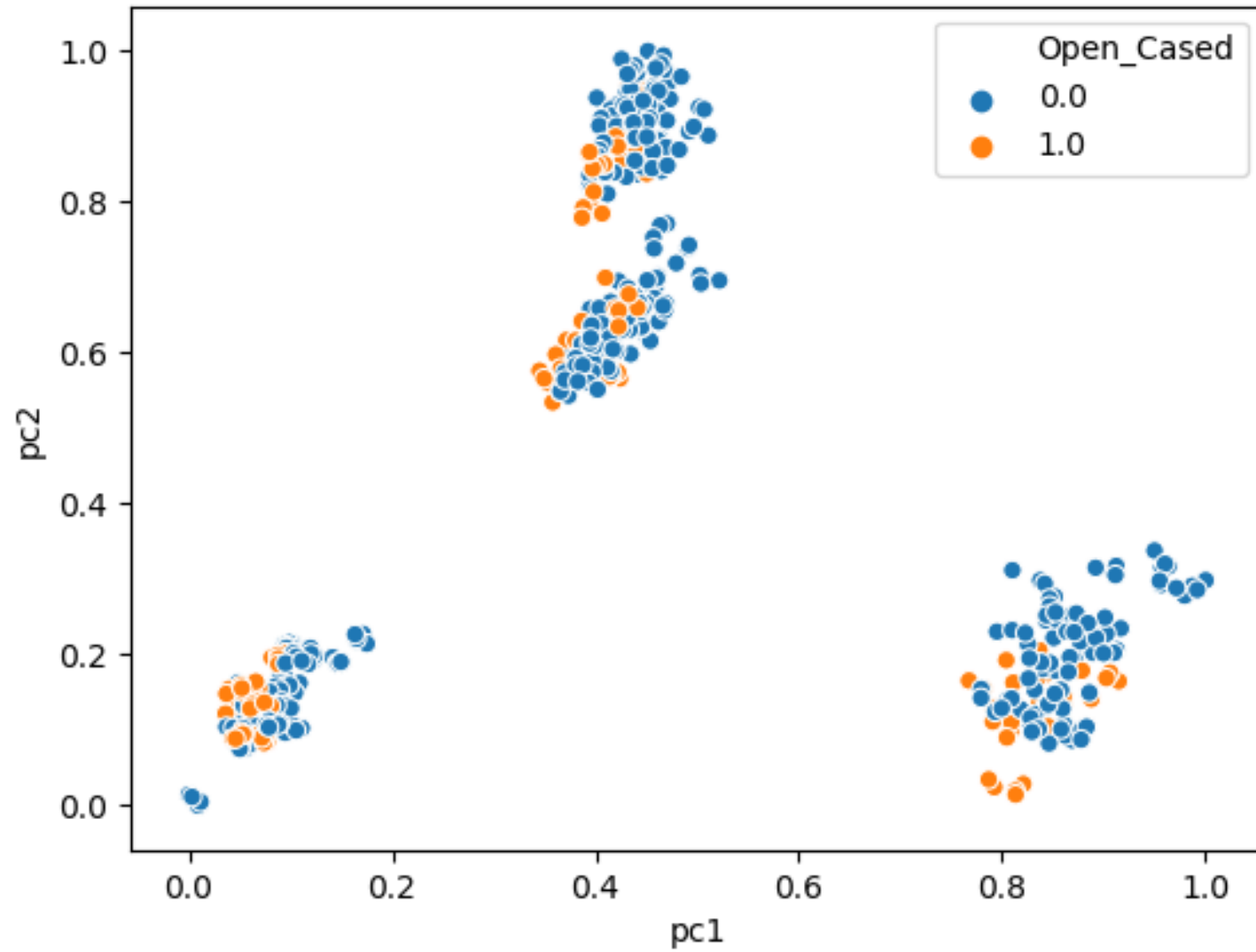
Distribution of features



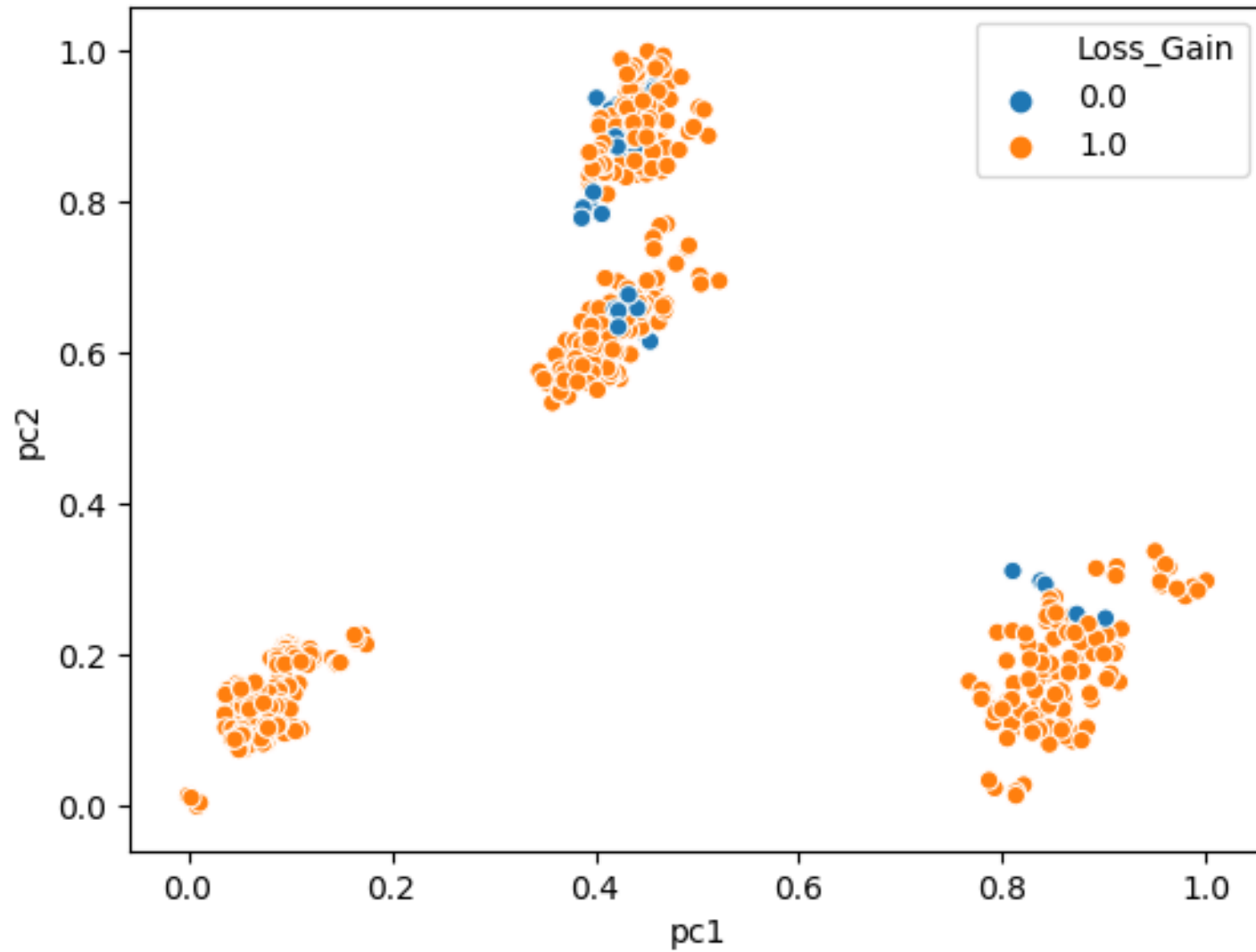
Distribution of features



