

Supplementary Material

Machine Learning Approach for Rapid Estimation of Five-Day Biochemical Oxygen Demand in Wastewater

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Table S1. Experimental database used for the training, testing and development of ANN models.

Nr	Input Parameters					Output Parameter
	Chemical Oxygen De-	Suspended	Total Nitro-	Ammonia Nitro-	Total Phospho-	Biochemical Oxygen
	mand (COD)	Solids (SS)	gen (TN)	gen (NH ₄ -N)	rous (TP)	Demand (BOD ₅)
	mg L ⁻¹	mg L ⁻¹	mg L ⁻¹	mg L ⁻¹	mg L ⁻¹	mg L ⁻¹
1	424	228	67.7	57.3	5.6	271
2	433	214	68.4	58.3	5.81	287
3	493	279	75.3	64.2	6.51	318
4	538	288	78.5	68.9	6.81	334
5	521	251	78.3	66.8	6.74	335
6	535	281	78.5	69.2	6.88	347
7	532	267	78.1	68.2	6.89	345
8	529	228	78.6	67.7	6.86	341
9	541	295	79.7	70.1	6.95	348
10	530	269	78.5	68.3	6.88	339
11	525	277	78.6	67.9	6.85	341
12	515	267	76.8	66.3	6.75	318
13	512	257	77.1	65.8	6.69	320
14	523	285	78.2	67.5	6.8	339
15	515	293	76.9	66.7	6.61	319
16	517	254	76.2	67.2	6.67	325
17	479	227	74.1	63.3	6.45	313
18	489	266	75.1	65	6.52	324
19	493	285	75.3	66.1	6.55	327
20	490	274	75.1	64.8	6.49	321
21	481	280	74.6	63.7	6.42	312
22	435	244	70.2	58.3	5.89	288
23	431	250	69.1	57.9	5.84	285
24	422	212	67.5	57	5.65	273
25	337	223	57.1	47.1	4.78	221
26	297	215	52.8	43.5	4.31	197
27	352	233	59.6	50.5	4.95	238
28	410	255	66.3	56.5	5.62	270
29	324	217	55.8	45.8	4.61	216
30	342	230	58.9	49.1	4.89	231
31	413	257	67.2	57.4	5.62	277
32	277	215	52.9	42.9	4.38	198
33	328	222	56.1	45.8	4.65	215
34	340	230	58.9	49.1	4.89	231
35	348	238	60.2	50.2	4.98	234
36	319	215	54.6	44.2	4.51	204
37	327	219	55.3	45.2	4.59	212
38	281	211	53.1	42.2	4.31	199
39	270	209	51.8	41.4	4.18	186
40	334	225	57.5	47.5	4.75	223
41	315	220	55.9	46.2	4.51	204
42	278	213	52.4	42	4.23	197
43	340	230	56	48.4	4.82	220
44	279	212	54	42.6	4.17	195

