SummaryPlot

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This R script is used for generating summary plot for the Geneconv project

1, Read in tables

```
rm(list=ls())  # clean up workspace
path <-
"/Users/xji3/Genconv/NewClusterPackRun/NewPackageNewRun/OldResults01152
015/"
#path <- "G:/Geneconv/NewClusterPackRun/NewPackageNewRun/"
#HKY_clock_summary <- "HKY_clock_summary"
summary.list <- c( "HKY_nonclock_summary",
                   "HKY_clock_summary",
                   "MG94_clock_summary",
                   "MG94_nonclock_summary",
                   "Force_HKY_clock_summary",
                   "Force_HKY_nonclock_summary",
                   "Force_MG94_clock_summary",
                   "Force_MG94_nonclock_summary"
                   )
#summary.list <- c("Force_MG94_clock_summary")
for (target.summary in summary.list){
  summary_file <- paste(path, target.summary, '.txt', sep = '')
  all <- readLines(summary_file, n = -1)
  col.names <- strsplit(all[1], ' ')[[1]][-1]
  row.names <- strsplit(all[length(all)], ' ')[[1]][-1]
  summary_mat <- as.matrix(read.table(summary_file,
                                      row.names = row.names,
                                      col.names = col.names))
  assign(target.summary, summary_mat)

  para.list <- c(2:20)
  for (i in para.list){
    image.name <- paste(path, 'Rscripts/', target.summary, '_',
                        row.names[i], '.png', sep = '')
    png(image.name)
    plot(summary_mat[1, ], summary_mat[i, ],
         xlab = row.names[1], ylab = row.names[i],
         main = target.summary)
    dev.off()
    }
```

```
}
```

Now generate summary file of only pairs that have all cases finished in HKY or MG94 models.

```
# HKY
HKY.pair.names <-
intersect(intersect(intersect(colnames(HKY_clock_summary),
                              colnames(HKY_nonclock_summary)),
                              colnames(Force_HKY_clock_summary)),
                              colnames(Force_HKY_nonclock_summary))
HKY.clock.filtered <- HKY_clock_summary[, HKY.pair.names]
HKY.nonclock.filtered <- HKY_nonclock_summary[, HKY.pair.names]
HKY.Force.clock.filtered <- Force_HKY_clock_summary[, HKY.pair.names]
HKY.Force.nonclock.filtered <- Force_HKY_nonclock_summary[,
HKY.pair.names]

write.table(HKY.clock.filtered, paste( path, "HKY_clock_filtered", sep
= ""))
write.table(HKY.nonclock.filtered, paste( path,
"HKY_nonclock_filtered", sep = ""))
write.table(HKY.Force.clock.filtered, paste( path,
"HKY_Force_clock_filtered", sep = ""))
write.table(HKY.Force.nonclock.filtered, paste( path,
"HKY_Force_nonclock_filtered", sep = ""))



# MG94
MG94.pair.names <-
intersect(intersect(intersect(colnames(MG94_clock_summary),
                              colnames(MG94_nonclock_summary)),
                              colnames(Force_MG94_clock_summary)),
                              colnames(Force_MG94_nonclock_summary))
MG94.clock.filtered <- MG94_clock_summary[, MG94.pair.names]
MG94.nonclock.filtered <- MG94_nonclock_summary[, MG94.pair.names]
MG94.Force.clock.filtered <- Force_MG94_clock_summary[,
MG94.pair.names]
MG94.Force.nonclock.filtered <- Force_MG94_nonclock_summary[,
MG94.pair.names]

write.table(MG94.clock.filtered, paste( path, "MG94_clock_filtered",
sep = ""))
write.table(MG94.nonclock.filtered, paste( path,
"MG94_nonclock_filtered", sep = ""))
write.table(MG94.Force.clock.filtered, paste( path,
"MG94_Force_clock_filtered", sep = ""))
write.table(MG94.Force.nonclock.filtered, paste( path,
"MG94_Force_nonclock_filtered", sep = ""))
```

Now analyze the results

First, show the loglikelihood improvement for each model with/without tau

```
# HKY nonclock
(HKY.nonclock.filtered - HKY.Force.nonclock.filtered)[2,]
```

```
## YLR406C_YDL075W YDR502C_YLR180W YHR106W_YDR353W YIL057C_YER067W
##           45.21          209.16          165.03           41.56
## YPL087W_YBR183W YNL069C_YIL133C YGR043C_YLR354C YPR157W_YGR141W
##           49.82           90.20           58.85           75.49
## YDR099W_YER177W YBR024W_YBR037C YPR159W_YGR143W YGL133W_YPL216W
##          161.47           42.12          242.58           40.79
## YNL049C_YIL109C YPL232W_YMR183C YIR033W_YKL020C YMR243C_YOR316C
##          153.35          115.06           93.93           82.18
## YAL056W_YOR371C YDR438W_YML018C
##           26.78           24.13
```

```
# HKY clock
(HKY.clock.filtered - HKY.Force.clock.filtered)[2,]
```

```
## YLR406C_YDL075W YDR502C_YLR180W YHR106W_YDR353W YIL057C_YER067W
##           45.93          168.38          144.87           40.62
## YPL087W_YBR183W YNL069C_YIL133C YGR043C_YLR354C YPR157W_YGR141W
##           42.28           78.01           39.97           62.68
## YDR099W_YER177W YBR024W_YBR037C YPR159W_YGR143W YGL133W_YPL216W
##          154.92           29.14          243.60           21.22
## YNL049C_YIL109C YPL232W_YMR183C YIR033W_YKL020C YMR243C_YOR316C
##          118.15           94.26           75.01           69.15
## YAL056W_YOR371C YDR438W_YML018C
##           30.20           11.08
```

```
# MG94 nonclock
(MG94.nonclock.filtered - MG94.Force.nonclock.filtered)[2,]
```

```
## YLR406C_YDL075W YER131W_YGL189C YDR502C_YLR180W YML026C_YDR450W
##         17.0098         15.5082         44.6676        199.1628
## YHR106W_YDR353W YIL057C_YER067W YNL069C_YIL133C YGR043C_YLR354C
##         22.1329         17.1557         59.6840          5.3063
## YDR099W_YER177W YMR143W_YDL083C YJR048W_YEL039C YBR191W_YPL079W
##         16.2328         37.2294         21.4012         63.4052
## YDR418W_YEL054C YPL232W_YMR183C YLR284C_YOR180C YBL087C_YER117W
##         31.1399         28.1146          0.7524         45.4327
## YGL062W_YBR218C YER102W_YBL072C YDR438W_YML018C
##        446.2657        138.0125          2.9400
```

```
# MG94 clock
(MG94.clock.filtered - MG94.Force.clock.filtered)[2,]
```

