

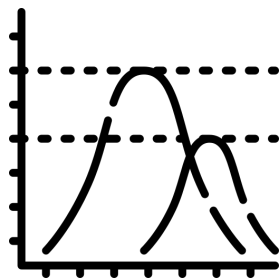
GPR-Based Concrete Pump Size Classification

PARISlab Research Project

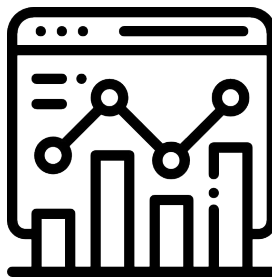
Nick Monozon

05/20/2022

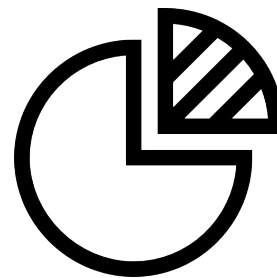
Overview



GPR-Based
Classification

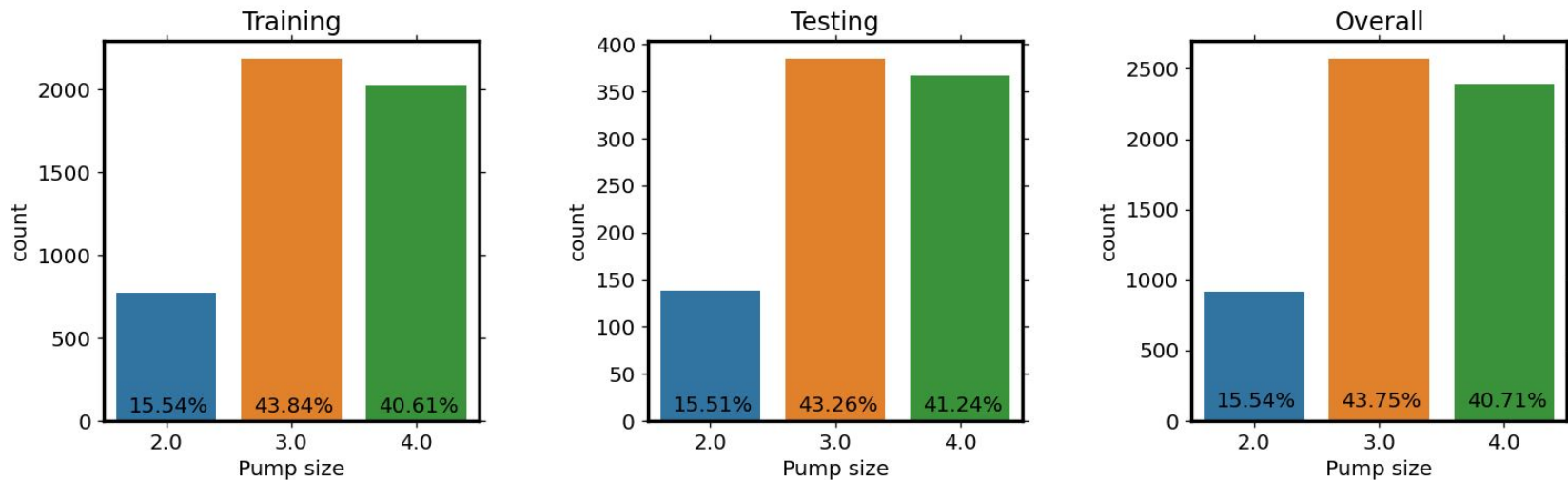


SHAP Analysis

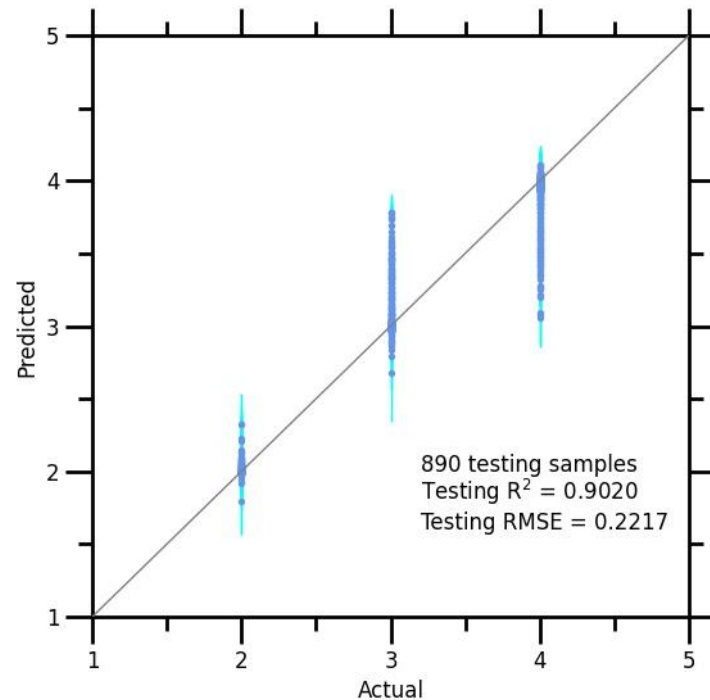
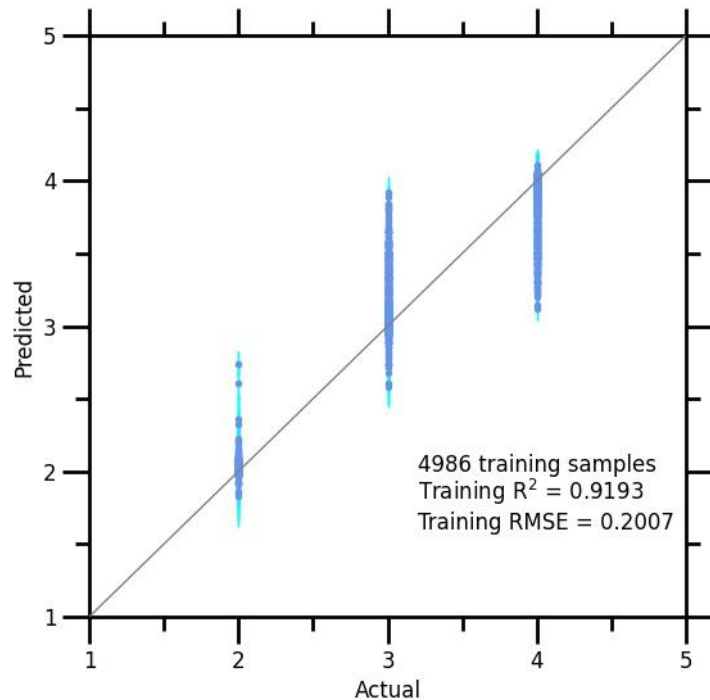


