

Table 5: ML model training and validation classification results applied to the first 1450 data records of the synthetic GR dataset using 80% training: 20% validation splits.

ML training and validation results for clastic facies prediction					
<b>ADA</b>	7-Var	6-Var	5-Var	4-Var	3-Var
Train R <sup>2</sup>	1.0000	1.0000	1.0000	0.9777	0.9956
Train RMSE	0.0000	0.0000	0.0000	0.2659	0.1174
Train MAE	0.0000	0.0000	0.0000	0.0190	0.0034
Validation R <sup>2</sup>	0.8156	0.7887	0.7790	0.6800	0.6874
Validation RMSE	0.7216	0.7724	0.7900	0.9505	0.9396
Validation MAE	0.1966	0.2172	0.2241	0.3034	0.2828
Total error number	28	29	30	37	33
All R <sup>2</sup>	0.9664	0.9615	0.9597	0.9234	0.9395
All RMSE	0.3227	0.3454	0.3533	0.4871	0.4331
All MAE	0.0393	0.0434	0.0448	0.0759	0.0593
<b>DT</b>					
Train R <sup>2</sup>	1.0000	1.0000	1.0000	1.0000	1.0000
Train RMSE	0.0000	0.0000	0.0000	0.0000	0.0000
Train MAE	0.0000	0.0000	0.0000	0.0000	0.0000
Validation R <sup>2</sup>	0.7228	0.7130	0.6434	0.6898	0.5921
Validation RMSE	0.8847	0.9002	1.0034	0.9359	1.0732
Validation MAE	0.2586	0.2862	0.3310	0.2966	0.3793
Total error number	31	36	39	36	44
All R <sup>2</sup>	0.9495	0.9477	0.9350	0.9435	0.9257

All RMSE	0.3957	0.4026	0.4488	0.4185	0.4799
All MAE	0.0517	0.0572	0.0662	0.0593	0.0759
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<b>KNN</b>					
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Train R <sup>2</sup>	1.0000	1.0000	1.0000	1.0000	1.0000
Train RMSE	0.0000	0.0000	0.0000	0.0000	0.0000
Train MAE	0.0000	0.0000	0.0000	0.0000	0.0000
Validation R <sup>2</sup>	0.7325	0.7069	0.7167	0.6214	0.5628
Validation RMSE	0.8690	0.9097	0.8944	1.0339	1.1111
Validation MAE	0.2517	0.2690	0.2690	0.3517	0.4069
Total error number	29	31	34	43	50
All R <sup>2</sup>	0.9513	0.9466	0.9484	0.9310	0.9203
All RMSE	0.3886	0.4068	0.4000	0.4624	0.4969
All MAE	0.0503	0.0538	0.0538	0.0703	0.0814
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<b>MLP</b>					
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Train R <sup>2</sup>	0.9074	0.8205	0.9284	0.8600	0.7130
Train RMSE	0.5414	0.7537	0.4762	0.6657	0.9532
Train MAE	0.0931	0.1698	0.0733	0.1448	0.3034
Validation R <sup>2</sup>	0.7216	0.6654	0.7387	0.6874	0.5249
Validation RMSE	0.8867	0.9720	0.8590	0.9396	1.1582
Validation MAE	0.2828	0.3310	0.2690	0.2966	0.4448
Total error number	36	41	34	36	54
All R <sup>2</sup>	0.8736	0.7923	0.8938	0.8286	0.6788
All RMSE	0.6259	0.8022	0.5736	0.7287	0.9976
All MAE	0.1310	0.2021	0.1124	0.1752	0.3317
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<b>RF</b>					
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Train R <sup>2</sup>	1.0000	1.0000	1.0000	1.0000	1.0000
Train RMSE	0.0000	0.0000	0.0000	0.0000	0.0000
Train MAE	0.0000	0.0000	0.0000	0.0000	0.0000
Validation R <sup>2</sup>	0.7790	0.8070	0.7472	0.7472	0.6605
Validation RMSE	0.7900	0.7381	0.8449	0.8449	0.9791
Validation MAE	0.2172	0.2000	0.2448	0.2586	0.3103
Total error number	28	27	30	34	35
All R <sup>2</sup>	0.9597	0.9648	0.9539	0.9539	0.9381
All RMSE	0.3533	0.3301	0.3778	0.3778	0.4379
All MAE	0.0434	0.0400	0.0490	0.0517	0.0621

