

# Package ‘VectorForgeML’

February 23, 2026

**Type** Package

**Title** High-Performance Machine Learning Framework with C++ Acceleration

**Version** 0.1.0

**Description** Machine learning utilities for fast vectorized model training.

Methods are based on standard statistical learning references such as  
Hastie et al. (2009) <[doi:10.1007/978-0-387-84858-7](https://doi.org/10.1007/978-0-387-84858-7)>.

**License** Apache License (>= 2)

**Encoding** UTF-8

**Depends** R (>= 3.5.0)

**Imports** methods, Rcpp

**LinkingTo** Rcpp

**SystemRequirements** OpenMP (optional)

**URL** <https://vectorforgeml.work.gd>

**BugReports** <https://github.com/mohd-musheer/VectorForgeML/issues>

**NeedsCompilation** yes

**RoxygenNote** 7.3.3

## Contents

accuracy_score . . . . .	2
ColumnTransformer-class . . . . .	3
confusion_matrix . . . . .	3
confusion_stats . . . . .	4
DecisionTree-class . . . . .	5
drop_constant_columns . . . . .	5
f1_score . . . . .	6
find_best_k . . . . .	7
fit_linear_model . . . . .	7
KMeans-class . . . . .	8
KNN-class . . . . .	9
LabelEncoder-class . . . . .	9
LinearRegression-class . . . . .	10
LogisticRegression-class . . . . .	10
macro_f1 . . . . .	11
macro_precision . . . . .	12

macro_recall . . . . .	12
MinMaxScaler-class . . . . .	13
mse . . . . .	13
OneHotEncoder-class . . . . .	14
PCA-class . . . . .	14
Pipeline-class . . . . .	15
plot_confusion_matrix . . . . .	15
precision_score . . . . .	16
predict_linear_model . . . . .	17
r2_score . . . . .	17
RandomForest-class . . . . .	18
recall_score . . . . .	19
RidgeRegression-class . . . . .	19
rmse . . . . .	20
SoftmaxRegression-class . . . . .	21
StandardScaler-class . . . . .	21
train_test_split . . . . .	22

**Index****23**


---

accuracy_score	<i>Accuracy Score</i>
----------------	-----------------------

---

**Description**

Computes classification accuracy.

**Usage**

```
accuracy_score(y_true, y_pred)
```

**Arguments**

y_true	true labels
y_pred	predicted labels

**Details**

Provides functionality for accuracy\_score operations.

**Value**

numeric accuracy

**See Also**

[VectorForgeML-package](#)

**Examples**

```
y_true <- c(1,0,1,1)
y_pred <- c(1,0,0,1)
accuracy_score(y_true, y_pred)
```

---

**ColumnTransformer-class**

*Column Transformer*

---

**Description**

Applies transformations to specific columns.

**Details**

Provides functionality for ColumnTransformer operations.

**Value**

ColumnTransformer object

**See Also**

[VectorForgeML-package](#)

**Examples**

```
model <- ColumnTransformer$new(num_cols="A", cat_cols="B")
```

---

**confusion\_matrix**

*Confusion Matrix*

---

**Description**

Computes confusion matrix.

**Usage**

```
confusion_matrix(y_true, y_pred)
```

**Arguments**

y_true	true labels
y_pred	predicted labels

**Details**

Provides functionality for confusion\_matrix operations.

**Value**

matrix

**See Also**

[VectorForgeML-package](#)

**Examples**

```
y_true <- c(1,0,1,1)
y_pred <- c(1,0,0,1)
confusion_matrix(y_true, y_pred)
```

---

confusion\_stats      *Confusion Matrix Statistics*

---

**Description**

Calculates accuracy, precision, recall, F1 from confusion matrix.

**Usage**

```
confusion_stats(cm)
```

**Arguments**

cm                  confusion matrix

**Details**

Provides functionality for confusion\_stats operations.

**Value**

list

**See Also**

[VectorForgeML-package](#)

**Examples**

```
cm <- matrix(c(10, 2, 1, 15), nrow=2)
try({ confusion_stats(cm) })
```

---

DecisionTree-class      *Decision Tree Model*

---

### Description

Tree-based classification/regression algorithm.

### Details

Provides functionality for DecisionTree operations.

### Value

DecisionTree object

### See Also

[VectorForgeML-package](#)

### Examples

```
model <- DecisionTree$new()
X <- matrix(rnorm(20), nrow=10)
y <- sample(0:1, 10, replace=TRUE)
model$fit(X,y)
model$predict(X)
```

---

drop\_constant\_columns    *Drop Constant Columns*

---

### Description

Removes columns with zero variance.

### Usage

```
drop_constant_columns(X, eps = 1e-12)
```

### Arguments

X	input matrix/dataframe
eps	for param eps

### Details

Provides functionality for drop\_constant\_columns operations.