LOCO-CV

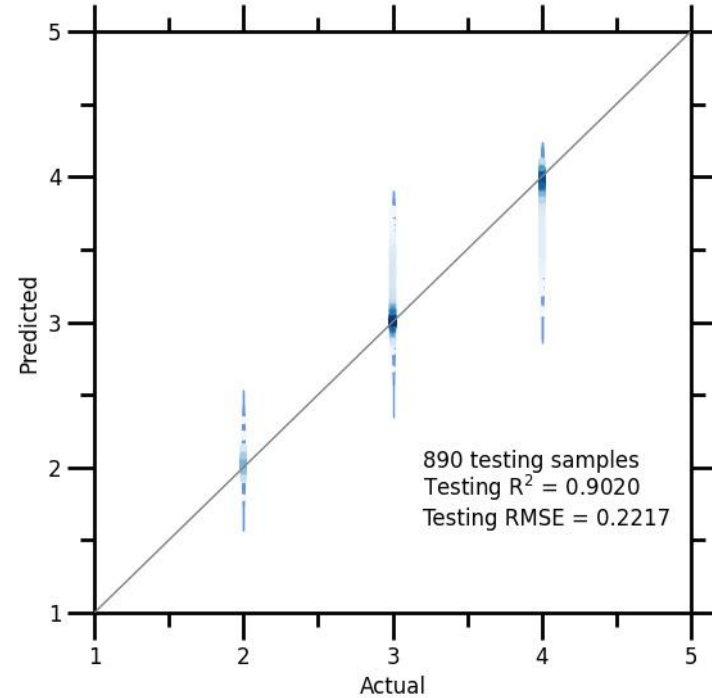
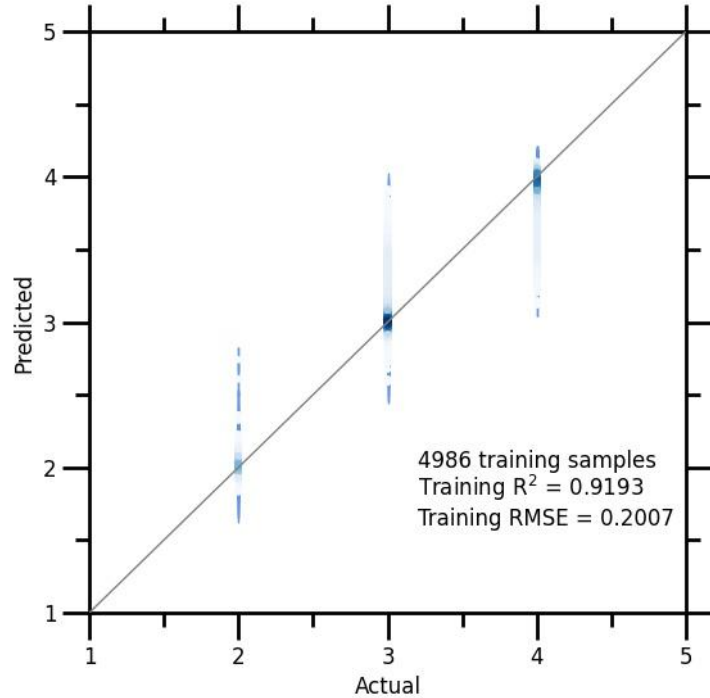
Leakage-minimized train-test-split



