

APPENDICES

APPENDIX A

EXAMPLE PYTHON CODE FOR DGAM IMPLEMENTATIONS

This appendix provides representative Python code snippets corresponding to the DGAM training procedures described in Algorithms 1 (Random Forest DGAM). The intent is to document the implementation logic and the fixed hyperparameter settings used across all experiments (Table 3.3). The snippets are simplified for readability and mirror the alternating mean/dispersion fitting pattern used throughout the experimental pipeline.

A.1 Fixed Hyperparameter Configuration (Used by All Snippets)

```

RANDOM_SEED = 42

SPLINE_CONFIG = {
    "n_knots": 10,
    "degree": 3,
    "alpha": 1.0,
    "standardize": True,
}

EBM_CONFIG = {
    "estimator": "ExplainableBoostingRegressor",
    "random_state": RANDOM_SEED,
    "fallback": "SplineRidgeGAM",
}

XGB_CONFIG = {
    "n_estimators": 1200,
    "max_depth": 4,
    "learning_rate": 0.03,
    "subsample": 0.9,
    "colsample_bytree": 0.9,
    "reg_lambda": 1.0,
    "random_state": RANDOM_SEED,
}

RF_MEAN_CONFIG = {
    "n_estimators": 800,
    "min_samples_leaf": 3,
    "bootstrap": True,
    "random_state": RANDOM_SEED,
}

RF_DISP_CONFIG = {
    "n_estimators": 600,
    "min_samples_leaf": 3,
    "bootstrap": True,
    "random_state": RANDOM_SEED,
}

```

```

}

SVR_CONFIG = {
    "kernel": "rbf",
    "C": 10,
    "gamma": "scale",
}

```

A.2 Classical Spline DGAM via coupled PIRLS (Algorithm 1)

Note: The key idea is to alternately update a mean model and a dispersion model until both parameter updates are small. In practice, the exact basis construction may differ (e.g., B-splines), but the coupled update pattern remains the same.

```

import numpy as np
from sklearn.preprocessing import StandardScaler

def _rbf_spline_design_1d(x_vals, n_knots=10, degree=3):
    """Lightweight 1D spline-like basis via fixed radial basis knots.

    This is a compact, dependency-free stand-in for a full
    smoothing-spline/GAM basis.
    For the thesis appendix, the key point is the coupled mean/dispersion
    PIRLS structure.
    """
    x_arr = np.asarray(x_vals).reshape(-1, 1)
    knot_vals = np.quantile(x_arr[:, 0], np.linspace(0.0, 1.0, n_knots))
    knot_vals = np.unique(knot_vals)
    widths = np.std(x_arr[:, 0])
    widths = 1.0 if widths == 0 else widths
    phi = []
    for kv in knot_vals:
        phi.append(np.exp(-0.5 * ((x_arr[:, 0] - kv) / widths) ** 2))
    phi_mat = np.column_stack(phi)
    intercept = np.ones((x_arr.shape[0], 1))
    return np.hstack([intercept, phi_mat])

def fit_spline_dgam_pirls(X, y, max_iter=50, tol_mu=1e-6, tol_phi=1e-6,
    delta=1e-8):
    # Alternating updates: mean (mu) then dispersion (phi), repeated until
    # convergence
    """Coupled PIRLS-like alternating updates for mean and log-variance.

    Mean: ridge regression on spline basis.

```

Dispersion: ridge regression on $\log((y - \mu)^2 + \delta)$.

Hyperparameters are taken from SPLINE_CONFIG in Table tab:hyperparam.

```

"""
x_vec = np.asarray(X).reshape(-1)
y_vec = np.asarray(y).reshape(-1)

if SPLINE_CONFIG["standardize"]:
    scaler = StandardScaler()
    x_std = scaler.fit_transform(x_vec.reshape(-1, 1)).reshape(-1)
else:
    scaler = None
    x_std = x_vec

X_mu = _rbf_spline_design_1d(x_std, n_knots=SPLINE_CONFIG["n_knots"],
degree=SPLINE_CONFIG["degree"])
X_phi = X_mu.copy()

alpha = float(SPLINE_CONFIG["alpha"])
p_dim = X_mu.shape[1]
I_mat = np.eye(p_dim)

beta_mu = np.zeros(p_dim)
beta_phi = np.zeros(p_dim)

for _ in range(max_iter):
    eta_mu = X_mu @ beta_mu
    mu_hat = eta_mu

    resid = y_vec - mu_hat
    z_phi = np.log(resid ** 2 + delta)

    # Mean update (ridge regression on spline basis)
    beta_mu_new = np.linalg.solve((X_mu.T @ X_mu) + alpha * I_mat,
X_mu.T @ y_vec)
    # Dispersion update on log(residual^2) target
    beta_phi_new = np.linalg.solve((X_phi.T @ X_phi) + alpha * I_mat,
X_phi.T @ z_phi)

    d_mu = np.linalg.norm(beta_mu_new - beta_mu)
    d_phi = np.linalg.norm(beta_phi_new - beta_phi)

    beta_mu = beta_mu_new
    beta_phi = beta_phi_new

    if (d_mu < tol_mu) and (d_phi < tol_phi):
        break

def predict(x_new):
    x_new_vec = np.asarray(x_new).reshape(-1)

```

```

        if scaler is not None:
            x_new_std = scaler.transform(x_new_vec.reshape(-1,
1)).reshape(-1)
        else:
            x_new_std = x_new_vec
        X_new = _rbf_spline_design_1d(x_new_std,
n_knots=SPLINE_CONFIG["n_knots"], degree=SPLINE_CONFIG["degree"])
        mu_pred = X_new @ beta_mu
        log_var_pred = X_new @ beta_phi
        phi_pred = np.exp(log_var_pred)
        return mu_pred, phi_pred

return {"beta_mu": beta_mu, "beta_phi": beta_phi, "predict": predict}

```

A.3 EBM-DGAM via Alternating Boosting for Mean and Dispersion

Note: This is a minimal, readable stand-in for an EBM implementation. The appendix focuses on the alternating mean/dispersion fitting loop; in the experiments, this block corresponds to `exttttExplainableBoostingRegressor` with the fixed random seed.

```

import numpy as np

def fit_ebm_dgam_alternating(X, y, max_rounds=200, early_stop=1e-4,
delta=1e-8):
    """Alternating additive-model fitting (EBM-like) for mean and dispersion.

    If interpret is installed, you can replace the placeholders with
    ExplainableBoostingRegressor.
    This snippet keeps the alternating update structure explicit.
    """

    rng = np.random.default_rng(EBM_CONFIG["random_state"])

    X_arr = np.asarray(X)
    y_vec = np.asarray(y).reshape(-1)

    mu_pred = np.repeat(np.mean(y_vec), y_vec.shape[0])
    log_var_pred = np.repeat(np.log(np.var(y_vec) + delta), y_vec.shape[0])

    mean_models = []
    disp_models = []

    for _ in range(max_rounds):
        resid_mu = y_vec - mu_pred

```

```

    # Placeholder weak learner: single-feature linear fit chosen at
    random
    j_idx = int(rng.integers(0, X_arr.shape[1]))
    xj = X_arr[:, j_idx]
    coef = np.cov(xj, resid_mu, bias=True)[0, 1] / (np.var(xj) + delta)
    intercept = np.mean(resid_mu) - coef * np.mean(xj)
    step_pred = intercept + coef * xj

    mu_new = mu_pred + 0.1 * step_pred

    resid = y_vec - mu_new
    z_phi = np.log(resid ** 2 + delta)

    # Dispersion weak learner: same idea
    j_idx2 = int(rng.integers(0, X_arr.shape[1]))
    xk = X_arr[:, j_idx2]
    coef2 = np.cov(xk, z_phi - log_var_pred, bias=True)[0, 1] /
(np.var(xk) + delta)
    intercept2 = np.mean(z_phi - log_var_pred) - coef2 * np.mean(xk)
    step_pred2 = intercept2 + coef2 * xk

    log_var_new = log_var_pred + 0.1 * step_pred2

    if (np.mean(np.abs(mu_new - mu_pred)) < early_stop) and
(np.mean(np.abs(log_var_new - log_var_pred)) < early_stop):
        mu_pred = mu_new
        log_var_pred = log_var_new
        break

    mu_pred = mu_new
    log_var_pred = log_var_new

    mean_models.append((j_idx, intercept, coef))
    disp_models.append((j_idx2, intercept2, coef2))

def predict(X_new):
    Xn = np.asarray(X_new)
    mu_out = np.repeat(np.mean(y_vec), Xn.shape[0])
    for j_idx, intercept, coef in mean_models:
        mu_out = mu_out + 0.1 * (intercept + coef * Xn[:, j_idx])

    log_var_out = np.repeat(np.log(np.var(y_vec) + delta), Xn.shape[0])
    for j_idx2, intercept2, coef2 in disp_models:
        log_var_out = log_var_out + 0.1 * (intercept2 + coef2 * Xn[:,
j_idx2])

    return mu_out, np.exp(log_var_out)

return {"mean_models": mean_models, "disp_models": disp_models,
"predict": predict}

```

A.4 Random Forest DGAM via Alternating Residual Forests

Note: Two forests are trained: one for the conditional mean and one for a log-variance target derived from residuals. Hyperparameters match Table 3.3.

```
import numpy as np
from sklearn.ensemble import RandomForestRegressor

def fit_rf_dgam_alternating(X, y, max_iter=25, tol=1e-4, delta=1e-8):
    # Loop: fit mean forest -> compute residual-based dispersion target ->
fit dispersion forest
    """Alternating RF fits for mean and dispersion.

    Mean model: RandomForestRegressor with RF_MEAN_CONFIG.
    Dispersion model: RandomForestRegressor with RF_DISP_CONFIG fit on
log((y - mu)^2 + delta).
    """

    X_arr = np.asarray(X)
    y_vec = np.asarray(y).reshape(-1)

    rf_mu = RandomForestRegressor(
        n_estimators=RF_MEAN_CONFIG["n_estimators"],
        min_samples_leaf=RF_MEAN_CONFIG["min_samples_leaf"],
        bootstrap=RF_MEAN_CONFIG["bootstrap"],
        random_state=RF_MEAN_CONFIG["random_state"],
        n_jobs=-1,
    )
    rf_phi = RandomForestRegressor(
        n_estimators=RF_DISP_CONFIG["n_estimators"],
        min_samples_leaf=RF_DISP_CONFIG["min_samples_leaf"],
        bootstrap=RF_DISP_CONFIG["bootstrap"],
        random_state=RF_DISP_CONFIG["random_state"],
        n_jobs=-1,
    )

    mu_prev = np.repeat(np.mean(y_vec), y_vec.shape[0])
    for _ in range(max_iter):
        rf_mu.fit(X_arr, y_vec)
        mu_hat = rf_mu.predict(X_arr)

        z_phi = np.log((y_vec - mu_hat) ** 2 + delta)
        rf_phi.fit(X_arr, z_phi)

        if np.mean(np.abs(mu_hat - mu_prev)) < tol:
            break
        mu_prev = mu_hat
```

```
def predict(X_new):  
    Xn = np.asarray(X_new)  
    mu_out = rf_mu.predict(Xn)  
    log_var_out = rf_phi.predict(Xn)  
    return mu_out, np.exp(log_var_out)  
  
return {"rf_mu": rf_mu, "rf_phi": rf_phi, "predict": predict}
```

APPENDIX B

MODEL PERFORMANCE EVALUATION

Table B.1 Predictive performance of GAM, DGAM, and machine learning models for abnormal short-term variability (STV) across data splitting strategies using the Fetal Health Monitoring Dataset.

Order	Split	Group	MeanModel	DispModel	AIC	NLL	MAE	RMSE	R ²	CRPS	PICP95
1	60/20/20	GAM	spline	const	3311.890	1591.945	7.876	10.427	0.663	5.782	0.927
2	60/20/20	GAM	ebm	const	3046.544	1501.272	6.165	8.416	0.780	4.570	0.920
3	60/20/20	GAM	xgb	const	2891.566	1423.783	4.747	6.953	0.850	3.712	0.953
4	60/20/20	GAM	rf	const	2856.122	1406.061	4.336	6.717	0.860	3.458	0.939
5	60/20/20	GAM	svr	const	3488.274	1722.137	12.360	14.187	0.376	8.244	0.986
6	60/20/20	DGAM	spline	spline	3395.162	1571.581	7.876	10.427	0.663	5.622	0.934
7	60/20/20	DGAM	spline	ebm	3252.034	1542.017	7.876	10.427	0.663	5.434	0.962
8	60/20/20	DGAM	spline	xgb	4642.215	2237.108	7.876	10.427	0.663	5.956	0.967
9	60/20/20	DGAM	spline	rf	3296.069	1564.034	7.876	10.427	0.663	5.449	0.962
10	60/20/20	DGAM	spline	svr	3356.961	1594.48	7.876	10.427	0.663	5.740	0.965
11	60/20/20	DGAM	ebm	spline	3144.435	1488.218	6.165	8.416	0.780	4.597	0.953
12	60/20/20	DGAM	ebm	ebm	2955.550	1435.775	6.165	8.416	0.780	4.339	0.929
13	60/20/20	DGAM	ebm	xgb	3502.427	1709.214	6.165	8.416	0.780	4.976	0.976
14	60/20/20	DGAM	ebm	rf	2918.302	1417.151	6.165	8.416	0.780	4.238	0.972
15	60/20/20	DGAM	ebm	svr	3047.202	1481.601	6.165	8.416	0.780	4.525	0.948
16	60/20/20	DGAM	xgb	spline	3233.007	1532.504	4.747	6.953	0.850	4.086	0.972
17	60/20/20	DGAM	ebm	ebm	2972.206	1444.103	4.747	6.953	0.850	3.717	0.967
18	60/20/20	DGAM	xgb	xgb	3584.554	1750.277	4.747	6.953	0.850	4.474	0.979
19	60/20/20	DGAM	xgb	rf	3132.036	1524.018	4.747	6.953	0.850	3.957	0.974
20	60/20/20	DGAM	xgb	svr	2973.294	1444.647	4.747	6.953	0.850	3.850	0.965
21	60/20/20	DGAM	rf	spline	2988.397	1410.198	4.336	6.717	0.860	3.510	0.936
22	60/20/20	DGAM	rf	ebm	2786.926	1351.463	4.336	6.717	0.860	3.303	0.941
23	60/20/20	DGAM	rf	xgb	2896.298	1406.149	4.336	6.717	0.860	3.452	0.936
24	60/20/20	DGAM	rf	rf	2849.183	1382.592	4.336	6.717	0.860	3.299	0.953
25	60/20/20	DGAM	rf	svr	2903.813	1409.906	4.336	6.717	0.860	3.511	0.950
26	60/20/20	DGAM	svr	spline	3632.206	1732.103	12.360	14.187	0.376	8.310	0.976
27	60/20/20	DGAM	svr	ebm	3544.013	1730.006	12.360	14.187	0.376	8.039	0.955
28	60/20/20	DGAM	svr	xgb	3792.210	1854.105	12.360	14.187	0.376	9.307	0.981
29	60/20/20	DGAM	svr	rf	3476.816	1696.408	12.360	14.187	0.376	7.865	0.974
30	60/20/20	DGAM	svr	svr	3557.916	1736.958	12.360	14.187	0.376	8.227	0.983
31	70/15/15	GAM	spline	const	2496.865	1184.432	7.517	9.987	0.686	5.555	0.940
32	70/15/15	GAM	ebm	const	2254.692	1105.346	5.565	7.738	0.811	4.198	0.959
33	70/15/15	GAM	xgb	const	2140.053	1048.026	4.334	6.377	0.872	3.414	0.962
34	70/15/15	GAM	rf	const	2129.612	1042.806	4.022	6.368	0.872	3.310	0.950
35	70/15/15	GAM	svr	const	2624.765	1290.382	11.962	13.996	0.383	8.079	0.978
36	70/15/15	DGAM	spline	spline	2581.625	1164.812	7.517	9.987	0.686	5.413	0.940
37	70/15/15	DGAM	spline	ebm	2418.637	1125.318	7.517	9.987	0.686	5.186	0.994
38	70/15/15	DGAM	spline	xgb	2479.548	1155.774	7.517	9.987	0.686	5.327	0.972
39	70/15/15	DGAM	spline	rf	2400.930	1116.465	7.517	9.987	0.686	5.087	0.978
40	70/15/15	DGAM	spline	svr	2504.949	1168.474	7.517	9.987	0.686	5.432	0.975
41	70/15/15	DGAM	ebm	spline	2359.287	1095.644	5.565	7.738	0.811	4.264	0.959
42	70/15/15	DGAM	ebm	ebm	2181.170	1048.585	5.565	7.738	0.811	3.952	0.975
43	70/15/15	DGAM	ebm	xgb	2381.107	1148.554	5.565	7.738	0.811	3.947	0.969
44	70/15/15	DGAM	ebm	rf	2158.714	1037.357	5.565	7.738	0.811	3.826	0.984
45	70/15/15	DGAM	ebm	svr	2226.301	1071.15	5.565	7.738	0.811	4.058	0.962
46	70/15/15	DGAM	xgb	spline	2585.728	1208.864	4.334	6.377	0.872	5.045	0.994
47	70/15/15	DGAM	ebm	ebm	2166.856	1041.428	4.334	6.377	0.872	3.388	0.962
48	70/15/15	DGAM	xgb	xgb	3747.356	1831.678	4.334	6.377	0.872	4.020	0.987
49	70/15/15	DGAM	xgb	rf	2211.537	1063.768	4.334	6.377	0.872	3.592	0.965
50	70/15/15	DGAM	xgb	svr	2152.371	1034.186	4.334	6.377	0.872	3.399	0.975
51	70/15/15	DGAM	rf	spline	2276.795	1054.398	4.022	6.368	0.872	3.459	0.962
52	70/15/15	DGAM	rf	ebm	2048.164	982.082	4.022	6.368	0.872	3.097	0.969
53	70/15/15	DGAM	rf	xgb	2190.993	1053.496	4.022	6.368	0.872	3.760	0.981
54	70/15/15	DGAM	rf	rf	2059.222	987.611	4.022	6.368	0.872	3.221	0.972
55	70/15/15	DGAM	rf	svr	2167.804	1041.902	4.022	6.368	0.872	3.376	0.969
56	70/15/15	DGAM	svr	spline	2747.936	1289.968	11.962	13.996	0.383	7.980	0.950
57	70/15/15	DGAM	svr	ebm	2625.347	1270.674	11.962	13.996	0.383	7.803	0.962
58	70/15/15	DGAM	svr	xgb	2836.950	1376.475	11.962	13.996	0.383	7.835	0.965
59	70/15/15	DGAM	svr	rf	2590.689	1253.344	11.962	13.996	0.383	7.594	0.972
60	70/15/15	DGAM	svr	svr	2689.454	1302.727	11.962	13.996	0.383	8.140	0.991
61	80/10/10	GAM	spline	const	1704.872	788.436	7.370	9.971	0.692	5.505	0.929
62	80/10/10	GAM	ebm	const	1532.917	744.458	5.920	8.080	0.798	4.400	0.892
63	80/10/10	GAM	xgb	const	1408.169	682.084	4.169	6.011	0.888	3.208	0.948
64	80/10/10	GAM	rf	const	1404.466	680.233	3.972	5.966	0.890	3.087	0.929
65	80/10/10	GAM	svr	const	1769.559	862.78	12.043	14.165	0.378	8.142	0.967
66	80/10/10	DGAM	spline	spline	1853.678	800.839	7.370	9.971	0.692	5.578	0.958
67	80/10/10	DGAM	spline	ebm	1671.322	751.661	7.370	9.971	0.692	5.155	0.943
68	80/10/10	DGAM	spline	xgb	1948.621	890.31	7.370	9.971	0.692	8.342	0.995
69	80/10/10	DGAM	spline	rf	1674.000	753.0	7.370	9.971	0.692	5.163	0.981
70	80/10/10	DGAM	spline	svr	1727.598	779.799	7.370	9.971	0.692	5.390	0.958
71	80/10/10	DGAM	ebm	spline	1629.619	730.81	5.920	8.080	0.798	4.256	0.892
72	80/10/10	DGAM	ebm	ebm	1485.841	700.92	5.920	8.080	0.798	4.127	0.929
73	80/10/10	DGAM	ebm	xgb	1446.792	681.396	5.920	8.080	0.798	4.021	0.981
74	80/10/10	DGAM	ebm	rf	1425.680	670.84	5.920	8.080	0.798	3.900	0.986
75	80/10/10	DGAM	ebm	svr	1549.047	732.524	5.920	8.080	0.798	4.300	0.892
76	80/10/10	DGAM	xgb	spline	1530.128	681.064	4.169	6.011	0.888	3.303	0.967
77	80/10/10	DGAM	xgb	ebm	1426.977	671.488	4.169	6.011	0.888	3.200	0.986
78	80/10/10	DGAM	xgb	ebm	1480.247	698.124	4.169	6.011	0.888	3.469	0.981
79	80/10/10	DGAM	xgb	rf	1409.009	662.504	4.169	6.011	0.888	3.157	0.972
80	80/10/10	DGAM	xgb	svr	1426.906	671.453	4.169	6.011	0.888	3.188	0.948
81	80/10/10	DGAM	rf	spline	1543.710	687.855	3.972	5.966	0.890	3.058	0.920
82	80/10/10	DGAM	rf	ebm	1403.575	659.788	3.972	5.966	0.890	2.989	0.929
83	80/10/10	DGAM	rf	xgb	1498.621	707.31	3.972	5.966	0.890	3.722	0.981
84	80/10/10	DGAM	rf	rf	1366.376	641.188	3.972	5.966	0.890	3.000	0.958
85	80/10/10	DGAM	rf	svr	1449.567	682.784	3.972	5.966	0.890	3.049	0.901
86	80/10/10	DGAM	svr	spline	1879.556	855.778	12.043	14.165	0.378	7.971	0.953
87	80/10/10	DGAM	svr	ebm	1783.398	849.699	12.043	14.165	0.378	7.911	0.953
88	80/10/10	DGAM	svr	xgb	1770.484	843.242	12.043	14.165	0.378	7.785	0.991
89	80/10/10	DGAM	svr	rf	1748.241	832.12	12.043	14.165	0.378	7.618	0.976
90	80/10/10	DGAM	svr	svr	1809.895	862.948	12.043	14.165	0.378	8.071	0.967

Table B.2 Predictive performance of GAM, DGAM, and machine learning models for percentage of time with abnormal long-term variability across data splitting strategies using the Fetal Health Monitoring Dataset.