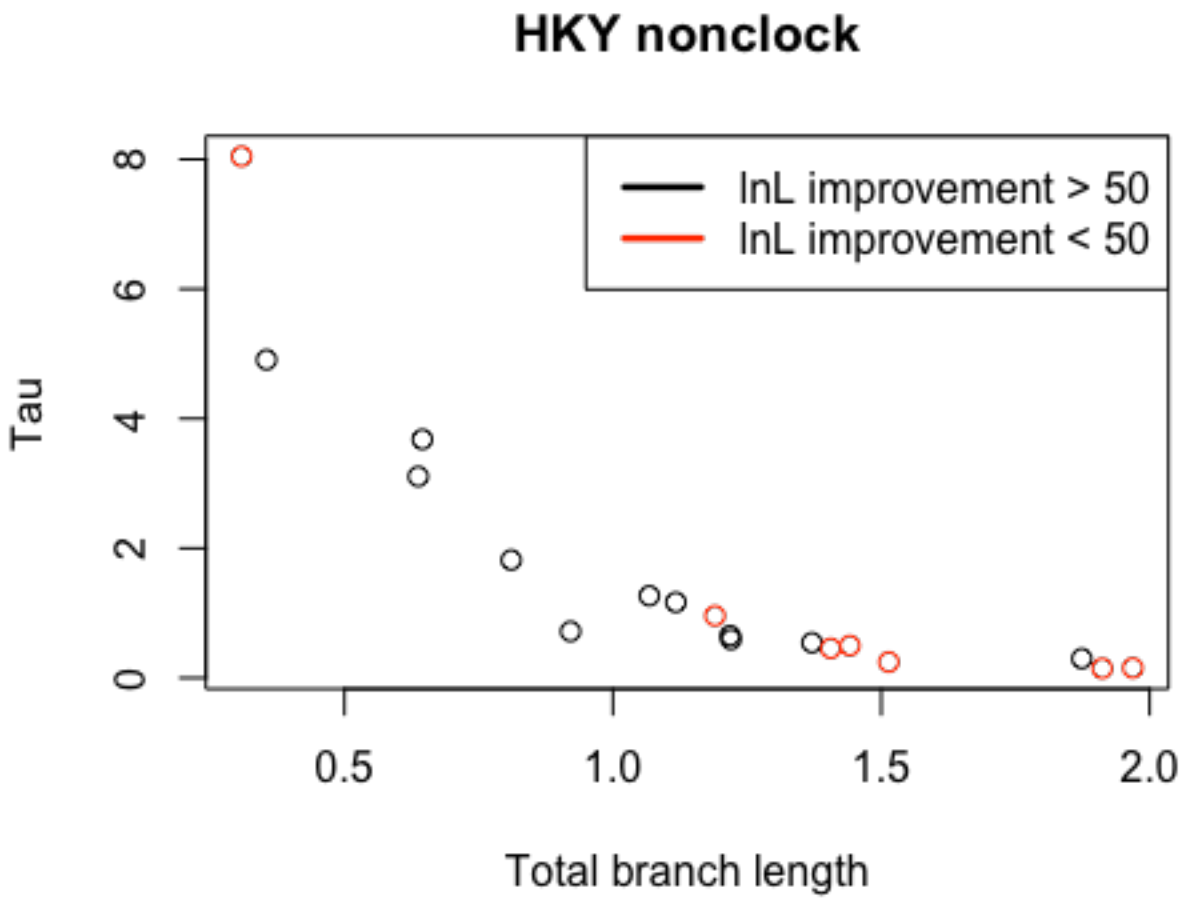
```
## YLR406C_YDL075W YER131W_YGL189C YDR502C_YLR180W YML026C_YDR450W
##           17.42           15.99          241.96          315.83
## YHR106W_YDR353W YIL057C_YER067W YNL069C_YIL133C YGR043C_YLR354C
```

```
##          521.17          592.15           54.09          722.27
## YDR099W_YER177W YMR143W_YDL083C YJR048W_YEL039C YBR191W_YPL079W
##          209.31           45.36          192.82           69.24
## YDR418W_YEL054C YPL232W_YMR183C YLR284C_YOR180C YBL087C_YER117W
##           34.20          838.06           31.09           47.32
## YGL062W_YBR218C YER102W_YBL072C YDR438W_YML018C
##         2039.77          149.04          -87.86
```

Now plot Total blen v.s. Tau into different groups (differ by color)