### **SVC**

Train R <sup>2</sup>	0.7680	0.7631	0.7054	0.6476	0.5651
Train RMSE	0.8570	0.8660	0.9658	1.0562	1.1733
Train MAE	0.2259	0.2345	0.2793	0.3483	0.4284
Validation R <sup>2</sup>	0.6544	0.6153	0.5982	0.4773	0.4724
Validation RMSE	0.9879	1.0422	1.0651	1.2149	1.2205
Validation MAE	0.3414	0.3759	0.3897	0.4828	0.4759
Total error number	43	46	49	56	55
All R <sup>2</sup>	0.7474	0.7362	0.6859	0.6167	0.5484
All RMSE	0.8847	0.9040	0.9865	1.0898	1.1829
All MAE	0.2490	0.2628	0.3014	0.3752	0.4379

### **XGB**

Train R <sup>2</sup>	1.0000	1.0000	1.0000	1.0000	1.0000
Train RMSE	0.0000	0.0000	0.0000	0.0000	0.0000

Train MAE	0.0000	0.0000	0.0000	0.0000	0.0000
Validation R <sup>2</sup>	0.8608	0.8425	0.8669	0.8486	0.7179
Validation RMSE	0.6270	0.6670	0.6131	0.6539	0.8925
Validation MAE	0.1448	0.1552	0.1276	0.1379	0.2724
Total error number	20	20	16	16	33
All R <sup>2</sup>	0.9746	0.9713	0.9757	0.9724	0.9486
All RMSE	0.2804	0.2983	0.2742	0.2924	0.3991
All MAE	0.0290	0.0310	0.0255	0.0276	0.0545

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Table 6: ML trained model classification results for the unseen testing subset results applied to the last 800 data records of the synthetic GR dataset.

ML unseen testing subset results for clastic facies prediction					
<b>ADA</b>	7-Var	6-Var	5-Var	4-Var	3-Var
Test R <sup>2</sup>	0.6056	0.6558	0.5719	0.4491	0.2302
Test RMSE	1.0811	1.0100	1.1264	1.2777	1.5104
Test MAE	0.3813	0.3350	0.3913	0.4975	0.7213
Total error number	126	115	130	154	216
Execution time (seconds)	29.3	30.2	28.4	23.6	22.0
<b>DT</b>					
Test R <sup>2</sup>	0.4238	0.4171	0.3458	0.2766	-0.0115
Test RMSE	1.3067	1.3143	1.3924	1.4642	1.7313
Test MAE	0.5300	0.5325	0.5713	0.5813	0.9175
Total error number	165	162	164	149	263
Execution time (seconds)	4.9	5.1	5.1	5.0	5.2
<b>KNN</b>					
Test R <sup>2</sup>	0.6541	0.6372	0.6254	0.6431	0.5377
Test RMSE	1.0124	1.0368	1.0536	1.0283	1.1705
Test MAE	0.3475	0.3750	0.3725	0.3675	0.4600
Total error number	117	129	126	130	157
Execution time (seconds)	5.0	5.2	5.0	5.2	4.9
<b>MLP</b>					
Test R <sup>2</sup>	0.6221	0.6368	0.6208	0.5786	0.4917

Test RMSE	1.0583	1.0374	1.0601	1.1175	1.2273
Test MAE	0.3450	0.3313	0.3488	0.4238	0.4788
Total error number	106	103	106	142	149
Execution time (seconds)	99.1	102.0	106.8	110.2	84.7
<b>RF</b>					
Test R <sup>2</sup>	0.7355	0.7030	0.6566	0.6347	0.4449
Test RMSE	0.8853	0.9381	1.0087	1.0404	1.2826
Test MAE	0.2513	0.2700	0.3075	0.3425	0.5300
Total error number	82	81	91	109	165
Execution time (seconds)	23.2	25.2	23.5	21.9	21.4
<b>SVC</b>					
Test R <sup>2</sup>	0.7305	0.7237	0.7073	0.6398	0.6140
Test RMSE	0.8937	0.9048	0.9314	1.0332	1.0695
Test MAE	0.2713	0.2763	0.2925	0.3500	0.3938
Total error number	95	96	102	119	138
Execution time (seconds)	5.0	5.7	5.0	5.1	4.9
<b>XBG</b>					
Test R <sup>2</sup>	0.6807	0.6604	0.6183	0.5035	0.4230
Test RMSE	0.9728	1.0031	1.0636	1.2130	1.3077
Test MAE	0.2913	0.3238	0.3588	0.4713	0.5725
Total error number	92	103	114	149	188
Execution time (seconds)	80.5	81.2	68.5	72.5	71.6