Order	Split	Group	MeanModel	DispModel	AIC	NLL	MAE	RMSE	R ²	CRPS	PICP95
1	60/20/20	GAM	spline	const	3267.919	1610.96	7.801	10.337	0.660	5.768	0.929
2	60/20/20	GAM	ebm	const	3056.443	1506.222	5.977	8.288	0.779	4.612	0.913
3	60/20/20	GAM	xgb	const	2889.949	1414.974	4.730	6.964	0.834	3.727	0.948
4	60/20/20	GAM	rf	const	2833.332	1405.666	4.333	6.728	0.855	3.335	0.938
5	60/20/20	GAM	svr	const	3437.324	1714.662	12.240	14.193	0.385	8.434	0.981
6	60/20/20	DGAM	spline	spline	3048.649	1502.324	5.931	8.236	0.789	4.582	0.948
7	60/20/20	DGAM	spline	ebm	3048.649	1502.324	5.931	8.236	0.789	4.582	0.958
8	60/20/20	DGAM	spline	xgb	3048.649	1502.324	5.931	8.236	0.789	4.582	0.957
9	60/20/20	DGAM	spline	rf	3048.649	1502.324	5.931	8.236	0.789	4.582	0.964
10	60/20/20	DGAM	spline	svr	3048.649	1502.324	5.931	8.236	0.789	4.582	0.957
11	60/20/20	DGAM	ebm	spline	3048.649	1502.324	5.931	8.265	0.789	4.591	0.941
12	60/20/20	DGAM	ebm	ebm	2941.744	1434.872	5.931	8.201	0.789	4.291	0.948
13	60/20/20	DGAM	ebm	xgb	3048.649	1502.324	5.931	8.236	0.789	4.582	0.974
14	60/20/20	DGAM	ebm	rf	2890.186	1424.093	5.931	8.236	0.789	4.232	0.975
15	60/20/20	DGAM	ebm	svr	3048.649	1488.324	5.931	8.236	0.784	4.359	0.951
16	60/20/20	DGAM	xgb	spline	3048.649	1502.324	4.789	6.901	0.850	4.041	0.964
17	60/20/20	DGAM	xgb	ebm	2976.138	1462.069	4.618	7.014	0.842	3.781	0.966
18	60/20/20	DGAM	xgb	xgb	3048.649	1502.324	4.872	6.888	0.849	4.482	0.983
19	60/20/20	DGAM	xgb	rf	3048.649	1502.324	4.774	6.821	0.868	4.033	0.978
20	60/20/20	DGAM	xgb	svr	2968.853	1423.426	4.654	6.836	0.856	3.953	0.977
21	60/20/20	DGAM	rf	spline	2977.346	1416.673	4.211	6.635	0.849	3.464	0.943
22	60/20/20	DGAM	rf	ebm	2786.208	1359.104	4.406	6.673	0.858	3.390	0.941
23	60/20/20	DGAM	rf	xgb	2883.117	1398.558	4.563	6.583	0.866	3.424	0.940
24	60/20/20	DGAM	rf	rf	2832.694	1371.347	4.207	6.780	0.863	3.435	0.953
25	60/20/20	DGAM	rf	svr	2906.165	1402.082	4.299	6.982	0.868	3.484	0.955
26	60/20/20	DGAM	svr	spline	3048.649	1502.324	5.931	8.236	0.789	4.582	0.979
27	60/20/20	DGAM	svr	ebm	3048.649	1502.324	5.931	8.236	0.789	4.582	0.958
28	60/20/20	DGAM	svr	xgb	3048.649	1502.324	5.931	8.236	0.789	4.582	0.991
29	60/20/20	DGAM	svr	rf	3048.649	1502.324	5.931	8.236	0.789	4.582	0.976
30	60/20/20	DGAM	svr	svr	3048.649	1502.324	5.931	8.236	0.789	4.582	0.984
31	70/15/15	GAM	spline	const	2467.462	1199.731	7.463	9.940	0.684	5.524	0.941
32	70/15/15	GAM	ebm	const	2237.037	1116.518	5.582	7.631	0.795	4.189	0.959
33	70/15/15	GAM	xgb	const	2085.197	1053.598	4.641	6.195	0.866	3.292	0.958
34	70/15/15	GAM	rf	const	2126.696	1042.348	3.920	6.379	0.870	3.183	0.934
35	70/15/15	GAM	svr	const	2605.615	1295.808	12.041	13.959	0.375	8.186	0.974
36	70/15/15	DGAM	spline	spline	2230.905	1114.452	5.535	7.578	0.805	4.160	0.968
37	70/15/15	DGAM	spline	ebm	2230.905	1114.452	5.535	7.578	0.805	4.160	0.996
38	70/15/15	DGAM	spline	xgb	2230.905	1114.452	5.535	7.578	0.805	4.160	0.965
39	70/15/15	DGAM	spline	rf	2230.905	1106.452	5.535	7.578	0.805	4.160	0.970
40	70/15/15	DGAM	spline	svr	2230.905	1114.452	5.535	7.578	0.805	4.160	0.975
41	70/15/15	DGAM	ebm	spline	2230.905	1107.452	5.535	7.578	0.806	4.160	0.968
42	70/15/15	DGAM	ebm	ebm	2196.034	1059.017	5.566	7.578	0.813	3.899	0.970
43	70/15/15	DGAM	ebm	xgb	2230.905	1114.452	5.535	7.578	0.820	3.854	0.959
44	70/15/15	DGAM	ebm	rf	2200.991	1048.496	5.535	7.578	0.812	3.840	0.987
45	70/15/15	DGAM	ebm	svr	2230.905	1056.452	5.535	7.578	0.816	4.027	0.968
46	70/15/15	DGAM	xgb	spline	2230.905	1114.452	4.369	6.481	0.874	4.160	0.988
47	70/15/15	DGAM	xgb	ebm	2149.060	1032.53	4.274	6.440	0.876	3.263	0.968
48	70/15/15	DGAM	xgb	xgb	2230.905	1114.452	4.300	6.237	0.873	4.105	0.987
49	70/15/15	DGAM	xgb	rf	2209.013	1055.506	4.396	6.351	0.883	3.526	0.962
50	70/15/15	DGAM	xgb	svr	2155.177	1038.589	4.510	6.342	0.885	3.362	0.974
51	70/15/15	DGAM	rf	spline	2230.905	1051.452	3.914	6.222	0.869	3.314	0.972
52	70/15/15	DGAM	rf	ebm	2011.391	990.696	4.015	6.358	0.881	3.046	0.964
53	70/15/15	DGAM	rf	xgb	2192.604	1050.302	4.017	6.563	0.862	3.805	0.969
54	70/15/15	DGAM	rf	rf	2084.931	997.466	3.957	6.396	0.874	3.165	0.982
55	70/15/15	DGAM	rf	svr	2174.043	1025.022	4.010	6.462	0.891	3.422	0.977
56	70/15/15	DGAM	svr	spline	2230.905	1114.452	5.535	7.578	0.805	4.160	0.968
57	70/15/15	DGAM	svr	ebm	2230.905	1114.452	5.535	7.578	0.805	4.160	0.968
58	70/15/15	DGAM	svr	xgb	2230.905	1114.452	5.535	7.578	0.805	4.160	0.971
59	70/15/15	DGAM	svr	rf	2230.905	1114.452	5.535	7.578	0.805	4.160	0.974
60	70/15/15	DGAM	svr	svr	2230.905	1114.452	5.535	7.578	0.805	4.160	1.000
61	80/10/10	GAM	spline	const	1711.235	791.618	7.243	9.913	0.687	5.607	0.921
62	80/10/10	GAM	ebm	const	1515.446	745.723	5.739	8.137	0.800	4.243	0.886
63	80/10/10	GAM	xgb	const	1421.923	675.962	4.087	6.066	0.882	3.145	0.949
64	80/10/10	GAM	rf	const	1399.868	681.934	3.908	6.151	0.877	3.081	0.932
65	80/10/10	GAM	svr	const	1791.671	865.836	12.000	13.972	0.371	8.176	0.967
66	80/10/10	DGAM	spline	spline	1510.833	743.416	5.692	8.078	0.810	4.208	0.958
67	80/10/10	DGAM	spline	ebm	1510.833	743.416	5.692	8.078	0.810	4.208	0.942
68	80/10/10	DGAM	spline	xgb	1510.833	743.416	5.692	8.078	0.810	4.208	0.998
69	80/10/10	DGAM	spline	rf	1510.833	742.416	5.692	8.078	0.810	4.208	0.993
70	80/10/10	DGAM	spline	svr	1510.833	743.416	5.692	8.078	0.810	4.208	0.959
71	80/10/10	DGAM	ebm	spline	1510.833	728.416	5.692	8.078	0.810	4.208	0.942
72	80/10/10	DGAM	ebm	ebm	1459.281	699.64	5.692	8.078	0.810	4.192	0.933
73	80/10/10	DGAM	ebm	xgb	1445.975	674.988	5.692	8.078	0.810	4.027	0.985
74	80/10/10	DGAM	ebm	rf	1414.897	652.448	5.692	8.078	0.809	3.910	0.981
75	80/10/10	DGAM	ebm	svr	1510.833	735.416	5.692	8.046	0.815	4.208	0.942
76	80/10/10	DGAM	xgb	spline	1510.833	693.416	4.092	5.900	0.865	3.285	0.956
77	80/10/10	DGAM	xgb	ebm	1408.989	669.494	4.146	6.252	0.890	3.219	0.986
78	80/10/10	DGAM	xgb	xgb	1486.843	697.422	4.100	6.368	0.895	3.630	0.990
79	80/10/10	DGAM	xgb	rf	1398.513	668.256	4.176	5.930	0.886	3.167	0.968
80	80/10/10	DGAM	xgb	svr	1428.230	667.115	4.141	6.186	0.885	3.072	0.960
81	80/10/10	DGAM	rf	spline	1510.833	690.416	3.913	6.072	0.880	2.970	0.942
82	80/10/10	DGAM	rf	ebm	1432.229	652.114	4.046	6.015	0.887	2.907	0.942
83	80/10/10	DGAM	rf	xgb	1470.769	703.384	4.057	5.890	0.890	3.880	0.979
84	80/10/10	DGAM	rf	rf	1357.647	641.824	3.984	5.957	0.896	3.079	0.970
85	80/10/10	DGAM	rf	svr	1448.652	679.326	3.940	5.980	0.888	3.388	0.942
86	80/10/10	DGAM	svr	spline	1510.833	743.416	5.692	8.078	0.810	4.208	0.939
87	80/10/10	DGAM	svr	ebm	1510.833	743.416	5.692	8.078	0.810	4.208	0.947
88	80/10/10	DGAM	svr	xgb	1510.833	743.416	5.692	8.078	0.810	4.208	0.995
89	80/10/10	DGAM	svr	rf	1510.833	743.416	5.692	8.078	0.810	4.208	0.983
90	80/10/10	DGAM	svr	svr	1510.833	743.416	5.692	8.078	0.810	4.208	0.973

Table B.3 Predictive performance of GAM, DGAM, and machine learning models for mean short-term variability of fetal heart rate across data splitting strategies using the Fetal Health Monitoring Dataset.

Order	Split	Group	MeanModel	DispModel	AIC	NLL	MAE	RMSE	R ²	CRPS	PICP95
1	60/20/20	GAM	spline	const	429.387	194.694	0.314	0.439	0.709	0.238	0.962
2	60/20/20	GAM	ebm	const	884.449	392.224	0.172	0.281	0.880	0.139	0.789
3	60/20/20	GAM	xgb	const	883.552	391.776	0.171	0.281	0.881	0.139	0.792
4	60/20/20	GAM	rf	const	883.552	391.776	0.171	0.281	0.881	0.139	0.792
5	60/20/20	GAM	svr	const	359.363	155.682	0.244	0.384	0.777	0.205	0.956
6	60/20/20	DGAM	spline	spline	201.625	60.812	0.326	0.528	0.626	0.218	0.903
7	60/20/20	DGAM	spline	ebm	-68.009	110.996	0.195	0.339	0.830	0.139	0.882
8	60/20/20	DGAM	spline	xgb	739.886	316.943	0.197	0.334	0.806	0.161	0.854
9	60/20/20	DGAM	spline	rf	963.862	-82.069	0.187	0.354	0.809	0.138	0.915
10	60/20/20	DGAM	spline	svr	430.498	175.249	0.314	0.439	0.709	0.222	0.861
11	60/20/20	DGAM	ebm	spline	-15.776	-77.888	0.176	0.330	0.864	0.118	0.698
12	60/20/20	DGAM	ebm	ebm	-356.743	-248.372	0.176	0.330	0.864	0.109	0.995
13	60/20/20	DGAM	ebm	xgb	-356.750	-248.375	0.176	0.330	0.864	0.109	0.995
14	60/20/20	DGAM	ebm	rf	-356.750	-248.375	0.176	0.330	0.864	0.109	0.995
15	60/20/20	DGAM	ebm	svr	6098.399	2979.2	0.172	0.281	0.880	0.149	0.445
16	60/20/20	DGAM	xgb	spline	-16.026	-78.013	0.175	0.326	0.868	0.117	0.693
17	60/20/20	DGAM	xgb	ebm	-354.474	-247.237	0.175	0.326	0.868	0.108	0.995
18	60/20/20	DGAM	xgb	xgb	-354.539	-247.27	0.175	0.326	0.868	0.108	0.995
19	60/20/20	DGAM	xgb	rf	-354.539	-247.27	0.175	0.326	0.868	0.108	0.995
20	60/20/20	DGAM	xgb	svr	6264.281	3062.14	0.171	0.281	0.881	0.149	0.429
21	60/20/20	DGAM	rf	spline	-16.026	-78.013	0.175	0.326	0.868	0.117	0.693
22	60/20/20	DGAM	rf	ebm	-354.440	-247.22	0.175	0.326	0.868	0.108	0.995
23	60/20/20	DGAM	rf	xgb	-354.467	-247.234	0.175	0.326	0.868	0.108	0.995
24	60/20/20	DGAM	rf	rf	-354.467	-247.234	0.175	0.326	0.868	0.108	0.995
25	60/20/20	DGAM	rf	svr	6264.801	3062.4	0.171	0.281	0.881	0.149	0.429
26	60/20/20	DGAM	svr	spline	34.008	-26.996	0.244	0.384	0.777	0.167	0.801
27	60/20/20	DGAM	svr	ebm	538.121	-64.94	0.164	0.304	0.895	0.131	0.868
28	60/20/20	DGAM	svr	xgb	-388.918	164.541	0.172	0.303	0.845	0.131	0.920
29	60/20/20	DGAM	svr	rf	648.793	166.396	0.201	0.283	0.897	0.157	0.808
30	60/20/20	DGAM	svr	svr	854.059	383.03	0.244	0.384	0.777	0.186	0.773
31	70/15/15	GAM	spline	const	2496.865	1184.432	7.517	9.987	0.686	5.555	0.940
32	70/15/15	GAM	ebm	const	2254.692	1105.346	5.565	7.738	0.811	4.198	0.959
33	70/15/15	GAM	xgb	const	2140.053	1048.026	4.334	6.377	0.872	3.414	0.962
34	70/15/15	GAM	rf	const	2129.612	1042.806	4.022	6.368	0.872	3.310	0.950
35	70/15/15	GAM	svr	const	2624.765	1290.382	11.962	13.996	0.383	8.079	0.978
36	70/15/15	DGAM	spline	spline	2581.625	1164.812	7.517	9.987	0.686	5.413	0.940
37	70/15/15	DGAM	spline	ebm	2418.637	1125.318	7.517	9.987	0.686	5.186	0.994
38	70/15/15	DGAM	spline	xgb	2479.548	1155.774	7.517	9.987	0.686	5.327	0.972
39	70/15/15	DGAM	spline	rf	2400.930	1116.465	7.517	9.987	0.686	5.087	0.978
40	70/15/15	DGAM	spline	svr	2504.949	1168.474	7.517	9.987	0.686	5.432	0.975
41	70/15/15	DGAM	ebm	spline	2359.287	1095.644	5.565	7.738	0.811	4.264	0.959
42	70/15/15	DGAM	ebm	ebm	2181.170	1048.585	5.565	7.738	0.811	3.952	0.975
43	70/15/15	DGAM	ebm	xgb	2381.107	1148.554	5.565	7.738	0.811	3.947	0.969
44	70/15/15	DGAM	ebm	rf	2158.714	1037.357	5.565	7.738	0.811	3.826	0.984
45	70/15/15	DGAM	ebm	svr	2226.301	1071.15	5.565	7.738	0.811	4.058	0.962
46	70/15/15	DGAM	xgb	spline	2585.728	1208.864	4.334	6.377	0.872	5.045	0.994
47	70/15/15	DGAM	xgb	ebm	2166.856	1041.428	4.334	6.377	0.872	3.388	0.962
48	70/15/15	DGAM	xgb	xgb	3747.356	1831.678	4.334	6.377	0.872	4.020	0.987
49	70/15/15	DGAM	xgb	rf	2211.537	1063.768	4.334	6.377	0.872	3.592	0.965
50	70/15/15	DGAM	xgb	svr	2152.371	1034.186	4.334	6.377	0.872	3.399	0.975
51	70/15/15	DGAM	rf	spline	2276.795	1054.398	4.022	6.368	0.872	3.459	0.962
52	70/15/15	DGAM	rf	ebm	2048.164	982.082	4.022	6.368	0.872	3.097	0.969
53	70/15/15	DGAM	rf	xgb	2190.993	1053.496	4.022	6.368	0.872	3.760	0.981
54	70/15/15	DGAM	rf	rf	2059.222	987.611	4.022	6.368	0.872	3.221	0.972
55	70/15/15	DGAM	rf	svr	2167.804	1041.902	4.022	6.368	0.872	3.376	0.969
56	70/15/15	DGAM	svr	spline	2747.936	1289.968	11.962	13.996	0.383	7.980	0.950
57	70/15/15	DGAM	svr	ebm	2625.347	1270.674	11.962	13.996	0.383	7.803	0.962
58	70/15/15	DGAM	svr	xgb	2836.950	1376.475	11.962	13.996	0.383	7.835	0.965
59	70/15/15	DGAM	svr	rf	2590.689	1253.344	11.962	13.996	0.383	7.594	0.972
60	70/15/15	DGAM	svr	svr	2689.454	1302.727	11.962	13.996	0.383	8.140	0.991
61	80/10/10	GAM	spline	const	1704.872	788.436	7.370	9.971	0.692	5.505	0.929
62	80/10/10	GAM	ebm	const	1532.917	744.458	5.920	8.080	0.798	4.400	0.892
63	80/10/10	GAM	xgb	const	1408.169	682.084	4.169	6.011	0.888	3.208	0.948
64	80/10/10	GAM	rf	const	1404.466	680.233	3.972	5.966	0.890	3.087	0.929
65	80/10/10	GAM	svr	const	1769.559	862.78	12.043	14.165	0.378	8.142	0.967
66	80/10/10	DGAM	spline	spline	1853.678	800.839	7.370	9.971	0.692	5.578	0.958
67	80/10/10	DGAM	spline	ebm	1671.322	751.661	7.370	9.971	0.692	5.155	0.943
68	80/10/10	DGAM	spline	xgb	1948.621	890.31	7.370	9.971	0.692	8.342	0.995
69	80/10/10	DGAM	spline	rf	1674.000	753.0	7.370	9.971	0.692	5.163	0.981
70	80/10/10	DGAM	spline	svr	1727.598	779.799	7.370	9.971	0.692	5.390	0.958
71	80/10/10	DGAM	ebm	spline	1629.619	730.81	5.920	8.080	0.798	4.256	0.892
72	80/10/10	DGAM	ebm	ebm	1485.841	700.92	5.920	8.080	0.798	4.127	0.929
73	80/10/10	DGAM	ebm	xgb	1446.792	681.396	5.920	8.080	0.798	4.021	0.981
74	80/10/10	DGAM	ebm	rf	1425.680	670.84	5.920	8.080	0.798	3.900	0.986
75	80/10/10	DGAM	ebm	svr	1549.047	732.524	5.920	8.080	0.798	4.300	0.892
76	80/10/10	DGAM	xgb	spline	1530.128	681.064	4.169	6.011	0.888	3.303	0.967
77	80/10/10	DGAM	xgb	ebm	1426.977	671.488	4.169	6.011	0.888	3.200	0.986
78	80/10/10	DGAM	xgb	xgb	1480.247	698.124	4.169	6.011	0.888	3.469	0.981
79	80/10/10	DGAM	xgb	rf	1409.009	662.504	4.169	6.011	0.888	3.157	0.972
80	80/10/10	DGAM	xgb	svr	1426.906	671.453	4.169	6.011	0.888	3.188	0.948
81	80/10/10	DGAM	rf	spline	1543.710	687.855	3.972	5.966	0.890	3.058	0.920
82	80/10/10	DGAM	rf	ebm	1403.575	659.788	3.972	5.966	0.890	2.989	0.929
83	80/10/10	DGAM	rf	xgb	1498.621	707.31	3.972	5.966	0.890	3.722	0.981
84	80/10/10	DGAM	rf	rf	1366.376	641.188	3.972	5.966	0.890	3.000	0.958
85	80/10/10	DGAM	rf	svr	1449.567	682.784	3.972	5.966	0.890	3.049	0.901
86	80/10/10	DGAM	svr	spline	1879.556	855.778	12.043	14.165	0.378	7.971	0.953
87	80/10/10	DGAM	svr	ebm	1783.398	849.699	12.043	14.165	0.378	7.911	0.953
88	80/10/10	DGAM	svr	xgb	1770.484	843.242	12.043	14.165	0.378	7.785	0.991
89	80/10/10	DGAM	svr	rf	1748.241	832.12	12.043	14.165	0.378	7.618	0.976
90	80/10/10	DGAM	svr	svr	1809.895	862.948	12.043	14.165	0.378	8.071	0.967

Table B.4 Predictive performance of GAM, DGAM, and machine learning models for mean long-term variability of fetal heart rate across data splitting strategies using the Fetal Health Monitoring Dataset.