45	285	218	55	43.1	4.26	208
46	274	208	52	42.2	4.12	190
47	268	204	51	41.3	4.11	180
48	321	220	59	45.6	4.54	230
49	413	244	63.4	53	5.09	255
50	490	265	70.5	60.4	6.14	307
51	400	210	64.9	57.9	4.93	205
52	414	215	63.5	56.7	5.11	218
53	395	208	60.9	58.6	4.96	210
54	408	197	62.8	55.1	4.84	201
55	400	203	59.7	51.3	4.09	187
56	386	216	62.2	52.4	4.17	200
57	415	207	60.4	49	3.98	209
58	402	214	58.8	50.5	4.01	198
59	405	239	64.2	57.4	4.59	218
60	390	255	68.5	60.1	4.63	196
61	400	274	66.8	54.7	4.25	201
62	410	242	65.7	52.5	4.41	185
63	354	209	53.8	48.5	4.81	192
64	387	211	55.6	50.6	4.6	210
65	364	219	56.2	49.4	4.58	234
66	310	204	52.4	45.6	4.21	214
67	305	201	53.9	41.6	4.34	171
68	380	189	52.2	40.8	4.82	185
69	310	211	54.6	42.4	4.55	179
70	334	191	55.2	43.1	4.67	165
71	350	249	55.7	40.8	4.79	183
72	332	263	54	43.7	4.67	152
73	344	224	52.3	39.6	4.42	162
74	337	258	56.1	42.5	4.83	174
75	362	228	59.7	49.6	5.44	196
76	384	241	58.6	50.4	5.52	192
77	396	210	63.1	53.9	5.82	227
78	423	233	60.7	55.1	6.12	241
79	416	183	52.4	48.3	5.9	233
80	401	235	54.6	50.6	6.12	225
81	420	244	57.3	49.6	6.05	236
82	394	214	53.1	47.8	5.98	217
83	399	188	63	54.2	6.05	195
84	437	234	62.4	53.7	6.26	231
85	416	222	61.8	50.9	6.17	205
86	448	271	60.6	52.4	6.33	224
87	441	194	64.4	55.6	6.71	233
88	437	228	63.2	54.9	6.64	248
89	472	204	66.9	55.7	6.81	266
90	452	213	65.6	53.7	6.53	228
91	477	193	68.9	59.6	5.92	269
92	481	214	69.5	57.6	5.81	264
93	493	225	72.7	63.4	6.11	276

94	463	209	71.1	60.3	5.74	282
95	495	261	71.8	63.3	4.58	288
96	512	227	76.2	65.7	5.64	292
97	527	260	74.1	61.9	5.22	307
98	480	252	72.9	68.1	5.31	285
99	426	234	73.4	62.6	5.24	226
100	436	211	74.6	61.6	5.22	218
101	423	231	72.7	60.7	5.16	234
102	442	228	72.1	59.3	5.07	229
103	424	251	65.3	56.2	4.66	215
104	455	208	66.2	55.6	4.75	209
105	432	221	64.8	53.9	4.36	224
106	413	237	65.6	53.6	4.06	204
107	401	244	63.1	51.9	4.51	223
108	391	216	61.9	51.2	4.44	193
109	412	245	62.8	52.3	4.68	227
110	395	237	60.6	50.4	4.32	211
111	388	216	60.8	50.4	4.97	194
112	394	227	59.8	51.2	4.84	223
113	381	209	57.6	48.1	4.72	215
114	346	219	55.1	46.2	4.69	203
115	281	189	51.3	40.6	4.27	174
116	248	178	50.6	39.8	4.12	169
117	294	204	51.6	42.6	4.52	188
118	303	185	52.8	41.2	4.34	176
119	323	259	55.1	41.5	4.64	199
120	336	284	52.5	42.7	4.87	176
121	314	213	53.6	39.9	4.41	159
122	355	274	54.5	40.8	4.95	183
123	365	239	57.4	49.7	5.44	198
124	381	228	62.2	52.8	5.79	211
125	401	262	61	54.6	5.95	234
126	395	208	53.8	48.7	5.95	212
127	410	252	57.1	51.8	6.07	231
128	387	214	59.6	48.5	6.26	252
129	369	228	55.8	45.3	6.14	224
130	395	203	67.5	56.9	6.29	201
131	426	242	66.7	52.1	6.11	245
132	389	198	60	48.6	6.34	228
133	419	228	61.5	55.6	6.21	210
134	401	222	71.8	58.4	6.3	219
135	412	240	65.4	51.6	6.75	211
136	435	185	67.8	56.4	7.02	251
137	477	217	66.5	58.2	6.49	286
138	489	221	69.5	55.3	5.88	288
139	475	236	67.9	59.4	5.7	263
140	485	255	74.3	64.7	6	217
141	474	213	72.8	62.5	5.85	258
142	470	221	74.3	66.1	5.07	291