### Value

cleaned matrix

**See Also**

[VectorForgeML-package](#)

**Examples**

```
x <- data.frame(a=c(1,1,1), b=c(1,2,3))
drop_constant_columns(x)
```

**f1\_score**

*F1 Score*

**Description**

Harmonic mean of precision and recall.

**Usage**

```
f1_score(y_true, y_pred, positive = NULL)
```

**Arguments**

<code>y_true</code>	true labels
<code>y_pred</code>	predicted labels
<code>positive</code>	positive class label

**Details**

Provides functionality for `f1_score` operations.

**Value**

numeric `f1` score

**See Also**

[VectorForgeML-package](#)

**Examples**

```
y_true <- c(1,0,1,1)
y_pred <- c(1,0,0,1)
f1_score(y_true, y_pred)
```

---

`find_best_k`*Find Best K*

---

**Description**

Finds optimal K value for KNN.

**Usage**

```
find_best_k(X, y, k_values = seq(1, 15, 2))
```

**Arguments**

X	features
y	labels
k_values	for k value

**Details**

Provides functionality for find\_best\_k operations.

**Value**

numeric best k

**See Also**

[VectorForgeML-package](#)

**Examples**

```
x <- matrix(rnorm(200), nrow=100)
y <- sample(0:1, 100, replace=TRUE)
find_best_k(x, y, k_values=c(1,3,5))
```

---

`fit_linear_model`*Fit Linear Model (Fast C++ backend)*

---

**Description**

Internal helper for linear regression training.

**Usage**

```
fit_linear_model(X, y)
```

**Arguments**

X	numeric matrix
y	numeric vector

**Details**

Provides functionality for fit\_linear\_model operations.

**Value**

model object

**See Also**

[VectorForgeML-package](#)

**Examples**

```
X <- matrix(rnorm(20), nrow=10)
y <- rnorm(10)
try({ fit_linear_model(X, y) })
```

**Description**

Unsupervised clustering algorithm.

**Details**

Provides functionality for KMeans operations.

**Value**

KMeans object

**See Also**

[VectorForgeML-package](#)

**Examples**

```
x <- matrix(rnorm(20), nrow=10)
model <- KMeans$new()
model$fit(x)
```

---

KNN-class*K-Nearest Neighbors Model*

---

**Description**

Instance-based learning algorithm.

**Details**

Provides functionality for KNN operations.

**Value**

KNN object

**See Also**

[VectorForgeML-package](#)

**Examples**

```
model <- KNN$new(k=3, mode="classification")
X <- matrix(rnorm(20), nrow=10)
y <- sample(0:1, 10, replace=TRUE)
model$fit(X,y)
model$predict(X)
```

---

LabelEncoder-class*Label Encoder*

---

**Description**

Converts categorical labels into numeric values.

**Details**

Provides functionality for LabelEncoder operations.

**Value**

LabelEncoder object

**See Also**

[VectorForgeML-package](#)

## Examples

```
enc <- LabelEncoder$new()
x <- c("a", "b", "a")
enc$fit(x)
enc$transform(x)
```

### LinearRegression-class

*Linear Regression Model*

## Description

Fast linear regression implemented in C++ backend.

## Details

Provides functionality for LinearRegression operations.

## Value

LinearRegression object

## See Also

[VectorForgeML-package](#)

## Examples

```
model <- LinearRegression$new()
X <- matrix(rnorm(100), 50, 2)
y <- rnorm(50)
model$fit(X, y)
model$predict(X)
```

### LogisticRegression-class

*Logistic Regression Model*

## Description

Binary classification logistic regression.

## Details

Provides functionality for LogisticRegression operations.

**Value**

LogisticRegression object

**See Also**

[VectorForgeML-package](#)

**Examples**

```
model <- LogisticRegression$new()
X <- matrix(rnorm(20), nrow=10)
y <- sample(0:1, 10, replace=TRUE)
model$fit(X,y)
model$predict(X)
```

---

macro\_f1

*Macro Precision*

---

**Description**

Computes macro-averaged precision.

**Usage**

```
macro_f1(y_true, y_pred)
```

**Arguments**

y_true	true labels
y_pred	predicted labels

**Details**

Provides functionality for macro\_f1 operations.

**Value**

numeric score

**See Also**

[VectorForgeML-package](#)

---

macro_precision	<i>Macro Precision</i>
-----------------	------------------------

---

**Description**

Computes macro-averaged precision.

**Usage**

```
macro_precision(y_true, y_pred)
```

**Arguments**

y_true	true labels
y_pred	predicted labels

**Details**

Provides functionality for macro\_precision operations.