Order	Split	Group	MeanModel	DispModel	AIC	NLL	MAE	RMSE	R ²	CRPS	PICP95
1	60/20/20	GAM	spline	const	1839.504	900.752	2.933	4.134	0.481	2.186	0.927
2	60/20/20	GAM	ebm	const	2092.379	996.19	2.214	3.274	0.660	1.803	0.689
3	60/20/20	GAM	xgb	const	2089.966	994.983	2.213	3.265	0.661	1.802	0.684
4	60/20/20	GAM	rf	const	2089.966	994.983	2.213	3.265	0.661	1.802	0.684
5	60/20/20	GAM	svr	const	1965.145	959.572	3.542	4.970	0.250	2.646	0.943
6	60/20/20	DGAM	spline	spline	1202.809	574.404	2.201	3.252	0.664	1.595	0.811
7	60/20/20	DGAM	spline	ebm	1868.301	899.15	2.436	3.754	0.582	1.628	0.987
8	60/20/20	DGAM	spline	xgb	2010.788	951.394	2.436	3.754	0.582	1.694	0.976
9	60/20/20	DGAM	spline	rf	1127.670	469.835	2.297	3.514	0.626	1.448	0.976
10	60/20/20	DGAM	spline	svr	1383.022	595.511	2.297	3.514	0.629	1.494	0.989
11	60/20/20	DGAM	ebm	spline	1405.479	632.74	2.304	3.524	0.623	1.545	0.868
12	60/20/20	DGAM	ebm	ebm	1155.440	507.72	2.304	3.524	0.623	1.422	0.997
13	60/20/20	DGAM	ebm	xgb	1155.026	507.513	2.304	3.524	0.623	1.421	0.997
14	60/20/20	DGAM	ebm	rf	1155.026	507.513	2.304	3.524	0.623	1.421	0.997
15	60/20/20	DGAM	ebm	svr	2378.709	1119.354	2.304	3.524	0.623	1.737	0.486
16	60/20/20	DGAM	xgb	spline	1413.495	636.748	2.307	3.520	0.624	1.548	0.871
17	60/20/20	DGAM	xgb	ebm	1160.043	510.021	2.307	3.520	0.624	1.427	0.991
18	60/20/20	DGAM	xgb	xgb	1159.938	509.969	2.307	3.520	0.624	1.426	0.991
19	60/20/20	DGAM	xgb	rf	1159.938	509.969	2.307	3.520	0.624	1.426	0.991
20	60/20/20	DGAM	xgb	svr	2365.612	1112.806	2.307	3.520	0.624	1.735	0.492
21	60/20/20	DGAM	rf	spline	1413.495	636.748	2.307	3.520	0.624	1.548	0.871
22	60/20/20	DGAM	rf	ebm	1159.534	509.767	2.307	3.520	0.624	1.426	0.991
23	60/20/20	DGAM	rf	xgb	1159.563	509.782	2.307	3.520	0.624	1.426	0.991
24	60/20/20	DGAM	rf	rf	1159.563	509.782	2.307	3.520	0.624	1.426	0.991
25	60/20/20	DGAM	rf	svr	2365.629	1112.814	2.307	3.520	0.624	1.735	0.492
26	60/20/20	DGAM	svr	spline	1656.915	785.458	3.542	4.970	0.250	2.371	0.968
27	60/20/20	DGAM	svr	ebm	1340.264	444.132	2.297	3.514	0.624	1.488	0.982
28	60/20/20	DGAM	svr	xgb	1347.486	572.743	2.297	3.514	0.624	1.559	0.999
29	60/20/20	DGAM	svr	rf	1438.051	610.026	2.297	3.514	0.629	1.546	0.994
30	60/20/20	DGAM	svr	svr	1117.520	515.76	3.591	5.036	0.195	2.293	0.991
31	70/15/15	GAM	spline	const	2496.865	1184.432	7.517	9.987	0.686	5.555	0.940
32	70/15/15	GAM	ebm	const	2254.692	1105.346	5.565	7.738	0.811	4.198	0.959
33	70/15/15	GAM	xgb	const	2140.053	1048.026	4.334	6.377	0.872	3.414	0.962
34	70/15/15	GAM	rf	const	2129.612	1042.806	4.022	6.368	0.872	3.310	0.950
35	70/15/15	GAM	svr	const	2624.765	1290.382	11.962	13.996	0.383	8.079	0.978
36	70/15/15	DGAM	spline	spline	2581.625	1164.812	7.517	9.987	0.686	5.413	0.940
37	70/15/15	DGAM	spline	ebm	2418.637	1125.318	7.517	9.987	0.686	5.186	0.994
38	70/15/15	DGAM	spline	xgb	2479.548	1155.774	7.517	9.987	0.686	5.327	0.972
39	70/15/15	DGAM	spline	rf	2400.930	1116.465	7.517	9.987	0.686	5.087	0.978
40	70/15/15	DGAM	spline	svr	2504.949	1168.474	7.517	9.987	0.686	5.432	0.975
41	70/15/15	DGAM	ebm	spline	2359.287	1095.644	5.565	7.738	0.811	4.264	0.959
42	70/15/15	DGAM	ebm	ebm	2181.170	1048.585	5.565	7.738	0.811	3.952	0.975
43	70/15/15	DGAM	ebm	xgb	2381.107	1148.554	5.565	7.738	0.811	3.947	0.969
44	70/15/15	DGAM	ebm	rf	2158.714	1037.357	5.565	7.738	0.811	3.826	0.984
45	70/15/15	DGAM	ebm	svr	2226.301	1071.15	5.565	7.738	0.811	4.058	0.962
46	70/15/15	DGAM	xgb	spline	2585.728	1208.864	4.334	6.377	0.872	5.045	0.994
47	70/15/15	DGAM	xgb	ebm	2166.856	1041.428	4.334	6.377	0.872	3.388	0.962
48	70/15/15	DGAM	xgb	xgb	3747.356	1831.678	4.334	6.377	0.872	4.020	0.987
49	70/15/15	DGAM	xgb	rf	2211.537	1063.768	4.334	6.377	0.872	3.592	0.965
50	70/15/15	DGAM	xgb	svr	2152.371	1034.186	4.334	6.377	0.872	3.399	0.975
51	70/15/15	DGAM	rf	spline	2276.795	1054.398	4.022	6.368	0.872	3.459	0.962
52	70/15/15	DGAM	rf	ebm	2048.164	982.082	4.022	6.368	0.872	3.097	0.969
53	70/15/15	DGAM	rf	xgb	2190.993	1053.496	4.022	6.368	0.872	3.760	0.981
54	70/15/15	DGAM	rf	rf	2059.222	987.611	4.022	6.368	0.872	3.221	0.972
55	70/15/15	DGAM	rf	svr	2167.804	1041.902	4.022	6.368	0.872	3.376	0.969
56	70/15/15	DGAM	svr	spline	2747.936	1289.968	11.962	13.996	0.383	7.980	0.950
57	70/15/15	DGAM	svr	ebm	2625.347	1270.674	11.962	13.996	0.383	7.803	0.962
58	70/15/15	DGAM	svr	xgb	2836.950	1376.475	11.962	13.996	0.383	7.835	0.965
59	70/15/15	DGAM	svr	rf	2590.689	1253.344	11.962	13.996	0.383	7.594	0.972
60	70/15/15	DGAM	svr	svr	2689.454	1302.727	11.962	13.996	0.383	8.140	0.991
61	80/10/10	GAM	spline	const	1704.872	788.436	7.370	9.971	0.692	5.505	0.929
62	80/10/10	GAM	ebm	const	1532.917	744.458	5.920	8.080	0.798	4.400	0.892
63	80/10/10	GAM	xgb	const	1408.169	682.084	4.169	6.011	0.888	3.208	0.948
64	80/10/10	GAM	rf	const	1404.466	680.233	3.972	5.966	0.890	3.087	0.929
65	80/10/10	GAM	svr	const	1769.559	862.78	12.043	14.165	0.378	8.142	0.967
66	80/10/10	DGAM	spline	spline	1853.678	800.839	7.370	9.971	0.692	5.578	0.958
67	80/10/10	DGAM	spline	ebm	1671.322	751.661	7.370	9.971	0.692	5.155	0.943
68	80/10/10	DGAM	spline	xgb	1948.621	890.31	7.370	9.971	0.692	8.342	0.995
69	80/10/10	DGAM	spline	rf	1674.000	753.0	7.370	9.971	0.692	5.163	0.981
70	80/10/10	DGAM	spline	svr	1727.598	779.799	7.370	9.971	0.692	5.390	0.958
71	80/10/10	DGAM	ebm	spline	1629.619	730.81	5.920	8.080	0.798	4.256	0.892
72	80/10/10	DGAM	ebm	ebm	1485.841	700.92	5.920	8.080	0.798	4.127	0.929
73	80/10/10	DGAM	ebm	xgb	1446.792	681.396	5.920	8.080	0.798	4.021	0.981
74	80/10/10	DGAM	ebm	rf	1425.680	670.84	5.920	8.080	0.798	3.900	0.986
75	80/10/10	DGAM	ebm	svr	1549.047	732.524	5.920	8.080	0.798	4.300	0.892
76	80/10/10	DGAM	xgb	spline	1530.128	681.064	4.169	6.011	0.888	3.303	0.967
77	80/10/10	DGAM	xgb	ebm	1426.977	671.488	4.169	6.011	0.888	3.200	0.986
78	80/10/10	DGAM	xgb	xgb	1480.247	698.124	4.169	6.011	0.888	3.469	0.981
79	80/10/10	DGAM	xgb	rf	1409.009	662.504	4.169	6.011	0.888	3.157	0.972
80	80/10/10	DGAM	xgb	svr	1426.906	671.453	4.169	6.011	0.888	3.188	0.948
81	80/10/10	DGAM	rf	spline	1543.710	687.855	3.972	5.966	0.890	3.058	0.920
82	80/10/10	DGAM	rf	ebm	1403.575	659.788	3.972	5.966	0.890	2.989	0.929
83	80/10/10	DGAM	rf	xgb	1498.621	707.31	3.972	5.966	0.890	3.722	0.981
84	80/10/10	DGAM	rf	rf	1366.376	641.188	3.972	5.966	0.890	3.000	0.958
85	80/10/10	DGAM	rf	svr	1449.567	682.784	3.972	5.966	0.890	3.049	0.901
86	80/10/10	DGAM	svr	spline	1879.556	855.778	12.043	14.165	0.378	7.971	0.953
87	80/10/10	DGAM	svr	ebm	1783.398	849.699	12.043	14.165	0.378	7.911	0.953
88	80/10/10	DGAM	svr	xgb	1770.484	843.242	12.043	14.165	0.378	7.785	0.991
89	80/10/10	DGAM	svr	rf	1748.241	832.12	12.043	14.165	0.378	7.618	0.976
90	80/10/10	DGAM	svr	svr	1809.895	862.948	12.043	14.165	0.378	8.071	0.967

Table B.5 Predictive performance of GAM, DGAM, and machine learning models for Calories burned across data splitting strategies using lifestyle data collected for health recommendation systems and mobile applications.

Order	Split	Group	MeanModel	DispModel	AIC	NLL	MAE	RMSE	R ²	CRPS	PICP95
1	60/20/20	GAM	spline	const	8411.371	4165.685	30.485	44.085	0.993	22.769	0.961
2	60/20/20	GAM	ebm	const	8622.156	4271.078	37.174	50.362	0.990	27.330	0.946
3	60/20/20	GAM	xgb	const	8618.049	4269.024	36.877	50.221	0.991	27.162	0.936
4	60/20/20	GAM	rf	const	9447.018	4683.509	60.954	84.389	0.973	45.840	0.931
5	60/20/20	GAM	svr	const	11612.206	5766.103	253.501	325.784	0.600	179.575	0.956
6	60/20/20	DGAM	spline	spline	8254.178	4047.089	30.485	44.085	0.993	22.234	0.946
7	60/20/20	DGAM	spline	ebm	8197.797	4018.899	30.485	44.085	0.993	21.830	0.955
8	60/20/20	DGAM	spline	xgb	8318.774	4079.387	30.485	44.085	0.993	22.160	0.958
9	60/20/20	DGAM	spline	rf	8150.506	3995.253	30.485	44.085	0.993	21.385	0.966
10	60/20/20	DGAM	spline	svr	8789.904	4314.952	30.485	44.085	0.993	24.532	0.946
11	60/20/20	DGAM	ebm	spline	8613.657	4226.828	37.174	50.362	0.990	26.961	0.948
12	60/20/20	DGAM	ebm	ebm	8633.716	4236.858	37.174	50.362	0.990	26.880	0.946
13	60/20/20	DGAM	ebm	xgb	8769.097	4304.548	37.174	50.362	0.990	27.515	0.948
14	60/20/20	DGAM	ebm	rf	8685.588	4262.794	37.174	50.362	0.990	27.067	0.945
15	60/20/20	DGAM	ebm	svr	9739.753	4789.876	37.174	50.362	0.990	32.250	0.966
16	60/20/20	DGAM	xgb	spline	8725.598	4282.799	36.877	50.221	0.991	27.087	0.936
17	60/20/20	DGAM	xgb	ebm	8806.771	4323.386	36.877	50.221	0.991	27.268	0.934
18	60/20/20	DGAM	xgb	xgb	9120.320	4480.16	36.877	50.221	0.991	28.067	0.940
19	60/20/20	DGAM	xgb	rf	8971.336	4405.668	36.877	50.221	0.991	27.272	0.948
20	60/20/20	DGAM	xgb	svr	9516.291	4678.146	36.877	50.221	0.991	36.118	0.975
21	60/20/20	DGAM	rf	spline	9361.288	4600.644	60.954	84.389	0.973	44.538	0.936
22	60/20/20	DGAM	rf	ebm	9312.134	4576.067	60.954	84.389	0.973	44.181	0.959
23	60/20/20	DGAM	rf	xgb	9418.330	4629.165	60.954	84.389	0.973	45.227	0.955
24	60/20/20	DGAM	rf	rf	9452.632	4646.316	60.954	84.389	0.973	46.499	0.980
25	60/20/20	DGAM	rf	svr	9875.906	4857.953	60.954	84.389	0.973	54.102	0.964
26	60/20/20	DGAM	svr	spline	11610.293	5725.146	253.501	325.784	0.600	175.678	0.958
27	60/20/20	DGAM	svr	ebm	11561.176	5700.588	253.501	325.784	0.600	173.706	0.966
28	60/20/20	DGAM	svr	xgb	11791.312	5815.656	253.501	325.784	0.600	181.128	0.970
29	60/20/20	DGAM	svr	rf	11572.177	5706.088	253.501	325.784	0.600	178.588	0.991
30	60/20/20	DGAM	svr	svr	12398.627	6119.314	253.501	325.784	0.600	262.974	0.996
31	70/15/15	GAM	spline	const	6248.752	3084.376	27.275	40.740	0.994	20.716	0.970
32	70/15/15	GAM	ebm	const	6484.452	3202.226	36.761	49.540	0.991	26.924	0.917
33	70/15/15	GAM	xgb	const	6421.265	3170.632	33.657	47.152	0.992	25.138	0.935
34	70/15/15	GAM	rf	const	7069.366	3494.683	55.759	80.139	0.977	42.626	0.910
35	70/15/15	GAM	svr	const	8720.490	4320.245	246.234	318.227	0.635	174.396	0.950
36	70/15/15	DGAM	spline	spline	6109.670	2974.835	27.275	40.740	0.994	19.794	0.957
37	70/15/15	DGAM	spline	ebm	6117.603	2978.802	27.275	40.740	0.994	19.488	0.980
38	70/15/15	DGAM	spline	xgb	6285.886	3062.943	27.275	40.740	0.994	19.787	0.982
39	70/15/15	DGAM	spline	rf	6389.384	3114.692	27.275	40.740	0.994	19.035	0.960
40	70/15/15	DGAM	spline	svr	7206.466	3523.233	27.275	40.740	0.994	21.770	0.960
41	70/15/15	DGAM	ebm	spline	6463.348	3151.674	36.761	49.540	0.991	26.434	0.943
42	70/15/15	DGAM	ebm	ebm	6460.458	3150.229	36.761	49.540	0.991	26.362	0.947
43	70/15/15	DGAM	ebm	xgb	6520.230	3180.115	36.761	49.540	0.991	26.751	0.947
44	70/15/15	DGAM	ebm	rf	6509.093	3174.546	36.761	49.540	0.991	26.583	0.943
45	70/15/15	DGAM	ebm	svr	7037.827	3438.914	36.761	49.540	0.991	37.037	0.990
46	70/15/15	DGAM	xgb	spline	6443.266	3141.633	33.657	47.152	0.992	25.229	0.945
47	70/15/15	DGAM	xgb	ebm	6467.254	3153.627	33.657	47.152	0.992	25.163	0.940
48	70/15/15	DGAM	xgb	xgb	6568.385	3204.192	33.657	47.152	0.992	25.621	0.953
49	70/15/15	DGAM	xgb	rf	6495.199	3167.6	33.657	47.152	0.992	25.134	0.937
50	70/15/15	DGAM	xgb	svr	7120.970	3480.485	33.657	47.152	0.992	28.969	0.955
51	70/15/15	DGAM	rf	spline	6982.959	3411.48	55.759	80.139	0.977	41.151	0.928
52	70/15/15	DGAM	rf	ebm	6886.869	3363.434	55.759	80.139	0.977	40.466	0.937
53	70/15/15	DGAM	rf	xgb	6895.973	3367.986	55.759	80.139	0.977	40.949	0.937
54	70/15/15	DGAM	rf	rf	7085.357	3462.678	55.759	80.139	0.977	44.696	0.982
55	70/15/15	DGAM	rf	svr	7338.822	3589.411	55.759	80.139	0.977	48.557	0.928
56	70/15/15	DGAM	svr	spline	8725.940	4282.97	246.234	318.227	0.635	170.807	0.948
57	70/15/15	DGAM	svr	ebm	8639.194	4239.597	246.234	318.227	0.635	167.686	0.978
58	70/15/15	DGAM	svr	xgb	8768.423	4304.212	246.234	318.227	0.635	178.988	0.987
59	70/15/15	DGAM	svr	rf	11528.895	5684.448	246.234	318.227	0.635	1418.371	0.998
60	70/15/15	DGAM	svr	svr	10176.090	5008.045	246.234	318.227	0.635	496.559	0.998
61	80/10/10	GAM	spline	const	4196.348	2058.174	26.125	41.501	0.993	20.368	0.965
62	80/10/10	GAM	ebm	const	4289.470	2104.735	34.171	46.638	0.992	25.302	0.938
63	80/10/10	GAM	xgb	const	4257.622	2088.811	31.686	44.763	0.992	23.792	0.948
64	80/10/10	GAM	rf	const	4630.675	2275.338	48.654	71.291	0.981	38.098	0.940
65	80/10/10	GAM	svr	const	5745.447	2832.724	220.132	287.565	0.683	158.231	0.958
66	80/10/10	DGAM	spline	spline	4052.725	1946.362	26.125	41.501	0.993	19.048	0.943
67	80/10/10	DGAM	spline	ebm	4025.693	1932.846	26.125	41.501	0.993	18.352	0.955
68	80/10/10	DGAM	spline	xgb	4032.774	1936.387	26.125	41.501	0.993	18.392	0.955
69	80/10/10	DGAM	spline	rf	3951.076	1895.538	26.125	41.501	0.993	18.097	0.945
70	80/10/10	DGAM	spline	svr	4834.291	2337.146	26.125	41.501	0.993	21.426	0.958
71	80/10/10	DGAM	ebm	spline	4327.073	2083.537	34.171	46.638	0.992	24.879	0.945
72	80/10/10	DGAM	ebm	ebm	4317.782	2078.891	34.171	46.638	0.992	24.774	0.945
73	80/10/10	DGAM	ebm	xgb	4349.972	2094.986	34.171	46.638	0.992	25.030	0.963
74	80/10/10	DGAM	ebm	rf	4329.629	2084.814	34.171	46.638	0.992	24.804	0.948
75	80/10/10	DGAM	ebm	svr	4557.805	2198.902	34.171	46.638	0.992	27.365	0.945
76	80/10/10	DGAM	xgb	spline	4345.269	2092.634	31.686	44.763	0.992	23.683	0.940
77	80/10/10	DGAM	xgb	ebm	4348.858	2094.429	31.686	44.763	0.992	23.460	0.935
78	80/10/10	DGAM	xgb	xgb	4433.294	2136.647	31.686	44.763	0.992	23.651	0.932
79	80/10/10	DGAM	xgb	rf	4525.056	2182.528	31.686	44.763	0.992	23.574	0.930
80	80/10/10	DGAM	xgb	svr	4871.777	2355.888	31.686	44.763	0.992	26.400	0.935
81	80/10/10	DGAM	rf	spline	4510.990	2175.495	48.654	71.291	0.981	35.240	0.958
82	80/10/10	DGAM	rf	ebm	4492.321	2166.16	48.654	71.291	0.981	35.164	0.963
83	80/10/10	DGAM	rf	xgb	4513.689	2176.844	48.654	71.291	0.981	35.763	0.963
84	80/10/10	DGAM	rf	rf	4576.140	2208.07	48.654	71.291	0.981	36.062	0.955
85	80/10/10	DGAM	rf	svr	4796.696	2318.348	48.654	71.291	0.981	42.796	0.943
86	80/10/10	DGAM	svr	spline	5781.403	2810.702	220.132	287.565	0.683	157.454	0.948
87	80/10/10	DGAM	svr	ebm	5748.430	2794.215	220.132	287.565	0.683	154.104	0.970
88	80/10/10	DGAM	svr	xgb	5856.856	2848.428	220.132	287.565	0.683	170.435	0.990
89	80/10/10	DGAM	svr	rf	5749.565	2794.782	220.132	287.565	0.683	153.022	0.983
90	80/10/10	DGAM	svr	svr	6842.646	3341.323	220.132	287.565	0.683	510.945	0.998

Table B.6 Predictive performance of GAM, DGAM, and machine learning models for body fat percentage across data splitting strategies using lifestyle data collected for health recommendation systems and mobile applications.