143	485	235	77.4	67.5	4.85	280
144	502	200	76.2	62.4	5.12	260
145	530	215	75.9	65.5	5.54	272
146	416	242	74.6	62.5	5.3	214
147	457	233	76.2	63.9	5.24	252
148	441	218	71.9	60.4	5.17	267
149	465	236	73.7	61.4	5.21	245
150	434	247	67.4	55.6	4.89	251
151	461	227	69.5	57.6	5.04	229
152	455	243	66.4	54.9	4.56	234
153	425	258	67.2	55.4	4.29	217
154	406	196	64.6	52.3	4.45	214
155	394	228	63.1	50.6	4.23	195
156	401	242	63.4	51.4	4.95	205
157	416	237	62.3	49.9	4.12	227
158	379	199	60.3	49.3	4.8	186
159	402	216	61.3	50.1	4.75	216
160	396	227	59.8	49.8	4.69	207
161	354	236	56.9	45.6	4.84	213
162	277	214	50.9	41.5	4.76	188
163	252	208	51.8	40.3	4.61	197
164	273	182	53.1	42.2	4.35	186
165	287	179	51.3	40.9	4.54	167
166	327	277	55.4	43.4	4.86	204
167	296	252	53.6	41.6	4.55	194
168	331	208	52.9	40.6	4.28	167
169	317	224	53.3	42.6	5.24	198
170	355	246	58.3	46.1	5.64	207
171	309	234	58.8	46.3	5.12	193
172	328	185	57.1	45.8	4.87	182
173	384	217	61.9	50.2	5.56	204
174	378	214	61.2	49.6	5.84	199
175	417	193	64	52.1	6.33	234
176	397	207	62.6	50.6	6.19	247
177	354	231	60.8	48.9	5.95	189
178	389	196	70.1	58.5	6.41	204
179	401	238	69.6	57.2	6.37	226
180	374	204	61.8	50.7	6.12	208
181	395	217	64.9	53.6	5.98	191
182	412	231	73.5	62.2	6.21	223
183	383	236	68.7	57.6	6.92	197
184	428	196	69.5	58.2	7.11	248
185	462	205	70.9	59.8	6.59	271
186	479	225	68.4	58.5	5.96	281
187	465	216	69.3	59.6	5.68	227
188	491	241	77.3	63.4	6.18	262
189	488	233	75.6	61.9	5.54	276
190	483	219	76.5	67.1	5.13	280
191	479	242	77.5	66.8	4.93	275

192	495	201	78.1	67.2	5.23	266
193	517	225	78.8	66.3	5.72	284
194	551	239	78.1	67.8	5.64	305
195	535	218	78.7	68.1	5.81	292
196	467	271	77.8	66.5	4.91	289
197	482	255	79.8	67.4	5.06	273
198	452	233	77.1	64.2	5.98	276
199	521	231	77.9	66.2	5.94	288
200	479	244	75.8	63.5	3.99	251
201	432	278	79.5	62.1	4.17	212
202	395	197	68.8	55.7	4.12	192
203	389	240	63.8	52.9	3.86	179
204	414	224	68.6	55.9	3.84	232
205	408	233	64.8	54.6	3.97	219
206	368	198	52.4	49.1	4.49	179
207	388	231	51.1	50.6	4.57	182
208	405	208	53.8	52.3	4.89	199
209	325	227	55.9	51.6	4.77	202
210	253	235	47.6	44.2	4.85	194
211	277	247	51.2	47.6	4.58	185
212	232	204	49.3	40.8	4.22	163
213	241	218	44.2	40.4	4.71	154
214	305	295	57.6	45.5	5.07	194
215	300	264	58.7	40.9	4.74	184
216	269	205	52.5	39.5	4.05	152
217	282	225	48.6	42.4	5.1	212
218	315	191	60.8	45.7	5.5	165
219	298	224	61.7	47.8	4.82	185
220	305	204	52.9	42.8	5.32	190
221	323	212	57.4	44.3	5.12	185
222	348	207	55.4	43.3	5.27	193
223	385	188	60.6	45.9	6.21	217
224	363	227	55.7	43.6	5.48	222
225	335	176	51.8	40.5	5.79	178
226	380	197	70.2	59.2	6.89	242
227	395	220	68.4	52.8	7.12	251
228	345	193	63.1	45.9	6.81	212
229	369	228	65.2	48.7	6.52	185
230	399	229	71.8	57.9	7.11	196
231	377	206	70.9	58.3	7.21	178
232	412	215	67.3	55.6	7.05	224
233	479	196	70.4	58.4	7.28	252
234	472	240	67.9	50.5	7.24	255
235	443	217	65.4	48.5	6.99	231
236	469	258	73.6	51.6	7.12	249
237	493	223	71.8	52.6	7.29	271
238	413	142	58.66	45.29	5.72	204
239	457	147	56.22	47.46	5.45	221
240	395	153	59.5	48.4	5.56	206