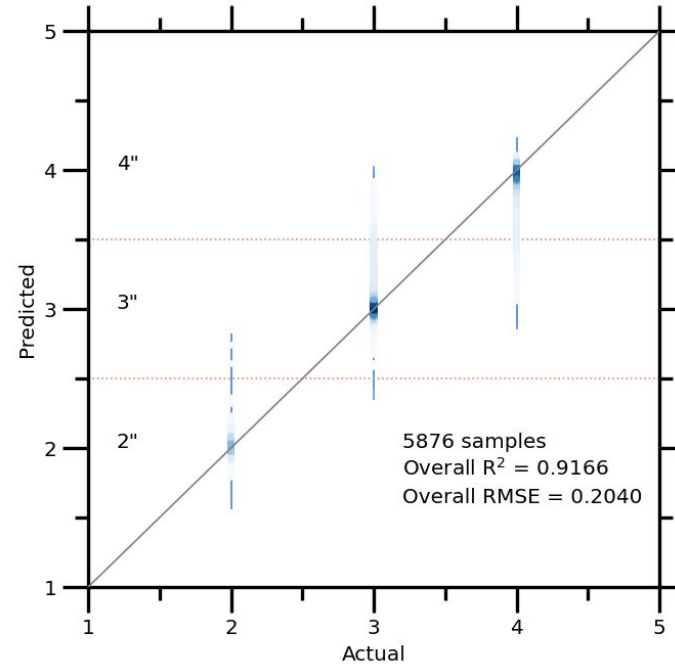
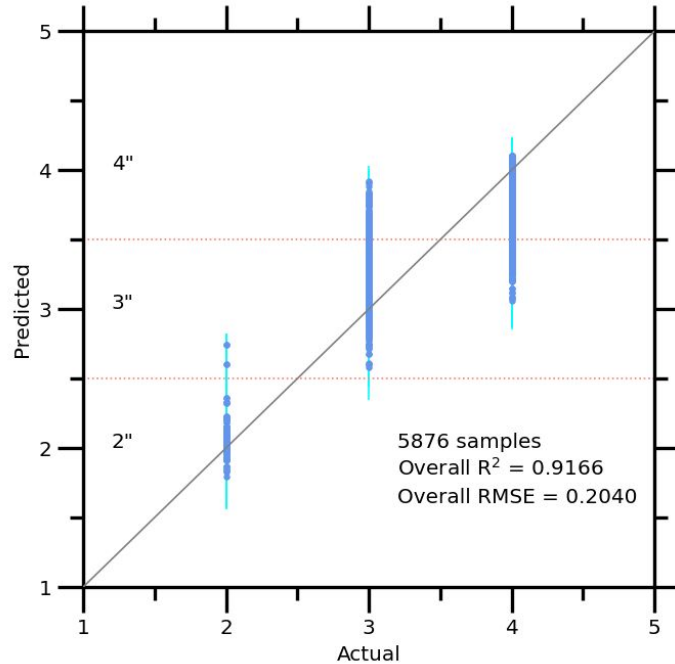
GPR Modeling



GPR Modeling Density Plots



GPR-Based Classification



GPR-Based Classification

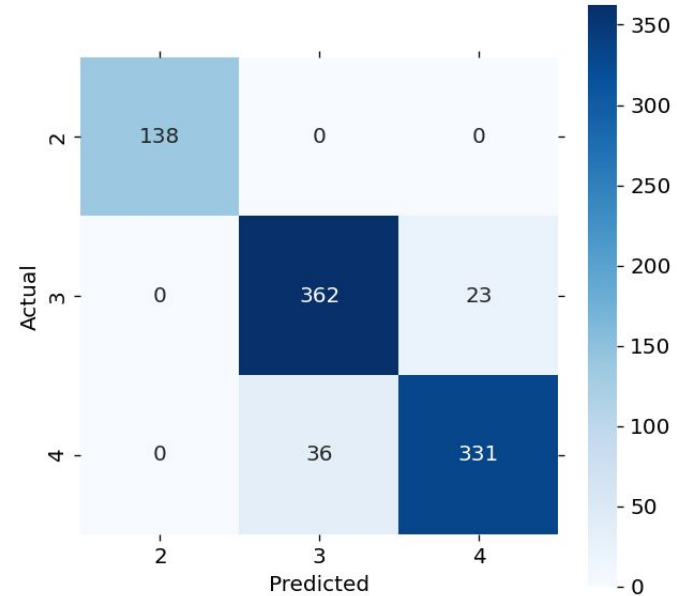
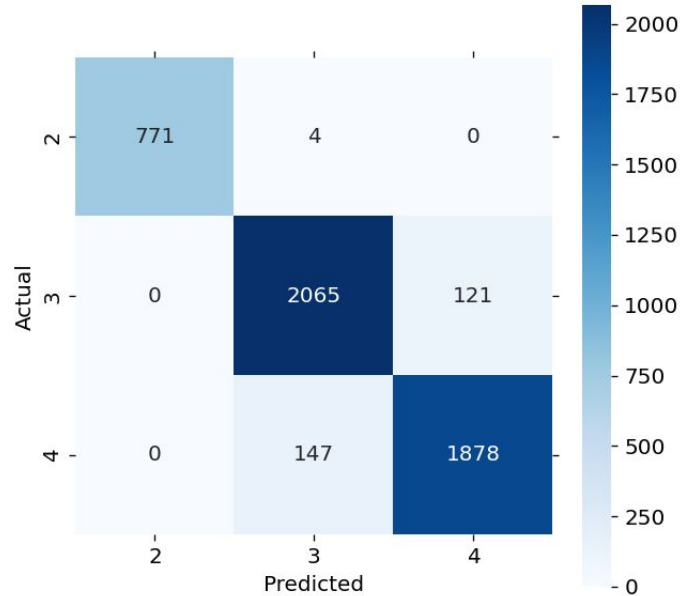
Training Data

	precision	recall	f1-score	support
2.0	1.0000	0.9948	0.9974	775.0000
3.0	0.9319	0.9446	0.9382	2186.0000
4.0	0.9395	0.9274	0.9334	2025.0000
accuracy	0.9454	0.9454	0.9454	0.9454
macro avg	0.9571	0.9556	0.9563	4986.0000
weighted avg	0.9455	0.9454	0.9455	4986.0000