**Value**

numeric score

**See Also**

[VectorForgeML-package](#)

---

macro_recall	<i>Macro Precision</i>
--------------	------------------------

---

**Description**

Computes macro-averaged precision.

**Usage**

```
macro_recall(y_true, y_pred)
```

**Arguments**

y_true	true labels
y_pred	predicted labels

**Details**

Provides functionality for macro\_recall operations.

**Value**

numeric score

**See Also**

[VectorForgeML-package](#)

MinMaxScaler-class      *Standard Scaler*

**Description**

Standardizes features by removing mean and scaling to unit variance.

**Details**

Provides functionality for MinMaxScaler operations.

**Value**

StandardScaler object

**See Also**

[VectorForgeML-package](#)

**Examples**

```
s <- MinMaxScaler$new()
x <- matrix(rnorm(20), nrow=10)
s$fit(x)
s$transform(x)
```

mse                    *Mean Squared Error*

**Description**

Calculates regression error.

**Usage**

```
mse(y_true, y_pred)
```

**Arguments**

y_true	true values
y_pred	predicted values

**Details**

Provides functionality for mse operations.

**Value**

numeric mse

**See Also**

[VectorForgeML-package](#)

OneHotEncoder-class     *One Hot Encoder*

**Description**

Converts categorical variables into binary vectors.

**Details**

Provides functionality for OneHotEncoder operations.

**Value**

OneHotEncoder object

**See Also**

[VectorForgeML-package](#)

**Examples**

```
enc <- OneHotEncoder$new()
df <- data.frame(a=c("x","y","x"))
enc$fit(df)
enc$transform(df)
```

PCA-class     *Principal Component Analysis*

**Description**

Dimensionality reduction technique.

**Details**

Provides functionality for PCA operations.

**Value**

PCA object

**See Also**[VectorForgeML-package](#)**Examples**

```
model <- PCA$new(n_components=2)
X <- matrix(rnorm(30), nrow=10)
model$fit(X)
model$transform(X)
```

---

Pipeline-class

*Pipeline*

---

**Description**

Chains preprocessing and model steps.

**Details**

Provides functionality for Pipeline operations.

**Value**

Pipeline object

**See Also**[VectorForgeML-package](#)**Examples**

```
model <- Pipeline$new(list(StandardScaler$new()))
```

---

plot\_confusion\_matrix *Plot Confusion Matrix*

---

**Description**

Visualizes confusion matrix.

**Usage**

```
plot_confusion_matrix(cm, normalize = TRUE)
```

**Arguments**

cm	confusion matrix
normalize	Normlize

**Details**

Provides functionality for plot\_confusion\_matrix operations.

**Value**

plot

**See Also**

[VectorForgeML-package](#)

**Examples**

```
cm <- matrix(c(10, 2, 1, 15), nrow=2)
try({ plot_confusion_matrix(cm) })
```

precision_score	<i>Precision Score</i>
-----------------	------------------------

**Description**

Computes precision metric.

**Usage**

```
precision_score(y_true, y_pred, positive = NULL)
```

**Arguments**

y_true	true labels
y_pred	predicted labels
positive	positive class label

**Details**

Provides functionality for precision\_score operations.

**Value**

numeric precision

**See Also**

[VectorForgeML-package](#)

**Examples**

```
y_true <- c(1,0,1,1)
y_pred <- c(1,0,0,1)
precision_score(y_true, y_pred)
```

---

`predict_linear_model`    *Predict Linear Model*

---

### Description

Predict values using trained linear model.

### Usage

```
predict_linear_model(model, X)
```

### Arguments

model	trained model
X	matrix

### Details

Provides functionality for predict\_linear\_model operations.

### Value

numeric vector

### See Also

[VectorForgeML-package](#)

### Examples

```
X <- matrix(rnorm(20), nrow=10)
y <- rnorm(10)
model <- fit_linear_model(X, y)
predict_linear_model(model, X)
```

---

`r2_score`                  *R2 Score*

---

### Description

Coefficient of determination.

### Usage

```
r2_score(y_true, y_pred)
```

### Arguments

y_true	true values
y_pred	predicted values

**Details**

Provides functionality for r2\_score operations.

**Value**

numeric r2 score

**See Also**

[VectorForgeML-package](#)

---

RandomForest-class      *Random Forest Model*

---

**Description**

Ensemble of decision trees.

**Details**

Provides functionality for RandomForest operations.

**Value**

RandomForest object

**See Also**

[VectorForgeML-package](#)

**Examples**

```
model <- RandomForest$new(ntrees=5)
X <- matrix(rnorm(20), nrow=10)
y <- sample(0:1, 10, replace=TRUE)
model$fit(X,y)
model$predict(X)
```

---

recall_score	<i>Recall Score</i>
--------------	---------------------

---

**Description**

Computes recall metric.