Order	Split	Group	MeanModel	DispModel	AIC	NLL	MAE	RMSE	R ²	CRPS	PICP95
1	60/20/20	GAM	spline	const	2594.624	1258.312	0.907	1.166	0.946	0.648	0.949
2	60/20/20	GAM	ebm	const	2446.513	1184.256	0.801	1.063	0.955	0.587	0.944
3	60/20/20	GAM	xgb	const	2094.140	1008.07	0.631	0.851	0.971	0.465	0.931
4	60/20/20	GAM	rf	const	3287.063	1604.532	1.395	1.796	0.871	1.007	0.938
5	60/20/20	GAM	svr	const	2027.739	974.87	0.560	0.818	0.973	0.434	0.931
6	60/20/20	DGAM	spline	spline	2628.127	1236.064	0.907	1.166	0.946	0.644	0.946
7	60/20/20	DGAM	spline	ebm	2629.966	1236.983	0.907	1.166	0.946	0.643	0.946
8	60/20/20	DGAM	spline	xgb	2798.862	1321.431	0.907	1.166	0.946	0.659	0.945
9	60/20/20	DGAM	spline	rf	2707.971	1275.986	0.907	1.166	0.946	0.644	0.940
10	60/20/20	DGAM	spline	svr	6085.228	2964.614	0.907	1.166	0.946	0.934	0.948
11	60/20/20	DGAM	ebm	spline	2568.083	1206.042	0.801	1.063	0.955	0.589	0.943
12	60/20/20	DGAM	ebm	ebm	2511.544	1177.772	0.801	1.063	0.955	0.584	0.939
13	60/20/20	DGAM	ebm	xgb	2656.350	1250.175	0.801	1.063	0.955	0.595	0.936
14	60/20/20	DGAM	ebm	rf	2512.788	1178.394	0.801	1.063	0.955	0.582	0.927
15	60/20/20	DGAM	ebm	svr	4899.529	2371.764	0.801	1.063	0.955	0.788	0.950
16	60/20/20	DGAM	xgb	spline	2141.650	992.825	0.631	0.851	0.971	0.462	0.920
17	60/20/20	DGAM	xgb	ebm	2133.906	988.953	0.631	0.851	0.971	0.463	0.932
18	60/20/20	DGAM	xgb	xgb	2289.049	1066.524	0.631	0.851	0.971	0.485	0.940
19	60/20/20	DGAM	xgb	rf	2148.559	996.28	0.631	0.851	0.971	0.462	0.932
20	60/20/20	DGAM	xgb	svr	3552.065	1698.032	0.631	0.851	0.971	0.973	0.980
21	60/20/20	DGAM	rf	spline	3308.463	1576.232	1.395	1.796	0.871	1.007	0.941
22	60/20/20	DGAM	rf	ebm	3241.693	1542.846	1.395	1.796	0.871	0.999	0.946
23	60/20/20	DGAM	rf	xgb	3388.753	1616.376	1.395	1.796	0.871	1.029	0.955
24	60/20/20	DGAM	rf	rf	3288.920	1566.46	1.395	1.796	0.871	0.997	0.949
25	60/20/20	DGAM	rf	svr	9087.774	4465.887	1.395	1.796	0.871	1.460	0.968
26	60/20/20	DGAM	svr	spline	1953.712	898.856	0.560	0.818	0.973	0.418	0.941
27	60/20/20	DGAM	svr	ebm	1946.840	895.42	0.560	0.818	0.973	0.419	0.943
28	60/20/20	DGAM	svr	xgb	2126.798	985.399	0.560	0.818	0.973	0.433	0.946
29	60/20/20	DGAM	svr	rf	1863.700	853.85	0.560	0.818	0.973	0.417	0.940
30	60/20/20	DGAM	svr	svr	2360.795	1102.398	0.560	0.818	0.973	0.512	0.944
31	70/15/15	GAM	spline	const	1909.681	915.84	0.859	1.102	0.952	0.613	0.928
32	70/15/15	GAM	ebm	const	1829.281	875.64	0.792	1.034	0.957	0.571	0.923
33	70/15/15	GAM	xgb	const	1498.157	710.078	0.569	0.782	0.976	0.420	0.928
34	70/15/15	GAM	rf	const	2484.687	1203.344	1.400	1.775	0.874	1.002	0.918
35	70/15/15	GAM	svr	const	1550.545	736.272	0.556	0.815	0.973	0.430	0.908
36	70/15/15	DGAM	spline	spline	1942.820	893.41	0.859	1.102	0.952	0.607	0.938
37	70/15/15	DGAM	spline	ebm	1956.380	900.19	0.859	1.102	0.952	0.605	0.937
38	70/15/15	DGAM	spline	xgb	2121.127	982.564	0.859	1.102	0.952	0.620	0.930
39	70/15/15	DGAM	spline	rf	2030.797	937.398	0.859	1.102	0.952	0.608	0.930
40	70/15/15	DGAM	spline	svr	3330.326	1587.163	0.859	1.102	0.952	1.517	0.988
41	70/15/15	DGAM	ebm	spline	1909.057	876.528	0.792	1.034	0.957	0.571	0.925
42	70/15/15	DGAM	ebm	ebm	1875.119	859.56	0.792	1.034	0.957	0.568	0.917
43	70/15/15	DGAM	ebm	xgb	1968.509	906.254	0.792	1.034	0.957	0.576	0.918
44	70/15/15	DGAM	ebm	rf	1925.216	884.608	0.792	1.034	0.957	0.568	0.915
45	70/15/15	DGAM	ebm	svr	2677.317	1260.658	0.792	1.034	0.957	0.699	0.923
46	70/15/15	DGAM	xgb	spline	1524.136	684.068	0.569	0.782	0.976	0.419	0.933
47	70/15/15	DGAM	xgb	ebm	1501.614	672.807	0.569	0.782	0.976	0.418	0.932
48	70/15/15	DGAM	xgb	xgb	1605.969	724.984	0.569	0.782	0.976	0.430	0.943
49	70/15/15	DGAM	xgb	rf	1508.680	676.34	0.569	0.782	0.976	0.419	0.943
50	70/15/15	DGAM	xgb	svr	2936.315	1390.158	0.569	0.782	0.976	0.506	0.935
51	70/15/15	DGAM	rf	spline	2530.822	1187.411	1.400	1.775	0.874	1.002	0.943
52	70/15/15	DGAM	rf	ebm	2482.858	1163.429	1.400	1.775	0.874	0.996	0.938
53	70/15/15	DGAM	rf	xgb	2559.406	1201.703	1.400	1.775	0.874	1.008	0.953
54	70/15/15	DGAM	rf	rf	2527.553	1185.776	1.400	1.775	0.874	0.995	0.962
55	70/15/15	DGAM	rf	svr	3273.768	1558.884	1.400	1.775	0.874	1.419	0.968
56	70/15/15	DGAM	svr	spline	1561.048	702.524	0.556	0.815	0.973	0.417	0.923
57	70/15/15	DGAM	svr	ebm	1608.783	726.392	0.556	0.815	0.973	0.418	0.920
58	70/15/15	DGAM	svr	xgb	1759.418	801.709	0.556	0.815	0.973	0.427	0.922
59	70/15/15	DGAM	svr	rf	1540.341	692.17	0.556	0.815	0.973	0.418	0.912
60	70/15/15	DGAM	svr	svr	1867.693	855.846	0.556	0.815	0.973	0.509	0.920
61	80/10/10	GAM	spline	const	1209.124	565.562	0.741	0.995	0.962	0.542	0.943
62	80/10/10	GAM	ebm	const	1163.264	542.632	0.711	0.937	0.966	0.520	0.943
63	80/10/10	GAM	xgb	const	916.503	419.252	0.503	0.690	0.982	0.374	0.943
64	80/10/10	GAM	rf	const	1605.861	763.93	1.262	1.633	0.898	0.914	0.940
65	80/10/10	GAM	svr	const	972.425	447.212	0.477	0.739	0.979	0.380	0.932
66	80/10/10	DGAM	spline	spline	1216.784	530.392	0.741	0.995	0.962	0.533	0.965
67	80/10/10	DGAM	spline	ebm	1220.494	532.247	0.741	0.995	0.962	0.534	0.950
68	80/10/10	DGAM	spline	xgb	1310.541	577.27	0.741	0.995	0.962	0.545	0.943
69	80/10/10	DGAM	spline	rf	1254.623	549.312	0.741	0.995	0.962	0.537	0.963
70	80/10/10	DGAM	spline	svr	2909.728	1376.864	0.741	0.995	0.962	0.701	0.950
71	80/10/10	DGAM	ebm	spline	1220.607	532.304	0.711	0.937	0.966	0.514	0.935
72	80/10/10	DGAM	ebm	ebm	1235.641	539.82	0.711	0.937	0.966	0.515	0.945
73	80/10/10	DGAM	ebm	xgb	1313.799	578.9	0.711	0.937	0.966	0.523	0.940
74	80/10/10	DGAM	ebm	rf	1259.003	551.502	0.711	0.937	0.966	0.516	0.940
75	80/10/10	DGAM	ebm	svr	1844.015	844.008	0.711	0.937	0.966	0.749	0.958
76	80/10/10	DGAM	xgb	spline	950.326	397.163	0.503	0.690	0.982	0.368	0.935
77	80/10/10	DGAM	xgb	ebm	943.334	393.667	0.503	0.690	0.982	0.368	0.950
78	80/10/10	DGAM	xgb	xgb	984.797	414.398	0.503	0.690	0.982	0.377	0.950
79	80/10/10	DGAM	xgb	rf	955.577	399.788	0.503	0.690	0.982	0.369	0.938
80	80/10/10	DGAM	xgb	svr	1500.027	672.014	0.503	0.690	0.982	0.445	0.940
81	80/10/10	DGAM	rf	spline	1653.365	748.682	1.262	1.633	0.898	0.915	0.943
82	80/10/10	DGAM	rf	ebm	1592.224	718.112	1.262	1.633	0.898	0.906	0.945
83	80/10/10	DGAM	rf	xgb	1655.104	749.552	1.262	1.633	0.898	0.932	0.932
84	80/10/10	DGAM	rf	rf	1609.519	726.76	1.262	1.633	0.898	0.907	0.958
85	80/10/10	DGAM	rf	svr	2532.294	1188.147	1.262	1.633	0.898	1.127	0.905
86	80/10/10	DGAM	svr	spline	961.329	402.664	0.477	0.739	0.979	0.361	0.938
87	80/10/10	DGAM	svr	ebm	951.421	397.71	0.477	0.739	0.979	0.364	0.932
88	80/10/10	DGAM	svr	xgb	1017.781	430.89	0.477	0.739	0.979	0.371	0.925
89	80/10/10	DGAM	svr	rf	945.498	394.749	0.477	0.739	0.979	0.363	0.935
90	80/10/10	DGAM	svr	svr	1139.264	491.632	0.477	0.739	0.979	0.424	0.945

Table B.7 Predictive performance of GAM, DGAM, and machine learning models for average heart rate maintained during the session across data splitting strategies using lifestyle data collected for health recommendation systems and mobile applications.

Order	Split	Group	MeanModel	DispModel	AIC	NLL	MAE	RMSE	R ²	CRPS	PICP95
1	60/20/20	GAM	spline	const	1795.287	858.644	0.505	0.708	0.998	0.376	0.945
2	60/20/20	GAM	ebm	const	1718.634	820.317	0.523	0.674	0.998	0.377	0.954
3	60/20/20	GAM	xgb	const	1251.272	586.636	0.370	0.503	0.999	0.275	0.948
4	60/20/20	GAM	rf	const	1547.864	734.932	0.408	0.603	0.998	0.318	0.949
5	60/20/20	GAM	svr	const	2347.043	1134.522	0.641	0.999	0.995	0.501	0.949
6	60/20/20	DGAM	spline	spline	1603.987	723.994	0.505	0.708	0.998	0.360	0.956
7	60/20/20	DGAM	spline	ebm	1390.773	617.386	0.505	0.708	0.998	0.343	0.964
8	60/20/20	DGAM	spline	xgb	1271.266	557.633	0.505	0.708	0.998	0.332	0.966
9	60/20/20	DGAM	spline	rf	1215.683	529.842	0.505	0.708	0.998	0.329	0.974
10	60/20/20	DGAM	svr	svr	1801.754	822.877	0.505	0.708	0.998	0.334	0.966
11	60/20/20	DGAM	ebm	spline	1824.895	834.448	0.523	0.674	0.998	0.378	0.970
12	60/20/20	DGAM	ebm	ebm	1778.108	811.054	0.523	0.674	0.998	0.374	0.953
13	60/20/20	DGAM	ebm	xgb	1886.781	865.39	0.523	0.674	0.998	0.382	0.966
14	60/20/20	DGAM	ebm	rf	1752.492	798.246	0.523	0.674	0.998	0.372	0.965
15	60/20/20	DGAM	ebm	svr	2296.387	1070.194	0.523	0.674	0.998	0.482	0.974
16	60/20/20	DGAM	xgb	spline	1508.472	676.236	0.370	0.503	0.999	0.281	0.951
17	60/20/20	DGAM	xgb	ebm	1440.294	642.147	0.370	0.503	0.999	0.280	0.949
18	60/20/20	DGAM	xgb	xgb	1527.101	685.55	0.370	0.503	0.999	0.289	0.940
19	60/20/20	DGAM	xgb	rf	1351.235	597.618	0.370	0.503	0.999	0.276	0.946
20	60/20/20	DGAM	xgb	svr	2890.002	1367.001	0.370	0.503	0.999	0.471	0.971
21	60/20/20	DGAM	rf	spline	1668.678	756.339	0.408	0.603	0.998	0.322	0.951
22	60/20/20	DGAM	rf	ebm	1619.194	731.597	0.408	0.603	0.998	0.317	0.955
23	60/20/20	DGAM	rf	xgb	1667.397	755.698	0.408	0.603	0.998	0.322	0.954
24	60/20/20	DGAM	rf	rf	1529.050	686.525	0.408	0.603	0.998	0.312	0.949
25	60/20/20	DGAM	rf	svr	2345.364	1094.682	0.408	0.603	0.998	0.403	0.960
26	60/20/20	DGAM	svr	spline	2300.326	1072.163	0.641	0.999	0.995	0.495	0.955
27	60/20/20	DGAM	svr	ebm	2306.124	1075.062	0.641	0.999	0.995	0.498	0.953
28	60/20/20	DGAM	svr	xgb	2294.837	1069.418	0.641	0.999	0.995	0.499	0.956
29	60/20/20	DGAM	svr	rf	2441.492	1142.746	0.641	0.999	0.995	0.515	0.960
30	60/20/20	DGAM	svr	svr	3608.668	1726.334	0.641	0.999	0.995	0.953	0.996
31	70/15/15	GAM	spline	const	1367.021	644.51	0.510	0.705	0.998	0.375	0.937
32	70/15/15	GAM	ebm	const	1282.558	602.279	0.512	0.659	0.998	0.369	0.953
33	70/15/15	GAM	xgb	const	885.033	403.516	0.350	0.473	0.999	0.258	0.935
34	70/15/15	GAM	rf	const	1226.943	574.472	0.407	0.626	0.998	0.318	0.930
35	70/15/15	GAM	svr	const	1852.874	887.437	0.666	1.042	0.995	0.516	0.922
36	70/15/15	DGAM	spline	spline	1252.256	548.128	0.510	0.705	0.998	0.359	0.953
37	70/15/15	DGAM	spline	ebm	1131.563	487.782	0.510	0.705	0.998	0.346	0.932
38	70/15/15	DGAM	spline	xgb	1045.651	444.826	0.510	0.705	0.998	0.337	0.942
39	70/15/15	DGAM	spline	rf	1095.780	469.89	0.510	0.705	0.998	0.336	0.947
40	70/15/15	DGAM	spline	svr	1123.111	483.556	0.510	0.705	0.998	0.331	0.958
41	70/15/15	DGAM	ebm	spline	1355.571	599.786	0.512	0.659	0.998	0.366	0.957
42	70/15/15	DGAM	ebm	ebm	1310.168	577.084	0.512	0.659	0.998	0.362	0.957
43	70/15/15	DGAM	ebm	xgb	1349.672	596.836	0.512	0.659	0.998	0.364	0.963
44	70/15/15	DGAM	ebm	rf	1295.712	569.856	0.512	0.659	0.998	0.359	0.970
45	70/15/15	DGAM	ebm	svr	1799.450	821.725	0.512	0.659	0.998	0.469	0.973
46	70/15/15	DGAM	xgb	spline	1048.248	446.124	0.350	0.473	0.999	0.264	0.932
47	70/15/15	DGAM	xgb	ebm	1021.984	432.992	0.350	0.473	0.999	0.264	0.945
48	70/15/15	DGAM	xgb	xgb	1088.196	466.098	0.350	0.473	0.999	0.273	0.962
49	70/15/15	DGAM	xgb	rf	1012.003	428.002	0.350	0.473	0.999	0.260	0.935
50	70/15/15	DGAM	xgb	svr	2167.098	1005.549	0.350	0.473	0.999	0.343	0.947
51	70/15/15	DGAM	rf	spline	1283.862	563.931	0.407	0.626	0.998	0.321	0.950
52	70/15/15	DGAM	rf	ebm	1284.883	564.442	0.407	0.626	0.998	0.320	0.957
53	70/15/15	DGAM	rf	xgb	1280.350	562.175	0.407	0.626	0.998	0.324	0.957
54	70/15/15	DGAM	rf	rf	1286.028	565.014	0.407	0.626	0.998	0.311	0.950
55	70/15/15	DGAM	rf	svr	1678.211	761.106	0.407	0.626	0.998	0.478	0.977
56	70/15/15	DGAM	svr	spline	1852.465	848.232	0.666	1.042	0.995	0.509	0.938
57	70/15/15	DGAM	svr	ebm	1907.323	875.662	0.666	1.042	0.995	0.509	0.935
58	70/15/15	DGAM	svr	xgb	1976.364	910.182	0.666	1.042	0.995	0.512	0.937
59	70/15/15	DGAM	svr	rf	1975.423	909.712	0.666	1.042	0.995	0.518	0.927
60	70/15/15	DGAM	svr	svr	1875.415	859.708	0.666	1.042	0.995	0.511	0.945
61	80/10/10	GAM	spline	const	907.869	414.934	0.501	0.682	0.998	0.367	0.935
62	80/10/10	GAM	ebm	const	854.455	388.228	0.509	0.638	0.998	0.361	0.955
63	80/10/10	GAM	xgb	const	562.857	242.428	0.341	0.443	0.999	0.246	0.950
64	80/10/10	GAM	rf	const	674.388	298.194	0.334	0.502	0.999	0.262	0.953
65	80/10/10	GAM	svr	const	1120.858	521.429	0.563	0.880	0.996	0.444	0.965
66	80/10/10	DGAM	spline	spline	836.267	340.134	0.501	0.682	0.998	0.349	0.958
67	80/10/10	DGAM	spline	ebm	767.507	305.754	0.501	0.682	0.998	0.337	0.953
68	80/10/10	DGAM	spline	xgb	704.744	274.372	0.501	0.682	0.998	0.326	0.953
69	80/10/10	DGAM	spline	rf	674.652	259.326	0.501	0.682	0.998	0.324	0.963
70	80/10/10	DGAM	spline	svr	640.991	242.496	0.501	0.682	0.998	0.318	0.965
71	80/10/10	DGAM	ebm	spline	923.064	383.532	0.509	0.638	0.998	0.358	0.970
72	80/10/10	DGAM	ebm	ebm	909.647	376.824	0.509	0.638	0.998	0.353	0.963
73	80/10/10	DGAM	ebm	xgb	955.688	399.844	0.509	0.638	0.998	0.353	0.968
74	80/10/10	DGAM	ebm	rf	942.044	393.022	0.509	0.638	0.998	0.351	0.965
75	80/10/10	DGAM	ebm	svr	1087.474	465.737	0.509	0.638	0.998	0.392	0.945
76	80/10/10	DGAM	xgb	spline	721.191	282.596	0.341	0.443	0.999	0.259	0.978
77	80/10/10	DGAM	xgb	ebm	698.265	271.132	0.341	0.443	0.999	0.255	0.968
78	80/10/10	DGAM	xgb	xgb	738.816	291.408	0.341	0.443	0.999	0.259	0.955
79	80/10/10	DGAM	xgb	rf	695.205	269.602	0.341	0.443	0.999	0.252	0.955
80	80/10/10	DGAM	xgb	svr	1459.239	651.62	0.341	0.443	0.999	0.310	0.938
81	80/10/10	DGAM	rf	spline	719.829	281.914	0.334	0.502	0.999	0.264	0.945
82	80/10/10	DGAM	rf	ebm	761.942	302.971	0.334	0.502	0.999	0.264	0.970
83	80/10/10	DGAM	rf	xgb	767.309	305.654	0.334	0.502	0.999	0.271	0.968
84	80/10/10	DGAM	rf	rf	718.938	281.469	0.334	0.502	0.999	0.258	0.960
85	80/10/10	DGAM	rf	svr	981.659	412.83	0.334	0.502	0.999	0.353	0.968
86	80/10/10	DGAM	svr	spline	1130.894	487.447	0.563	0.880	0.996	0.433	0.970
87	80/10/10	DGAM	svr	ebm	1145.603	494.802	0.563	0.880	0.996	0.435	0.970
88	80/10/10	DGAM	svr	xgb	1138.073	491.037	0.563	0.880	0.996	0.436	0.968
89	80/10/10	DGAM	svr	rf	1211.229	527.614	0.563	0.880	0.996	0.445	0.965
90	80/10/10	DGAM	svr	svr	2178.210	1011.105	0.563	0.880	0.996	0.449	0.960

Table B.8 Predictive performance of GAM, DGAM, and machine learning models for Maximum heart rate recorded during a workout session across data splitting strategies using lifestyle data collected for health recommendation systems and mobile applications.