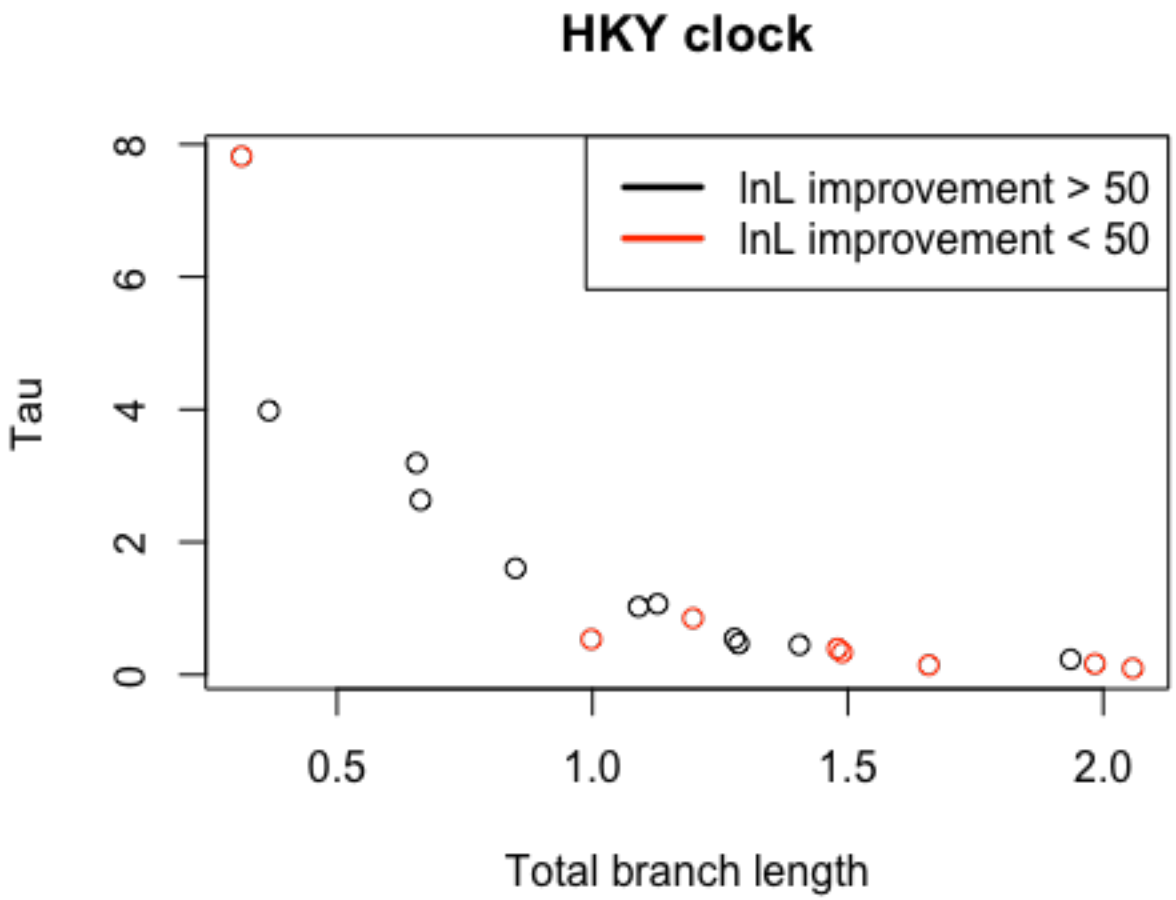
HKY nonclock case

```
plot(colSums(HKY.Force.nonclock.filtered[9:20, ]),
HKY.nonclock.filtered[8, ],
     type = "n", xlab = "Total branch length", ylab = "Tau" )
col.color <- rep("black", dim(HKY.nonclock.filtered)[2])
col.color[(HKY.nonclock.filtered - HKY.Force.nonclock.filtered)[2,] <
50] <- "red"
points(x = colSums(HKY.Force.nonclock.filtered[9:20, ]), y =
HKY.nonclock.filtered[8, ],
       type = "p", col = col.color, bg = col.color)
legend("topright", c("lnL improvement > 50", "lnL improvement < 50"),
       lty = c(1, 1),
       lwd = c(2.5, 2.5),
       col = c("black", "red"))
title("HKY nonclock")
```



HKY clock case

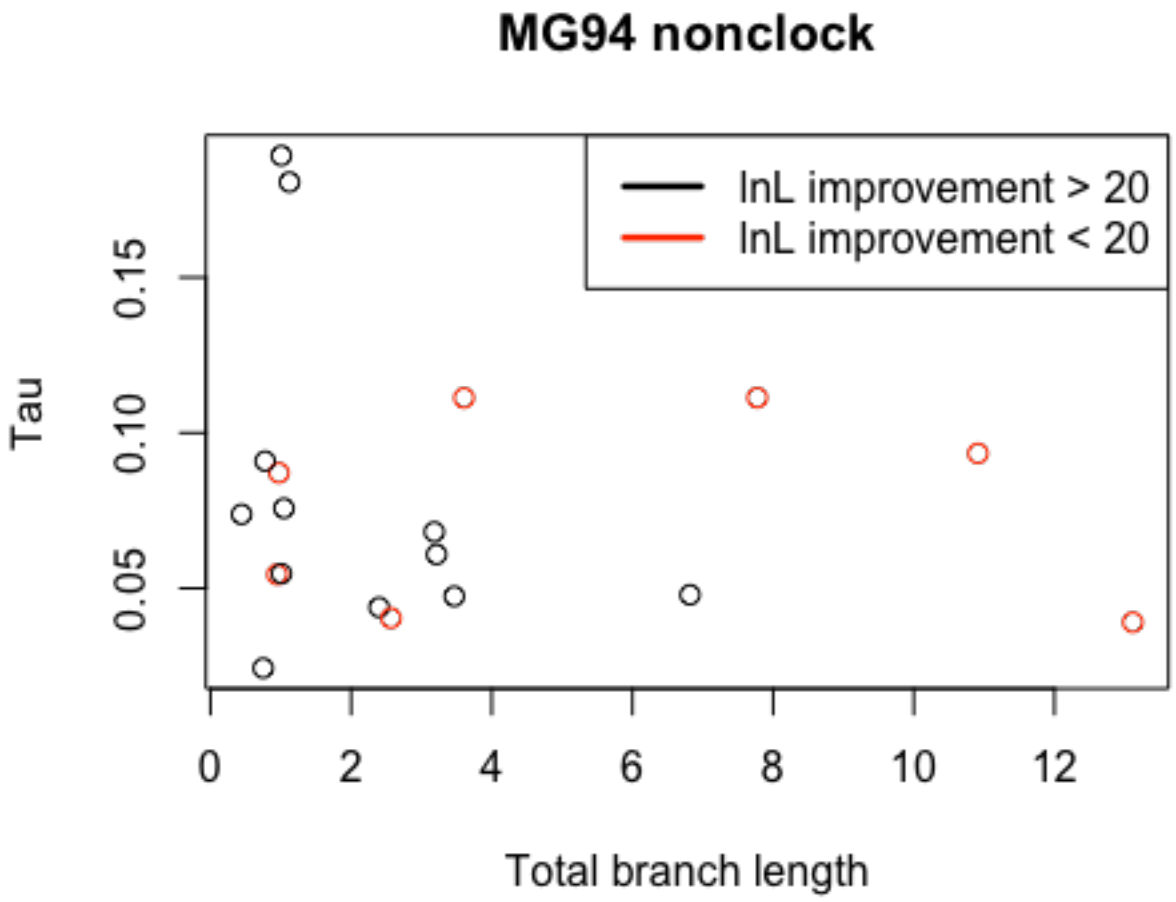
```
plot(colSums(HKY.Force.clock.filtered[9:20, ]), HKY.clock.filtered[8,
],
     type = "n", xlab = "Total branch length", ylab = "Tau" )
col.color <- rep("black", dim(HKY.clock.filtered)[2])
col.color[(HKY.clock.filtered - HKY.Force.clock.filtered)[2,] < 50] <-
"red"
points(x = colSums(HKY.Force.clock.filtered[9:20, ]), y =
HKY.clock.filtered[8, ],
       type = "p", col = col.color, bg = col.color)
legend("topright", c("lnL improvement > 50", "lnL improvement < 50"),
       lty = c(1, 1),
       lwd = c(2.5, 2.5),
       col = c("black", "red"))
title("HKY clock")
```



