

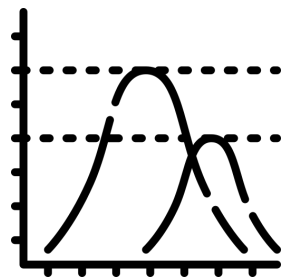
GPR-Based Concrete Pump Size Classification

PARISlab Research Project

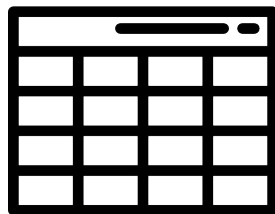
Nick Monozon

06/03/2022

Overview



GPR-Based
Classification



New Features



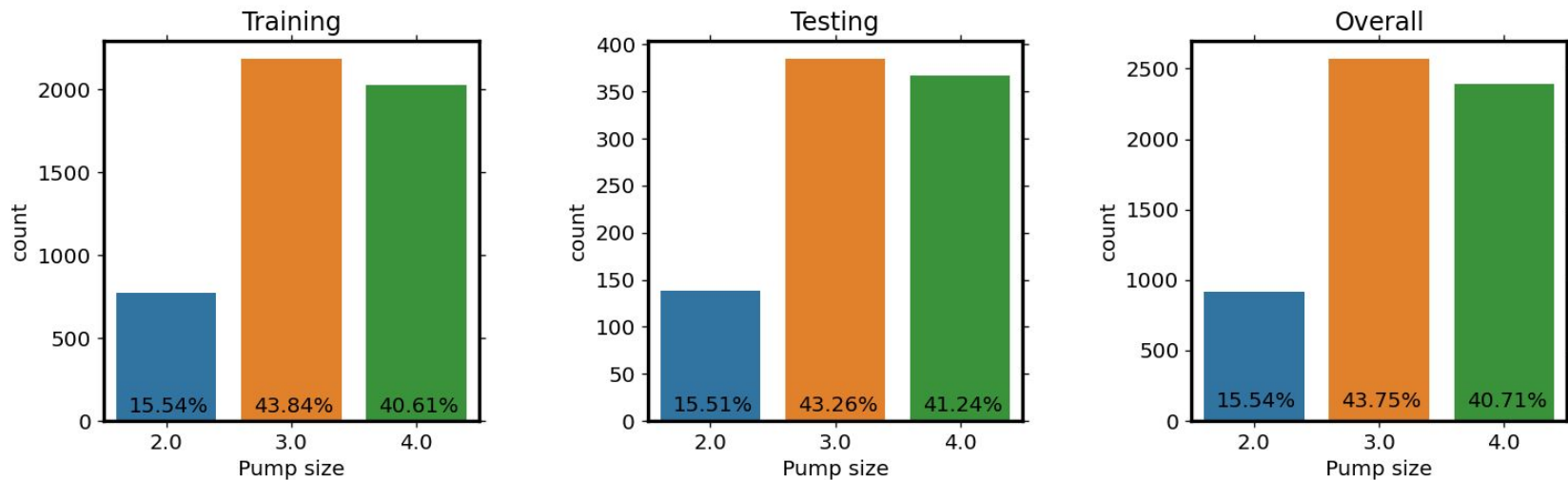
SHAP Analysis

Dataset

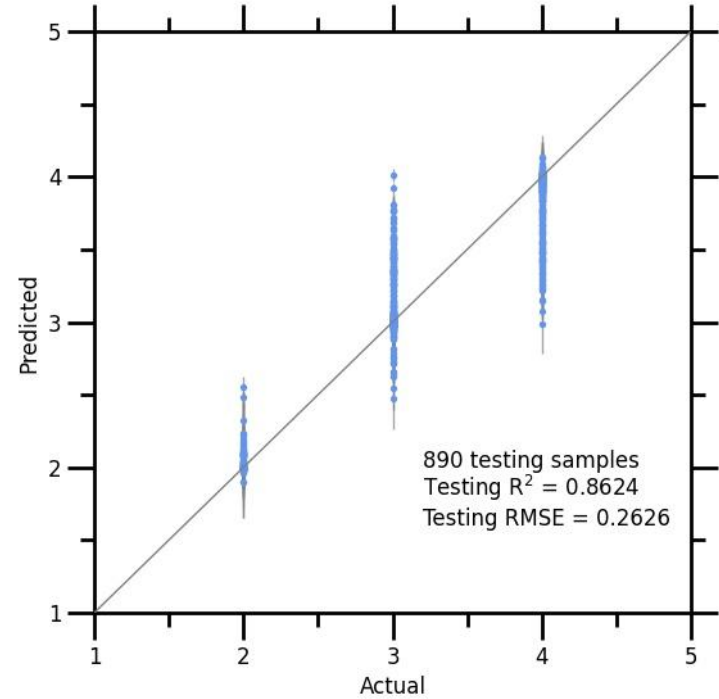
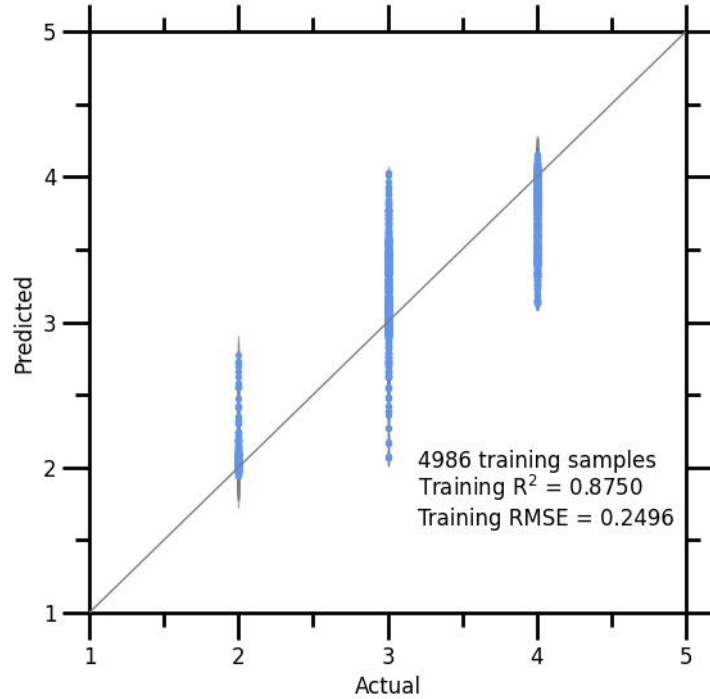
	w/cm	cementitious	1" (25mm)	3/4" (19mm)	1/2" (12.5mm)	3/8" (9.5mm)	#4 (4.75mm)	#8 (2.36mm)	#16 (1.18mm)	#30 (.6mm)	#50 (.3mm)	#100 (.15mm)	#200 (75µm)
0	0.47	602.0	0.000000	0.000000	2.348408	12.211723	28.843817	11.579208	10.786936	10.759012	12.822674	7.313666	2.505840
1	0.47	635.0	0.000000	0.000000	0.000000	3.493513	32.179237	15.894136	16.019618	12.128595	10.022419	6.226674	2.617509
2	0.40	752.0	0.000000	0.000000	0.000000	3.663176	33.712892	15.888995	15.466926	11.697753	9.673838	6.004570	2.524143
3	0.52	611.0	0.000000	0.000000	0.000000	3.556096	32.744951	15.892240	15.815749	11.969672	9.893840	6.144747	2.583070
4	0.41	750.0	0.000000	0.000000	0.883919	6.054843	26.128906	12.779020	10.142867	12.937489	17.497874	9.696488	3.102876
...
5871	0.54	510.0	0.000000	8.039488	21.606124	7.034552	12.224366	8.698900	11.458715	10.191833	11.069667	6.449967	2.325443
5872	0.55	500.0	0.000000	8.018182	21.548865	7.015910	12.198201	8.714155	11.484038	10.219112	11.099289	6.467228	2.331667
5873	0.55	484.0	0.000000	7.904840	21.244257	6.916735	12.892945	8.059475	8.577318	10.118950	13.660583	7.589213	2.428548
5874	0.55	500.0	0.345573	6.565883	24.535669	13.131766	7.422120	7.497440	10.551862	9.866307	10.716093	6.243951	2.251168
5875	0.55	486.0	0.349991	6.649826	24.849350	13.299652	7.486945	7.408497	10.418136	9.730552	10.568652	6.158041	2.220194