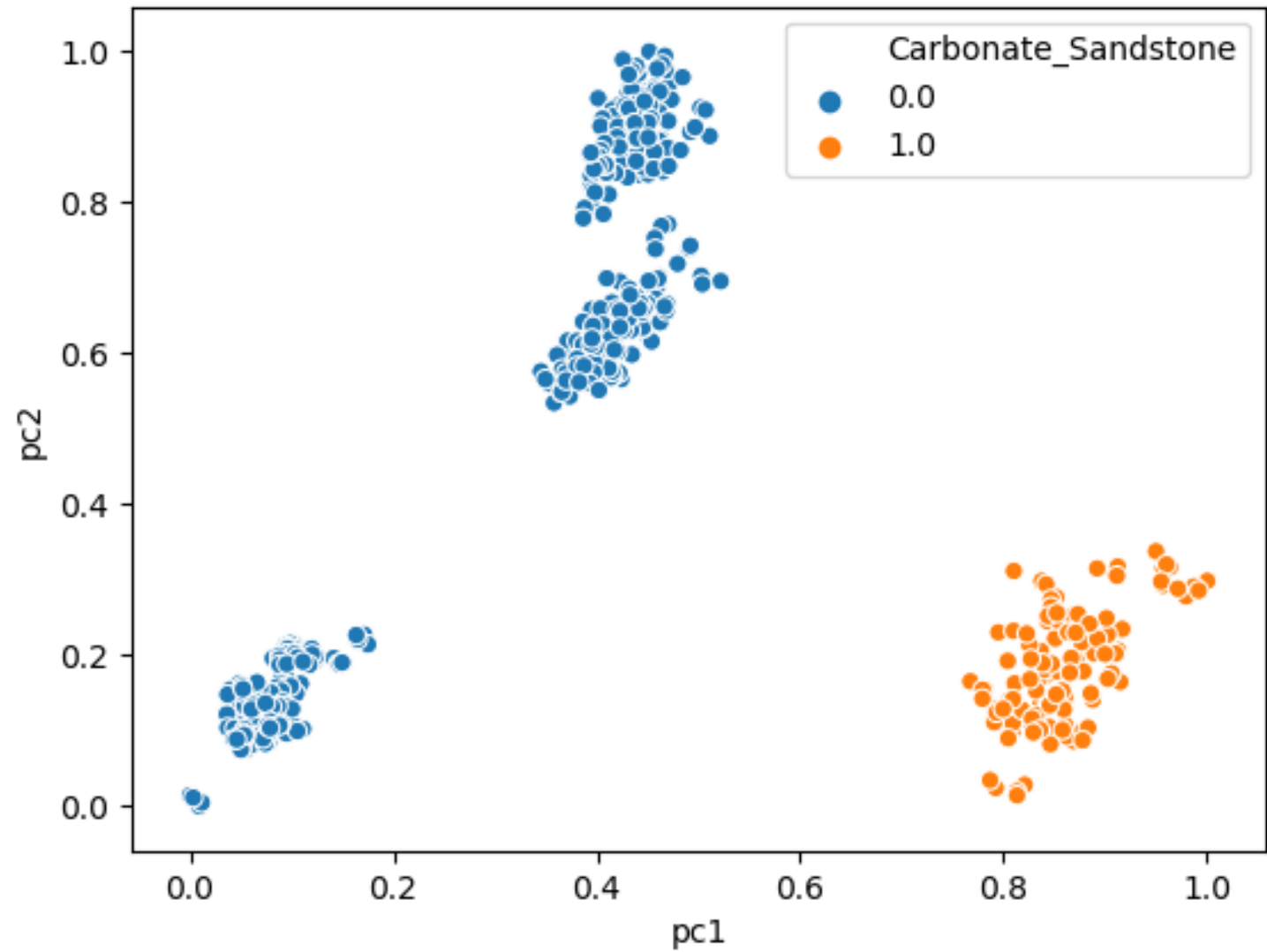
Distribution of features



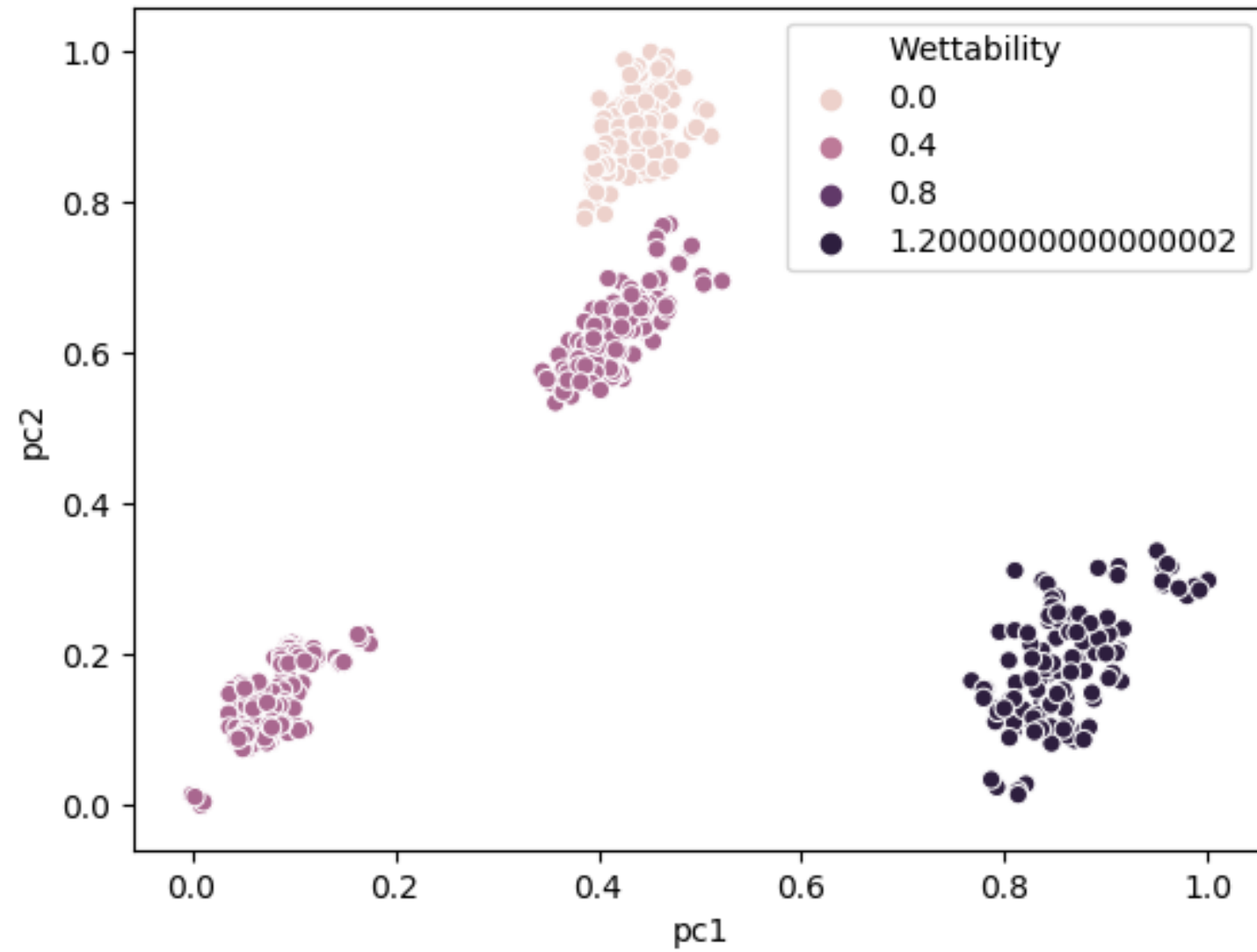
Distribution of features