MG94 nonclock case

```
improvement.lmt <- 20
plot(colSums(MG94.Force.nonclock.filtered[10:21, ]),
MG94.nonclock.filtered[8, ],
     type = "n", xlab = "Total branch length", ylab = "Tau" )
col.color <- rep("black", dim(MG94.nonclock.filtered)[2])
col.color[(MG94.nonclock.filtered - MG94.Force.nonclock.filtered)[2,] <
improvement.lmt] <- "red"
points(x = colSums(MG94.Force.nonclock.filtered[10:21, ]), y =
MG94.nonclock.filtered[8, ],
       type = "p", col = col.color, bg = col.color)
legend("topright",
       c(paste("lnL improvement > ", toString(improvement.lmt), sep =
""),
         paste("lnL improvement < ", toString(improvement.lmt), sep =
"")),
       lty = c(1, 1),
       lwd = c(2.5, 2.5),
```

```
       col = c("black", "red"))
title("MG94 nonclock")
```



MG94 clock case

```
improvement.lmt <- 20
plot(colSums(MG94.Force.clock.filtered[10:21, ]),
MG94.clock.filtered[8, ],
     type = "n", xlab = "Total branch length", ylab = "Tau" )
col.color <- rep("black", dim(MG94.clock.filtered)[2])
col.color[(MG94.clock.filtered - MG94.Force.clock.filtered)[2,] <
improvement.lmt] <- "red"
points(x = colSums(MG94.Force.clock.filtered[10:21, ]), y =
MG94.clock.filtered[8, ],
       type = "p", col = col.color, bg = col.color)
legend("topright",
       c(paste("lnL improvement > ", toString(improvement.lmt), sep =
""),
         paste("lnL improvement < ", toString(improvement.lmt), sep =
"")),
```

```
       lty = c(1, 1),
       lwd = c(2.5, 2.5),
       col = c("black", "red"))
title("MG94 clock")
```

Now see if the pairs red in HKY are also red in MG94

nonclock case

```
HKY.pair.names[(HKY.nonclock.filtered -
HKY.Force.nonclock.filtered)[2,] < 50]

## [1] "YLR406C_YDL075W" "YIL057C_YER067W" "YPL087W_YBR183W"
"YBR024W_YBR037C"
## [5] "YGL133W_YPL216W" "YAL056W_YOR371C" "YDR438W_YML018C"

MG94.pair.names[(MG94.nonclock.filtered -
MG94.Force.nonclock.filtered)[2,] < improvement.lmt]
```

```
## [1] "YLR406C_YDL075W" "YER131W_YGL189C" "YIL057C_YER067W"
"YGR043C_YLR354C"
## [5] "YDR099W_YER177W" "YLR284C_YOR180C" "YDR438W_YML018C"
```

Only 3 pairs show up in both: YLR406C_YDL075W, YIL057C_YER067W, YDR438W_YML018C.

clock case

```
HKY.pair.names[(HKY.clock.filtered - HKY.Force.clock.filtered)[2,] <
50]

## [1] "YLR406C_YDL075W" "YIL057C_YER067W" "YPL087W_YBR183W"
"YGR043C_YLR354C"
## [5] "YBR024W_YBR037C" "YGL133W_YPL216W" "YAL056W_YOR371C"
"YDR438W_YML018C"

MG94.pair.names[(MG94.clock.filtered - MG94.Force.clock.filtered)[2,] <
improvement.lmt]

## [1] "YLR406C_YDL075W" "YER131W_YGL189C" "YDR438W_YML018C"
```

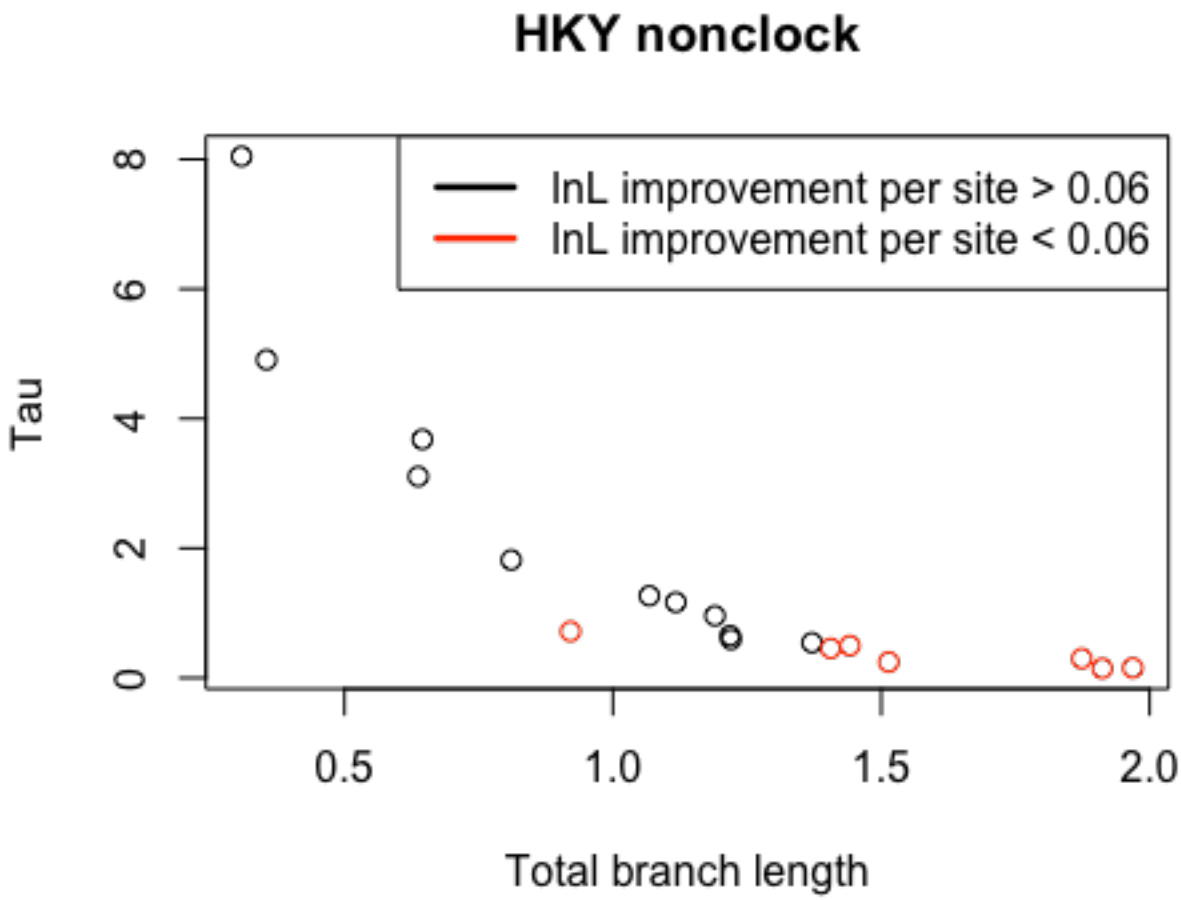
2 pairs show up in both: YLR406C_YDL075W, YDR438W_YML018C