5876 rows × 13 columns

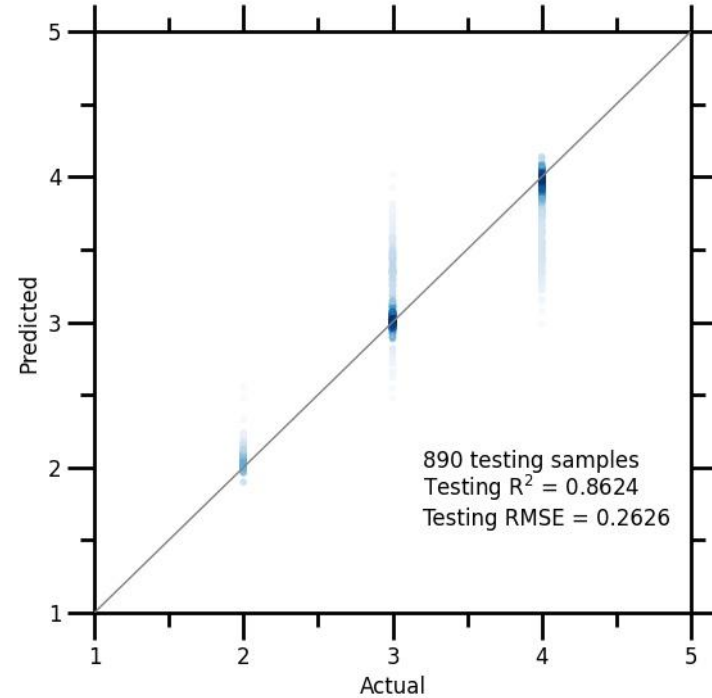
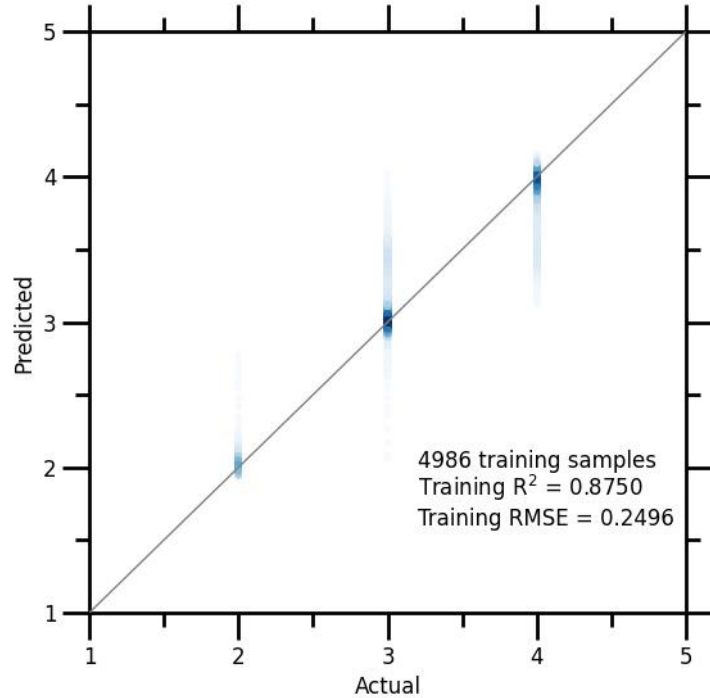
Leakage-minimized train-test-split