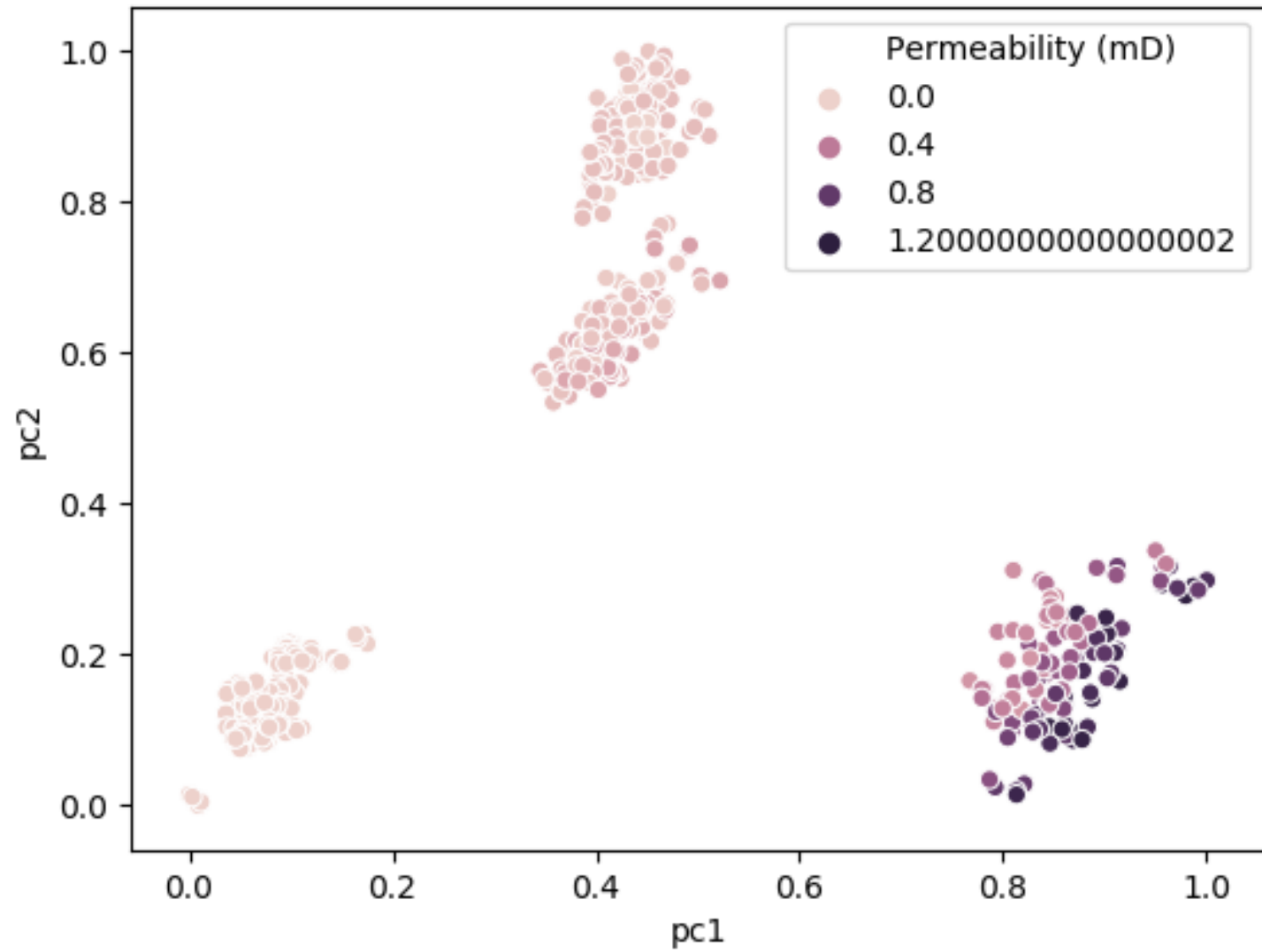
Distribution of features



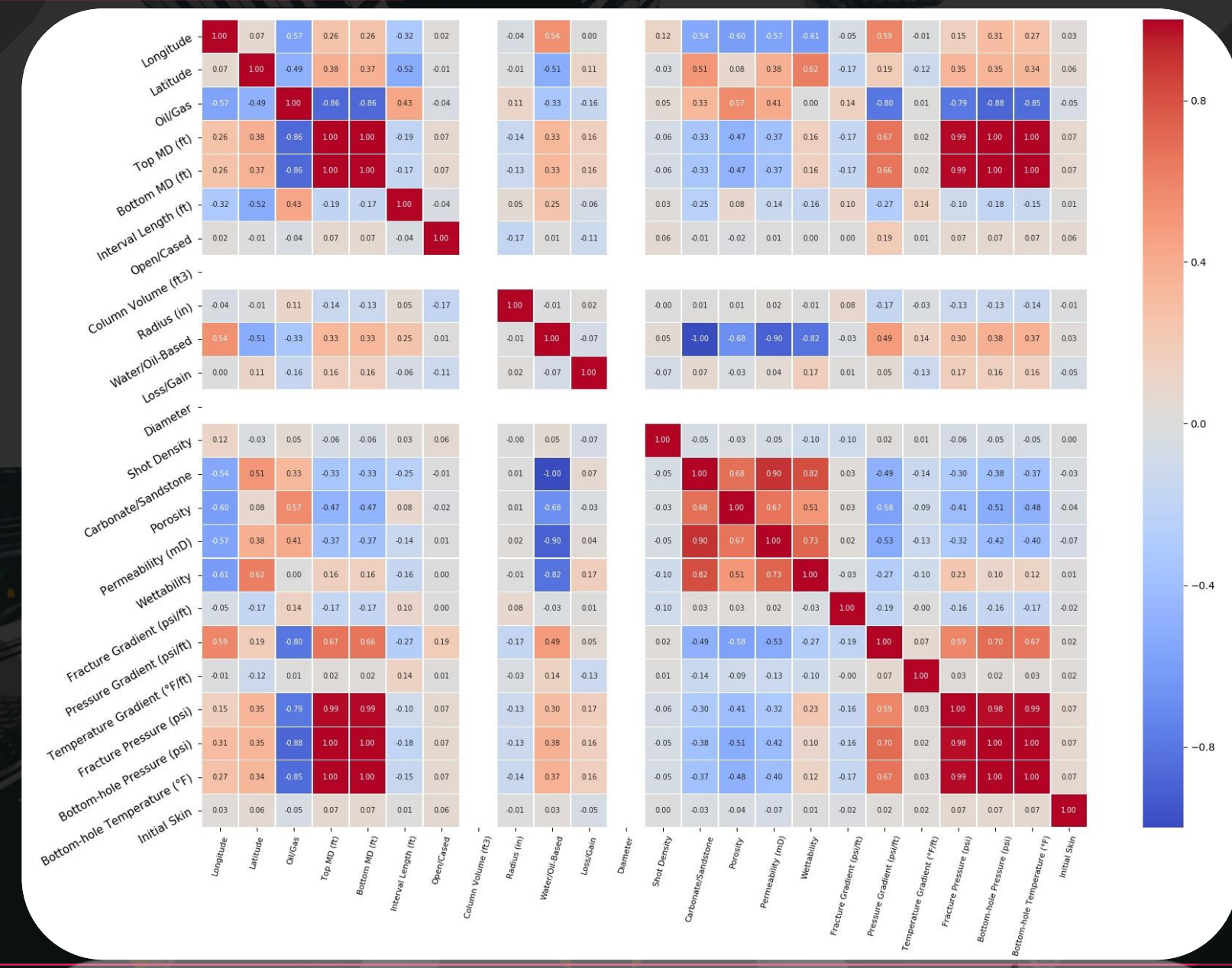
Distribution of features