==========

Now plot Total blen v.s. Tau into different groups (differ by lnL improvement per site)

HKY nonclock case

```
plot(colSums(HKY.Force.nonclock.filtered[9:20, ]),
HKY.nonclock.filtered[8, ],
     type = "n", xlab = "Total branch length", ylab = "Tau" )
col.color <- rep("black", dim(HKY.nonclock.filtered)[2])
col.color[((HKY.nonclock.filtered - HKY.Force.nonclock.filtered)[2,] /
HKY.nonclock.filtered[1, ]) < 0.06] <- "red"
points(x = colSums(HKY.Force.nonclock.filtered[9:20, ]), y =
HKY.nonclock.filtered[8, ],
       type = "p", col = col.color, bg = col.color)
legend("topright", c("lnL improvement per site > 0.06",
                     "lnL improvement per site < 0.06"),
       lty = c(1, 1),
       lwd = c(2.5, 2.5),
       col = c("black", "red"))
title("HKY nonclock")
```



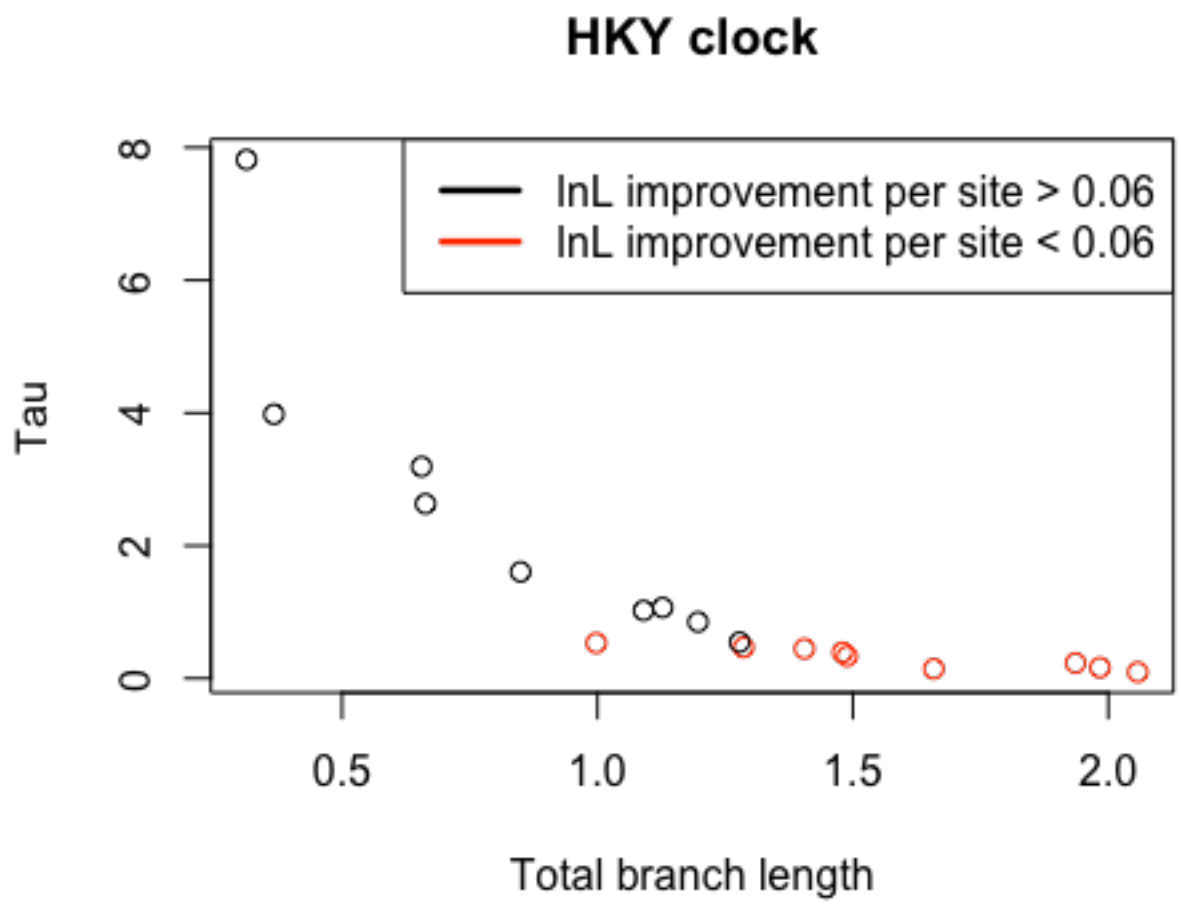

```
# lnL improvement per site
((HKY.nonclock.filtered - HKY.Force.nonclock.filtered)[2,] /
HKY.nonclock.filtered[1, ])
```

```
## YLR406C_YDL075W YDR502C_YLR180W YHR106W_YDR353W YIL057C_YER067W
##         0.13337         0.18252         0.17245         0.08823
## YPL087W_YBR183W YNL069C_YIL133C YGR043C_YLR354C YPR157W_YGR141W
##         0.05409         0.15185         0.05909         0.06093
## YDR099W_YER177W YBR024W_YBR037C YPR159W_YGR143W YGL133W_YPL216W
##         0.21108         0.05014         0.12123         0.01368
## YNL049C_YIL109C YPL232W_YMR183C YIR033W_YKL020C YMR243C_YOR316C
##         0.06107         0.13457         0.03502         0.07266
## YAL056W_YOR371C YDR438W_YML018C
##         0.01355         0.02331
```

