all\_models$name

[1] "lasso\_a1\_logloss\_downsampled"

**[2] "lasso\_a1\_logloss"**

[3] "lasso\_a2\_logloss\_downsampled"

[4] "lasso\_w1\_logloss\_downsampled"

**[5] "lasso\_w1\_logloss"**

[6] "lasso\_w2\_logloss\_downsampled"

**[7] "lasso\_w2\_logloss"**

[8] "logistic\_a1"

**[9] "logistic\_a2"**

[10] "logistic\_w1"

**[11] "logistic\_w2"**

[12] "re\_a1"

[13] "re\_w1"

[14] "ridge\_a1\_logloss\_downsampled"

**[15] "ridge\_a1\_logloss"**

[16] "ridge\_a2\_logloss\_downsampled"

**[17] "ridge\_a2\_logloss"**

[18] "ridge\_w1\_logloss\_downsampled"

**[19] "ridge\_w1\_logloss"**

[20] "ridge\_w2\_logloss\_downsampled"

**[21] "ridge\_w2\_logloss"**

all\_models$model

[[1]]

glmnet

1066651 samples

5 predictor

2 classes: 'neg', 'pos'

No pre-processing

Resampling: Cross-Validated (5 fold, repeated 5 times)

Summary of sample sizes: 853321, 853321, 853321, 853321, 853320, 853321, ...

Addtional sampling using down-sampling

Resampling results across tuning parameters:

lambda logLoss

0.0003162278 0.4438869

0.0006520572 0.4396907

0.0013445329 0.4371007

0.0027724080 0.4326661

0.0057166665 0.4260474

0.0117876863 0.4191178

0.0243060443 0.4178569

0.0501187234 0.4292072

Tuning parameter 'alpha' was held constant at a value of 1

logLoss was used to select the optimal model using the smallest value.

The final values used for the model were alpha = 1 and lambda = 0.02430604.

**[[2]]**

**glmnet**

**1066651 samples**

**5 predictor**

**2 classes: 'neg', 'pos'**

**No pre-processing**

**Resampling: Cross-Validated (5 fold, repeated 5 times)**

**Summary of sample sizes: 853321, 853321, 853321, 853321, 853320, 853320, ...**

**Resampling results across tuning parameters:**

**lambda logLoss**

**1.5e-06 0.0005294435**

**3.2e-06 0.0005300965**

**4.9e-06 0.0005313101**

**6.6e-06 0.0005325244**

**8.3e-06 0.0005334039**

**1.0e-05 0.0005341020**

**Tuning parameter 'alpha' was held constant at a value of 1**

**logLoss was used to select the optimal model using the smallest value.**

**The final values used for the model were alpha = 1 and lambda = 1.5e-06.**

[[3]]

glmnet

1066651 samples

11 predictor

2 classes: 'neg', 'pos'

No pre-processing

Resampling: Cross-Validated (5 fold, repeated 5 times)

Summary of sample sizes: 853321, 853321, 853321, 853321, 853320, 853321, ...

Addtional sampling using down-sampling

Resampling results across tuning parameters:

alpha lambda logLoss

0.10 1.719969e-07 0.4672688

0.10 1.719969e-06 0.4672688

0.10 1.719969e-05 0.4672688

0.55 1.719969e-07 0.4853405

0.55 1.719969e-06 0.4853405

0.55 1.719969e-05 0.4853405

1.00 1.719969e-07 0.4789418

1.00 1.719969e-06 0.4789418

1.00 1.719969e-05 0.4789418

logLoss was used to select the optimal model using the smallest value.

The final values used for the model were alpha = 0.1 and lambda = 1.719969e-05.

[[4]]

glmnet

1066651 samples

9 predictor

2 classes: 'neg', 'pos'

No pre-processing

Resampling: Cross-Validated (5 fold, repeated 5 times)

Summary of sample sizes: 853321, 853321, 853321, 853320, 853321, 853321, ...

Addtional sampling using down-sampling

Resampling results across tuning parameters:

lambda logLoss

0.0003162278 0.5311719

0.0006520572 0.5232104

0.0013445329 0.5094197

0.0027724080 0.4879512

0.0057166665 0.4623317

0.0117876863 0.4391680

0.0243060443 0.4272467

0.0501187234 0.4309311

Tuning parameter 'alpha' was held constant at a value of 1

logLoss was used to select the optimal model using the smallest value.

The final values used for the model were alpha = 1 and lambda = 0.02430604.