**Usage**

```
recall_score(y_true, y_pred, positive = NULL)
```

**Arguments**

y_true	true labels
y_pred	predicted labels
positive	positive class label

**Details**

Provides functionality for recall\_score operations.

**Value**

numeric recall

**See Also**

[VectorForgeML-package](#)

**Examples**

```
y_true <- c(1,0,1,1)
y_pred <- c(1,0,0,1)
recall_score(y_true, y_pred)
```

---

RidgeRegression-class	<i>Ridge Regression Model</i>
-----------------------	-------------------------------

---

**Description**

Linear regression with L2 regularization.

**Details**

Provides functionality for RidgeRegression operations.

**Value**

RidgeRegression object

**See Also**

[VectorForgeML-package](#)

**Examples**

```
model <- RidgeRegression$new()
X <- matrix(rnorm(20), nrow=10)
y <- rnorm(10)
model$fit(X,y,lambda=1.0)
model$predict(X)
```

---

rmse

*Root Mean Squared Error*

---

**Description**

Square root of MSE.

**Usage**

```
rmse(y_true, y_pred)
```

**Arguments**

y_true	true values
y_pred	predicted values

**Details**

Provides functionality for rmse operations.

**Value**

numeric rmse

**See Also**

[VectorForgeML-package](#)

**SoftmaxRegression-class***Softmax Regression Model***Description**

Multiclass logistic regression.

**Details**

Provides functionality for SoftmaxRegression operations.

**Value**

SoftmaxRegression object

**See Also**

[VectorForgeML-package](#)

**Examples**

```
model <- SoftmaxRegression$new()
X <- matrix(rnorm(20), nrow=10)
y <- sample(0:2, 10, replace=TRUE)
model$fit(X,y)
model$predict(X)
```

**StandardScaler-class**    *Drop Constant Columns***Description**

Removes columns with zero variance.

**Arguments**

X	input matrix/dataframe
---	------------------------

**Details**

Provides functionality for StandardScaler operations.

**Value**

cleaned matrix

**See Also**

[VectorForgeML-package](#)

**Examples**

```
s <- StandardScaler$new()
x <- matrix(rnorm(20), nrow=10)
s$fit(x)
s$transform(x)
```

train_test_split	<i>Train Test Split</i>
------------------	-------------------------

**Description**

Splits dataset into training and testing sets.

**Usage**

```
train_test_split(X, y, test_size = 0.2, seed = NULL)
```

**Arguments**

X	features
y	labels
test_size	proportion for test set
seed	for random seed

**Details**

Provides functionality for train\_test\_split operations.

**Value**

list

**See Also**

[VectorForgeML-package](#)

**Examples**

```
X <- matrix(rnorm(20), nrow=10)
y <- sample(0:1, 10, replace=TRUE)
train_test_split(X, y, test_size=0.2)
```

# Index

accuracy\_score, 2  
ColumnTransformer  
    (ColumnTransformer-class), 3  
ColumnTransformer-class, 3  
confusion\_matrix, 3  
confusion\_stats, 4  
DecisionTree (DecisionTree-class), 5  
DecisionTree-class, 5  
drop\_constant\_columns, 5  
f1\_score, 6  
find\_best\_k, 7  
fit\_linear\_model, 7  
KMeans (KMeans-class), 8  
KMeans-class, 8  
KNN (KNN-class), 9  
KNN-class, 9  
LabelEncoder (LabelEncoder-class), 9  
LabelEncoder-class, 9  
LinearRegression  
    (LinearRegression-class), 10  
LinearRegression-class, 10  
LogisticRegression  
    (LogisticRegression-class), 10  
LogisticRegression-class, 10  
macro\_f1, 11  
macro\_precision, 12  
macro\_recall, 12  
MinMaxScaler (MinMaxScaler-class), 13  
MinMaxScaler-class, 13  
mse, 13  
OneHotEncoder (OneHotEncoder-class), 14  
OneHotEncoder-class, 14  
PCA (PCA-class), 14  
PCA-class, 14  
Pipeline (Pipeline-class), 15  
Pipeline-class, 15  
plot\_confusion\_matrix, 15  
precision\_score, 16  
predict\_linear\_model, 17  
r2\_score, 17  
RandomForest (RandomForest-class), 18  
RandomForest-class, 18  
recall\_score, 19  
RidgeRegression  
    (RidgeRegression-class), 19  
RidgeRegression-class, 19  
rmse, 20  
SoftmaxRegression  
    (SoftmaxRegression-class), 21  
SoftmaxRegression-class, 21  
StandardScaler (StandardScaler-class),  
    21  
StandardScaler-class, 21  
train\_test\_split, 22