HKY clock case

```
plot(colSums(HKY.Force.clock.filtered[9:20, ]), HKY.clock.filtered[8,
],
     type = "n", xlab = "Total branch length", ylab = "Tau" )
```

```
col.color <- rep("black", dim(HKY.clock.filtered)[2])
col.color[((HKY.clock.filtered - HKY.Force.clock.filtered)[2,] /
HKY.clock.filtered[1, ]) < 0.06] <- "red"
points(x = colSums(HKY.Force.clock.filtered[9:20, ]), y =
HKY.clock.filtered[8, ],
       type = "p", col = col.color, bg = col.color)
legend("topright", c("lnL improvement per site > 0.06",
                     "lnL improvement per site < 0.06"),
       lty = c(1, 1),
       lwd = c(2.5, 2.5),
       col = c("black", "red"))
title("HKY clock")
```



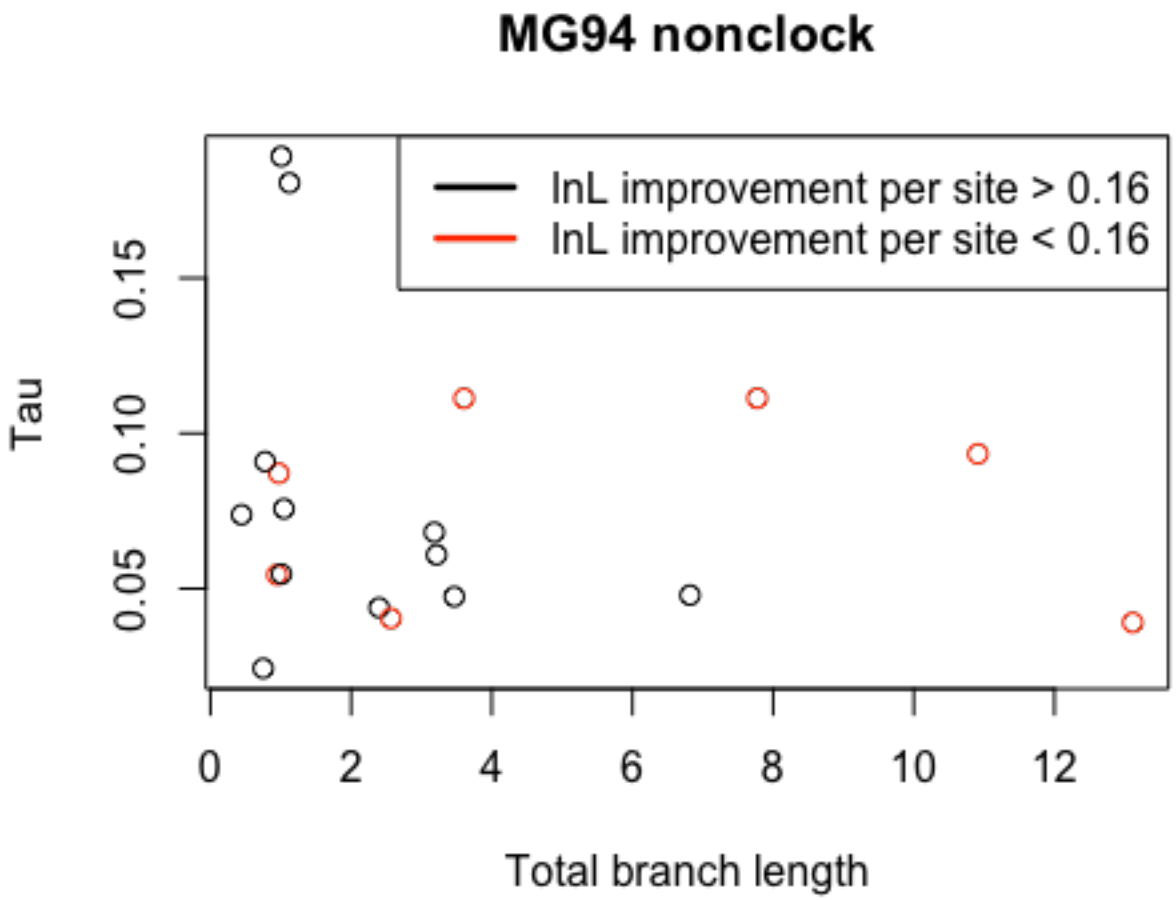

```
# lnL improvement per site
((HKY.clock.filtered - HKY.Force.clock.filtered)[2,] /
HKY.clock.filtered[1, ])
```

```
## YLR406C_YDL075W YDR502C_YLR180W YHR106W_YDR353W YIL057C_YER067W
##        0.135487        0.146931        0.151376        0.086245
## YPL087W_YBR183W YNL069C_YIL133C YGR043C_YLR354C YPR157W_YGR141W
```

```
##        0.045908        0.131323        0.040133        0.050586
## YDR099W_YER177W YBR024W_YBR037C YPR159W_YGR143W YGL133W_YPL216W
##        0.202513        0.034693        0.121737        0.007116
## YNL049C_YIL109C YPL232W_YMR183C YIR033W_YKL020C YMR243C_YOR316C
##        0.047052        0.110245        0.027969        0.061142
## YAL056W_YOR371C YDR438W_YML018C
##        0.015277        0.010706
```