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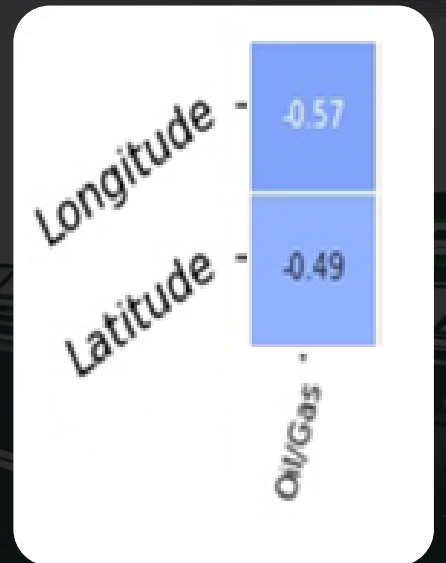
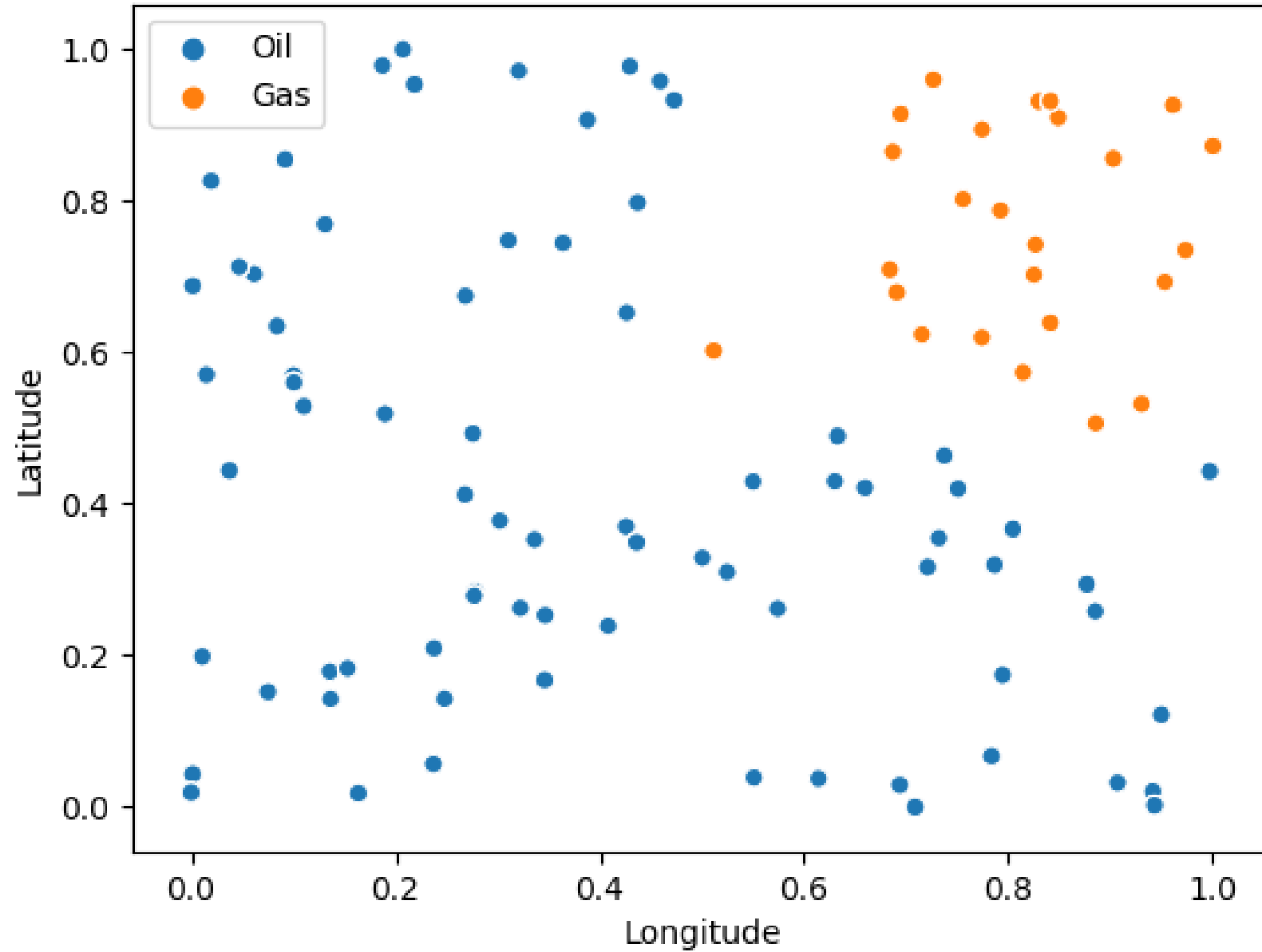