**[[5]]**

**glmnet**

**1066651 samples**

**9 predictor**

**2 classes: 'neg', 'pos'**

**No pre-processing**

**Resampling: Cross-Validated (5 fold, repeated 5 times)**

**Summary of sample sizes: 853321, 853321, 853320, 853321, 853321, 853321, ...**

**Resampling results across tuning parameters:**

**lambda logLoss**

**1.5e-06 0.0005083363**

**3.2e-06 0.0005097654**

**4.9e-06 0.0005112971**

**6.6e-06 0.0005128861**

**8.3e-06 0.0005148254**

**1.0e-05 0.0005167955**

**Tuning parameter 'alpha' was held constant at a value of 1**

**logLoss was used to select the optimal model using the smallest value.**

**The final values used for the model were alpha = 1 and lambda = 1.5e-06.**

[[6]]

glmnet

1066651 samples

22 predictor

2 classes: 'neg', 'pos'

No pre-processing

Resampling: Cross-Validated (5 fold, repeated 5 times)

Summary of sample sizes: 853321, 853321, 853321, 853321, 853320, 853321, ...

Addtional sampling using down-sampling

Resampling results across tuning parameters:

alpha lambda logLoss

0.10 2.17268e-07 0.7433027

0.10 2.17268e-06 0.7433027

0.10 2.17268e-05 0.7433027

0.55 2.17268e-07 0.8396142

0.55 2.17268e-06 0.8396142

0.55 2.17268e-05 0.8396142

1.00 2.17268e-07 2.5014838

1.00 2.17268e-06 2.5014838

1.00 2.17268e-05 2.5014838

logLoss was used to select the optimal model using the smallest value.

The final values used for the model were alpha = 0.1 and lambda = 2.17268e-05.

**[[7]]**

**glmnet**

**1066651 samples**

**22 predictor**

**2 classes: 'neg', 'pos'**

**No pre-processing**

**Resampling: Cross-Validated (5 fold, repeated 5 times)**

**Summary of sample sizes: 853321, 853321, 853321, 853320, 853321, 853320, ...**

**Resampling results across tuning parameters:**

**alpha lambda logLoss**

**0.10 2.17268e-07 0.0004867996**

**0.10 2.17268e-06 0.0004926819**

**0.10 2.17268e-05 0.0005010554**

**0.55 2.17268e-07 0.0004866793**

**0.55 2.17268e-06 0.0004948692**

**0.55 2.17268e-05 0.0005074369**

**1.00 2.17268e-07 0.0004865343**

**1.00 2.17268e-06 0.0004960707**

**1.00 2.17268e-05 0.0005120952**

**logLoss was used to select the optimal model using the smallest value.**

**The final values used for the model were alpha = 1 and lambda = 2.17268e-07.**

[[8]]

Call: glm(formula = summerkill ~ long + lat + season + air\_pca + max\_air,

family = "binomial", data = training)

Coefficients:

(Intercept) long lat seasonspring seasonsummer seasonwinter air\_pca max\_air

-11.99187 -0.43782 -1.21068 -0.05653 2.61739 -14.31198 -12.58472 13.13791

Degrees of Freedom: 1066650 Total (i.e. Null); 1066643 Residual

Null Deviance: 1314

Residual Deviance: 1113 AIC: 1129

**[[9]]**

**Call: glm(formula = summerkill ~ long + lat + season + min\_air + mean\_air +**

**max\_air + min\_air\_z + mean\_air\_z + max\_air\_z, family = "binomial",**

**data = training)**

**Coefficients:**

**(Intercept) long lat seasonspring seasonsummer seasonwinter min\_air mean\_air max\_air min\_air\_z**

**-12.8770 -0.2407 -0.7645 0.4144 3.4590 -13.1309 47.1191 -89.7636 43.1293 -7.4803**

**mean\_air\_z max\_air\_z**

**12.7800 -5.4758**

**Degrees of Freedom: 1066650 Total (i.e. Null); 1066639 Residual**

**Null Deviance: 1314**

**Residual Deviance: 1042 AIC: 1066**

[[10]]

Call: glm(formula = summerkill ~ long + lat + variance\_after\_ice\_30 +

variance\_after\_ice\_60 + log\_schmidt + ice\_duration + water\_pca,

family = "binomial", data = training)

Coefficients:

(Intercept) long lat variance\_after\_ice\_30 variance\_after\_ice\_60 log\_schmidt