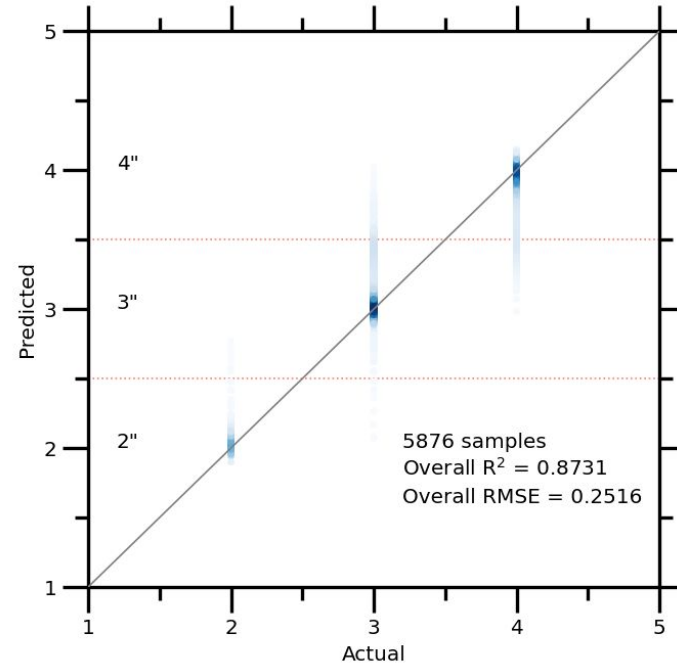
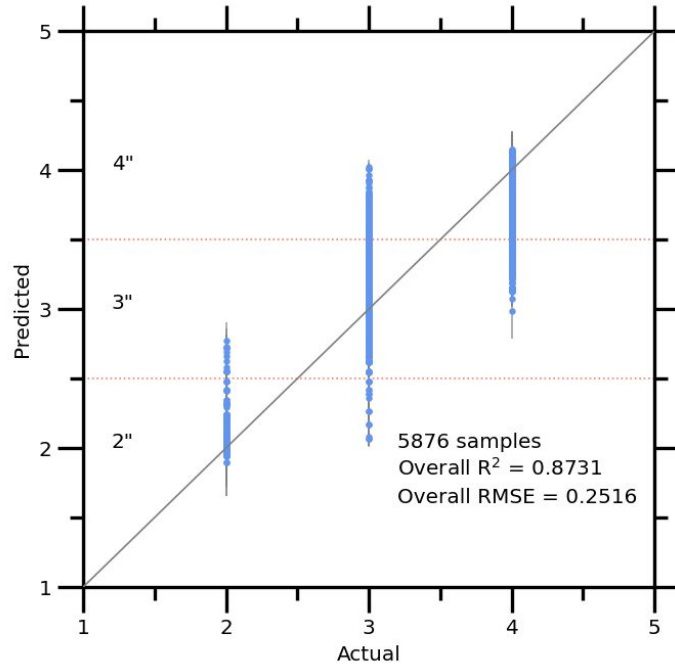
GPR Modeling