Testing Data

	precision	recall	f1-score	support
2.0	1.0000	1.0000	1.0000	138.0000
3.0	0.9095	0.9403	0.9246	385.0000
4.0	0.9350	0.9019	0.9182	367.0000
accuracy	0.9337	0.9337	0.9337	0.9337
macro avg	0.9482	0.9474	0.9476	890.0000
weighted avg	0.9341	0.9337	0.9337	890.0000

GPR-Based Classification

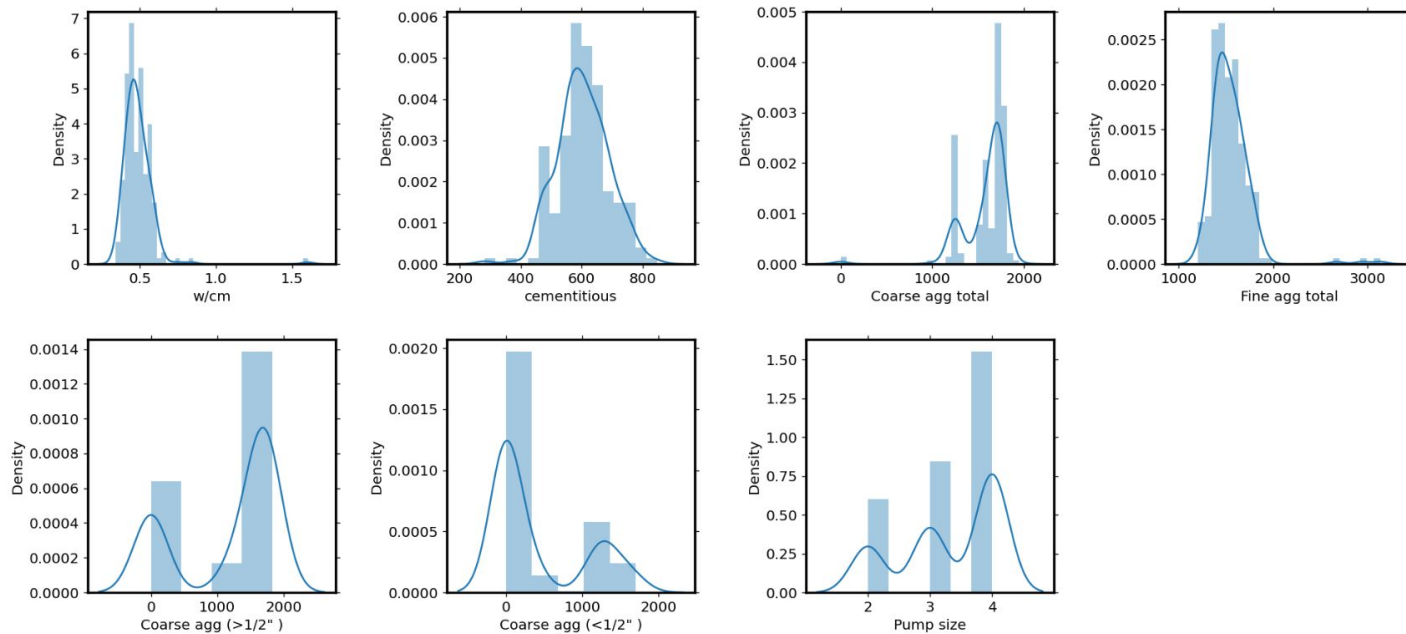


New dataset (n=209)

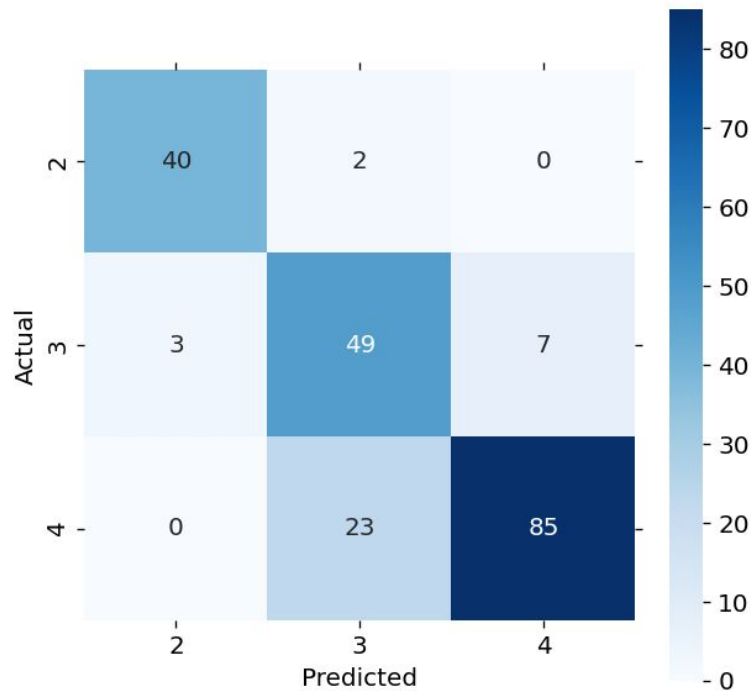
	w/cm	cementitious	Coarse agg total	Fine agg total	Coarse agg (>1/2")	Coarse agg (<1/2")	Pump size
0	0.61	492.0	1250.0	1870.22	0	1250.0	2
1	0.58	529.0	1225.0	1795.31	0	1225.0	2
2	0.52	577.0	1250.0	1746.47	0	1250.0	2
3	0.52	596.0	1250.0	1739.71	0	1250.0	2
4	0.47	637.0	1250.0	1689.00	0	1250.0	2
...
204	0.55	500.0	1700.0	1502.07	1700	0.0	4
205	0.56	492.0	1751.0	1602.77	1751	0.0	4
206	0.50	534.0	1700.0	1534.02	1700	0.0	4
207	0.50	550.0	1700.0	1572.04	1700	0.0	4
208	0.55	484.0	1700.0	1502.59	1700	0.0	4