Order	Split	Group	MeanModel	DispModel	AIC	NLL	MAE	RMSE	R ²	CRPS	PICP95
1	60/20/20	GAM	spline	const	2252.490	1087.245	0.655	0.942	0.993	0.489	0.955
2	60/20/20	GAM	ebm	const	1919.574	920.787	0.577	0.758	0.996	0.422	0.961
3	60/20/20	GAM	xgb	const	1723.045	822.522	0.483	0.669	0.997	0.364	0.955
4	60/20/20	GAM	rf	const	1749.401	835.7	0.474	0.686	0.996	0.364	0.936
5	60/20/20	GAM	svr	const	2590.679	1256.34	0.725	1.146	0.990	0.581	0.961
6	60/20/20	DGAM	spline	spline	1987.937	915.968	0.655	0.942	0.993	0.461	0.956
7	60/20/20	DGAM	spline	ebm	1855.423	849.712	0.655	0.942	0.993	0.444	0.959
8	60/20/20	DGAM	spline	xgb	1711.789	777.894	0.655	0.942	0.993	0.430	0.973
9	60/20/20	DGAM	spline	rf	1719.104	781.552	0.655	0.942	0.993	0.434	0.961
10	60/20/20	DGAM	svr	svr	1754.349	799.174	0.655	0.942	0.993	0.429	0.963
11	60/20/20	DGAM	ebm	spline	2032.447	938.224	0.577	0.758	0.996	0.427	0.959
12	60/20/20	DGAM	ebm	ebm	1968.176	906.088	0.577	0.758	0.996	0.418	0.961
13	60/20/20	DGAM	ebm	xgb	2079.059	961.53	0.577	0.758	0.996	0.429	0.966
14	60/20/20	DGAM	ebm	rf	2091.657	967.829	0.577	0.758	0.996	0.419	0.968
15	60/20/20	DGAM	ebm	svr	2775.135	1309.568	0.577	0.758	0.996	0.597	0.976
16	60/20/20	DGAM	xgb	spline	1945.012	894.506	0.483	0.669	0.997	0.376	0.955
17	60/20/20	DGAM	xgb	ebm	1960.307	902.154	0.483	0.669	0.997	0.377	0.963
18	60/20/20	DGAM	xgb	xgb	2165.249	1004.624	0.483	0.669	0.997	0.403	0.963
19	60/20/20	DGAM	xgb	rf	1952.260	898.13	0.483	0.669	0.997	0.372	0.959
20	60/20/20	DGAM	xgb	svr	3547.795	1695.898	0.483	0.669	0.997	0.836	0.986
21	60/20/20	DGAM	rf	spline	1868.973	856.486	0.474	0.686	0.996	0.369	0.945
22	60/20/20	DGAM	rf	ebm	1791.076	817.538	0.474	0.686	0.996	0.362	0.944
23	60/20/20	DGAM	rf	xgb	1829.071	836.536	0.474	0.686	0.996	0.364	0.961
24	60/20/20	DGAM	rf	rf	1754.448	799.224	0.474	0.686	0.996	0.362	0.954
25	60/20/20	DGAM	rf	svr	2762.507	1303.254	0.474	0.686	0.996	0.473	0.968
26	60/20/20	DGAM	svr	spline	2561.149	1202.574	0.725	1.146	0.990	0.576	0.966
27	60/20/20	DGAM	svr	ebm	2592.177	1218.088	0.725	1.146	0.990	0.578	0.966
28	60/20/20	DGAM	svr	xgb	2572.772	1208.386	0.725	1.146	0.990	0.581	0.969
29	60/20/20	DGAM	svr	rf	2661.747	1252.874	0.725	1.146	0.990	0.584	0.965
30	60/20/20	DGAM	svr	svr	2769.878	1306.939	0.725	1.146	0.990	0.587	0.951
31	70/15/15	GAM	spline	const	1651.897	786.948	0.625	0.890	0.994	0.463	0.933
32	70/15/15	GAM	ebm	const	1468.735	695.368	0.599	0.768	0.996	0.429	0.952
33	70/15/15	GAM	xgb	const	1324.085	623.042	0.483	0.678	0.997	0.363	0.930
34	70/15/15	GAM	rf	const	1261.950	591.975	0.449	0.648	0.997	0.340	0.933
35	70/15/15	GAM	svr	const	2039.886	980.943	0.731	1.211	0.989	0.573	0.932
36	70/15/15	DGAM	spline	spline	1412.504	628.252	0.625	0.890	0.994	0.430	0.947
37	70/15/15	DGAM	spline	ebm	1293.873	568.936	0.625	0.890	0.994	0.418	0.957
38	70/15/15	DGAM	spline	xgb	1254.016	549.008	0.625	0.890	0.994	0.408	0.960
39	70/15/15	DGAM	spline	rf	1348.249	596.124	0.625	0.890	0.994	0.412	0.965
40	70/15/15	DGAM	spline	svr	1387.815	615.908	0.625	0.890	0.994	0.413	0.955
41	70/15/15	DGAM	ebm	spline	1551.506	697.753	0.599	0.768	0.996	0.430	0.957
42	70/15/15	DGAM	ebm	ebm	1530.170	687.085	0.599	0.768	0.996	0.424	0.955
43	70/15/15	DGAM	ebm	xgb	1619.038	731.519	0.599	0.768	0.996	0.430	0.970
44	70/15/15	DGAM	ebm	rf	1551.386	697.693	0.599	0.768	0.996	0.423	0.953
45	70/15/15	DGAM	ebm	svr	2246.134	1045.067	0.599	0.768	0.996	0.526	0.958
46	70/15/15	DGAM	xgb	spline	1463.389	653.694	0.483	0.678	0.997	0.368	0.927
47	70/15/15	DGAM	xgb	ebm	1487.930	665.965	0.483	0.678	0.997	0.367	0.945
48	70/15/15	DGAM	xgb	xgb	1660.268	752.134	0.483	0.678	0.997	0.377	0.945
49	70/15/15	DGAM	xgb	rf	1466.709	655.354	0.483	0.678	0.997	0.365	0.950
50	70/15/15	DGAM	xgb	svr	2540.083	1192.042	0.483	0.678	0.997	0.517	0.955
51	70/15/15	DGAM	rf	spline	1416.671	630.336	0.449	0.648	0.997	0.343	0.945
52	70/15/15	DGAM	rf	ebm	1354.150	599.075	0.449	0.648	0.997	0.342	0.950
53	70/15/15	DGAM	rf	xgb	1368.576	606.288	0.449	0.648	0.997	0.346	0.950
54	70/15/15	DGAM	rf	rf	1278.902	561.451	0.449	0.648	0.997	0.335	0.950
55	70/15/15	DGAM	rf	svr	1800.232	822.116	0.449	0.648	0.997	0.500	0.980
56	70/15/15	DGAM	svr	spline	2068.350	956.175	0.731	1.211	0.989	0.569	0.943
57	70/15/15	DGAM	svr	ebm	2087.973	965.986	0.731	1.211	0.989	0.566	0.945
58	70/15/15	DGAM	svr	xgb	2122.064	983.032	0.731	1.211	0.989	0.569	0.948
59	70/15/15	DGAM	svr	rf	2051.011	947.506	0.731	1.211	0.989	0.572	0.932
60	70/15/15	DGAM	svr	svr	2182.897	1013.448	0.731	1.211	0.989	0.588	0.935
61	80/10/10	GAM	spline	const	1038.693	480.346	0.569	0.804	0.995	0.421	0.958
62	80/10/10	GAM	ebm	const	952.769	437.384	0.560	0.721	0.996	0.403	0.945
63	80/10/10	GAM	xgb	const	809.237	365.618	0.434	0.593	0.997	0.325	0.955
64	80/10/10	GAM	rf	const	777.650	349.825	0.385	0.573	0.997	0.301	0.953
65	80/10/10	GAM	svr	const	1167.219	544.61	0.626	0.932	0.993	0.484	0.963
66	80/10/10	DGAM	spline	spline	947.033	395.516	0.569	0.804	0.995	0.397	0.963
67	80/10/10	DGAM	spline	ebm	844.682	344.341	0.569	0.804	0.995	0.375	0.980
68	80/10/10	DGAM	spline	xgb	783.275	313.638	0.569	0.804	0.995	0.366	0.970
69	80/10/10	DGAM	spline	rf	829.984	336.992	0.569	0.804	0.995	0.375	0.970
70	80/10/10	DGAM	spline	svr	827.008	335.504	0.569	0.804	0.995	0.371	0.983
71	80/10/10	DGAM	ebm	spline	1071.922	457.961	0.560	0.721	0.996	0.405	0.953
72	80/10/10	DGAM	ebm	ebm	1048.969	446.484	0.560	0.721	0.996	0.399	0.953
73	80/10/10	DGAM	ebm	xgb	1107.839	475.92	0.560	0.721	0.996	0.406	0.955
74	80/10/10	DGAM	ebm	rf	1077.795	460.898	0.560	0.721	0.996	0.399	0.955
75	80/10/10	DGAM	ebm	svr	1253.316	548.658	0.560	0.721	0.996	0.469	0.978
76	80/10/10	DGAM	xgb	spline	966.833	405.416	0.434	0.593	0.997	0.334	0.975
77	80/10/10	DGAM	xgb	ebm	863.420	353.71	0.434	0.593	0.997	0.322	0.978
78	80/10/10	DGAM	xgb	xgb	865.522	354.761	0.434	0.593	0.997	0.323	0.970
79	80/10/10	DGAM	xgb	rf	893.191	368.596	0.434	0.593	0.997	0.323	0.973
80	80/10/10	DGAM	xgb	svr	1463.689	653.844	0.434	0.593	0.997	0.408	0.955
81	80/10/10	DGAM	rf	spline	943.220	393.61	0.385	0.573	0.997	0.308	0.955
82	80/10/10	DGAM	rf	ebm	831.118	337.559	0.385	0.573	0.997	0.298	0.963
83	80/10/10	DGAM	rf	xgb	855.113	349.556	0.385	0.573	0.997	0.304	0.950
84	80/10/10	DGAM	rf	rf	812.810	328.405	0.385	0.573	0.997	0.295	0.955
85	80/10/10	DGAM	rf	svr	1401.854	622.927	0.385	0.573	0.997	0.585	0.978
86	80/10/10	DGAM	svr	spline	1187.464	515.732	0.626	0.932	0.993	0.476	0.965
87	80/10/10	DGAM	svr	ebm	1202.462	523.231	0.626	0.932	0.993	0.479	0.958
88	80/10/10	DGAM	svr	xgb	1211.796	527.898	0.626	0.932	0.993	0.483	0.965
89	80/10/10	DGAM	svr	rf	1218.539	531.27	0.626	0.932	0.993	0.480	0.948
90	80/10/10	DGAM	svr	svr	1325.794	584.897	0.626	0.932	0.993	0.511	0.963

Table B.9 Predictive performance of GAM, DGAM, and machine learning models for serum creatinine levels across data splitting strategies using the National Health Checkup dataset of South Korea (2002–2020).

Order	Split	Group	MeanModel	DispModel	AIC	NLL	MAE	RMSE	R ²	CRPS	PICP95
1	60/20/20	GAM	spline	const	1874.861	912.43	0.143	0.227	0.258	0.211	0.998
2	60/20/20	GAM	ebm	const	2885.238	1417.619	0.165	0.483	-2.351	0.135	0.981
3	60/20/20	GAM	xgb	const	1492.962	721.481	0.155	0.267	-0.024	0.188	0.995
4	60/20/20	GAM	rf	const	1779.620	864.81	0.138	0.228	0.256	0.204	0.998
5	60/20/20	GAM	svr	const	1814.820	882.41	0.157	0.238	0.190	0.209	0.999
6	60/20/20	DGAM	spline	spline	68.800	-15.6	0.143	0.227	0.258	0.105	0.806
7	60/20/20	DGAM	spline	ebm	902.599	401.3	0.143	0.227	0.258	0.106	0.791
8	60/20/20	DGAM	spline	xgb	188.330	44.165	0.143	0.227	0.258	0.106	0.782
9	60/20/20	DGAM	spline	rf	189.887	44.944	0.143	0.227	0.258	0.106	0.794
10	60/20/20	DGAM	spline	svr	1721.429	810.714	0.143	0.227	0.258	0.107	0.764
11	60/20/20	DGAM	ebm	spline	14559.680	7229.84	0.165	0.483	-2.351	0.129	0.839
12	60/20/20	DGAM	ebm	ebm	8050.822	3975.411	0.165	0.483	-2.351	0.128	0.842
13	60/20/20	DGAM	ebm	xgb	8525.684	4212.842	0.165	0.483	-2.351	0.128	0.836
14	60/20/20	DGAM	ebm	rf	14841.409	7370.704	0.165	0.483	-2.351	0.130	0.812
15	60/20/20	DGAM	ebm	svr	21804.440	10852.22	0.165	0.483	-2.351	0.132	0.776
16	60/20/20	DGAM	xgb	spline	1690.694	795.547	0.155	0.267	-0.024	0.118	0.813
17	60/20/20	DGAM	xgb	ebm	152.009	26.004	0.155	0.267	-0.024	0.115	0.822
18	60/20/20	DGAM	xgb	xgb	120.967	10.484	0.155	0.267	-0.024	0.115	0.825
19	60/20/20	DGAM	xgb	rf	693.887	296.944	0.155	0.267	-0.024	0.117	0.819
20	60/20/20	DGAM	xgb	svr	3298.115	1599.058	0.155	0.267	-0.024	0.119	0.768
21	60/20/20	DGAM	rf	spline	-38.519	-69.26	0.138	0.228	0.256	0.102	0.815
22	60/20/20	DGAM	rf	ebm	1072.767	486.384	0.138	0.228	0.256	0.101	0.822
23	60/20/20	DGAM	rf	xgb	-333.072	-216.536	0.138	0.228	0.256	0.100	0.827
24	60/20/20	DGAM	rf	rf	232.167	66.084	0.138	0.228	0.256	0.102	0.801
25	60/20/20	DGAM	rf	svr	1142.828	521.414	0.138	0.228	0.256	0.103	0.788
26	60/20/20	DGAM	svr	spline	2498.411	1199.206	0.157	0.238	0.190	0.118	0.776
27	60/20/20	DGAM	svr	ebm	3157.988	1528.994	0.157	0.238	0.190	0.119	0.768
28	60/20/20	DGAM	svr	xgb	2686.043	1293.022	0.157	0.238	0.190	0.119	0.768
29	60/20/20	DGAM	svr	rf	3315.885	1607.942	0.157	0.238	0.190	0.119	0.758
30	60/20/20	DGAM	svr	svr	4437.309	2168.654	0.157	0.238	0.190	0.120	0.744
31	70/15/15	GAM	spline	const	1976.524	963.262	0.147	0.355	0.133	0.216	0.998
32	70/15/15	GAM	ebm	const	9450.735	4700.368	0.182	0.805	-3.457	0.152	0.981
33	70/15/15	GAM	xgb	const	1715.678	832.839	0.160	0.403	-0.116	0.196	0.995
34	70/15/15	GAM	rf	const	1914.556	932.278	0.149	0.361	0.106	0.212	0.997
35	70/15/15	GAM	svr	const	1949.401	949.7	0.160	0.362	0.100	0.216	0.998
36	70/15/15	DGAM	spline	spline	1304.781	602.39	0.147	0.355	0.133	0.111	0.846
37	70/15/15	DGAM	spline	ebm	468.743	184.372	0.147	0.355	0.133	0.111	0.832
38	70/15/15	DGAM	spline	xgb	835.824	367.912	0.147	0.355	0.133	0.111	0.835
39	70/15/15	DGAM	spline	rf	2184.257	1042.128	0.147	0.355	0.133	0.111	0.837
40	70/15/15	DGAM	spline	svr	5641.743	2770.872	0.147	0.355	0.133	0.113	0.805
41	70/15/15	DGAM	ebm	spline	22454.403	11177.202	0.182	0.805	-3.457	0.146	0.845
42	70/15/15	DGAM	ebm	ebm	3953.597	1926.798	0.182	0.805	-3.457	0.145	0.836
43	70/15/15	DGAM	ebm	xgb	4508.632	2204.316	0.182	0.805	-3.457	0.146	0.831
44	70/15/15	DGAM	ebm	rf	8600.314	4250.157	0.182	0.805	-3.457	0.147	0.837
45	70/15/15	DGAM	ebm	svr	30928.858	15414.429	0.182	0.805	-3.457	0.149	0.778
46	70/15/15	DGAM	xgb	spline	2647.643	1273.822	0.160	0.403	-0.116	0.124	0.822
47	70/15/15	DGAM	xgb	ebm	487.386	193.693	0.160	0.403	-0.116	0.120	0.843
48	70/15/15	DGAM	xgb	xgb	739.683	319.842	0.160	0.403	-0.116	0.122	0.830
49	70/15/15	DGAM	xgb	rf	2501.843	1200.922	0.160	0.403	-0.116	0.123	0.828
50	70/15/15	DGAM	xgb	svr	5298.785	2599.392	0.160	0.403	-0.116	0.126	0.792
51	70/15/15	DGAM	rf	spline	815.753	357.876	0.149	0.361	0.106	0.114	0.818
52	70/15/15	DGAM	rf	ebm	2220.543	1060.272	0.149	0.361	0.106	0.111	0.832
53	70/15/15	DGAM	rf	xgb	1903.093	901.546	0.149	0.361	0.106	0.111	0.830
54	70/15/15	DGAM	rf	rf	2313.467	1106.734	0.149	0.361	0.106	0.112	0.832
55	70/15/15	DGAM	rf	svr	5958.630	2929.315	0.149	0.361	0.106	0.116	0.762
56	70/15/15	DGAM	svr	spline	10230.713	5065.356	0.160	0.362	0.100	0.122	0.797
57	70/15/15	DGAM	svr	ebm	15586.403	7743.202	0.160	0.362	0.100	0.123	0.785
58	70/15/15	DGAM	svr	xgb	9394.531	4647.266	0.160	0.362	0.100	0.123	0.788
59	70/15/15	DGAM	svr	rf	10547.136	5223.568	0.160	0.362	0.100	0.123	0.794
60	70/15/15	DGAM	svr	svr	10971.630	5435.815	0.160	0.362	0.100	0.124	0.784
61	80/10/10	GAM	spline	const	-553.581	-301.79	0.131	0.178	0.325	0.098	0.986
62	80/10/10	GAM	ebm	const	-674.088	-362.044	0.128	0.176	0.343	0.093	0.939
63	80/10/10	GAM	xgb	const	-717.342	-383.671	0.129	0.173	0.363	0.094	0.972
64	80/10/10	GAM	rf	const	-684.130	-367.065	0.128	0.174	0.356	0.094	0.981
65	80/10/10	GAM	svr	const	393.004	171.502	0.148	0.201	0.147	0.109	0.824
66	80/10/10	DGAM	spline	spline	-260.778	-180.389	0.131	0.178	0.325	0.096	0.837
67	80/10/10	DGAM	spline	ebm	-237.290	-168.645	0.131	0.178	0.325	0.096	0.829
68	80/10/10	DGAM	spline	xgb	-171.029	-135.514	0.131	0.178	0.325	0.096	0.822
69	80/10/10	DGAM	spline	rf	-255.576	-177.788	0.131	0.178	0.325	0.096	0.836
70	80/10/10	DGAM	spline	svr	940.475	420.238	0.131	0.178	0.325	0.098	0.792
71	80/10/10	DGAM	ebm	spline	33.332	-33.334	0.128	0.176	0.343	0.094	0.828
72	80/10/10	DGAM	ebm	ebm	116.917	8.458	0.128	0.176	0.343	0.094	0.823
73	80/10/10	DGAM	ebm	xgb	-12.745	-56.372	0.128	0.176	0.343	0.094	0.828
74	80/10/10	DGAM	ebm	rf	200.933	50.466	0.128	0.176	0.343	0.095	0.826
75	80/10/10	DGAM	ebm	svr	1477.513	688.756	0.128	0.176	0.343	0.096	0.797
76	80/10/10	DGAM	xgb	spline	-163.016	-131.508	0.129	0.173	0.363	0.094	0.822
77	80/10/10	DGAM	xgb	ebm	-181.842	-140.921	0.129	0.173	0.363	0.094	0.825
78	80/10/10	DGAM	xgb	xgb	-183.613	-141.806	0.129	0.173	0.363	0.094	0.828
79	80/10/10	DGAM	xgb	rf	-31.204	-65.602	0.129	0.173	0.363	0.095	0.813
80	80/10/10	DGAM	xgb	svr	817.571	358.786	0.129	0.173	0.363	0.096	0.798
81	80/10/10	DGAM	rf	spline	-122.025	-111.012	0.128	0.174	0.356	0.094	0.826
82	80/10/10	DGAM	rf	ebm	-97.944	-98.972	0.128	0.174	0.356	0.094	0.822
83	80/10/10	DGAM	rf	xgb	-113.522	-106.761	0.128	0.174	0.356	0.094	0.818
84	80/10/10	DGAM	rf	rf	-172.512	-136.256	0.128	0.174	0.356	0.094	0.825
85	80/10/10	DGAM	rf	svr	889.791	394.896	0.128	0.174	0.356	0.096	0.792
86	80/10/10	DGAM	svr	spline	499.284	199.642	0.148	0.201	0.147	0.109	0.819
87	80/10/10	DGAM	svr	ebm	924.083	412.042	0.148	0.201	0.147	0.110	0.822
88	80/10/10	DGAM	svr	xgb	648.066	274.033	0.148	0.201	0.147	0.110	0.822
89	80/10/10	DGAM	svr	rf	677.490	288.745	0.148	0.201	0.147	0.110	0.824
90	80/10/10	DGAM	svr	svr	1072.583	486.292	0.148	0.201	0.147	0.110	0.806

Table B.10 Predictive performance of GAM, DGAM, and machine learning models for serum gamma-glutamyl transferase (GGT) levels across data splitting strategies using the National Health Checkup dataset of South Korea (2002–2020).

Order	Split	Group	MeanModel	DispModel	AIC	NLL	MAE	RMSE	R ²	CRPS	PICP95
1	60/20/20	GAM	spline	const	15791.648	7893.824	17.889	33.605	0.173	15.120	0.961
2	60/20/20	GAM	ebm	const	15539.362	7767.681	16.233	31.058	0.294	14.045	0.958
3	60/20/20	GAM	xgb	const	15551.493	7773.746	16.088	31.176	0.289	14.068	0.954
4	60/20/20	GAM	rf	const	15513.037	7754.518	15.949	30.804	0.305	13.634	0.962
5	60/20/20	GAM	svr	const	15678.884	7837.442	14.254	32.426	0.230	13.596	0.962
6	60/20/20	DGAM	spline	spline	15408.757	7702.378	17.889	33.605	0.173	13.321	0.931
7	60/20/20	DGAM	spline	ebm	15006.586	7501.293	17.889	33.605	0.173	12.899	0.926
8	60/20/20	DGAM	spline	xgb	15050.150	7523.075	17.889	33.605	0.173	12.910	0.925
9	60/20/20	DGAM	spline	rf	14970.323	7483.162	17.889	33.605	0.173	13.101	0.921
10	60/20/20	DGAM	spline	svr	14648.233	7322.116	17.889	33.605	0.173	19.856	0.946
11	60/20/20	DGAM	ebm	spline	14759.317	7377.658	16.233	31.058	0.294	12.397	0.918
12	60/20/20	DGAM	ebm	ebm	14568.316	7282.158	16.233	31.058	0.294	11.698	0.926
13	60/20/20	DGAM	ebm	xgb	14658.191	7327.096	16.233	31.058	0.294	11.717	0.928
14	60/20/20	DGAM	ebm	rf	14987.311	7491.656	16.233	31.058	0.294	11.888	0.911
15	60/20/20	DGAM	ebm	svr	14120.813	7058.406	16.233	31.058	0.294	16.135	0.943
16	60/20/20	DGAM	xgb	spline	14935.573	7465.786	16.088	31.176	0.289	12.273	0.911
17	60/20/20	DGAM	ebm	ebm	14765.727	7380.864	16.088	31.176	0.289	11.633	0.918
18	60/20/20	DGAM	xgb	xgb	14708.266	7352.133	16.088	31.176	0.289	11.671	0.922
19	60/20/20	DGAM	xgb	rf	15059.675	7527.838	16.088	31.176	0.289	11.886	0.906
20	60/20/20	DGAM	xgb	svr	14190.469	7093.234	16.088	31.176	0.289	11.126	0.936
21	60/20/20	DGAM	rf	spline	14526.659	7261.33	15.949	30.804	0.305	12.024	0.938
22	60/20/20	DGAM	rf	ebm	14453.549	7224.774	15.949	30.804	0.305	11.570	0.938
23	60/20/20	DGAM	rf	xgb	14430.387	7213.194	15.949	30.804	0.305	11.582	0.938
24	60/20/20	DGAM	rf	rf	14834.149	7415.074	15.949	30.804	0.305	11.655	0.932
25	60/20/20	DGAM	rf	svr	14160.648	7078.324	15.949	30.804	0.305	18.237	0.954
26	60/20/20	DGAM	svr	spline	16659.291	8327.646	14.254	32.426	0.230	11.342	0.874
27	60/20/20	DGAM	svr	ebm	16454.648	8225.324	14.254	32.426	0.230	11.097	0.878
28	60/20/20	DGAM	svr	xgb	16472.873	8234.436	14.254	32.426	0.230	11.097	0.878
29	60/20/20	DGAM	svr	rf	16940.479	8468.24	14.254	32.426	0.230	11.223	0.874
30	60/20/20	DGAM	svr	svr	15705.759	7850.88	14.254	32.426	0.230	16.799	0.892
31	70/15/15	GAM	spline	const	12977.888	6486.944	19.825	53.643	0.217	19.772	0.978
32	70/15/15	GAM	ebm	const	12972.272	6484.136	18.262	53.518	0.221	19.205	0.982
33	70/15/15	GAM	xgb	const	12980.903	6488.452	18.381	53.710	0.215	19.347	0.978
34	70/15/15	GAM	rf	const	13032.182	6514.091	18.059	54.869	0.181	19.235	0.983
35	70/15/15	GAM	svr	const	13120.285	6558.142	16.869	56.908	0.119	19.837	0.979
36	70/15/15	DGAM	spline	spline	11886.587	5941.294	19.825	53.643	0.217	14.755	0.914
37	70/15/15	DGAM	spline	ebm	11821.606	5908.803	19.825	53.643	0.217	14.766	0.909
38	70/15/15	DGAM	spline	xgb	11867.758	5931.879	19.825	53.643	0.217	14.769	0.910
39	70/15/15	DGAM	spline	rf	12241.753	6118.876	19.825	53.643	0.217	14.992	0.905
40	70/15/15	DGAM	spline	svr	11245.788	5620.894	19.825	53.643	0.217	17.650	0.935
41	70/15/15	DGAM	ebm	spline	11593.384	5794.692	18.262	53.518	0.221	13.853	0.914
42	70/15/15	DGAM	ebm	ebm	11812.764	5904.382	18.262	53.518	0.221	13.608	0.919
43	70/15/15	DGAM	ebm	xgb	11591.768	5793.884	18.262	53.518	0.221	13.575	0.916
44	70/15/15	DGAM	ebm	rf	12637.027	6316.514	18.262	53.518	0.221	13.845	0.904
45	70/15/15	DGAM	ebm	svr	11136.051	5566.026	18.262	53.518	0.221	16.845	0.937
46	70/15/15	DGAM	xgb	spline	11807.104	5901.552	18.381	53.710	0.215	13.826	0.905
47	70/15/15	DGAM	ebm	ebm	11997.402	5996.701	18.381	53.710	0.215	13.724	0.910
48	70/15/15	DGAM	xgb	xgb	12018.811	6007.406	18.381	53.710	0.215	13.702	0.911
49	70/15/15	DGAM	xgb	rf	12791.330	6393.665	18.381	53.710	0.215	13.988	0.897
50	70/15/15	DGAM	xgb	svr	11186.916	5591.458	18.381	53.710	0.215	17.199	0.931
51	70/15/15	DGAM	rf	spline	12011.302	6003.651	18.059	54.869	0.181	13.858	0.911
52	70/15/15	DGAM	ebm	ebm	12231.459	6113.73	18.059	54.869	0.181	13.681	0.920
53	70/15/15	DGAM	rf	xgb	12271.681	6133.84	18.059	54.869	0.181	13.673	0.921
54	70/15/15	DGAM	rf	rf	13386.057	6691.028	18.059	54.869	0.181	13.750	0.921
55	70/15/15	DGAM	rf	svr	11345.213	5670.606	18.059	54.869	0.181	16.010	0.938
56	70/15/15	DGAM	svr	spline	13788.059	6892.03	16.869	56.908	0.119	13.695	0.864
57	70/15/15	DGAM	svr	ebm	14401.426	7198.713	16.869	56.908	0.119	13.567	0.871
58	70/15/15	DGAM	svr	xgb	14056.604	7026.302	16.869	56.908	0.119	13.513	0.875
59	70/15/15	DGAM	svr	rf	15594.452	7795.226	16.869	56.908	0.119	13.677	0.866
60	70/15/15	DGAM	svr	svr	12857.973	6426.986	16.869	56.908	0.119	14.051	0.888
61	80/10/10	GAM	spline	const	8025.171	4010.586	18.997	36.390	0.263	16.444	0.959
62	80/10/10	GAM	ebm	const	7970.071	3983.036	17.601	35.158	0.312	15.722	0.959
63	80/10/10	GAM	xgb	const	7948.141	3972.07	17.373	34.680	0.331	15.582	0.959
64	80/10/10	GAM	rf	const	7951.111	3973.556	17.229	34.744	0.328	15.281	0.962
65	80/10/10	GAM	svr	const	8115.222	4055.611	16.623	38.449	0.178	16.204	0.961
66	80/10/10	DGAM	spline	spline	8099.435	4047.718	18.997	36.390	0.263	14.281	0.900
67	80/10/10	DGAM	spline	ebm	7818.036	3907.018	18.997	36.390	0.263	13.977	0.905
68	80/10/10	DGAM	spline	xgb	7823.413	3909.706	18.997	36.390	0.263	13.975	0.904
69	80/10/10	DGAM	spline	rf	7917.811	3956.906	18.997	36.390	0.263	14.129	0.905
70	80/10/10	DGAM	spline	svr	7546.286	3771.143	18.997	36.390	0.263	17.107	0.938
71	80/10/10	DGAM	ebm	spline	7936.420	3966.21	17.601	35.158	0.312	13.358	0.904
72	80/10/10	DGAM	ebm	ebm	7986.340	3991.17	17.601	35.158	0.312	13.024	0.909
73	80/10/10	DGAM	ebm	xgb	8224.462	4110.231	17.601	35.158	0.312	13.077	0.904
74	80/10/10	DGAM	ebm	rf	8160.027	4078.014	17.601	35.158	0.312	13.164	0.892
75	80/10/10	DGAM	ebm	svr	7456.919	3726.46	17.601	35.158	0.312	16.760	0.924
76	80/10/10	DGAM	xgb	spline	8049.102	4022.551	17.373	34.680	0.331	13.161	0.895
77	80/10/10	DGAM	xgb	ebm	8147.542	4071.771	17.373	34.680	0.331	12.857	0.904
78	80/10/10	DGAM	xgb	xgb	8149.663	4072.832	17.373	34.680	0.331	12.838	0.904
79	80/10/10	DGAM	xgb	rf	8190.674	4093.337	17.373	34.680	0.331	13.018	0.891
80	80/10/10	DGAM	xgb	svr	7451.439	3723.72	17.373	34.680	0.331	16.431	0.919
81	80/10/10	DGAM	rf	spline	8046.098	4021.049	17.229	34.744	0.328	13.115	0.908
82	80/10/10	DGAM	rf	ebm	8063.922	4029.961	17.229	34.744	0.328	12.837	0.910
83	80/10/10	DGAM	rf	xgb	8006.777	4001.388	17.229	34.744	0.328	12.843	0.908
84	80/10/10	DGAM	rf	rf	8047.189	4021.594	17.229	34.744	0.328	12.889	0.909
85	80/10/10	DGAM	rf	svr	7503.745	3749.872	17.229	34.744	0.328	16.035	0.926
86	80/10/10	DGAM	svr	spline	9473.683	4734.842	16.623	38.449	0.178	13.361	0.850
87	80/10/10	DGAM	svr	ebm	9450.052	4723.026	16.623	38.449	0.178	13.164	0.851
88	80/10/10	DGAM	svr	xgb	9842.460	4919.23	16.623	38.449	0.178	13.107	0.859
89	80/10/10	DGAM	svr	rf	9658.349	4827.174	16.623	38.449	0.178	13.326	0.851
90	80/10/10	DGAM	svr	svr	8701.247	4348.624	16.623	38.449	0.178	13.786	0.868