Correlation Hit Map



Longitude	1.00	0.07	-0.57	0.26	0.26	-0.32	0.02	-0.04	0.54	0.00	0.12	-0.54	-0.60	-0.57	-0.61	-0.05	0.59	-0.01	0.15	0.31	0.27	0.03		
Latitude	0.07	1.00	-0.49	0.38	0.37	-0.52	-0.01	-0.01	-0.51	0.11	-0.03	0.51	0.08	0.38	0.62	-0.17	0.19	-0.12	0.35	0.35	0.34	0.06		
	Longitude	Latitude	Oil/Gas	Top MD (ft)	Bottom MD (ft)	Interval Length (ft)	Open/Cased	Column Volume (ft3)	Radius (in)	Water/Oil-Based	Loss/Gain	Diameter	Shot Density	Carbonate/Sandstone	Porosity	Permeability (mD)	Wettability	Fracture Gradient (psi/ft)	Pressure Gradient (psi/ft)	Temperature Gradient (°F/ft)	Fracture Pressure (psi)	Bottom-hole Pressure (psi)	Bottom-hole Temperature (°F)	Initial Skin

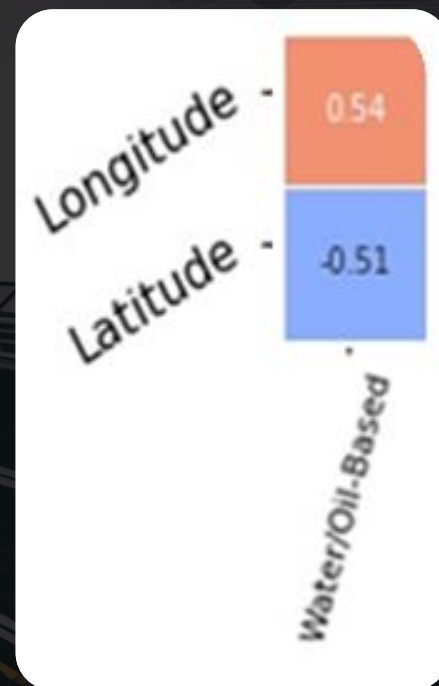
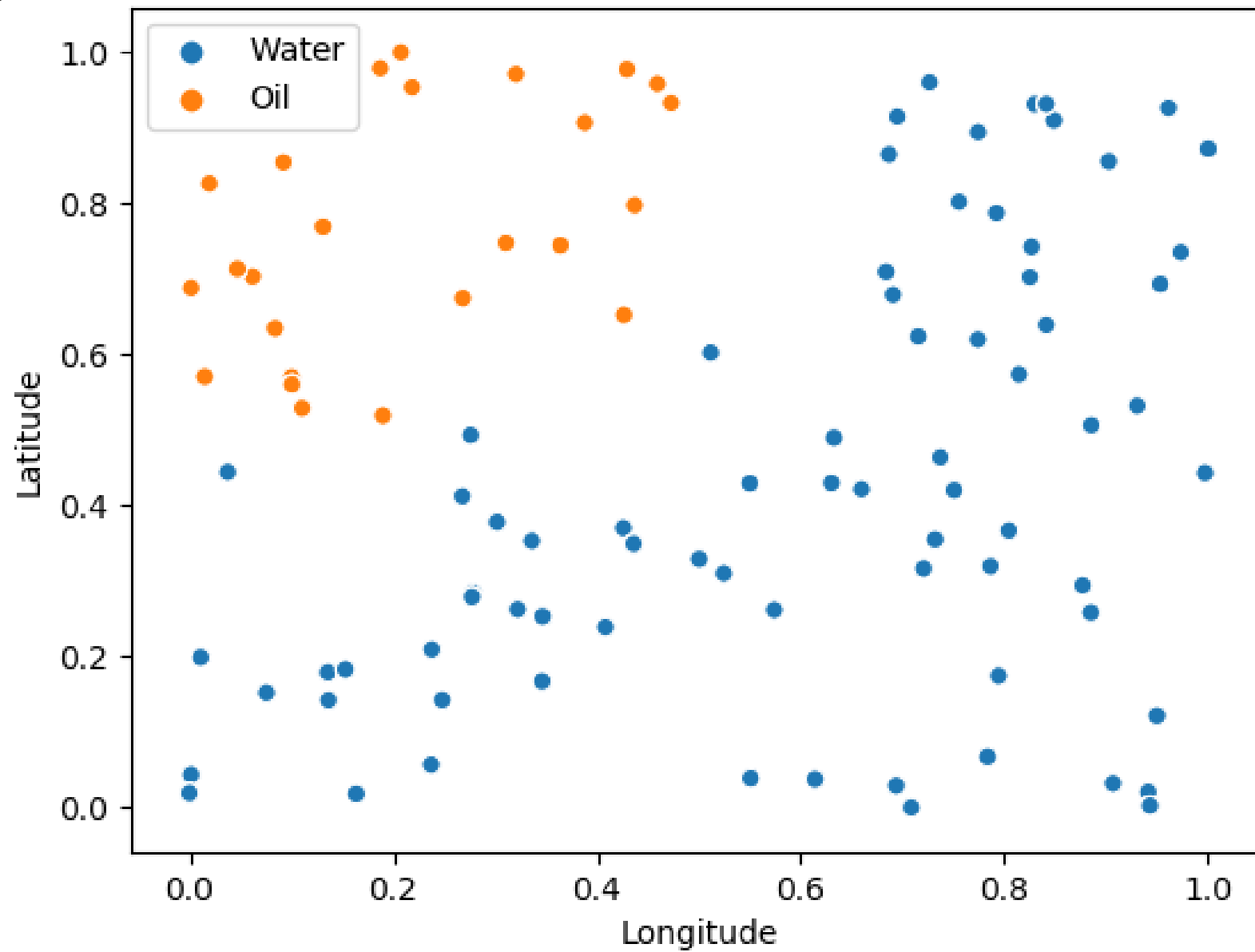
Oil or Gas Wells Based On it's Locations