-13.1439 -0.2420 -0.3608 -0.4976 -0.4865 -0.1887

ice\_duration water\_pca

-0.7977 -2.7591

Degrees of Freedom: 1066650 Total (i.e. Null); 1066643 Residual

Null Deviance: 1314

Residual Deviance: 1065 AIC: 1081

**[[11]]**

**Call: glm(formula = summerkill ~ long + lat + season + variance\_after\_ice\_60 +**

**log\_schmidt + cumulative\_above\_10 + cumulative\_above\_5 +**

**water\_pca + max\_bot + max\_surf + mean\_bot + max\_bot\_z + max\_surf\_z +**

**mean\_bot\_z + peak\_temp, family = "binomial", data = training)**

**Coefficients:**

**(Intercept) long lat seasonspring seasonsummer seasonwinter**

**-12.1683 -0.2662 -0.4754 0.5999 1.2758 -15.1469**

**variance\_after\_ice\_60 log\_schmidt cumulative\_above\_10 cumulative\_above\_5 water\_pca max\_bot**

**-0.3662 -0.5167 -5.4925 5.6474 -5.7059 -4.4800**

**max\_surf mean\_bot max\_bot\_z max\_surf\_z mean\_bot\_z peak\_temp**

**-5.2381 3.7618 0.6631 0.8702 -0.7905 0.6378**

**Degrees of Freedom: 1066650 Total (i.e. Null); 1066633 Residual**

**Null Deviance: 1314**

**Residual Deviance: 996.5 AIC: 1032**

[[12]]

Generalized linear mixed model fit by maximum likelihood (Adaptive Gauss-Hermite Quadrature, nAGQ = 10) ['glmerMod']

Family: binomial ( logit )

Formula: summerkill ~ long + lat + season + air\_pca + (1 | site\_id)

Data: training

AIC BIC logLik deviance df.resid

1094.3165 1189.3568 -539.1583 1078.3165 1066643

Random effects:

Groups Name Std.Dev.

site\_id (Intercept) 2.275

Number of obs: 1066651, groups: site\_id, 10774

Fixed Effects:

(Intercept) long lat seasonspring seasonsummer seasonwinter air\_pca

-14.6782 -0.3096 -1.0994 0.2765 2.8318 -16.2022 0.4765

convergence code 0; 0 optimizer warnings; 1 lme4 warnings

[[13]]

Generalized linear mixed model fit by maximum likelihood (Adaptive Gauss-Hermite Quadrature, nAGQ = 10) ['glmerMod']

Family: binomial ( logit )

Formula: summerkill ~ long + lat + season + variance\_after\_ice\_30 + variance\_after\_ice\_60 +

log\_schmidt + cumulative\_above\_10 + ice\_duration + water\_pca + (1 | site\_id)

Data: training

AIC BIC logLik deviance df.resid

1054.3676 1208.8080 -514.1838 1028.3676 1066638

Random effects:

Groups Name Std.Dev.

site\_id (Intercept) 2.084

Number of obs: 1066651, groups: site\_id, 10774

Fixed Effects:

(Intercept) long lat seasonspring seasonsummer seasonwinter

-16.1807 -0.3348 -0.5340 1.5184 0.9805 -12.1930

variance\_after\_ice\_30 variance\_after\_ice\_60 log\_schmidt cumulative\_above\_10 ice\_duration water\_pca

-0.4204 -0.4045 -0.1575 -0.2131 -0.8904 -2.7202

convergence code 0; 0 optimizer warnings; 2 lme4 warnings

[[14]]

glmnet

1066651 samples

5 predictor

2 classes: 'neg', 'pos'

No pre-processing

Resampling: Cross-Validated (5 fold, repeated 5 times)

Summary of sample sizes: 853321, 853321, 853320, 853321, 853321, 853321, ...

Addtional sampling using down-sampling

Resampling results across tuning parameters:

lambda logLoss

3.5e-08 0.4363563

5.0e+06 0.6931472

1.0e+07 0.6931472

1.5e+07 0.6931472

2.0e+07 0.6931472

2.5e+07 0.6931472

3.0e+07 0.6931472

3.5e+07 0.6931472

Tuning parameter 'alpha' was held constant at a value of 0

logLoss was used to select the optimal model using the smallest value.

The final values used for the model were alpha = 0 and lambda = 3.5e-08.

**[[15]]**

**glmnet**

**1066651 samples**

**5 predictor**

**2 classes: 'neg', 'pos'**

**No pre-processing**

**Resampling: Cross-Validated (5 fold, repeated 5 times)**

**Summary of sample sizes: 853320, 853321, 853321, 853321, 853321, 853321, ...**

**Resampling results across tuning parameters:**

**lambda logLoss**

**3.500e-07 0.0005314182**

**3.280e-06 0.0005314182**

**6.210e-06 0.0005314182**

**9.140e-06 0.0005315952**

**1.207e-05 0.0005324072**

**1.500e-05 0.0005332463**

**Tuning parameter 'alpha' was held constant at a value of 0**

**logLoss was used to select the optimal model using the smallest value.**

**The final values used for the model were alpha = 0 and lambda = 6.21e-06.**

[[16]]

glmnet

1066651 samples

11 predictor

2 classes: 'neg', 'pos'

No pre-processing

Resampling: Cross-Validated (5 fold, repeated 5 times)

Summary of sample sizes: 853321, 853321, 853321, 853320, 853321, 853321, ...