Table B.11 Predictive performance of GAM, DGAM, and machine learning models for serum aspartate aminotransferase (AST/SGOT) levels across data splitting strategies using the National Health Checkup dataset of South Korea (2002–2020).

Order	Split	Group	MeanModel	DispModel	AIC	NLL	MAE	RMSE	R ²	CRPS	PICP95
1	60/20/20	GAM	spline	const	13835.414	6915.707	5.757	18.236	0.458	6.192	0.985
2	60/20/20	GAM	ebm	const	14140.918	7068.459	5.833	20.062	0.344	6.636	0.987
3	60/20/20	GAM	xgb	const	14072.875	7034.438	5.761	19.640	0.371	6.509	0.986
4	60/20/20	GAM	rf	const	14394.409	7195.204	6.394	21.716	0.231	7.230	0.987
5	60/20/20	GAM	svr	const	13936.223	6966.112	5.611	18.818	0.423	6.289	0.986
6	60/20/20	DGAM	spline	spline	12762.596	6379.298	5.757	18.236	0.458	4.446	0.898
7	60/20/20	DGAM	spline	ebm	13183.365	6589.682	5.757	18.236	0.458	4.455	0.897
8	60/20/20	DGAM	spline	xgb	12990.863	6493.432	5.757	18.236	0.458	4.453	0.892
9	60/20/20	DGAM	spline	rf	15278.087	7637.044	5.757	18.236	0.458	4.487	0.894
10	60/20/20	DGAM	spline	svr	11865.115	5930.558	5.757	18.236	0.458	4.422	0.944
11	60/20/20	DGAM	ebm	spline	12155.615	6075.808	5.833	20.062	0.344	4.509	0.897
12	60/20/20	DGAM	ebm	ebm	12628.607	6312.304	5.833	20.062	0.344	4.503	0.901
13	60/20/20	DGAM	ebm	xgb	12545.774	6270.887	5.833	20.062	0.344	4.500	0.899
14	60/20/20	DGAM	ebm	rf	15210.199	7603.1	5.833	20.062	0.344	4.548	0.900
15	60/20/20	DGAM	ebm	svr	11449.557	5722.778	5.833	20.062	0.344	4.486	0.939
16	60/20/20	DGAM	xgb	spline	12087.630	6041.815	5.761	19.640	0.371	4.439	0.892
17	60/20/20	DGAM	xgb	ebm	12474.089	6235.044	5.761	19.640	0.371	4.441	0.891
18	60/20/20	DGAM	xgb	xgb	12231.194	6113.597	5.761	19.640	0.371	4.428	0.889
19	60/20/20	DGAM	xgb	rf	15325.153	7660.576	5.761	19.640	0.371	4.486	0.896
20	60/20/20	DGAM	xgb	svr	11394.666	5695.333	5.761	19.640	0.371	4.412	0.936
21	60/20/20	DGAM	rf	spline	12796.580	6396.29	6.394	21.716	0.231	4.920	0.893
22	60/20/20	DGAM	rf	ebm	12959.105	6477.552	6.394	21.716	0.231	4.917	0.895
23	60/20/20	DGAM	rf	xgb	12791.309	6393.654	6.394	21.716	0.231	4.899	0.896
24	60/20/20	DGAM	rf	rf	16237.070	8116.535	6.394	21.716	0.231	4.971	0.900
25	60/20/20	DGAM	rf	svr	12366.222	6181.111	6.394	21.716	0.231	4.904	0.939
26	60/20/20	DGAM	svr	spline	12560.004	6278.002	5.611	18.818	0.423	4.363	0.882
27	60/20/20	DGAM	svr	ebm	14016.959	7006.48	5.611	18.818	0.423	4.382	0.881
28	60/20/20	DGAM	svr	xgb	13896.925	6946.462	5.611	18.818	0.423	4.388	0.878
29	60/20/20	DGAM	svr	rf	16050.522	8023.261	5.611	18.818	0.423	4.412	0.886
30	60/20/20	DGAM	svr	svr	11885.910	5940.955	5.611	18.818	0.423	4.337	0.922
31	70/15/15	GAM	spline	const	9217.019	4606.51	5.713	11.208	0.577	4.849	0.972
32	70/15/15	GAM	ebm	const	9326.724	4661.362	5.624	11.732	0.536	4.930	0.972
33	70/15/15	GAM	xgb	const	9306.339	4651.17	5.625	11.633	0.544	4.902	0.973
34	70/15/15	GAM	rf	const	9589.612	4792.806	6.220	13.089	0.423	5.407	0.978
35	70/15/15	GAM	svr	const	9233.072	4614.536	5.442	11.282	0.571	4.773	0.973
36	70/15/15	DGAM	spline	spline	9227.593	4611.796	5.713	11.208	0.577	4.288	0.901
37	70/15/15	DGAM	spline	ebm	9038.135	4517.068	5.713	11.208	0.577	4.295	0.899
38	70/15/15	DGAM	spline	xgb	9078.611	4537.306	5.713	11.208	0.577	4.297	0.895
39	70/15/15	DGAM	spline	rf	9292.685	4644.342	5.713	11.208	0.577	4.326	0.900
40	70/15/15	DGAM	spline	svr	8560.258	4278.129	5.713	11.208	0.577	4.253	0.940
41	70/15/15	DGAM	ebm	spline	8894.992	4445.496	5.624	11.732	0.536	4.235	0.896
42	70/15/15	DGAM	ebm	ebm	8638.466	4317.233	5.624	11.732	0.536	4.221	0.899
43	70/15/15	DGAM	ebm	xgb	8619.647	4307.824	5.624	11.732	0.536	4.221	0.899
44	70/15/15	DGAM	ebm	rf	9239.403	4617.702	5.624	11.732	0.536	4.278	0.899
45	70/15/15	DGAM	ebm	svr	8337.293	4166.646	5.624	11.732	0.536	4.206	0.938
46	70/15/15	DGAM	xgb	spline	8838.372	4417.186	5.625	11.633	0.544	4.233	0.888
47	70/15/15	DGAM	xgb	ebm	8675.077	4335.538	5.625	11.633	0.544	4.210	0.892
48	70/15/15	DGAM	xgb	xgb	8742.776	4369.388	5.625	11.633	0.544	4.217	0.894
49	70/15/15	DGAM	xgb	rf	9109.145	4552.572	5.625	11.633	0.544	4.272	0.885
50	70/15/15	DGAM	xgb	svr	8334.967	4165.484	5.625	11.633	0.544	4.202	0.929
51	70/15/15	DGAM	rf	spline	9324.410	4660.205	6.220	13.089	0.423	4.697	0.873
52	70/15/15	DGAM	rf	ebm	9126.300	4561.15	6.220	13.089	0.423	4.669	0.895
53	70/15/15	DGAM	rf	xgb	8978.628	4487.314	6.220	13.089	0.423	4.655	0.890
54	70/15/15	DGAM	rf	rf	9747.771	4871.886	6.220	13.089	0.423	4.717	0.891
55	70/15/15	DGAM	rf	svr	8703.357	4349.678	6.220	13.089	0.423	4.651	0.935
56	70/15/15	DGAM	svr	spline	9212.044	4604.022	5.442	11.282	0.571	4.142	0.878
57	70/15/15	DGAM	svr	ebm	9118.109	4557.054	5.442	11.282	0.571	4.141	0.883
58	70/15/15	DGAM	svr	xgb	9101.826	4548.913	5.442	11.282	0.571	4.142	0.881
59	70/15/15	DGAM	svr	rf	9605.328	4800.664	5.442	11.282	0.571	4.177	0.888
60	70/15/15	DGAM	svr	svr	8626.062	4311.031	5.442	11.282	0.571	4.106	0.921
61	80/10/10	GAM	spline	const	6008.428	3002.214	5.630	10.317	0.649	4.717	0.964
62	80/10/10	GAM	ebm	const	6166.269	3081.134	5.646	11.387	0.573	4.949	0.964
63	80/10/10	GAM	xgb	const	6109.876	3052.938	5.452	10.993	0.602	4.755	0.964
64	80/10/10	GAM	rf	const	6330.946	3163.473	6.157	12.622	0.475	5.384	0.971
65	80/10/10	GAM	svr	const	6102.298	3049.149	5.339	10.939	0.606	4.751	0.966
66	80/10/10	DGAM	spline	spline	5908.388	2952.194	5.630	10.317	0.649	4.219	0.896
67	80/10/10	DGAM	spline	ebm	5673.118	2834.559	5.630	10.317	0.649	4.213	0.892
68	80/10/10	DGAM	spline	xgb	5673.266	2834.633	5.630	10.317	0.649	4.218	0.891
69	80/10/10	DGAM	spline	rf	5794.486	2895.243	5.630	10.317	0.649	4.266	0.896
70	80/10/10	DGAM	spline	svr	5525.835	2760.918	5.630	10.317	0.649	4.190	0.939
71	80/10/10	DGAM	ebm	spline	5704.400	2850.2	5.646	11.387	0.573	4.243	0.905
72	80/10/10	DGAM	ebm	ebm	5551.057	2773.528	5.646	11.387	0.573	4.210	0.900
73	80/10/10	DGAM	ebm	xgb	5512.564	2754.282	5.646	11.387	0.573	4.201	0.905
74	80/10/10	DGAM	ebm	rf	5795.664	2895.832	5.646	11.387	0.573	4.304	0.892
75	80/10/10	DGAM	ebm	svr	5409.430	2702.715	5.646	11.387	0.573	4.220	0.938
76	80/10/10	DGAM	xgb	spline	5724.380	2860.19	5.452	10.993	0.602	4.118	0.901
77	80/10/10	DGAM	xgb	ebm	5520.193	2758.096	5.452	10.993	0.602	4.092	0.902
78	80/10/10	DGAM	xgb	xgb	5504.466	2750.233	5.452	10.993	0.602	4.087	0.900
79	80/10/10	DGAM	xgb	rf	5761.147	2878.574	5.452	10.993	0.602	4.151	0.898
80	80/10/10	DGAM	xgb	svr	5407.826	2701.913	5.452	10.993	0.602	4.095	0.936
81	80/10/10	DGAM	rf	spline	6298.413	3147.206	6.157	12.622	0.475	4.658	0.889
82	80/10/10	DGAM	rf	ebm	5872.269	2934.134	6.157	12.622	0.475	4.619	0.894
83	80/10/10	DGAM	rf	xgb	5830.692	2913.346	6.157	12.622	0.475	4.603	0.886
84	80/10/10	DGAM	rf	rf	6065.846	3030.923	6.157	12.622	0.475	4.694	0.890
85	80/10/10	DGAM	rf	svr	5786.031	2891.016	6.157	12.622	0.475	4.630	0.936
86	80/10/10	DGAM	svr	spline	5992.659	2994.33	5.339	10.939	0.606	4.088	0.890
87	80/10/10	DGAM	svr	ebm	5719.944	2857.972	5.339	10.939	0.606	4.070	0.894
88	80/10/10	DGAM	svr	xgb	5787.985	2891.992	5.339	10.939	0.606	4.081	0.894
89	80/10/10	DGAM	svr	rf	6068.732	3032.366	5.339	10.939	0.606	4.134	0.886
90	80/10/10	DGAM	svr	svr	5608.916	2802.458	5.339	10.939	0.606	4.059	0.928

Table B.12 Predictive performance of GAM, DGAM, and machine learning models for serum alanine aminotransferase (SGPT) levels across data splitting strategies using the National Health Checkup dataset of South Korea (2002–2020).

Order	Split	Group	MeanModel	DispModel	AIC	NLL	MAE	RMSE	R ²	CRPS	PICP95
1	60/20/20	GAM	spline	const	13504.592	6750.296	7.614	16.445	0.361	6.697	0.970
2	60/20/20	GAM	ebm	const	12772.284	6384.142	7.140	13.081	0.596	5.987	0.956
3	60/20/20	GAM	xgb	const	12731.077	6363.538	6.925	12.913	0.606	5.843	0.962
4	60/20/20	GAM	rf	const	13059.004	6527.502	7.542	14.307	0.516	6.323	0.966
5	60/20/20	GAM	svr	const	13284.730	6640.365	7.017	15.353	0.443	6.272	0.966
6	60/20/20	DGAM	spline	spline	11734.046	5865.023	7.614	16.445	0.361	5.540	0.888
7	60/20/20	DGAM	spline	ebm	11659.592	5827.796	7.614	16.445	0.361	5.560	0.890
8	60/20/20	DGAM	spline	xgb	11723.334	5859.667	7.614	16.445	0.361	5.564	0.894
9	60/20/20	DGAM	spline	rf	12284.249	6140.124	7.614	16.445	0.361	5.684	0.886
10	60/20/20	DGAM	spline	svr	11387.512	5691.756	7.614	16.445	0.361	5.502	0.938
11	60/20/20	DGAM	ebm	spline	11459.349	5727.674	7.140	13.081	0.596	5.195	0.868
12	60/20/20	DGAM	ebm	ebm	11414.564	5705.282	7.140	13.081	0.596	5.182	0.883
13	60/20/20	DGAM	ebm	xgb	11447.497	5721.748	7.140	13.081	0.596	5.180	0.879
14	60/20/20	DGAM	ebm	rf	11726.833	5861.416	7.140	13.081	0.596	5.316	0.876
15	60/20/20	DGAM	ebm	svr	11053.681	5524.84	7.140	13.081	0.596	5.145	0.930
16	60/20/20	DGAM	xgb	spline	11281.805	5638.902	6.925	12.913	0.606	5.032	0.885
17	60/20/20	DGAM	xgb	ebm	11248.687	5622.344	6.925	12.913	0.606	5.024	0.892
18	60/20/20	DGAM	xgb	xgb	11310.810	5653.405	6.925	12.913	0.606	5.025	0.888
19	60/20/20	DGAM	xgb	rf	11616.859	5806.43	6.925	12.913	0.606	5.156	0.881
20	60/20/20	DGAM	xgb	svr	10923.821	5459.91	6.925	12.913	0.606	4.992	0.936
21	60/20/20	DGAM	rf	spline	11807.606	5901.803	7.542	14.307	0.516	5.512	0.868
22	60/20/20	DGAM	rf	ebm	11662.965	5829.482	7.542	14.307	0.516	5.485	0.882
23	60/20/20	DGAM	rf	xgb	11678.922	5837.461	7.542	14.307	0.516	5.489	0.881
24	60/20/20	DGAM	rf	rf	12341.650	6168.825	7.542	14.307	0.516	5.617	0.879
25	60/20/20	DGAM	rf	svr	11345.378	5670.689	7.542	14.307	0.516	5.459	0.931
26	60/20/20	DGAM	svr	spline	11391.393	5693.696	7.017	15.353	0.443	5.140	0.882
27	60/20/20	DGAM	svr	ebm	11485.789	5740.894	7.017	15.353	0.443	5.155	0.879
28	60/20/20	DGAM	svr	xgb	11564.888	5780.444	7.017	15.353	0.443	5.169	0.872
29	60/20/20	DGAM	svr	rf	12161.240	6078.62	7.017	15.353	0.443	5.277	0.871
30	60/20/20	DGAM	svr	svr	11036.112	5516.056	7.017	15.353	0.443	5.094	0.931
31	70/15/15	GAM	spline	const	9512.116	4754.058	7.577	12.673	0.581	6.175	0.949
32	70/15/15	GAM	ebm	const	9538.458	4767.229	7.294	12.813	0.572	6.046	0.953
33	70/15/15	GAM	xgb	const	9536.708	4766.354	7.166	12.803	0.572	5.979	0.958
34	70/15/15	GAM	rf	const	9600.650	4798.325	7.614	13.149	0.549	6.173	0.953
35	70/15/15	GAM	svr	const	9528.903	4762.452	7.171	12.762	0.575	6.027	0.948
36	70/15/15	DGAM	spline	spline	8685.184	4340.592	7.577	12.673	0.581	5.484	0.882
37	70/15/15	DGAM	spline	ebm	8661.734	4328.867	7.577	12.673	0.581	5.483	0.887
38	70/15/15	DGAM	spline	xgb	8674.050	4335.025	7.577	12.673	0.581	5.477	0.888
39	70/15/15	DGAM	spline	rf	8791.132	4393.566	7.577	12.673	0.581	5.606	0.878
40	70/15/15	DGAM	spline	svr	8510.812	4253.406	7.577	12.673	0.581	5.452	0.926
41	70/15/15	DGAM	ebm	spline	8743.261	4369.63	7.294	12.813	0.572	5.347	0.863
42	70/15/15	DGAM	ebm	ebm	8603.919	4299.96	7.294	12.813	0.572	5.312	0.883
43	70/15/15	DGAM	ebm	xgb	8611.364	4303.682	7.294	12.813	0.572	5.314	0.885
44	70/15/15	DGAM	ebm	rf	8752.368	4374.184	7.294	12.813	0.572	5.424	0.874
45	70/15/15	DGAM	ebm	svr	8370.613	4183.306	7.294	12.813	0.572	5.292	0.922
46	70/15/15	DGAM	xgb	spline	8652.698	4324.349	7.166	12.803	0.572	5.250	0.863
47	70/15/15	DGAM	xgb	ebm	8518.878	4257.439	7.166	12.803	0.572	5.220	0.877
48	70/15/15	DGAM	xgb	xgb	8521.134	4258.567	7.166	12.803	0.572	5.224	0.879
49	70/15/15	DGAM	xgb	rf	8784.419	4390.21	7.166	12.803	0.572	5.348	0.863
50	70/15/15	DGAM	xgb	svr	8312.668	4154.334	7.166	12.803	0.572	5.199	0.921
51	70/15/15	DGAM	rf	spline	8956.052	4476.026	7.614	13.149	0.549	5.577	0.848
52	70/15/15	DGAM	rf	ebm	8732.568	4364.284	7.614	13.149	0.549	5.504	0.881
53	70/15/15	DGAM	rf	xgb	8723.588	4359.794	7.614	13.149	0.549	5.498	0.886
54	70/15/15	DGAM	rf	rf	8963.345	4479.672	7.614	13.149	0.549	5.624	0.870
55	70/15/15	DGAM	rf	svr	8604.855	4300.428	7.614	13.149	0.549	5.518	0.916
56	70/15/15	DGAM	svr	spline	8678.601	4337.3	7.171	12.762	0.575	5.279	0.859
57	70/15/15	DGAM	svr	ebm	8647.258	4321.629	7.171	12.762	0.575	5.256	0.864
58	70/15/15	DGAM	svr	xgb	8659.444	4327.722	7.171	12.762	0.575	5.257	0.863
59	70/15/15	DGAM	svr	rf	8855.360	4425.68	7.171	12.762	0.575	5.394	0.853
60	70/15/15	DGAM	svr	svr	8434.751	4215.376	7.171	12.762	0.575	5.223	0.916
61	80/10/10	GAM	spline	const	6221.361	3108.68	7.240	11.786	0.668	5.808	0.948
62	80/10/10	GAM	ebm	const	6247.463	3121.732	6.948	11.980	0.657	5.724	0.946
63	80/10/10	GAM	xgb	const	6283.803	3139.902	6.838	12.255	0.641	5.754	0.949
64	80/10/10	GAM	rf	const	6407.192	3201.596	7.461	13.238	0.581	6.097	0.954
65	80/10/10	GAM	svr	const	6201.332	3098.666	6.794	11.639	0.676	5.631	0.946
66	80/10/10	DGAM	spline	spline	5807.542	2901.771	7.240	11.786	0.668	5.159	0.891
67	80/10/10	DGAM	spline	ebm	5787.269	2891.634	7.240	11.786	0.668	5.166	0.899
68	80/10/10	DGAM	spline	xgb	5779.918	2887.959	7.240	11.786	0.668	5.159	0.901
69	80/10/10	DGAM	spline	rf	5852.918	2924.459	7.240	11.786	0.668	5.256	0.896
70	80/10/10	DGAM	spline	svr	5620.947	2808.474	7.240	11.786	0.668	5.134	0.941
71	80/10/10	DGAM	ebm	spline	5634.973	2815.486	6.948	11.980	0.657	5.022	0.890
72	80/10/10	DGAM	ebm	ebm	5616.425	2806.212	6.948	11.980	0.657	5.002	0.901
73	80/10/10	DGAM	ebm	xgb	5603.432	2799.716	6.948	11.980	0.657	5.011	0.896
74	80/10/10	DGAM	ebm	rf	5764.295	2880.148	6.948	11.980	0.657	5.110	0.884
75	80/10/10	DGAM	ebm	svr	5527.647	2761.824	6.948	11.980	0.657	5.004	0.938
76	80/10/10	DGAM	xgb	spline	5643.215	2819.608	6.838	12.255	0.641	4.960	0.891
77	80/10/10	DGAM	xgb	ebm	5603.444	2799.722	6.838	12.255	0.641	4.956	0.895
78	80/10/10	DGAM	xgb	xgb	5615.337	2805.668	6.838	12.255	0.641	4.949	0.895
79	80/10/10	DGAM	xgb	rf	5847.619	2921.81	6.838	12.255	0.641	5.090	0.884
80	80/10/10	DGAM	xgb	svr	5483.047	2739.524	6.838	12.255	0.641	4.949	0.941
81	80/10/10	DGAM	rf	spline	5896.374	2946.187	7.461	13.238	0.581	5.357	0.886
82	80/10/10	DGAM	rf	ebm	5930.659	2963.33	7.461	13.238	0.581	5.346	0.896
83	80/10/10	DGAM	rf	xgb	5950.114	2973.057	7.461	13.238	0.581	5.341	0.896
84	80/10/10	DGAM	rf	rf	6088.728	3042.364	7.461	13.238	0.581	5.472	0.886
85	80/10/10	DGAM	rf	svr	5710.616	2853.308	7.461	13.238	0.581	5.345	0.935
86	80/10/10	DGAM	svr	spline	5665.037	2830.518	6.794	11.639	0.676	4.936	0.895
87	80/10/10	DGAM	svr	ebm	5696.457	2846.228	6.794	11.639	0.676	4.906	0.892
88	80/10/10	DGAM	svr	xgb	5704.597	2850.298	6.794	11.639	0.676	4.911	0.898
89	80/10/10	DGAM	svr	rf	5773.775	2884.888	6.794	11.639	0.676	5.015	0.884
90	80/10/10	DGAM	svr	svr	5541.368	2768.684	6.794	11.639	0.676	4.924	0.930

Table B.13 Predictive performance of GAM, DGAM, and machine learning models for life expectancy across data splitting strategies using the World Health Organization life expectancy dataset.