Correlation Hit Map

Longitude	Longitude	Latitude	Oil/Gas	Top MD (ft)	Bottom MD (ft)	Interval Length (ft)	Open/Cased	Column Volume (ft3)	Radius (in)	Water/Oil-Based	Loss/Gain	Diameter	Shot Density	Carbonate/Sandstone	Porosity	Permeability (mD)	Wettability	Fracture Gradient (psi/ft)	Pressure Gradient (psi/ft)	Temperature Gradient (*F/ft)	Fracture Pressure (psi)	Bottom-hole Pressure (psi)	Bottom-hole Temperature (*F)	Initial Skin
	Latitude	Longitude	Oil/Gas	Top MD (ft)	Bottom MD (ft)	Interval Length (ft)	Open/Cased	Column Volume (ft3)	Radius (in)	Water/Oil-Based	Loss/Gain	Diameter	Shot Density	Carbonate/Sandstone	Porosity	Permeability (mD)	Wettability	Fracture Gradient (psi/ft)	Pressure Gradient (psi/ft)	Temperature Gradient (*F/ft)	Fracture Pressure (psi)	Bottom-hole Pressure (psi)	Bottom-hole Temperature (*F)	Initial Skin
	1.00	0.07	-0.57	0.26	0.26	-0.32	0.02		-0.04	0.54	0.00		0.12	-0.54	-0.60	-0.57	-0.61	-0.05	0.59	-0.01	0.15	0.31	0.27	0.03
	0.07	1.00	-0.49	0.38	0.37	-0.52	-0.01		-0.01	-0.51	0.11		-0.03	0.51	0.08	0.38	0.62	-0.17	0.19	-0.12	0.35	0.35	0.34	0.06

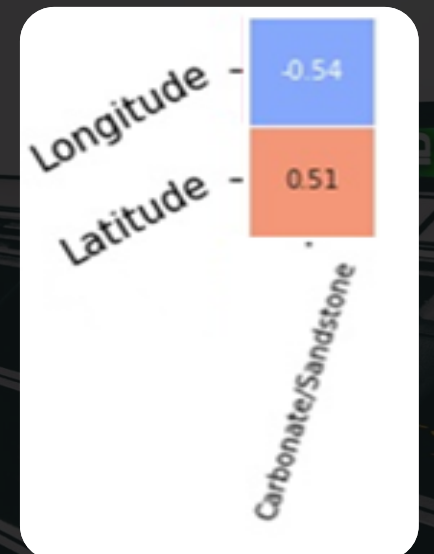
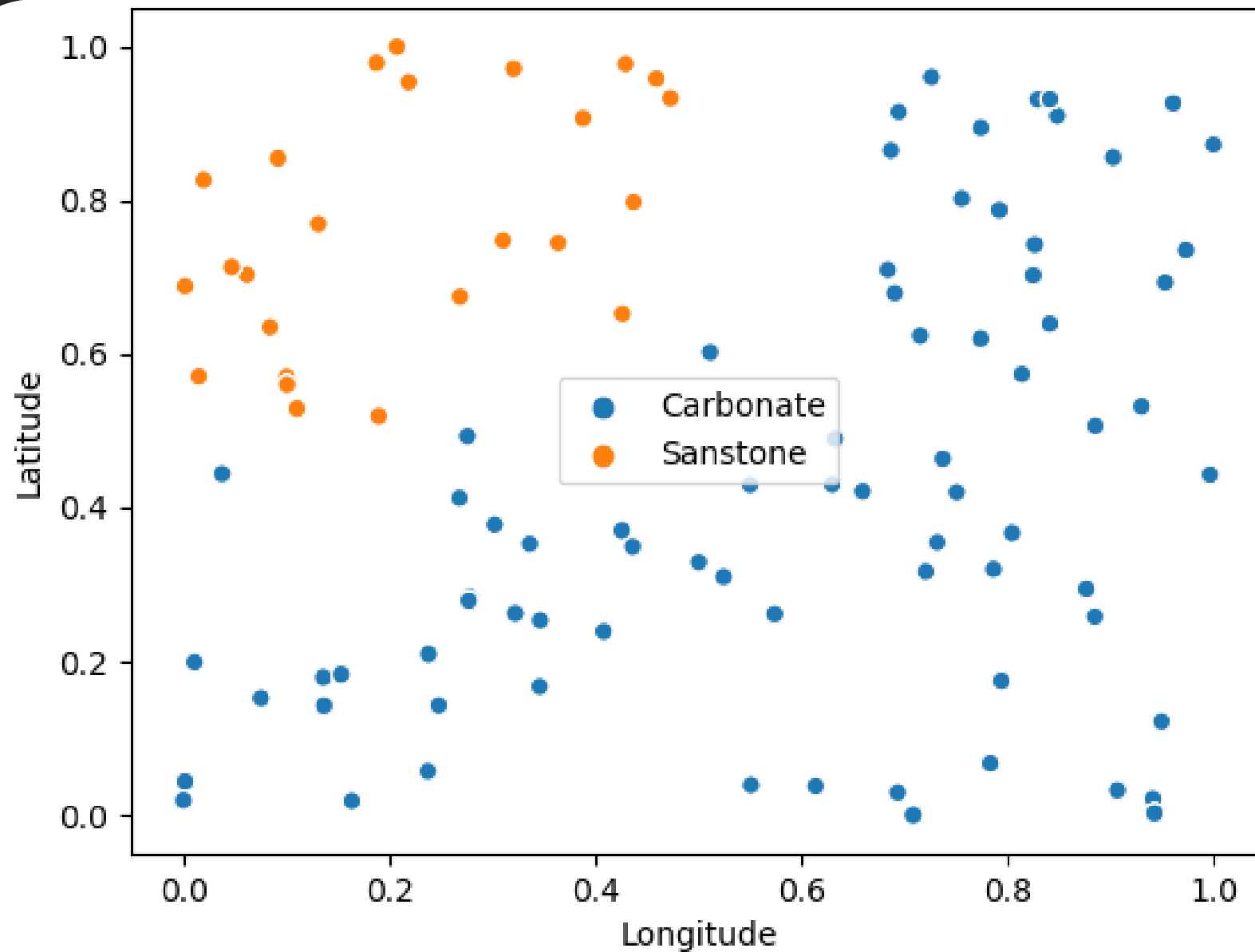
Water-Based or Oil-Based wells and it's Locations