GPR Modeling Density Plots



GPR-Based Classification



GPR-Based Classification

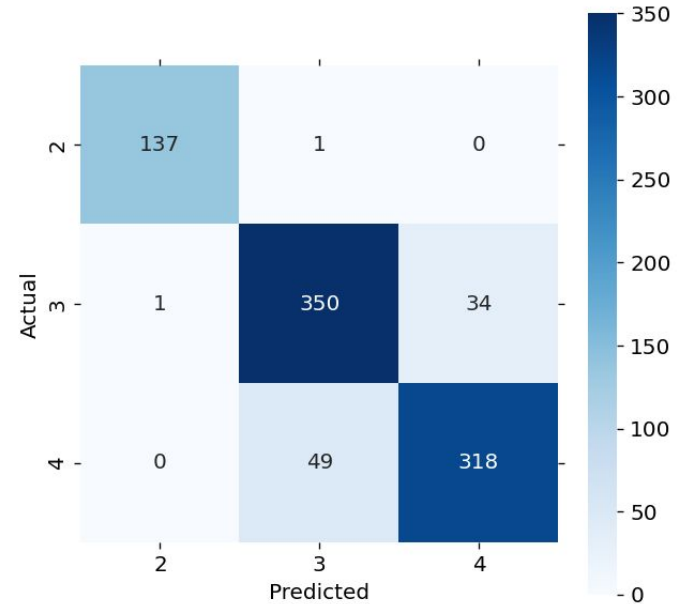
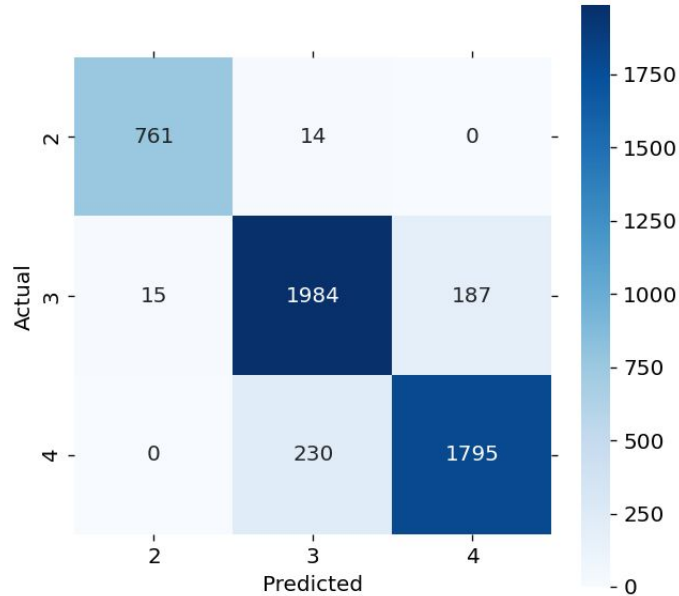
Training Data

	precision	recall	f1-score	support
2.0	0.9807	0.9819	0.9813	775.0000
3.0	0.8905	0.9076	0.8990	2186.0000
4.0	0.9057	0.8864	0.8959	2025.0000
accuracy	0.9105	0.9105	0.9105	0.9105
macro avg	0.9256	0.9253	0.9254	4986.0000
weighted avg	0.9107	0.9105	0.9105	4986.0000

