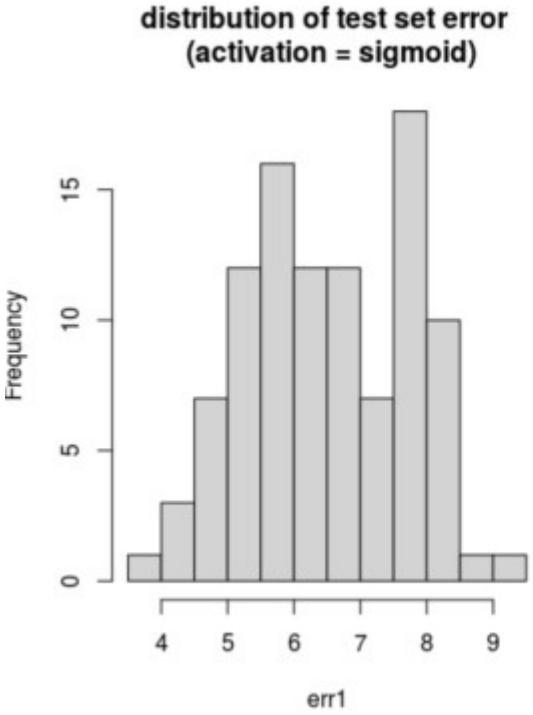
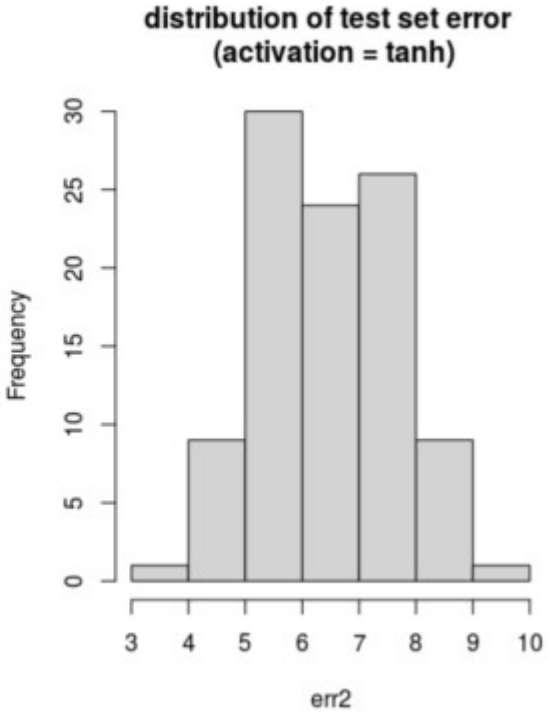
New activation functions were added to version 0.8.0 of mlsauce: ReLU6, tanh, sigmoid. These changes are available both in R and in the Python implementation of mlsauce.

The following R example illustrates the differences between out-of-sample errors, when \(g\) = sigmoid or \(g\) = tanh. Of course, **LSBoost can be tuned further** than what's demonstrated here.

```
# Input data
X <- as.matrix(MASS::Boston[, -1])
y <- as.integer(MASS::Boston[, 1])

n <- dim(X)[1]
p <- dim(X)[2]

# number of repeats for obtaining the distribution of errors
n_repeats <- 100


# function for calculating the out-of-sample error, based on activation
functions
get_rmse_error <- function(activation = c("sigmoid", "tanh", "relu6",
"relu"))
{
  err <- rep(0, n_repeats)

  pb <- txtProgressBar(min = 0, max = n_repeats, style = 3)
  for (i in 1:n_repeats)
  {
    set.seed(21341+i*10)
    train_index <- sample(x = 1:n, size = floor(0.8*n), replace = TRUE)
    test_index <- -train_index
    X_train <- as.matrix(X[train_index, ])
    y_train <- as.double(y[train_index])
    X_test <- as.matrix(X[test_index, ])
    y_test <- as.double(y[test_index])

    # using default parameters
    obj <- mlsauce::LSBoostRegressor(verbose = FALSE,
                                     activation =
match.arg(activation))

    obj$fit(X_train, y_train)

    err[i] <- sqrt(mean((obj$predict(X_test) - y_test)**2))

    setTxtProgressBar(pb, i)
  }

  return(err)
```

```
}

# test set error for g=sigmoid
(err1 <- get_rmse_error("sigmoid"))
# test set error for g=tanh
(err2 <- get_rmse_error("tanh"))

# distribution of test set error
par(mfrow=c(1, 2))
hist(err1, main = "distribution of test set error \n (activation =
sigmoid)")
hist(err2, main = "distribution of test set error \n (activation =
tanh)")
```





```
> print(sessionInfo())
R version 4.0.3 (2020-10-10)
Platform: x86_64-pc-linux-gnu (64-bit)
Running under: Ubuntu 16.04.7 LTS

Matrix products: default
BLAS:   /usr/lib/atlas-base/atlas/libblas.so.3.0
LAPACK: /usr/lib/atlas-base/atlas/liblapack.so.3.0

locale:
 [1] LC_CTYPE=C.UTF-8       LC_NUMERIC=C           LC_TIME=C.UTF-8
 [4] LC_COLLATE=C.UTF-8     LC_MONETARY=C.UTF-8    LC_MESSAGES=C.UTF-8
 [7] LC_PAPER=C.UTF-8       LC_NAME=C              LC_ADDRESS=C
[10] LC_TELEPHONE=C         LC_MEASUREMENT=C.UTF-8 LC_IDENTIFICATION=C

attached base packages:
[1] stats     graphics  grDevices utils     datasets  methods   base

loaded via a namespace (and not attached):
 [1] MASS_7.3-53     compiler_4.0.3  Matrix_1.2-18   tools_4.0.3
rappdirs_0.3.3
 [6] Rcpp_1.0.6      reticulate_1.18 grid_4.0.3      jsonlite_1.7.2
mlsauce_0.8.0
[11] lattice_0.20-41…
```