241	423	205	68.12	54.48	7.02	226
242	452	247	69.29	61.25	6.84	241
243	489	246	72.24	64.63	6.24	259
244	423	214	70.22	59.21	6.23	224
245	485	201	77.2	60.5	6.03	247
246	434	252	76.6	61.7	5.82	251
247	514	214	78.9	57.8	6.63	296
248	481	247	75.8	65.9	3.86	246
249	385	263	77.6	63.4	4.02	187
250	401	193	75.6	65.4	3.88	223
251	323	237	71.3	64.7	3.97	198
252	456	296	51.3	44.8	2.96	204
253	474	199	47.6	42.3	3.52	231
254	412	225	56.2	50.9	4.63	258
255	406	244	53.1	42.4	4.55	223
256	310	182	55.4	49.7	4.21	176
257	287	214	52.6	48.9	5.72	162
258	239	211	49.5	40.5	4.12	151
259	285	232	50.6	41.4	4.27	169
260	261	196	49.3	46.2	4.69	171
261	211	236	47.7	43.5	5.12	182
262	288	256	61.7	42.8	5.19	161
263	309	239	57.1	39.3	3.28	152
264	257	181	55.9	41.7	4.67	128
265	263	230	49.5	46.4	5.25	235
266	290	177	61.7	47.2	5.32	157
267	330	214	58.7	48.8	4.71	189
268	274	214	54.9	45.8	5.22	196
269	307	252	56.1	44.5	4.62	171
270	396	182	67.31	46.8	6.14	231
271	362	231	69.12	41.8	5.45	220
272	315	198	56.12	46.9	4.85	168
273	341	204	49.37	39.7	5.12	192
274	392	204	71.52	57.88	6.98	176
275	368	234	72.64	43.8	5.99	196
276	462	207	69.13	59.8	7.07	285
277	336	184	53.2	41.5	6.89	274
278	392	204	74.45	57.88	6.98	176
279	363	182	72.64	59.33	7.28	150
280	478	197	79.86	61.42	7.23	282
281	409	214	67.34	55.67	7.17	231
282	492	224	72.55	53.18	7.38	276
283	463	215	74.21	49.13	7.23	250
284	468	223	75.61	50.34	7.01	257
285	477	212	74.01	51.16	7.34	269
286	496	204	79.37	54.03	7.24	288
287	512	187	80.32	55.64	7.35	296
288	504	165	74.44	56.32	7.61	276
289	475	194	65.02	47.31	6.94	263