209 rows × 7 columns

New dataset feature distplots

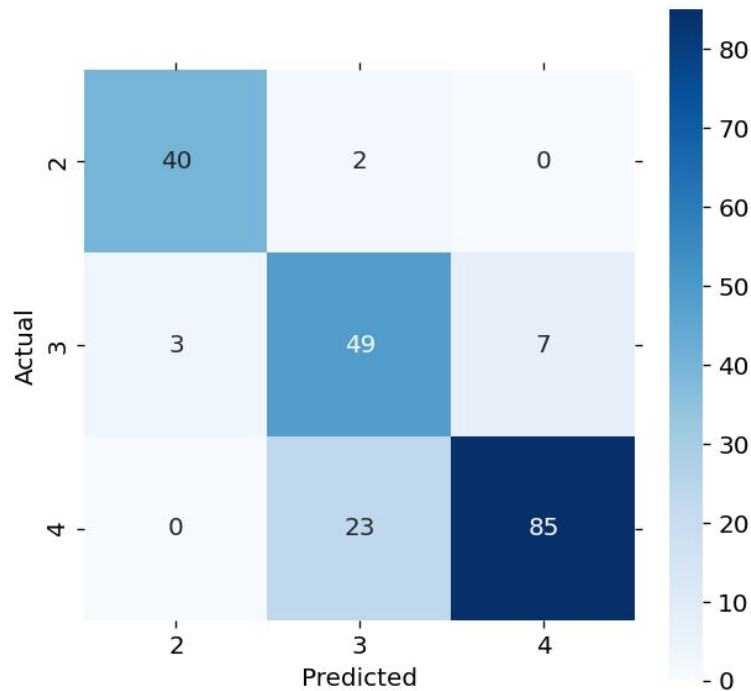


Classification for new dataset



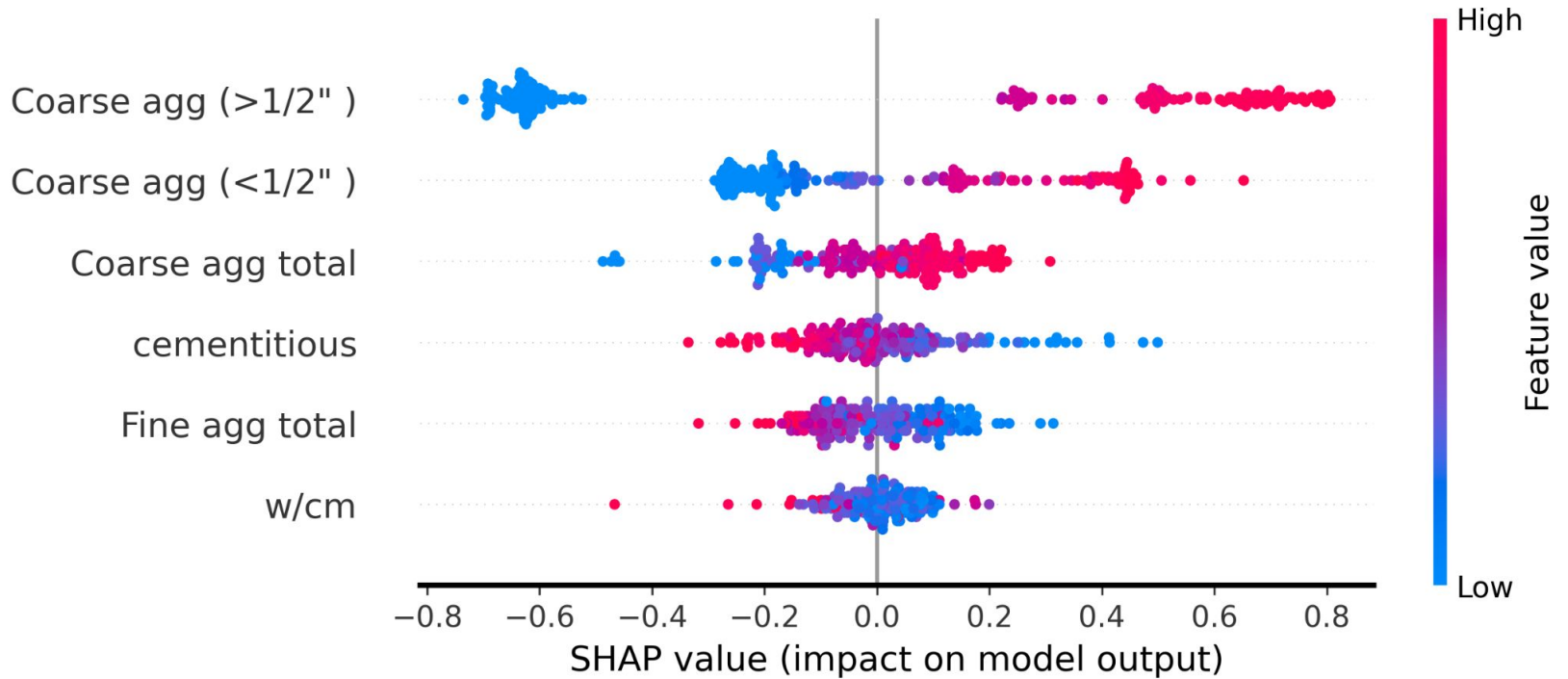
	precision	recall	f1-score	support
2.0	0.9302	0.9524	0.9412	42.0000
3.0	0.6622	0.8305	0.7368	59.0000
4.0	0.9239	0.7870	0.8500	108.0000
accuracy	0.8325	0.8325	0.8325	0.8325
macro avg	0.8388	0.8566	0.8427	209.0000
weighted avg	0.8513	0.8325	0.8364	209.0000