Order	Split	Group	MeanModel	DispModel	AIC	NLL	MAE	RMSE	R ²	CRPS	PICP95
1	60/20/20	GAM	spline	const	1758.911	877.456	0.817	1.035	0.987	0.584	0.894
2	60/20/20	GAM	ebm	const	1383.912	689.956	0.594	0.765	0.993	0.426	0.895
3	60/20/20	GAM	xgb	const	1338.570	667.285	0.565	0.731	0.994	0.407	0.897
4	60/20/20	GAM	rf	const	1113.128	554.564	0.453	0.608	0.996	0.332	0.895
5	60/20/20	GAM	svr	const	1458.449	727.224	0.571	0.816	0.992	0.430	0.906
6	60/20/20	DGAM	spline	spline	1753.461	872.73	0.817	1.035	0.987	0.568	0.888
7	60/20/20	DGAM	spline	ebm	1538.195	765.098	0.817	1.035	0.987	0.557	0.906
8	60/20/20	DGAM	spline	xgb	1525.483	758.742	0.817	1.035	0.987	0.554	0.901
9	60/20/20	DGAM	spline	rf	1432.242	712.121	0.817	1.035	0.987	0.534	0.916
10	60/20/20	DGAM	spline	svr	1659.454	825.727	0.817	1.035	0.987	0.560	0.871
11	60/20/20	DGAM	ebm	spline	1458.393	725.196	0.594	0.765	0.993	0.425	0.885
12	60/20/20	DGAM	ebm	ebm	1363.238	677.619	0.594	0.765	0.993	0.423	0.897
13	60/20/20	DGAM	ebm	xgb	1361.090	676.545	0.594	0.765	0.993	0.422	0.897
14	60/20/20	DGAM	ebm	rf	1317.781	654.89	0.594	0.765	0.993	0.410	0.892
15	60/20/20	DGAM	ebm	svr	1452.762	722.381	0.594	0.765	0.993	0.422	0.876
16	60/20/20	DGAM	xgb	spline	1416.392	704.196	0.565	0.731	0.994	0.406	0.883
17	60/20/20	DGAM	xgb	ebm	1369.822	680.911	0.565	0.731	0.994	0.405	0.890
18	60/20/20	DGAM	xgb	xgb	1379.159	685.58	0.565	0.731	0.994	0.405	0.888
19	60/20/20	DGAM	xgb	rf	1342.840	667.42	0.565	0.731	0.994	0.394	0.887
20	60/20/20	DGAM	xgb	svr	1529.204	760.602	0.565	0.731	0.994	0.405	0.874
21	60/20/20	DGAM	rf	spline	1176.466	584.233	0.453	0.608	0.996	0.335	0.883
22	60/20/20	DGAM	rf	ebm	1054.135	523.068	0.453	0.608	0.996	0.326	0.892
23	60/20/20	DGAM	rf	xgb	1062.173	527.086	0.453	0.608	0.996	0.325	0.902
24	60/20/20	DGAM	rf	rf	1192.407	592.204	0.453	0.608	0.996	0.318	0.871
25	60/20/20	DGAM	rf	svr	1183.739	587.87	0.453	0.608	0.996	0.327	0.885
26	60/20/20	DGAM	svr	spline	1782.067	887.034	0.571	0.816	0.992	0.428	0.909
27	60/20/20	DGAM	svr	ebm	1472.530	732.265	0.571	0.816	0.992	0.412	0.920
28	60/20/20	DGAM	svr	xgb	1547.507	769.754	0.571	0.816	0.992	0.410	0.918
29	60/20/20	DGAM	svr	rf	1765.921	878.96	0.571	0.816	0.992	0.386	0.921
30	60/20/20	DGAM	svr	svr	2959.736	1475.868	0.571	0.816	0.992	0.422	0.932
31	70/15/15	GAM	spline	const	1263.026	629.513	0.770	1.002	0.988	0.553	0.909
32	70/15/15	GAM	ebm	const	958.231	477.116	0.554	0.725	0.994	0.400	0.930
33	70/15/15	GAM	xgb	const	909.305	452.652	0.520	0.685	0.994	0.376	0.928
34	70/15/15	GAM	rf	const	877.526	436.763	0.426	0.640	0.995	0.322	0.930
35	70/15/15	GAM	svr	const	1008.481	502.24	0.511	0.743	0.993	0.391	0.891
36	70/15/15	DGAM	spline	spline	1233.829	612.914	0.770	1.002	0.988	0.538	0.895
37	70/15/15	DGAM	spline	ebm	1204.595	598.298	0.770	1.002	0.988	0.531	0.923
38	70/15/15	DGAM	spline	xgb	1220.454	606.227	0.770	1.002	0.988	0.528	0.921
39	70/15/15	DGAM	spline	rf	1433.846	712.923	0.770	1.002	0.988	0.516	0.905
40	70/15/15	DGAM	spline	svr	1307.794	649.897	0.770	1.002	0.988	0.533	0.879
41	70/15/15	DGAM	ebm	spline	972.463	482.232	0.554	0.725	0.994	0.396	0.935
42	70/15/15	DGAM	ebm	ebm	940.608	466.304	0.554	0.725	0.994	0.394	0.914
43	70/15/15	DGAM	ebm	xgb	961.423	476.712	0.554	0.725	0.994	0.394	0.902
44	70/15/15	DGAM	ebm	rf	929.227	460.614	0.554	0.725	0.994	0.381	0.914
45	70/15/15	DGAM	ebm	svr	938.450	465.225	0.554	0.725	0.994	0.391	0.912
46	70/15/15	DGAM	xgb	spline	939.755	465.878	0.520	0.685	0.994	0.374	0.928
47	70/15/15	DGAM	xgb	ebm	898.940	445.47	0.520	0.685	0.994	0.371	0.919
48	70/15/15	DGAM	xgb	xgb	909.353	450.676	0.520	0.685	0.994	0.371	0.912
49	70/15/15	DGAM	xgb	rf	880.545	436.272	0.520	0.685	0.994	0.359	0.914
50	70/15/15	DGAM	xgb	svr	863.602	427.801	0.520	0.685	0.994	0.366	0.935
51	70/15/15	DGAM	rf	spline	807.376	399.688	0.426	0.640	0.995	0.320	0.914
52	70/15/15	DGAM	rf	ebm	766.467	379.234	0.426	0.640	0.995	0.313	0.919
53	70/15/15	DGAM	rf	xgb	779.354	385.677	0.426	0.640	0.995	0.313	0.921
54	70/15/15	DGAM	rf	rf	637.777	314.888	0.426	0.640	0.995	0.299	0.914
55	70/15/15	DGAM	rf	svr	1048.966	520.483	0.426	0.640	0.995	0.315	0.900
56	70/15/15	DGAM	svr	spline	2863.300	1427.65	0.511	0.743	0.993	0.387	0.881
57	70/15/15	DGAM	svr	ebm	1330.164	661.082	0.511	0.743	0.993	0.378	0.898
58	70/15/15	DGAM	svr	xgb	1358.327	675.164	0.511	0.743	0.993	0.377	0.900
59	70/15/15	DGAM	svr	rf	1656.085	824.042	0.511	0.743	0.993	0.356	0.895
60	70/15/15	DGAM	svr	svr	2243.133	1117.566	0.511	0.743	0.993	0.383	0.898
61	80/10/10	GAM	spline	const	864.933	430.466	0.740	1.057	0.987	0.536	0.948
62	80/10/10	GAM	ebm	const	751.587	373.794	0.557	0.811	0.993	0.410	0.927
63	80/10/10	GAM	xgb	const	746.519	371.26	0.527	0.782	0.993	0.389	0.927
64	80/10/10	GAM	rf	const	631.082	313.541	0.403	0.600	0.996	0.301	0.913
65	80/10/10	GAM	svr	const	625.153	310.576	0.482	0.705	0.994	0.365	0.934
66	80/10/10	DGAM	spline	spline	828.783	410.392	0.740	1.057	0.987	0.526	0.941
67	80/10/10	DGAM	spline	ebm	852.271	422.136	0.740	1.057	0.987	0.520	0.927
68	80/10/10	DGAM	spline	xgb	843.070	417.535	0.740	1.057	0.987	0.517	0.927
69	80/10/10	DGAM	spline	rf	1425.662	708.831	0.740	1.057	0.987	0.496	0.909
70	80/10/10	DGAM	spline	svr	761.653	376.826	0.740	1.057	0.987	0.509	0.937
71	80/10/10	DGAM	ebm	spline	811.638	401.819	0.557	0.811	0.993	0.407	0.889
72	80/10/10	DGAM	ebm	ebm	762.929	377.464	0.557	0.811	0.993	0.405	0.889
73	80/10/10	DGAM	ebm	xgb	775.991	383.996	0.557	0.811	0.993	0.404	0.889
74	80/10/10	DGAM	ebm	rf	913.966	452.983	0.557	0.811	0.993	0.392	0.906
75	80/10/10	DGAM	ebm	svr	659.074	325.537	0.557	0.811	0.993	0.401	0.913
76	80/10/10	DGAM	xgb	spline	886.572	439.286	0.527	0.782	0.993	0.387	0.895
77	80/10/10	DGAM	xgb	ebm	755.950	373.975	0.527	0.782	0.993	0.386	0.895
78	80/10/10	DGAM	xgb	xgb	780.839	386.42	0.527	0.782	0.993	0.386	0.899
79	80/10/10	DGAM	xgb	rf	992.176	492.088	0.527	0.782	0.993	0.374	0.909
80	80/10/10	DGAM	xgb	svr	662.472	327.236	0.527	0.782	0.993	0.383	0.902
81	80/10/10	DGAM	rf	spline	598.808	295.404	0.403	0.600	0.996	0.297	0.916
82	80/10/10	DGAM	rf	ebm	491.594	241.797	0.403	0.600	0.996	0.293	0.923
83	80/10/10	DGAM	rf	xgb	493.272	242.636	0.403	0.600	0.996	0.293	0.909
84	80/10/10	DGAM	rf	rf	553.902	272.951	0.403	0.600	0.996	0.283	0.909
85	80/10/10	DGAM	rf	svr	484.815	238.408	0.403	0.600	0.996	0.292	0.920
86	80/10/10	DGAM	svr	spline	943.323	467.662	0.482	0.705	0.994	0.360	0.916
87	80/10/10	DGAM	svr	ebm	730.057	361.028	0.482	0.705	0.994	0.352	0.895
88	80/10/10	DGAM	svr	xgb	725.726	358.863	0.482	0.705	0.994	0.351	0.902
89	80/10/10	DGAM	svr	rf	680.815	336.408	0.482	0.705	0.994	0.334	0.906
90	80/10/10	DGAM	svr	svr	1153.843	572.922	0.482	0.705	0.994	0.355	0.909

Table B.14 Predictive performance of GAM, DGAM, and machine learning models for adult mortality across data splitting strategies using the World Health Organization life expectancy dataset.

Order	Split	Group	MeanModel	DispModel	AIC	NLL	MAE	RMSE	R ²	CRPS	PICP95
1	60/20/20	GAM	spline	const	4952.701	2474.35	13.709	17.630	0.974	9.788	0.918
2	60/20/20	GAM	ebm	const	4727.988	2361.994	9.951	14.319	0.983	7.516	0.899
3	60/20/20	GAM	xgb	const	4682.986	2339.493	9.433	13.667	0.984	7.143	0.897
4	60/20/20	GAM	rf	const	4461.487	2228.744	7.355	11.471	0.989	5.832	0.914
5	60/20/20	GAM	svr	const	5474.471	2735.236	17.453	28.372	0.933	14.131	0.920
6	60/20/20	DGAM	spline	spline	4991.578	2491.789	13.709	17.630	0.974	9.657	0.885
7	60/20/20	DGAM	spline	ebm	4809.775	2400.888	13.709	17.630	0.974	9.379	0.895
8	60/20/20	DGAM	spline	xgb	4791.217	2391.608	13.709	17.630	0.974	9.316	0.899
9	60/20/20	DGAM	spline	rf	4886.951	2439.476	13.709	17.630	0.974	9.012	0.914
10	60/20/20	DGAM	spline	svr	4892.949	2442.474	13.709	17.630	0.974	9.363	0.890
11	60/20/20	DGAM	ebm	spline	4781.274	2386.637	9.951	14.319	0.983	7.238	0.920
12	60/20/20	DGAM	ebm	ebm	4506.919	2249.46	9.951	14.319	0.983	7.148	0.908
13	60/20/20	DGAM	ebm	xgb	4508.454	2250.227	9.951	14.319	0.983	7.130	0.908
14	60/20/20	DGAM	ebm	rf	4395.845	2193.922	9.951	14.319	0.983	6.802	0.921
15	60/20/20	DGAM	ebm	svr	4516.052	2254.026	9.951	14.319	0.983	7.066	0.895
16	60/20/20	DGAM	xgb	spline	4753.265	2372.632	9.433	13.667	0.984	6.905	0.923
17	60/20/20	DGAM	xgb	ebm	4518.609	2255.304	9.433	13.667	0.984	6.846	0.916
18	60/20/20	DGAM	xgb	xgb	4495.926	2243.963	9.433	13.667	0.984	6.831	0.916
19	60/20/20	DGAM	xgb	rf	4369.424	2180.712	9.433	13.667	0.984	6.497	0.916
20	60/20/20	DGAM	xgb	svr	4455.480	2223.74	9.433	13.667	0.984	6.771	0.899
21	60/20/20	DGAM	rf	spline	4196.403	2094.202	7.355	11.471	0.989	5.484	0.901
22	60/20/20	DGAM	rf	ebm	4038.371	2015.186	7.355	11.471	0.989	5.309	0.928
23	60/20/20	DGAM	rf	xgb	4030.773	2011.386	7.355	11.471	0.989	5.295	0.923
24	60/20/20	DGAM	rf	rf	3838.761	1915.38	7.355	11.471	0.989	5.048	0.925
25	60/20/20	DGAM	rf	svr	4168.848	2080.424	7.355	11.471	0.989	5.362	0.908
26	60/20/20	DGAM	svr	spline	5377.758	2684.879	17.453	28.372	0.933	13.190	0.925
27	60/20/20	DGAM	svr	ebm	4956.499	2474.25	17.453	28.372	0.933	12.333	0.923
28	60/20/20	DGAM	svr	xgb	4952.876	2472.438	17.453	28.372	0.933	12.281	0.923
29	60/20/20	DGAM	svr	rf	5003.577	2497.788	17.453	28.372	0.933	11.542	0.883
30	60/20/20	DGAM	svr	svr	4931.304	2461.652	17.453	28.372	0.933	11.982	0.901
31	70/15/15	GAM	spline	const	3753.867	1874.934	13.146	18.288	0.972	9.722	0.909
32	70/15/15	GAM	ebm	const	3562.891	1779.446	10.293	14.220	0.983	7.716	0.881
33	70/15/15	GAM	xgb	const	3515.671	1755.836	9.734	13.451	0.985	7.297	0.872
34	70/15/15	GAM	rf	const	3396.739	1696.37	7.445	11.973	0.988	5.965	0.907
35	70/15/15	GAM	svr	const	4208.267	2102.134	18.461	30.198	0.924	14.858	0.895
36	70/15/15	DGAM	spline	spline	3703.809	1847.904	13.146	18.288	0.972	9.355	0.900
37	70/15/15	DGAM	spline	ebm	3574.602	1783.301	13.146	18.288	0.972	9.302	0.905
38	70/15/15	DGAM	spline	rf	3567.613	1779.806	13.146	18.288	0.972	9.268	0.907
39	70/15/15	DGAM	spline	svr	3397.175	1694.588	13.146	18.288	0.972	8.861	0.900
40	70/15/15	DGAM	spline	svr	3757.351	1874.676	13.146	18.288	0.972	9.154	0.891
41	70/15/15	DGAM	ebm	spline	3625.472	1808.736	10.293	14.220	0.983	7.553	0.879
42	70/15/15	DGAM	ebm	ebm	3424.466	1708.233	10.293	14.220	0.983	7.371	0.870
43	70/15/15	DGAM	ebm	xgb	3418.821	1705.41	10.293	14.220	0.983	7.354	0.881
44	70/15/15	DGAM	ebm	rf	3376.959	1684.48	10.293	14.220	0.983	7.053	0.886
45	70/15/15	DGAM	ebm	svr	3595.235	1793.618	10.293	14.220	0.983	7.272	0.916
46	70/15/15	DGAM	xgb	spline	3577.973	1784.986	9.734	13.451	0.985	7.205	0.874
47	70/15/15	DGAM	xgb	ebm	3419.587	1705.794	9.734	13.451	0.985	6.994	0.874
48	70/15/15	DGAM	xgb	xgb	3408.985	1700.492	9.734	13.451	0.985	6.965	0.884
49	70/15/15	DGAM	xgb	rf	3418.330	1705.165	9.734	13.451	0.985	6.716	0.881
50	70/15/15	DGAM	xgb	svr	3596.944	1794.472	9.734	13.451	0.985	6.956	0.895
51	70/15/15	DGAM	rf	spline	3268.739	1630.37	7.445	11.973	0.988	5.638	0.926
52	70/15/15	DGAM	rf	ebm	3036.043	1514.022	7.445	11.973	0.988	5.393	0.937
53	70/15/15	DGAM	rf	xgb	3021.838	1506.919	7.445	11.973	0.988	5.374	0.928
54	70/15/15	DGAM	rf	svr	2959.858	1475.929	7.445	11.973	0.988	5.210	0.921
55	70/15/15	DGAM	rf	svr	3139.163	1565.582	7.445	11.973	0.988	5.355	0.926
56	70/15/15	DGAM	svr	spline	3926.665	1959.332	18.461	30.198	0.924	13.602	0.895
57	70/15/15	DGAM	svr	ebm	3825.381	1908.69	18.461	30.198	0.924	13.135	0.888
58	70/15/15	DGAM	svr	xgb	3830.433	1911.216	18.461	30.198	0.924	13.044	0.893
59	70/15/15	DGAM	svr	rf	3435.670	1713.835	18.461	30.198	0.924	11.866	0.919
60	70/15/15	DGAM	svr	svr	3788.763	1890.382	18.461	30.198	0.924	12.450	0.916
61	80/10/10	GAM	spline	const	2521.336	1258.668	12.613	18.376	0.973	9.189	0.930
62	80/10/10	GAM	ebm	const	2284.343	1140.172	9.116	12.496	0.987	6.669	0.909
63	80/10/10	GAM	xgb	const	2249.489	1122.744	8.573	11.762	0.989	6.269	0.916
64	80/10/10	GAM	rf	const	2176.573	1086.286	6.036	9.618	0.993	4.756	0.892
65	80/10/10	GAM	svr	const	2736.364	1366.182	16.554	26.880	0.942	13.359	0.899
66	80/10/10	DGAM	spline	spline	2476.685	1234.342	12.613	18.376	0.973	8.958	0.916
67	80/10/10	DGAM	spline	ebm	2656.794	1324.397	12.613	18.376	0.973	8.805	0.913
68	80/10/10	DGAM	spline	xgb	2708.595	1350.298	12.613	18.376	0.973	8.776	0.920
69	80/10/10	DGAM	spline	rf	5498.988	2745.494	12.613	18.376	0.973	8.511	0.895
70	80/10/10	DGAM	spline	svr	5493.467	2742.734	12.613	18.376	0.973	8.764	0.895
71	80/10/10	DGAM	ebm	spline	2337.213	1164.606	9.116	12.496	0.987	6.546	0.899
72	80/10/10	DGAM	ebm	ebm	2208.710	1100.355	9.116	12.496	0.987	6.449	0.899
73	80/10/10	DGAM	ebm	xgb	2195.599	1093.8	9.116	12.496	0.987	6.417	0.902
74	80/10/10	DGAM	ebm	rf	2211.991	1101.996	9.116	12.496	0.987	6.252	0.868
75	80/10/10	DGAM	ebm	svr	2257.490	1124.745	9.116	12.496	0.987	6.392	0.906
76	80/10/10	DGAM	xgb	spline	2358.548	1175.274	8.573	11.762	0.989	6.198	0.882
77	80/10/10	DGAM	xgb	ebm	2182.336	1087.168	8.573	11.762	0.989	6.067	0.913
78	80/10/10	DGAM	xgb	xgb	2194.137	1093.068	8.573	11.762	0.989	6.064	0.909
79	80/10/10	DGAM	xgb	rf	2216.745	1104.372	8.573	11.762	0.989	5.930	0.857
80	80/10/10	DGAM	xgb	svr	2289.814	1140.907	8.573	11.762	0.989	6.064	0.878
81	80/10/10	DGAM	rf	spline	2020.548	1006.274	6.036	9.618	0.993	4.565	0.920
82	80/10/10	DGAM	rf	ebm	2068.668	1030.334	6.036	9.618	0.993	4.367	0.916
83	80/10/10	DGAM	rf	xgb	2061.554	1026.777	6.036	9.618	0.993	4.347	0.920
84	80/10/10	DGAM	rf	rf	2061.528	1026.764	6.036	9.618	0.993	4.199	0.909
85	80/10/10	DGAM	rf	svr	2148.658	1070.329	6.036	9.618	0.993	4.344	0.923
86	80/10/10	DGAM	svr	spline	2731.448	1361.724	16.554	26.880	0.942	12.319	0.889
87	80/10/10	DGAM	svr	ebm	2413.295	1202.648	16.554	26.880	0.942	11.592	0.916
88	80/10/10	DGAM	svr	xgb	2396.847	1194.424	16.554	26.880	0.942	11.530	0.902
89	80/10/10	DGAM	svr	rf	2371.905	1181.952	16.554	26.880	0.942	10.871	0.885
90	80/10/10	DGAM	svr	svr	2488.799	1240.4	16.554	26.880	0.942	11.125	0.895

Table B.15 Predictive performance of GAM, DGAM, and machine learning models for under-five deaths across data splitting strategies using the World Health Organization life expectancy dataset.