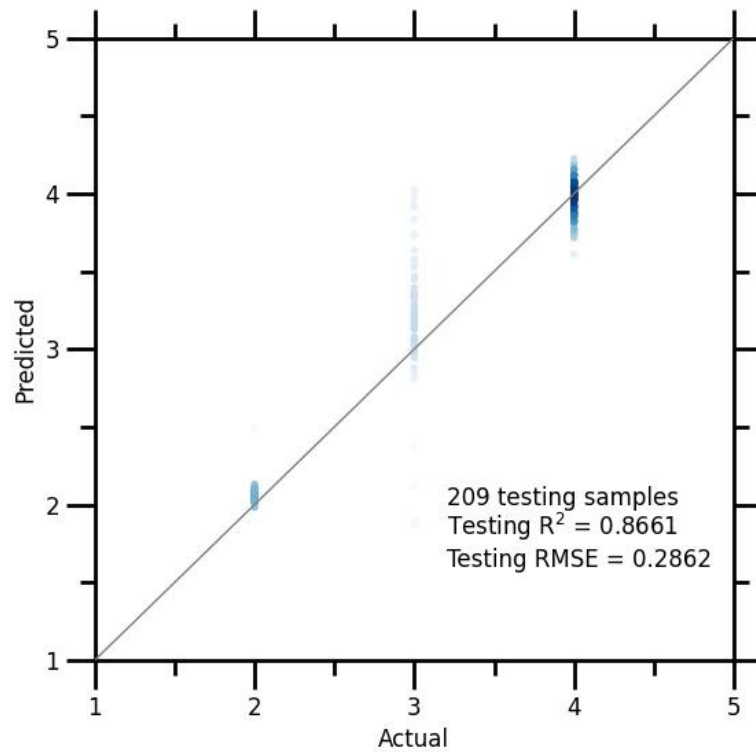
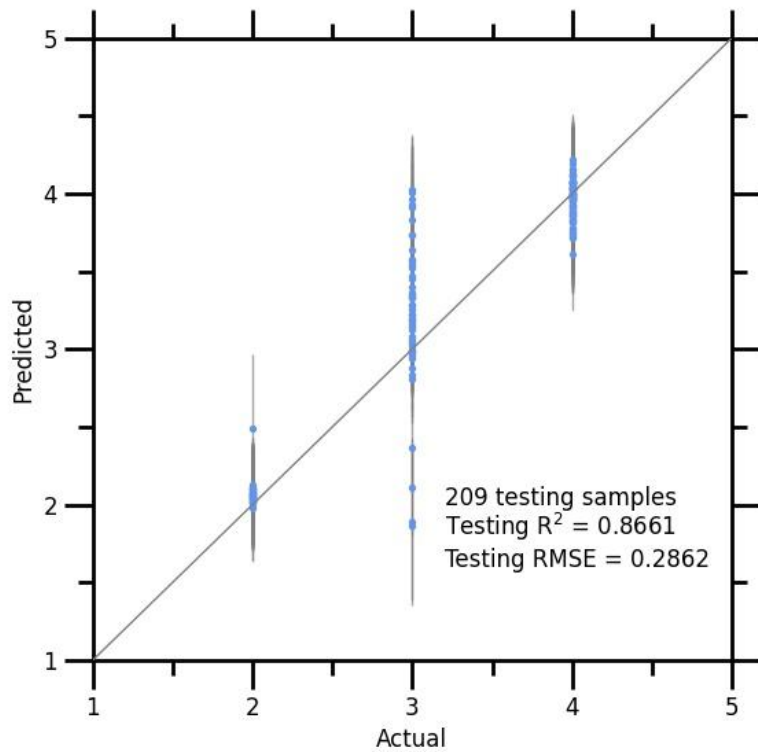
Testing Data

	precision	recall	f1-score	support
2.0	0.9928	0.9928	0.9928	138.0000
3.0	0.8750	0.9091	0.8917	385.0000
4.0	0.9034	0.8665	0.8846	367.0000
accuracy	0.9045	0.9045	0.9045	0.9045
macro avg	0.9237	0.9228	0.9230	890.0000
weighted avg	0.9050	0.9045	0.9044	890.0000