Classification for new dataset

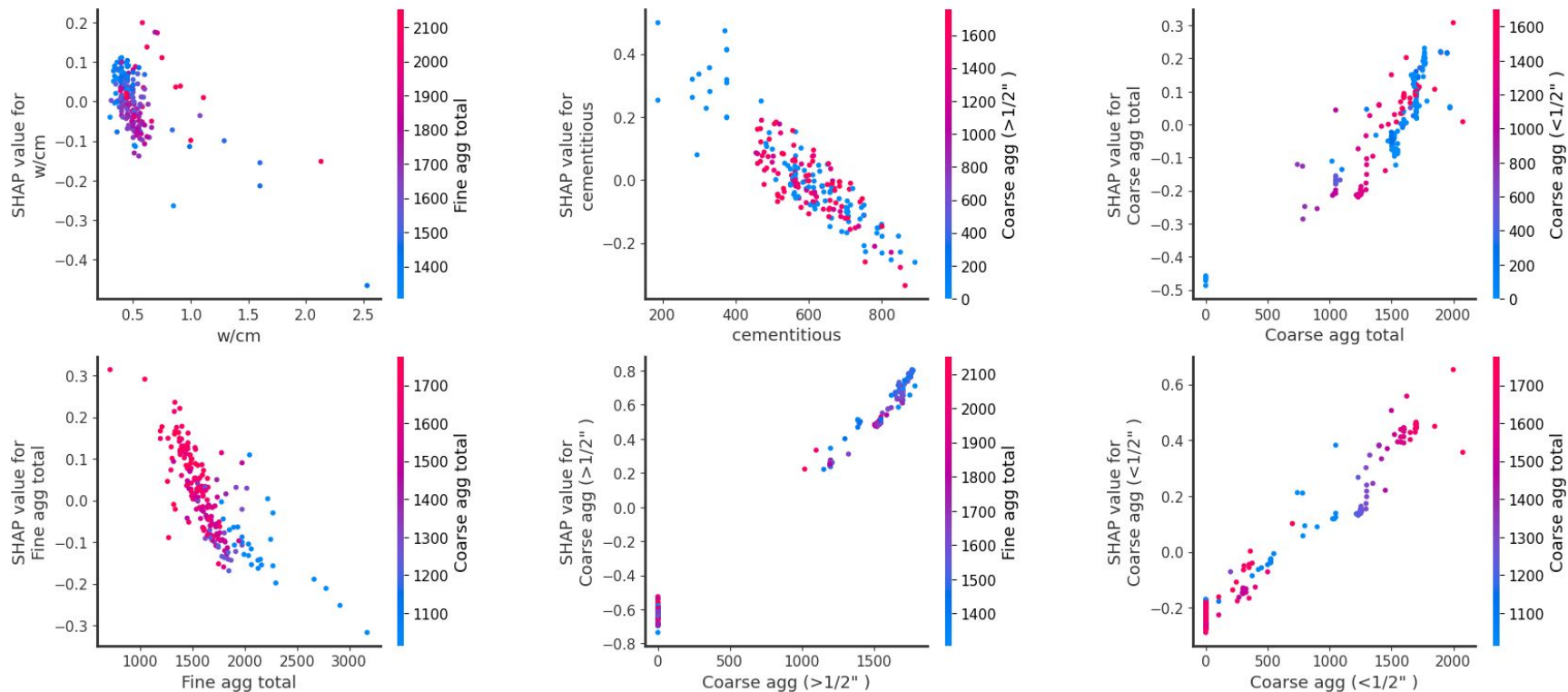


	precision	recall	f1-score	support
2.0	0.9302	0.9524	0.9412	42.0000
3.0	0.6622	0.8305	0.7368	59.0000
4.0	0.9239	0.7870	0.8500	108.0000
accuracy	0.8325	0.8325	0.8325	0.8325
macro avg	0.8388	0.8566	0.8427	209.0000
weighted avg	0.8513	0.8325	0.8364	209.0000