290	411	180	64.23	48.12	6.84	207
291	427	201	78.52	57.93	7.43	213
292	491	249	81.22	62.37	7.61	273
293	485	204	80.36	64.14	7.55	286
294	445	248	72.32	54.62	6.87	244
295	475	211	70.35	51.23	6.05	237
296	412	241	81.02	65.31	7.98	222
297	491	255	76.22	54.61	7.03	263
298	482	216	70.25	54.33	7.94	247
299	475	261	73.23	57.34	7.61	265
300	512	244	76.24	58.64	7.88	281
301	532	248	80.23	62.56	8.24	307
302	546	259	84.03	60.44	8.65	312
303	467	225	70.02	49.25	7.39	251
304	416	201	69.25	48.54	7.94	212
305	498	246	68.23	45.69	8.24	295
306	477	253	70.22	55.79	7.62	287
307	512	214	75.01	52.36	7.14	305
308	482	222	78.36	54.23	8.02	274
309	452	251	74.22	51.03	7.35	224
310	477	203	69.54	47.69	6.28	261
311	481	238	68.84	45.35	6.33	274
312	504	268	74.35	51.23	7.02	290
313	514	286	78.22	55.64	7.38	308
314	476	215	74.66	54.68	7.09	246
315	423	205	69.18	48.37	6.35	212
316	497	230	72.22	59.42	7.94	241
317	462	242	75.21	60.12	6.28	234
318	507	287	70.37	57.65	7.54	294
319	479	211	69.41	45.44	7.06	276
320	466	205	68.28	50.03	6.57	247
321	457	223	74.11	51.32	7.54	221
322	422	180	68.02	41.59	7.01	204
323	487	253	71.06	57.21	7.64	271
324	472	246	74.29	54.16	7.37	268
325	451	236	75.32	59.52	7.66	244
326	499	248	63.71	40.23	6.87	237
327	401	213	65.47	39.54	7.13	214
328	476	209	68.33	40.35	6.11	284
329	423	243	65.38	42.67	7.35	241
330	468	213	70.32	53.98	5.23	250
331	453	210	76.54	51.55	6.97	241
332	502	223	75.21	45.21	7.54	297
333	475	201	72.34	49.41	7.02	255
334	451	205	74.56	48.56	7.05	207
335	482	284	80.12	55.32	6.84	271
336	461	213	70.39	62.62	7.01	264
337	498	243	75.61	54.4	5.31	289
338	460	204	70.35	48.65	6.33	274

339	432	237	69.52	42.96	7.61	254
340	495	210	71.32	49.34	6.56	301
341	480	255	73.51	56.54	8.02	284
342	463	241	76.27	53.63	7.52	257
343	497	249	75.64	51.67	7.36	289
344	468	275	80.23	55.06	7.19	260
345	462	238	72.26	53.12	7.65	275
346	482	233	73.25	54.83	7.07	295
347	462	201	71.68	51.11	6.03	282
348	443	208	65.88	42.61	5.91	285
349	492	245	69.21	47.35	5.96	305
350	413	216	78.27	57.53	6.64	262
351	394	274	75.23	54.67	7.09	253
352	401	231	64.64	49.23	6.12	273
353	382	213	62.74	43.69	7.02	254
354	475	265	72.39	53.16	7.34	297
355	485	273	74.28	48.84	7.13	278
356	421	234	69.24	45.19	6.32	267
357	451	271	73.16	54.37	7.21	287
358	425	268	72.55	49.27	7.64	304
359	388	248	70.32	46.65	7.17	271
360	384	210	65.29	42.34	6.97	265
361	395	284	71.52	50.03	7.24	294
362	387	241	70.13	48.21	6.17	280
363	401	258	74.22	50.64	7.02	284
364	357	230	72.33	52.35	7.67	263
365	407	248	84.25	55.2	7.54	301
366	386	240	78.21	51.23	7.95	284
367	424	264	75.91	47.64	7.37	312
368	435	294	71.33	48.43	6.72	307
369	423	285	79.11	50.05	7.54	276
370	397	242	74.71	45.17	6.42	274
371	384	195	75.12	46.13	7.51	267
372	384	213	80.22	51.03	7.09	294
373	401	237	82.58	46.57	7.34	280
374	421	274	77.23	52.44	7.26	301
375	413	287	79.28	51.56	7.07	284
376	384	216	70.25	45.11	6.49	267
377	402	243	76.27	46.51	7.43	279
378	384	201	82.34	51.44	7.19	263
379	398	261	82.17	50.34	7.56	285
380	429	248	80.31	52.37	7.02	310
381	411	257	78.21	50.55	7.37	304
382	374	216	73.52	45.67	6.27	294
383	421	286	76.31	51.29	6.97	307
384	405	302	81.22	55.31	6.44	271
385	394	261	75.27	54.65	7.84	284
386	384	270	70.54	50.32	7.32	268
387	402	285	71.3	51.7	7.58	293