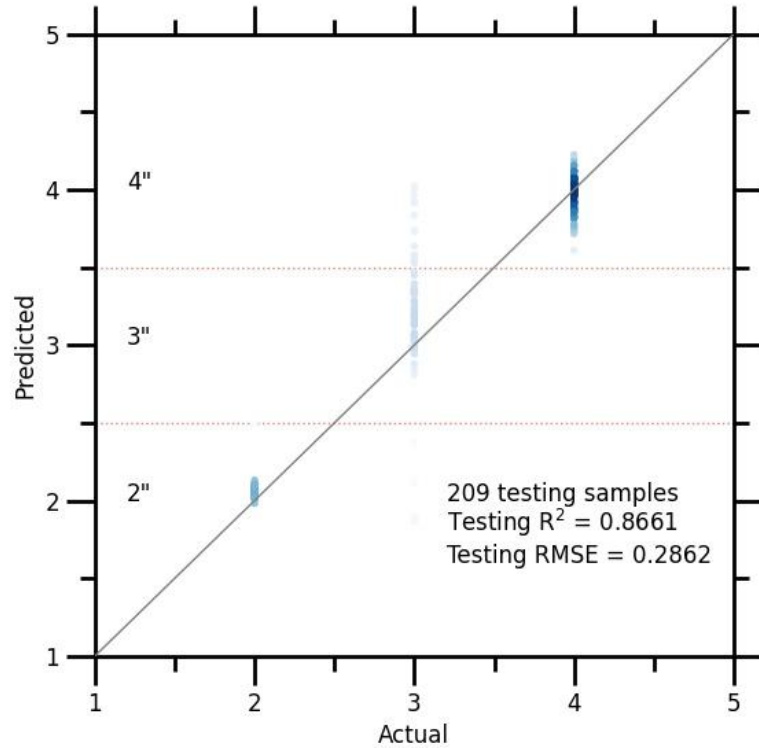
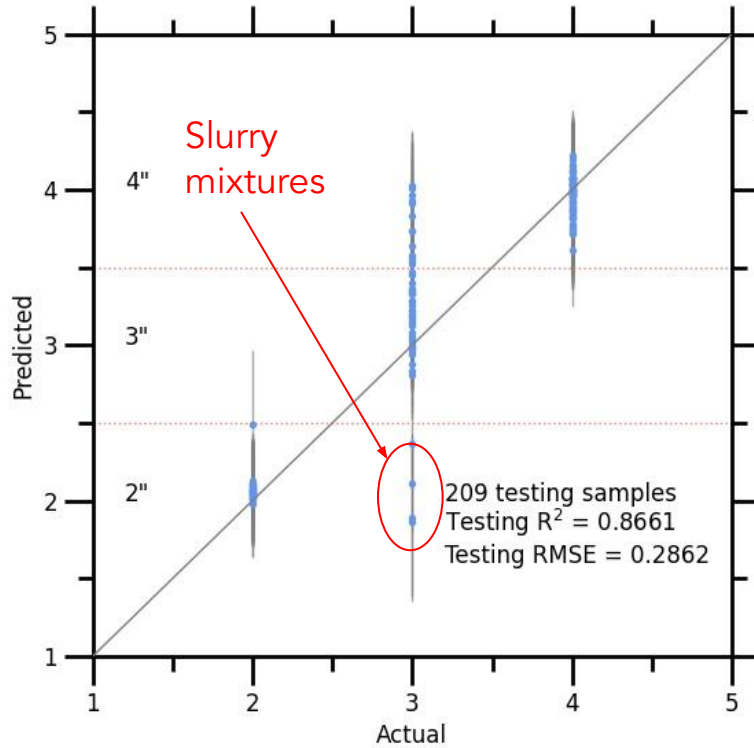
GPR-Based Classification