MG94 nonclock case

```
improvement.lmt <- 0.16
plot(colSums(MG94.Force.nonclock.filtered[10:21, ]),
MG94.nonclock.filtered[8, ],
     type = "n", xlab = "Total branch length", ylab = "Tau" )
col.color <- rep("black", dim(MG94.nonclock.filtered)[2])
col.color[((MG94.nonclock.filtered - MG94.Force.nonclock.filtered)[2,]
/ MG94.nonclock.filtered[1]) < improvement.lmt] <- "red"
points(x = colSums(MG94.Force.nonclock.filtered[10:21, ]), y =
MG94.nonclock.filtered[8, ],
       type = "p", col = col.color, bg = col.color)
legend("topright",
       c(paste("lnL improvement per site > ",
toString(improvement.lmt), sep = ""),
         paste("lnL improvement per site < ",
toString(improvement.lmt), sep = "")),
       lty = c(1, 1),
       lwd = c(2.5, 2.5),
       col = c("black", "red"))
title("MG94 nonclock")
```



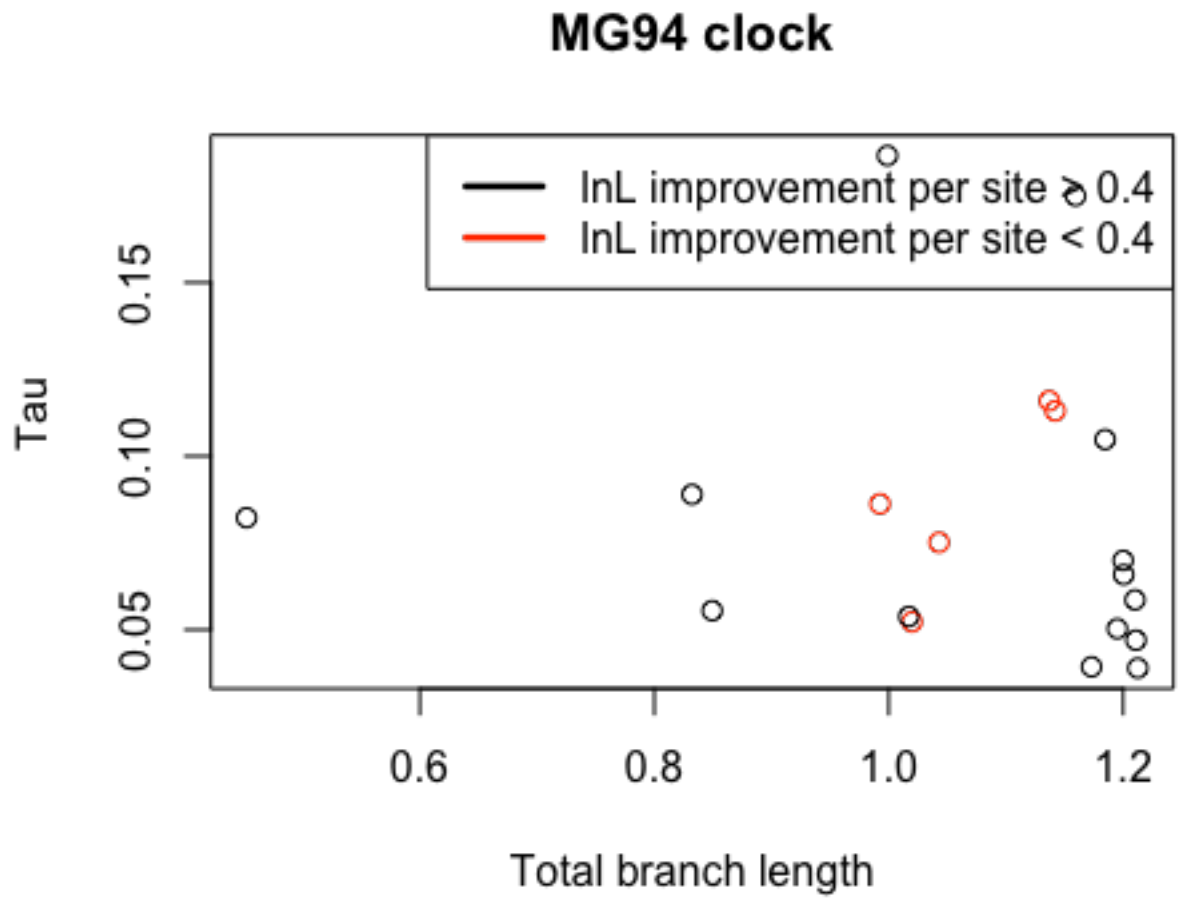

```
# lnL improvement per site
((MG94.nonclock.filtered - MG94.Force.nonclock.filtered)[2,] /
MG94.nonclock.filtered[1])
```

```
## YLR406C_YDL075W YER131W_YGL189C YDR502C_YLR180W YML026C_YDR450W
##        0.150529        0.137241        0.395289        1.762502
## YHR106W_YDR353W YIL057C_YER067W YNL069C_YIL133C YGR043C_YLR354C
##        0.195866        0.151820        0.528177        0.046959
## YDR099W_YER177W YMR143W_YDL083C YJR048W_YEL039C YBR191W_YPL079W
##        0.143653        0.329463        0.189391        0.561108
## YDR418W_YEL054C YPL232W_YMR183C YLR284C_YOR180C YBL087C_YER117W
##        0.275574        0.248802        0.006659        0.402059
## YGL062W_YBR218C YER102W_YBL072C YDR438W_YML018C
##        3.949254        1.221350        0.026018
```

MG94 clock case

```
improvement.lmt <- 0.4
plot(colSums(MG94.Force.clock.filtered[10:21, ]),
MG94.clock.filtered[8, ],
```

```
     type = "n", xlab = "Total branch length", ylab = "Tau" )
col.color <- rep("black", dim(MG94.clock.filtered)[2])
col.color[((MG94.clock.filtered - MG94.Force.clock.filtered)[2,] /
MG94.clock.filtered[1]) < improvement.lmt] <- "red"
points(x = colSums(MG94.Force.clock.filtered[10:21, ]), y =
MG94.clock.filtered[8, ],
       type = "p", col = col.color, bg = col.color)
legend("topright",
       c(paste("lnL improvement per site > ",
toString(improvement.lmt), sep = ""),
         paste("lnL improvement per site < ",
toString(improvement.lmt), sep = "")),
       lty = c(1, 1),
       lwd = c(2.5, 2.5),
       col = c("black", "red"))
title("MG94 clock")
```