Addtional sampling using down-sampling

Resampling results across tuning parameters:

lambda logLoss

0.01000000 0.4142016

0.04428571 0.4148915

0.07857143 0.4190055

0.11285714 0.4244299

0.14714286 0.4299997

0.18142857 0.4354306

0.21571429 0.4406463

0.25000000 0.4456318

Tuning parameter 'alpha' was held constant at a value of 0

logLoss was used to select the optimal model using the smallest value.

The final values used for the model were alpha = 0 and lambda = 0.01.

**[[17]]**

**glmnet**

**1066651 samples**

**11 predictor**

**2 classes: 'neg', 'pos'**

**No pre-processing**

**Resampling: Cross-Validated (5 fold, repeated 5 times)**

**Summary of sample sizes: 853320, 853321, 853321, 853321, 853321, 853321, ...**

**Resampling results across tuning parameters:**

**lambda logLoss**

**1.000000e-08 0.0005167008**

**1.930698e-08 0.0005167008**

**3.727594e-08 0.0005167008**

**7.196857e-08 0.0005167008**

**1.389495e-07 0.0005167008**

**2.682696e-07 0.0005167008**

**5.179475e-07 0.0005167008**

**1.000000e-06 0.0005167008**

**Tuning parameter 'alpha' was held constant at a value of 0**

**logLoss was used to select the optimal model using the smallest value.**

**The final values used for the model were alpha = 0 and lambda = 1e-06.**

[[18]]

glmnet

1066651 samples

9 predictor

2 classes: 'neg', 'pos'

No pre-processing

Resampling: Cross-Validated (5 fold, repeated 5 times)

Summary of sample sizes: 853320, 853321, 853321, 853321, 853321, 853321, ...

Addtional sampling using down-sampling

Resampling results across tuning parameters:

lambda logLoss

3.5e-08 0.3944551

5.0e+06 0.6931472

1.0e+07 0.6931472

1.5e+07 0.6931472

2.0e+07 0.6931472

2.5e+07 0.6931472

3.0e+07 0.6931472

3.5e+07 0.6931472

Tuning parameter 'alpha' was held constant at a value of 0

logLoss was used to select the optimal model using the smallest value.

The final values used for the model were alpha = 0 and lambda = 3.5e-08.

**[[19]]**

**glmnet**

**1066651 samples**

**9 predictor**

**2 classes: 'neg', 'pos'**

**No pre-processing**

**Resampling: Cross-Validated (5 fold, repeated 5 times)**

**Summary of sample sizes: 853320, 853321, 853321, 853321, 853321, 853320, ...**

**Resampling results across tuning parameters:**

**lambda logLoss**

**3.500e-07 0.0005104860**

**3.280e-06 0.0005104860**

**6.210e-06 0.0005104860**

**9.140e-06 0.0005105877**

**1.207e-05 0.0005121141**

**1.500e-05 0.0005134885**

**Tuning parameter 'alpha' was held constant at a value of 0**

**logLoss was used to select the optimal model using the smallest value.**

**The final values used for the model were alpha = 0 and lambda = 6.21e-06.**

[[20]]

glmnet

1066651 samples

22 predictor

2 classes: 'neg', 'pos'

No pre-processing

Resampling: Cross-Validated (5 fold, repeated 5 times)

Summary of sample sizes: 853321, 853320, 853321, 853321, 853321, 853321, ...

Addtional sampling using down-sampling

Resampling results across tuning parameters:

lambda logLoss

0.01000000 0.4125392

0.04428571 0.4081642

0.07857143 0.4007017

0.11285714 0.3990171

0.14714286 0.3992764

0.18142857 0.4004007

0.21571429 0.4019790

0.25000000 0.4038134

Tuning parameter 'alpha' was held constant at a value of 0

logLoss was used to select the optimal model using the smallest value.

The final values used for the model were alpha = 0 and lambda = 0.1128571.

**[[21]]**

**glmnet**

**1066651 samples**

**22 predictor**

**2 classes: 'neg', 'pos'**

**No pre-processing**

**Resampling: Cross-Validated (5 fold, repeated 5 times)**

**Summary of sample sizes: 853321, 853321, 853321, 853321, 853320, 853321, ...**

**Resampling results across tuning parameters:**

**lambda logLoss**

**1.000000e-08 0.0004996197**

**1.930698e-08 0.0004996197**

**3.727594e-08 0.0004996197**

**7.196857e-08 0.0004996197**

**1.389495e-07 0.0004996197**

**2.682696e-07 0.0004996197**

**5.179475e-07 0.0004996197**

**1.000000e-06 0.0004996197**

**Tuning parameter 'alpha' was held constant at a value of 0**

**logLoss was used to select the optimal model using the smallest value.**

**The final values used for the model were alpha = 0 and lambda = 1e-06.**