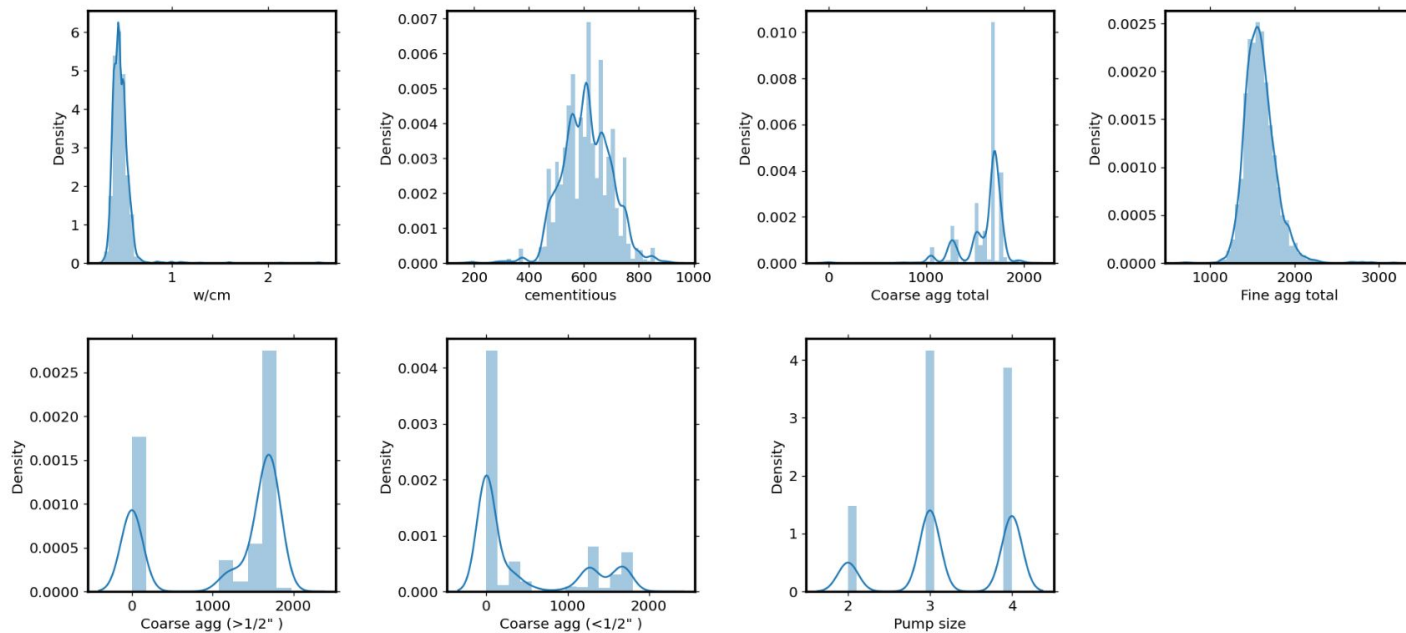
Beeswarm SHAP Plot



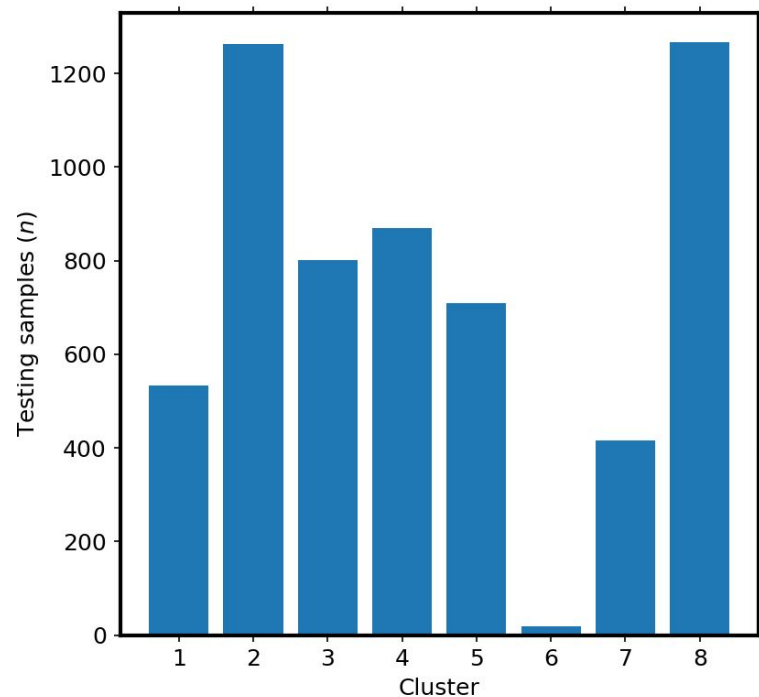
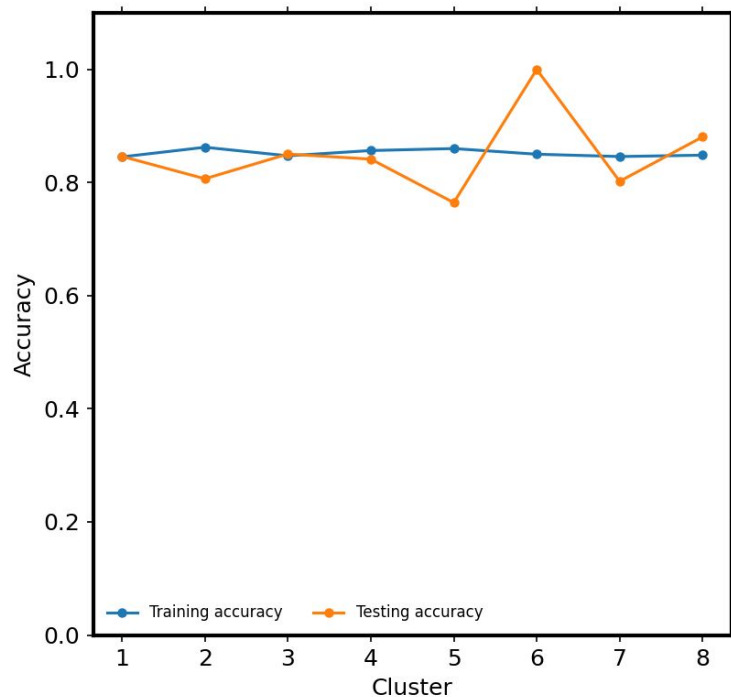
SHAP Dependence Plots