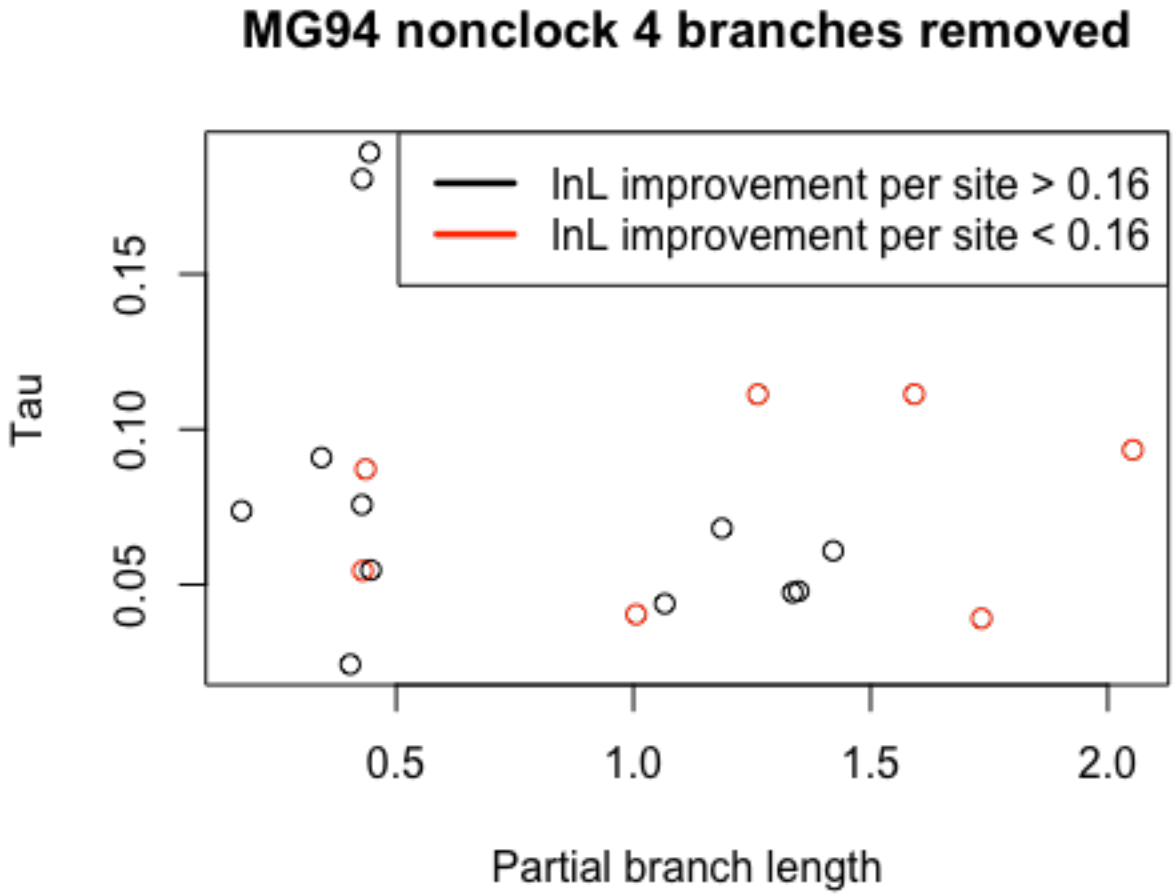

```
# lnL improvement per site
((MG94.clock.filtered - MG94.Force.clock.filtered)[2,] /
MG94.clock.filtered[1])
```

```
## YLR406C_YDL075W YER131W_YGL189C YDR502C_YLR180W YML026C_YDR450W
##          0.1542          0.1415          2.1412          2.7950
## YHR106W_YDR353W YIL057C_YER067W YNL069C_YIL133C YGR043C_YLR354C
##          4.6121          5.2403          0.4787          6.3917
## YDR099W_YER177W YMR143W_YDL083C YJR048W_YEL039C YBR191W_YPL079W
##          1.8523          0.4014          1.7063          0.6128
## YDR418W_YEL054C YPL232W_YMR183C YLR284C_YOR180C YBL087C_YER117W
##          0.3027          7.4165          0.2752          0.4188
## YGL062W_YBR218C YER102W_YBL072C YDR438W_YML018C
##         18.0510          1.3189         -0.7776
```

OK, the MG94 nonclock long branch lengths are suspecious. It seems that the first four branches carry most of the total length. What if plot without those branches?

MG94 nonclock case without first four branches: (N0, N1), (N0,kluyveri), (N1,N2), (N1,castellii) are excluded

```
improvement.lmt <- 0.16
plot(colSums(MG94.Force.nonclock.filtered[14:21, ]),
MG94.nonclock.filtered[8, ],
     type = "n", xlab = "Partial branch length", ylab = "Tau" )
col.color <- rep("black", dim(MG94.nonclock.filtered)[2])
col.color[((MG94.nonclock.filtered - MG94.Force.nonclock.filtered)[2,]
/ MG94.nonclock.filtered[1]) < improvement.lmt] <- "red"
points(x = colSums(MG94.Force.nonclock.filtered[14:21, ]), y =
MG94.nonclock.filtered[8, ],
       type = "p", col = col.color, bg = col.color)
legend("topright",
       c(paste("lnL improvement per site > ",
toString(improvement.lmt), sep = ""),
         paste("lnL improvement per site < ",
toString(improvement.lmt), sep = "")),
       lty = c(1, 1),
       lwd = c(2.5, 2.5),
       col = c("black", "red"))
title("MG94 nonclock 4 branches removed")
```




```
# lnL improvement per site
((MG94.nonclock.filtered - MG94.Force.nonclock.filtered)[2,] /
MG94.nonclock.filtered[1])
```

```
## YLR406C_YDL075W YER131W_YGL189C YDR502C_YLR180W YML026C_YDR450W
##        0.150529        0.137241        0.395289        1.762502
## YHR106W_YDR353W YIL057C_YER067W YNL069C_YIL133C YGR043C_YLR354C
##        0.195866        0.151820        0.528177        0.046959
## YDR099W_YER177W YMR143W_YDL083C YJR048W_YEL039C YBR191W_YPL079W
##        0.143653        0.329463        0.189391        0.561108
## YDR418W_YEL054C YPL232W_YMR183C YLR284C_YOR180C YBL087C_YER117W
##        0.275574        0.248802        0.006659        0.402059
## YGL062W_YBR218C YER102W_YBL072C YDR438W_YML018C
##        3.949254        1.221350        0.026018
```