Correlation Hit Map

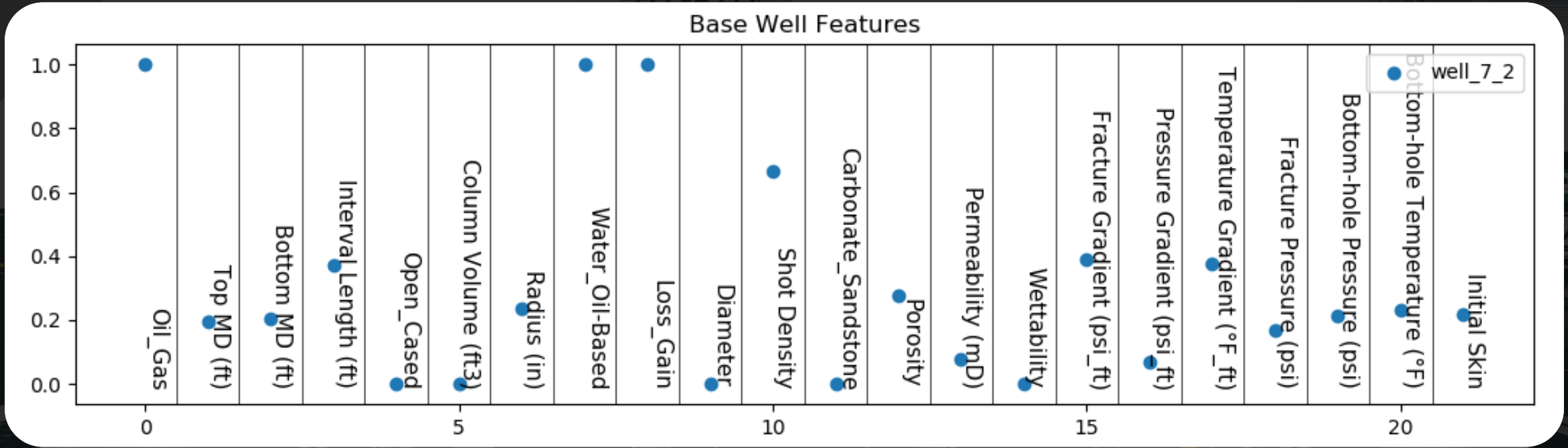
Longitude	1.00	0.07	-0.57	0.26	0.26	-0.32	0.02		-0.04	0.54	0.00		0.12	-0.54	-0.60	-0.57	-0.61	-0.05	0.59	-0.01	0.15	0.31	0.27	0.03
Latitude	0.07	1.00	-0.49	0.38	0.37	-0.52	-0.01		-0.01	-0.51	0.11		-0.03	0.51	0.08	0.38	0.62	-0.17	0.19	-0.12	0.35	0.35	0.34	0.06
	Longitude	Latitude	Oil/Gas	Top MD (ft)	Bottom MD (ft)	Interval Length (ft)	Open/Cased	Column Volume (ft3)	Radius (in)	Water/Oil-Based	Loss/Gain	Diameter	Shot Density	Carbonate/Sandstone	Porosity	Permeability (mD)	Wettability	Fracture Gradient (psi/ft)	Pressure Gradient (psi/ft)	Temperature Gradient (*F/ft)	Fracture Pressure (psi)	Bottom-hole Pressure (psi)	Bottom-hole Temperature (*F)	Initial Skin