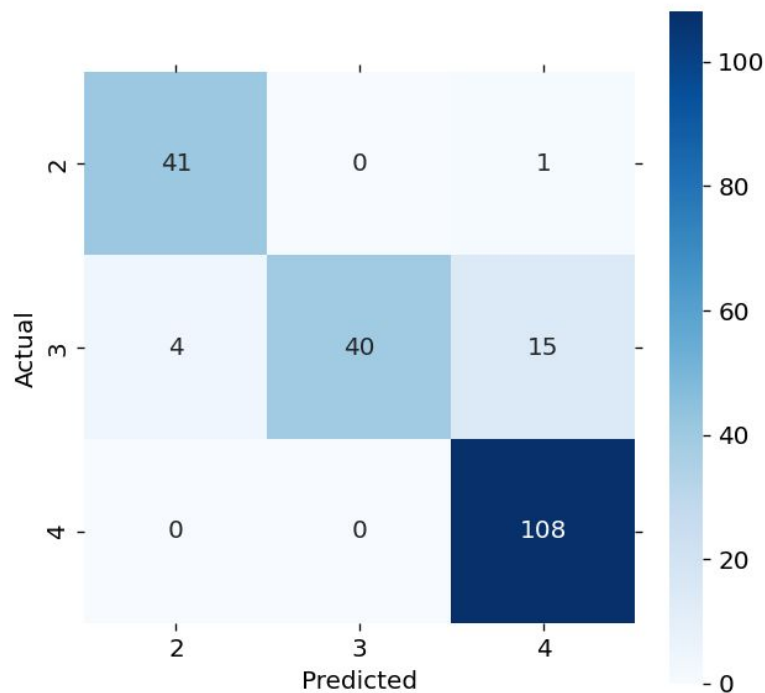
Evaluating on new dataset



Evaluating on new dataset

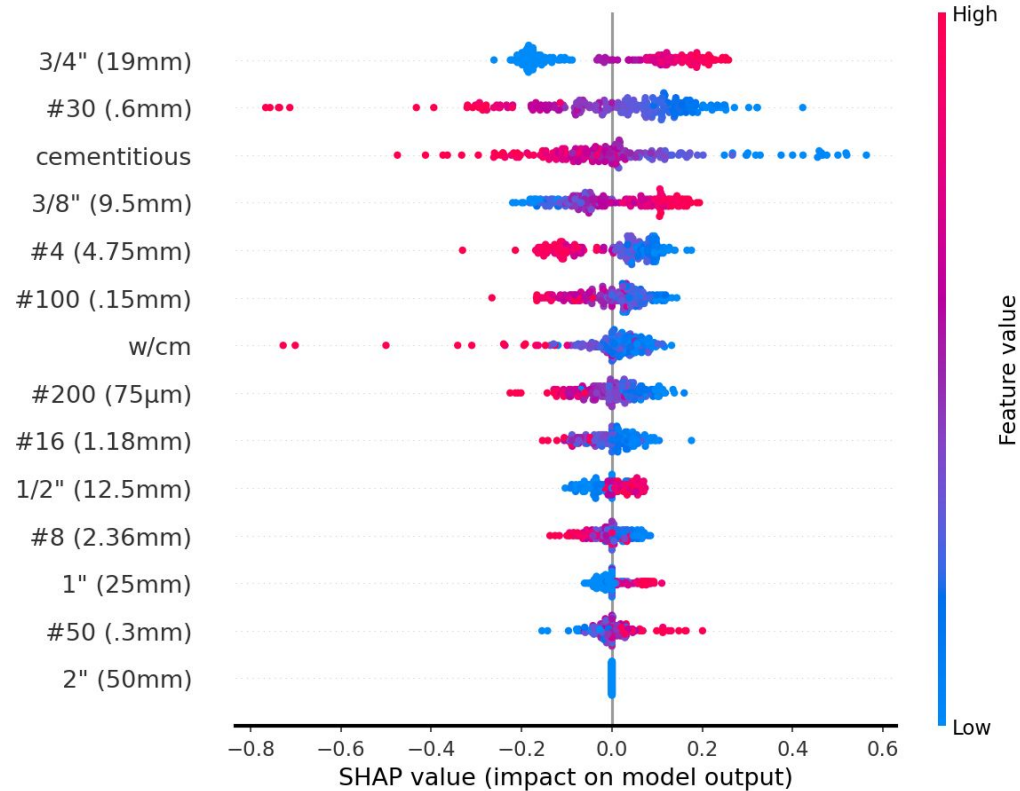


Classification for new dataset



	precision	recall	f1-score	support
2.0	0.9111	1.0000	0.9535	41.0000
3.0	1.0000	0.6780	0.8081	59.0000
4.0	0.8790	1.0000	0.9356	109.0000
accuracy	0.9091	0.9091	0.9091	0.9091
macro avg	0.9300	0.8927	0.8991	209.0000
weighted avg	0.9195	0.9091	0.9031	209.0000

Beeswarm SHAP Plot - Full Model



SHAP Dependence Plots