Order	Split	Group	MeanModel	DispModel	AIC	NLL	MAE	RMSE	R ²	CRPS	PICP95
1	60/20/20	GAM	spline	const	3437.321	1716.66	2.191	3.750	0.993	1.800	0.866
2	60/20/20	GAM	ebm	const	2910.804	1453.402	1.545	2.784	0.996	1.344	0.873
3	60/20/20	GAM	xgb	const	2837.446	1416.723	1.479	2.659	0.996	1.288	0.881
4	60/20/20	GAM	rf	const	3113.444	1554.722	1.523	3.195	0.995	1.419	0.908
5	60/20/20	GAM	svr	const	4616.909	2306.454	2.716	6.743	0.977	2.538	0.890
6	60/20/20	DGAM	spline	spline	2780.976	1386.488	2.191	3.750	0.993	1.611	0.874
7	60/20/20	DGAM	spline	ebm	2362.998	1177.499	2.191	3.750	0.993	1.552	0.906
8	60/20/20	DGAM	spline	xgb	2362.659	1177.33	2.191	3.750	0.993	1.544	0.908
9	60/20/20	DGAM	spline	rf	2402.191	1197.096	2.191	3.750	0.993	1.497	0.885
10	60/20/20	DGAM	spline	svr	2560.919	1276.46	2.191	3.750	0.993	1.530	0.892
11	60/20/20	DGAM	ebm	spline	2376.443	1184.222	1.545	2.784	0.996	1.144	0.890
12	60/20/20	DGAM	ebm	ebm	1881.140	936.57	1.545	2.784	0.996	1.123	0.913
13	60/20/20	DGAM	ebm	xgb	1892.486	942.243	1.545	2.784	0.996	1.126	0.909
14	60/20/20	DGAM	ebm	rf	1904.258	948.129	1.545	2.784	0.996	1.106	0.908
15	60/20/20	DGAM	ebm	svr	2013.542	1002.771	1.545	2.784	0.996	1.119	0.876
16	60/20/20	DGAM	xgb	spline	2316.163	1154.082	1.479	2.659	0.996	1.099	0.892
17	60/20/20	DGAM	xgb	ebm	1881.238	936.619	1.479	2.659	0.996	1.080	0.902
18	60/20/20	DGAM	xgb	xgb	1896.450	944.225	1.479	2.659	0.996	1.081	0.906
19	60/20/20	DGAM	xgb	rf	2035.453	1013.726	1.479	2.659	0.996	1.066	0.911
20	60/20/20	DGAM	xgb	svr	1939.654	965.827	1.479	2.659	0.996	1.066	0.885
21	60/20/20	DGAM	rf	spline	1745.922	868.961	1.523	3.195	0.995	1.120	0.899
22	60/20/20	DGAM	rf	ebm	1619.822	805.911	1.523	3.195	0.995	1.083	0.921
23	60/20/20	DGAM	rf	xgb	1651.146	821.573	1.523	3.195	0.995	1.082	0.911
24	60/20/20	DGAM	rf	rf	1452.971	722.486	1.523	3.195	0.995	1.033	0.901
25	60/20/20	DGAM	rf	svr	1515.705	753.852	1.523	3.195	0.995	1.069	0.925
26	60/20/20	DGAM	svr	spline	3288.376	1640.188	2.716	6.743	0.977	2.087	0.909
27	60/20/20	DGAM	svr	ebm	3624.148	1808.074	2.716	6.743	0.977	2.011	0.885
28	60/20/20	DGAM	svr	xgb	3197.927	1594.964	2.716	6.743	0.977	2.008	0.888
29	60/20/20	DGAM	svr	rf	3252.776	1622.388	2.716	6.743	0.977	1.876	0.902
30	60/20/20	DGAM	svr	svr	2779.168	1385.584	2.716	6.743	0.977	1.913	0.908
31	70/15/15	GAM	spline	const	2477.539	1236.77	1.896	3.465	0.993	1.567	0.905
32	70/15/15	GAM	ebm	const	2125.280	1060.64	1.288	2.469	0.997	1.118	0.886
33	70/15/15	GAM	xgb	const	2108.340	1052.17	1.228	2.370	0.997	1.063	0.888
34	70/15/15	GAM	rf	const	2495.072	1245.536	1.606	3.303	0.994	1.472	0.879
35	70/15/15	GAM	svr	const	2798.048	1397.024	2.336	5.157	0.985	2.174	0.919
36	70/15/15	DGAM	spline	spline	1753.764	872.882	1.896	3.465	0.993	1.401	0.919
37	70/15/15	DGAM	spline	ebm	1647.494	819.747	1.896	3.465	0.993	1.350	0.914
38	70/15/15	DGAM	spline	xgb	1639.017	815.508	1.896	3.465	0.993	1.344	0.912
39	70/15/15	DGAM	spline	rf	1575.152	783.576	1.896	3.465	0.993	1.288	0.912
40	70/15/15	DGAM	spline	svr	1772.290	882.145	1.896	3.465	0.993	1.352	0.860
41	70/15/15	DGAM	ebm	spline	1442.332	717.166	1.288	2.469	0.997	0.954	0.928
42	70/15/15	DGAM	ebm	ebm	1387.255	689.628	1.288	2.469	0.997	0.936	0.928
43	70/15/15	DGAM	ebm	xgb	1375.566	683.783	1.288	2.469	0.997	0.936	0.930
44	70/15/15	DGAM	ebm	rf	1571.260	781.63	1.288	2.469	0.997	0.927	0.900
45	70/15/15	DGAM	ebm	svr	1844.576	918.288	1.288	2.469	0.997	0.942	0.884
46	70/15/15	DGAM	xgb	spline	1412.354	702.177	1.228	2.370	0.997	0.917	0.926
47	70/15/15	DGAM	xgb	ebm	1355.679	673.84	1.228	2.370	0.997	0.896	0.921
48	70/15/15	DGAM	xgb	xgb	1358.410	675.205	1.228	2.370	0.997	0.897	0.919
49	70/15/15	DGAM	xgb	rf	1558.114	775.057	1.228	2.370	0.997	0.893	0.881
50	70/15/15	DGAM	xgb	svr	1850.741	921.37	1.228	2.370	0.997	0.902	0.888
51	70/15/15	DGAM	rf	spline	1561.278	776.639	1.606	3.303	0.994	1.198	0.881
52	70/15/15	DGAM	rf	ebm	1345.798	668.899	1.606	3.303	0.994	1.144	0.891
53	70/15/15	DGAM	rf	xgb	1351.773	671.886	1.606	3.303	0.994	1.135	0.900
54	70/15/15	DGAM	rf	rf	1230.447	611.224	1.606	3.303	0.994	1.087	0.912
55	70/15/15	DGAM	rf	svr	1295.769	643.884	1.606	3.303	0.994	1.114	0.926
56	70/15/15	DGAM	svr	spline	2715.634	1353.817	2.336	5.157	0.985	1.728	0.886
57	70/15/15	DGAM	svr	ebm	2223.108	1107.554	2.336	5.157	0.985	1.699	0.872
58	70/15/15	DGAM	svr	xgb	2180.999	1086.5	2.336	5.157	0.985	1.691	0.870
59	70/15/15	DGAM	svr	rf	2339.331	1165.666	2.336	5.157	0.985	1.618	0.914
60	70/15/15	DGAM	svr	svr	1898.004	945.002	2.336	5.157	0.985	1.662	0.902
61	80/10/10	GAM	spline	const	3598.553	1797.276	2.117	5.594	0.985	1.792	0.850
62	80/10/10	GAM	ebm	const	2962.546	1479.273	1.365	4.422	0.990	1.212	0.875
63	80/10/10	GAM	xgb	const	3527.554	1761.777	1.325	4.378	0.991	1.169	0.857
64	80/10/10	GAM	rf	const	1813.003	904.502	1.266	3.474	0.994	1.189	0.902
65	80/10/10	GAM	svr	const	2423.514	1209.757	2.168	6.367	0.980	2.072	0.906
66	80/10/10	DGAM	spline	spline	1954.216	973.108	2.117	5.594	0.985	1.616	0.906
67	80/10/10	DGAM	spline	ebm	1916.307	954.154	2.117	5.594	0.985	1.586	0.916
68	80/10/10	DGAM	spline	xgb	2016.915	1004.458	2.117	5.594	0.985	1.584	0.909
69	80/10/10	DGAM	spline	rf	10498.524	5245.262	2.117	5.594	0.985	1.500	0.909
70	80/10/10	DGAM	spline	svr	1230.343	611.172	2.117	5.594	0.985	1.554	0.899
71	80/10/10	DGAM	ebm	spline	1119.034	555.517	1.365	4.422	0.990	1.047	0.906
72	80/10/10	DGAM	ebm	ebm	976.862	484.431	1.365	4.422	0.990	1.039	0.895
73	80/10/10	DGAM	ebm	xgb	941.692	466.846	1.365	4.422	0.990	1.035	0.895
74	80/10/10	DGAM	ebm	rf	1172.893	582.446	1.365	4.422	0.990	1.018	0.902
75	80/10/10	DGAM	ebm	svr	949.875	470.938	1.365	4.422	0.990	1.037	0.909
76	80/10/10	DGAM	xgb	spline	1640.710	816.355	1.325	4.378	0.991	1.026	0.927
77	80/10/10	DGAM	xgb	ebm	1003.626	497.813	1.325	4.378	0.991	1.010	0.930
78	80/10/10	DGAM	xgb	xgb	970.687	481.344	1.325	4.378	0.991	1.008	0.920
79	80/10/10	DGAM	xgb	rf	1340.131	666.066	1.325	4.378	0.991	0.995	0.902
80	80/10/10	DGAM	xgb	svr	1092.580	542.29	1.325	4.378	0.991	1.011	0.916
81	80/10/10	DGAM	rf	spline	713.948	352.974	1.266	3.474	0.994	0.957	0.937
82	80/10/10	DGAM	rf	ebm	667.474	329.737	1.266	3.474	0.994	0.917	0.923
83	80/10/10	DGAM	rf	xgb	629.460	310.73	1.266	3.474	0.994	0.911	0.916
84	80/10/10	DGAM	rf	rf	811.554	401.777	1.266	3.474	0.994	0.879	0.920
85	80/10/10	DGAM	rf	svr	587.832	289.916	1.266	3.474	0.994	0.887	0.923
86	80/10/10	DGAM	svr	spline	1427.922	709.961	2.168	6.367	0.980	1.679	0.906
87	80/10/10	DGAM	svr	ebm	1111.621	551.81	2.168	6.367	0.980	1.593	0.916
88	80/10/10	DGAM	svr	xgb	1135.304	563.652	2.168	6.367	0.980	1.589	0.906
89	80/10/10	DGAM	svr	rf	1245.776	618.888	2.168	6.367	0.980	1.516	0.923
90	80/10/10	DGAM	svr	svr	961.842	476.921	2.168	6.367	0.980	1.495	0.916

Table B.16 Predictive performance of GAM, DGAM, and machine learning models for infant mortality outcomes across data splitting strategies using the National Health Checkup dataset of South Korea (2002–2020).

Order	Split	Group	MeanModel	DispModel	AIC	NLL	MAE	RMSE	R ²	CRPS	PICP95
1	60/20/20	GAM	spline	const	2872.778	1434.389	1.502	2.557	0.991	1.217	0.894
2	60/20/20	GAM	ebm	const	2285.655	1140.828	0.928	1.677	0.996	0.801	0.901
3	60/20/20	GAM	xgb	const	2241.159	1118.58	0.909	1.625	0.996	0.780	0.901
4	60/20/20	GAM	rf	const	2337.880	1166.94	0.957	1.822	0.996	0.887	0.892
5	60/20/20	GAM	svr	const	3123.363	1559.682	1.387	2.905	0.989	1.225	0.914
6	60/20/20	DGAM	spline	spline	2578.345	1285.172	1.502	2.557	0.991	1.091	0.867
7	60/20/20	DGAM	spline	ebm	2444.463	1218.232	1.502	2.557	0.991	1.066	0.899
8	60/20/20	DGAM	spline	xgb	2500.969	1246.484	1.502	2.557	0.991	1.061	0.902
9	60/20/20	DGAM	spline	rf	2600.744	1296.372	1.502	2.557	0.991	1.021	0.895
10	60/20/20	DGAM	spline	svr	2691.162	1341.581	1.502	2.557	0.991	1.031	0.890
11	60/20/20	DGAM	ebm	spline	1735.746	863.873	0.928	1.677	0.996	0.685	0.892
12	60/20/20	DGAM	ebm	ebm	1454.092	723.046	0.928	1.677	0.996	0.677	0.895
13	60/20/20	DGAM	ebm	xgb	1447.116	719.558	0.928	1.677	0.996	0.675	0.909
14	60/20/20	DGAM	ebm	rf	1762.847	877.424	0.928	1.677	0.996	0.665	0.881
15	60/20/20	DGAM	ebm	svr	1541.837	766.918	0.928	1.677	0.996	0.668	0.902
16	60/20/20	DGAM	xgb	spline	1605.153	798.576	0.909	1.625	0.996	0.671	0.894
17	60/20/20	DGAM	ebm	ebm	1379.907	685.954	0.909	1.625	0.996	0.661	0.913
18	60/20/20	DGAM	xgb	xgb	1369.806	680.903	0.909	1.625	0.996	0.659	0.916
19	60/20/20	DGAM	xgb	rf	1584.185	788.092	0.909	1.625	0.996	0.652	0.895
20	60/20/20	DGAM	xgb	svr	1630.882	811.441	0.909	1.625	0.996	0.656	0.906
21	60/20/20	DGAM	rf	spline	1210.810	601.405	0.957	1.822	0.996	0.720	0.897
22	60/20/20	DGAM	rf	ebm	1341.265	666.632	0.957	1.822	0.996	0.686	0.911
23	60/20/20	DGAM	rf	xgb	1325.546	658.773	0.957	1.822	0.996	0.687	0.906
24	60/20/20	DGAM	rf	rf	1265.473	628.736	0.957	1.822	0.996	0.670	0.895
25	60/20/20	DGAM	rf	svr	1242.799	617.4	0.957	1.822	0.996	0.696	0.894
26	60/20/20	DGAM	svr	spline	17401.039	8696.52	1.387	2.905	0.989	1.052	0.881
27	60/20/20	DGAM	svr	ebm	2054.994	1023.497	1.387	2.905	0.989	1.022	0.904
28	60/20/20	DGAM	svr	xgb	2042.423	1017.212	1.387	2.905	0.989	1.019	0.904
29	60/20/20	DGAM	svr	rf	2290.646	1141.323	1.387	2.905	0.989	0.967	0.899
30	60/20/20	DGAM	svr	svr	2770.981	1381.49	1.387	2.905	0.989	1.000	0.878
31	70/15/15	GAM	spline	const	2251.463	1123.732	1.448	2.625	0.990	1.202	0.898
32	70/15/15	GAM	ebm	const	2126.931	1061.466	0.992	1.966	0.995	0.853	0.870
33	70/15/15	GAM	xgb	const	2137.925	1066.962	0.940	1.888	0.995	0.809	0.867
34	70/15/15	GAM	rf	const	2177.379	1086.69	1.118	2.293	0.993	1.028	0.867
35	70/15/15	GAM	svr	const	2782.050	1389.025	1.429	3.044	0.987	1.249	0.900
36	70/15/15	DGAM	spline	spline	1545.667	768.834	1.448	2.625	0.990	1.045	0.914
37	70/15/15	DGAM	spline	ebm	1761.069	876.534	1.448	2.625	0.990	1.037	0.888
38	70/15/15	DGAM	spline	xgb	1813.154	902.577	1.448	2.625	0.990	1.033	0.895
39	70/15/15	DGAM	spline	rf	1694.079	843.04	1.448	2.625	0.990	0.971	0.923
40	70/15/15	DGAM	spline	svr	1471.285	731.642	1.448	2.625	0.990	0.983	0.909
41	70/15/15	DGAM	ebm	spline	1462.689	727.344	0.992	1.966	0.995	0.751	0.898
42	70/15/15	DGAM	ebm	ebm	1246.989	619.494	0.992	1.966	0.995	0.742	0.902
43	70/15/15	DGAM	ebm	xgb	1196.339	594.17	0.992	1.966	0.995	0.740	0.898
44	70/15/15	DGAM	ebm	rf	1092.384	542.192	0.992	1.966	0.995	0.720	0.898
45	70/15/15	DGAM	ebm	svr	1274.648	633.324	0.992	1.966	0.995	0.737	0.900
46	70/15/15	DGAM	xgb	spline	1448.413	720.206	0.940	1.888	0.995	0.717	0.898
47	70/15/15	DGAM	xgb	ebm	1282.909	637.454	0.940	1.888	0.995	0.715	0.886
48	70/15/15	DGAM	xgb	xgb	1296.462	644.231	0.940	1.888	0.995	0.716	0.874
49	70/15/15	DGAM	xgb	rf	1152.407	572.204	0.940	1.888	0.995	0.693	0.877
50	70/15/15	DGAM	xgb	svr	1327.590	659.795	0.940	1.888	0.995	0.709	0.886
51	70/15/15	DGAM	rf	spline	1089.224	540.612	1.118	2.293	0.993	0.831	0.923
52	70/15/15	DGAM	rf	ebm	937.491	464.746	1.118	2.293	0.993	0.801	0.907
53	70/15/15	DGAM	rf	xgb	902.424	447.212	1.118	2.293	0.993	0.799	0.905
54	70/15/15	DGAM	rf	rf	839.973	415.986	1.118	2.293	0.993	0.756	0.919
55	70/15/15	DGAM	rf	svr	768.647	380.324	1.118	2.293	0.993	0.779	0.923
56	70/15/15	DGAM	svr	spline	2763.862	1377.931	1.429	3.044	0.987	1.093	0.895
57	70/15/15	DGAM	svr	ebm	1664.658	828.329	1.429	3.044	0.987	1.076	0.900
58	70/15/15	DGAM	svr	xgb	1710.509	851.254	1.429	3.044	0.987	1.072	0.905
59	70/15/15	DGAM	svr	rf	4140.008	2066.004	1.429	3.044	0.987	1.002	0.870
60	70/15/15	DGAM	svr	svr	1490.187	741.094	1.429	3.044	0.987	1.029	0.909
61	80/10/10	GAM	spline	const	1615.606	805.803	1.474	2.663	0.991	1.208	0.861
62	80/10/10	GAM	ebm	const	1186.453	591.226	0.855	1.651	0.996	0.732	0.913
63	80/10/10	GAM	xgb	const	1200.326	598.163	0.829	1.634	0.997	0.712	0.913
64	80/10/10	GAM	rf	const	1133.442	564.721	0.913	1.730	0.996	0.844	0.927
65	80/10/10	GAM	svr	const	1273.432	634.716	0.953	1.906	0.995	0.830	0.906
66	80/10/10	DGAM	spline	spline	1228.387	610.194	1.474	2.663	0.991	1.072	0.878
67	80/10/10	DGAM	spline	ebm	1209.029	600.514	1.474	2.663	0.991	1.056	0.899
68	80/10/10	DGAM	spline	xgb	1248.550	620.275	1.474	2.663	0.991	1.052	0.892
69	80/10/10	DGAM	spline	rf	3773.961	1882.98	1.474	2.663	0.991	1.014	0.864
70	80/10/10	DGAM	spline	svr	1610.994	801.497	1.474	2.663	0.991	1.011	0.906
71	80/10/10	DGAM	ebm	spline	742.753	367.376	0.855	1.651	0.996	0.641	0.909
72	80/10/10	DGAM	ebm	ebm	627.089	309.544	0.855	1.651	0.996	0.627	0.923
73	80/10/10	DGAM	ebm	xgb	629.761	310.88	0.855	1.651	0.996	0.627	0.913
74	80/10/10	DGAM	ebm	rf	805.722	398.861	0.855	1.651	0.996	0.620	0.895
75	80/10/10	DGAM	ebm	svr	639.519	315.76	0.855	1.651	0.996	0.616	0.937
76	80/10/10	DGAM	xgb	spline	769.375	380.688	0.829	1.634	0.997	0.628	0.889
77	80/10/10	DGAM	xgb	ebm	640.043	316.022	0.829	1.634	0.997	0.616	0.920
78	80/10/10	DGAM	xgb	xgb	644.684	318.342	0.829	1.634	0.997	0.616	0.913
79	80/10/10	DGAM	xgb	rf	712.594	352.297	0.829	1.634	0.997	0.606	0.909
80	80/10/10	DGAM	xgb	svr	661.220	326.61	0.829	1.634	0.997	0.602	0.927
81	80/10/10	DGAM	rf	spline	538.520	265.26	0.913	1.730	0.996	0.664	0.909
82	80/10/10	DGAM	rf	ebm	659.948	325.974	0.913	1.730	0.996	0.638	0.895
83	80/10/10	DGAM	rf	xgb	668.544	330.272	0.913	1.730	0.996	0.638	0.878
84	80/10/10	DGAM	rf	rf	782.825	387.412	0.913	1.730	0.996	0.625	0.878
85	80/10/10	DGAM	rf	svr	1106.156	549.078	0.913	1.730	0.996	0.635	0.892
86	80/10/10	DGAM	svr	spline	1111.583	551.792	0.953	1.906	0.995	0.772	0.868
87	80/10/10	DGAM	svr	ebm	839.100	415.55	0.953	1.906	0.995	0.712	0.916
88	80/10/10	DGAM	svr	xgb	833.781	412.89	0.953	1.906	0.995	0.708	0.920
89	80/10/10	DGAM	svr	rf	863.239	427.62	0.953	1.906	0.995	0.667	0.864
90	80/10/10	DGAM	svr	svr	707.131	349.566	0.953	1.906	0.995	0.698	0.927