Carbonate Or Sandstone wells Based On it's Locations

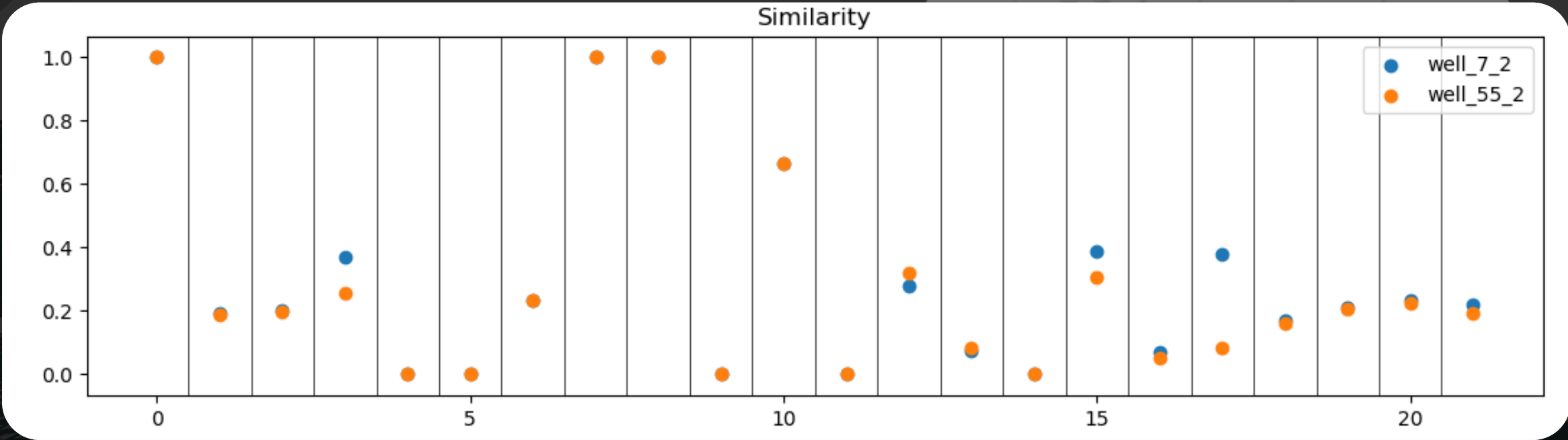


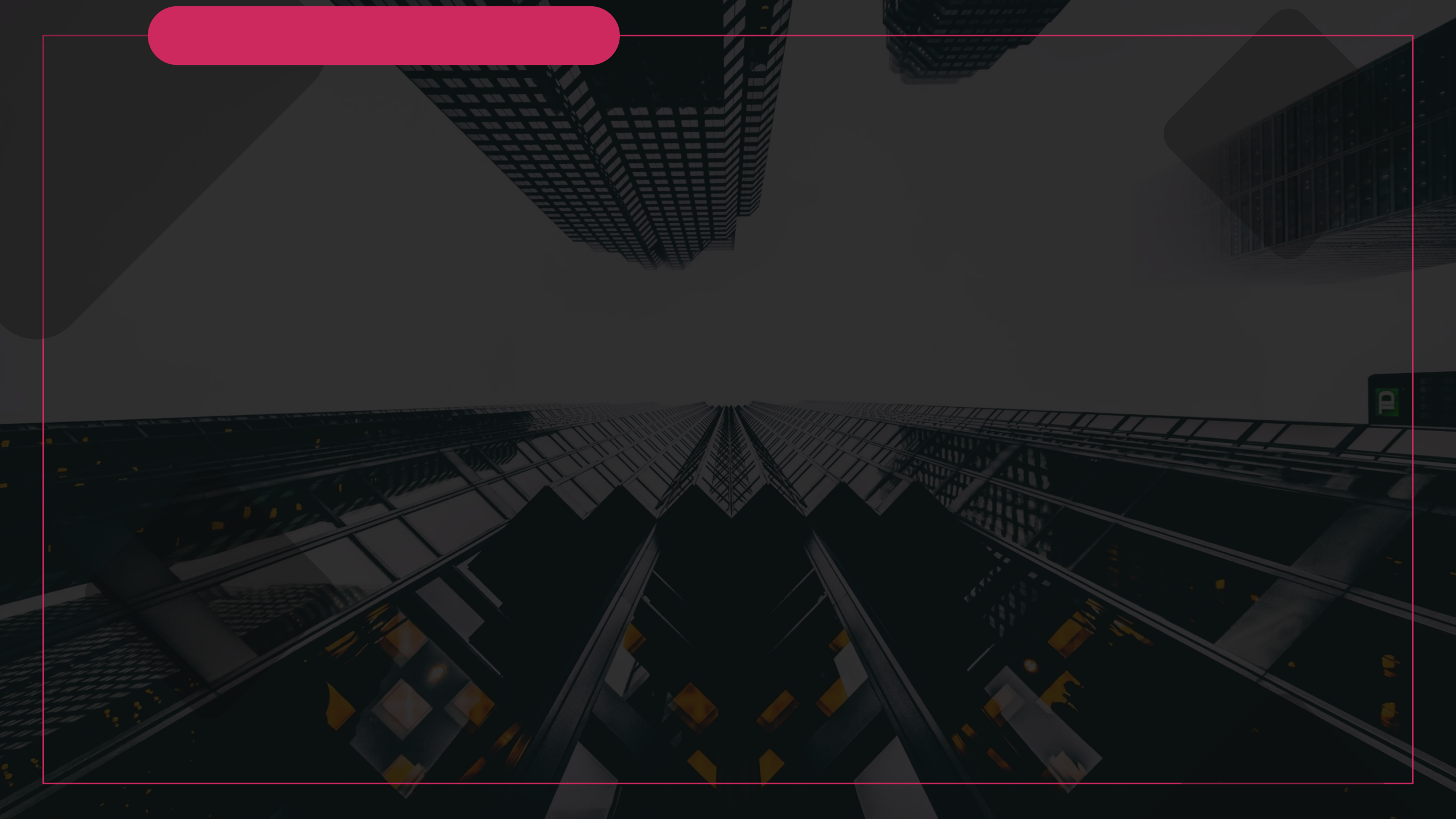


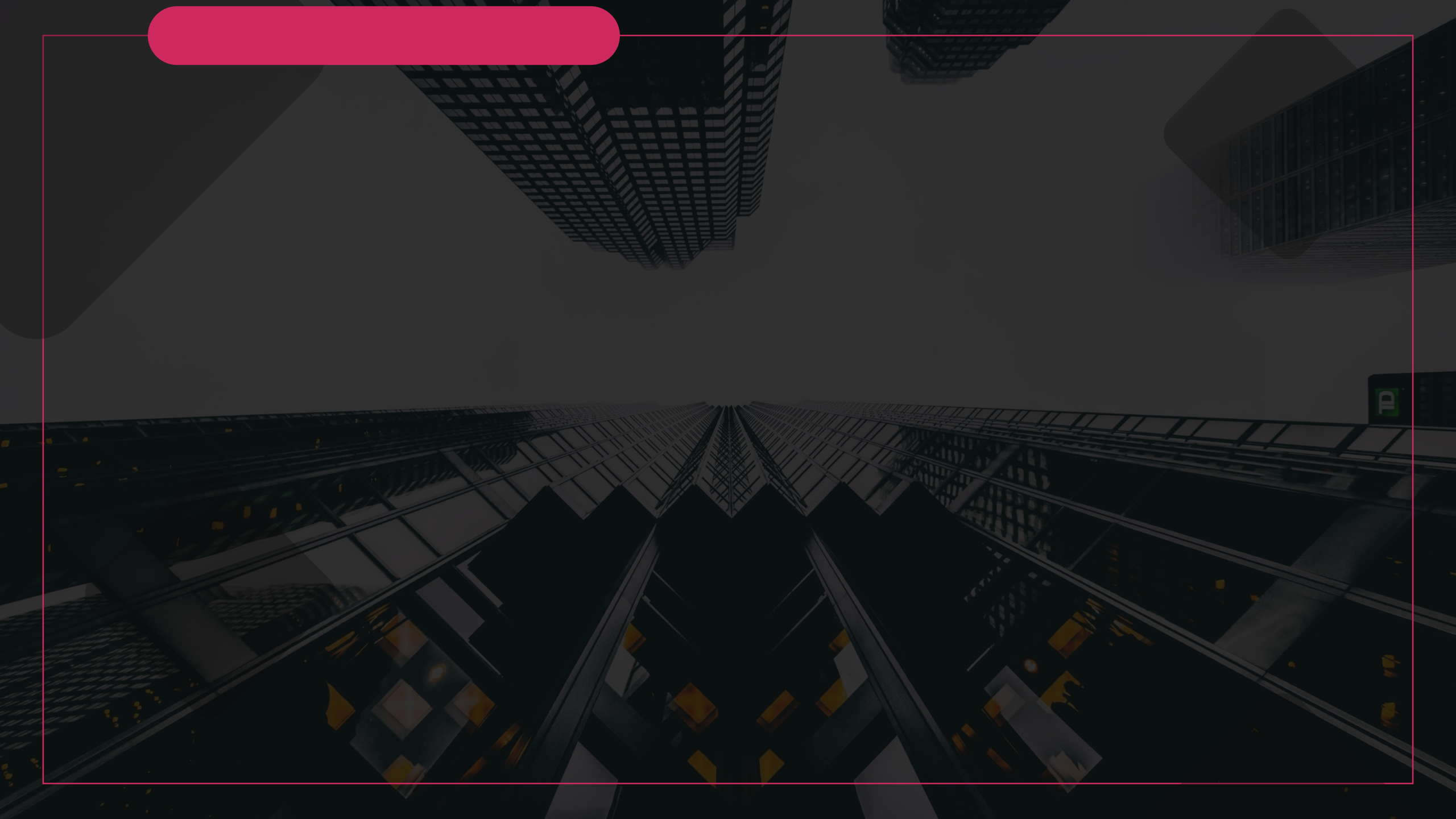
Similarity Detection



- well_7_2 | 0.9999999999999999
- well_55_2 | 0.9874315243896826
- well_7_5 | 0.9871105455232349
- well_39_5 | 0.9814943098934606
- well_7_3 | 0.9801936353690502









THANK
YOU



Questions

1. What is Machine Learning?
2. What is Data Analysis?
3. How it would be effective?