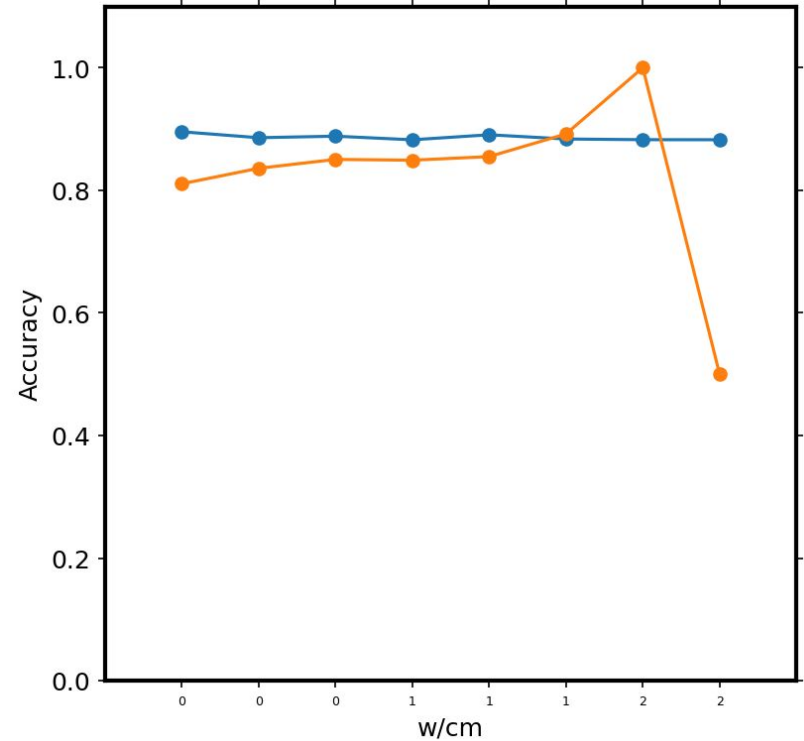
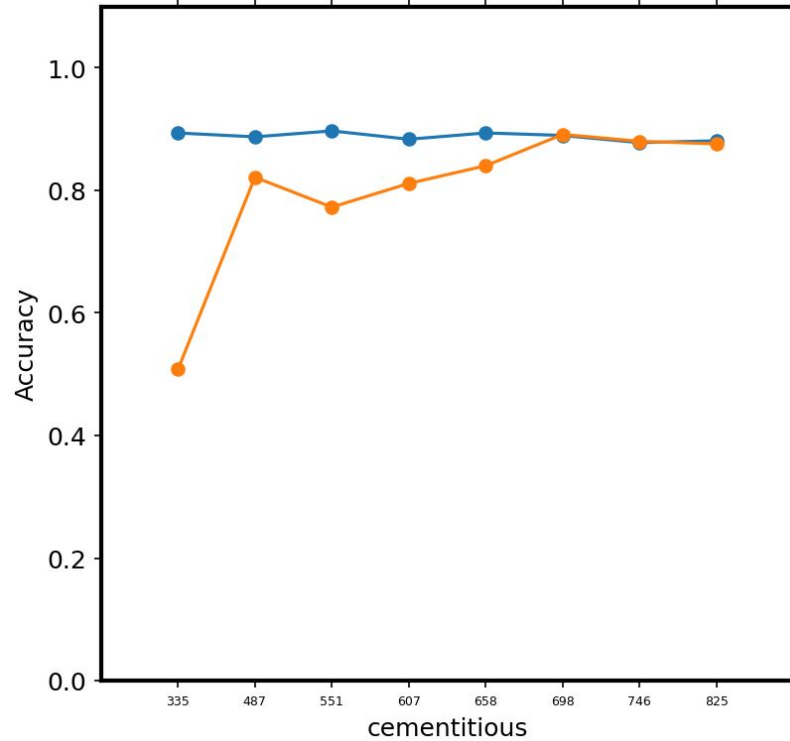
Feature distplots



LOCO-CV (n_clusters=8)



LOCO-CV with single feature



LOCO-CV with single feature

