```
# R script for vertical non-inferiority test (tested with R version 2.13.1)
# Supplemental material for "Showing that the race model inequality is not
#     violated"
#
# Hybrid bootstrap confidence interval for maximal distance (Freitag et al.,
#     2006, Eq. 4 with m=n)
# H_0: F_R(t) + delta = F_T(t), for some t
# H_1: F_R(t) + delta > F_T(t), for all t
#
# Arguments
#     dT, dR: samples T and R
#     delta: non-inferioriry margin [default 0.1]
#     nboot: number of bootstrap cycles [default 9999]
#
# Return value
#     P: P-value of non-inferiority test

dci = function(dT, dR, delta=0.1, nboot=9999)
{
    # observed distance
    range=union(dT, dR)
    dmax_obs = max(ecdf(dT)(range) - ecdf(dR)(range))

    # bootstrap confidence interval
    m = numeric(nboot)
    for(i in 1:nboot)
    {
        sT   = sample(dT, replace=TRUE)
        sR   = sample(dR, replace=TRUE)
        m[i] = max(ecdf(sT)(range) - ecdf(sR)(range))
    } # for

    c(P=mean(2*dmax_obs - m > delta))
} # dci

# dci(dT=rnorm(100, 100, 15), dR=rnorm(100, 100, 15)) # only for testing

# Invoke non-inferiority test with data from redundant signals task
# H_0: F_AV(t) >= F_A(t) + F_V(t) + delta, for some t
# H_1: F_AV(t) <  F_A(t) + F_V(t) + delta, for all t
#
# Arguments
#     tA, tV, tAV: response times for auditory, visual, audiovisual stimuli
#     delta: vertical non-inferiority margin in units of t [default 10 ms]
#     nboot: number of bootstrap cycles [default 9999]
#
# Return value (see dci)
#     P: one-tailed P-value (< .05 means that race model inequality holds)

vhold = function(tA, tV, tAV, delta=0.1, nboot=9999)
{
    # lower 50% of 1:1 mixture of tA and tV
    dci(tAV, sort(c(tA, tV))[1:floor((length(tA)+length(tV))/2)], delta, nboot)
} # vhold

# only for testing
# vhold(rnorm(100, 100, 15), rnorm(100, 100, 15), pmin(rnorm(100, 100, 15),
#    rnorm(100, 100, 15)))
```

```
# Run the test for data saved in a file
#
# Cond  RT
# A     526
# V     324
# AV    234
# V     Inf # omitted response
#
# Arguments
#     fname: path to results file [forward slashes, default C:/RTDATA/obs01.txt]
#     delta: verical non-inferiority margin [default: 0.1]
#     nboot: number of bootstrap cycles [default: 9999]
#
# Return value (see also dci)
#     P: one-tailed P-value of bootstrap test (< .05 means that race model
#        inequality holds)

rmi.vtest = function(fname='C:/RTDATA/obs01.txt', delta=0.1, nboot=9999)
{
    d = read.table(fname, header=TRUE)
    s = split(d$RT, d$Cond)
    vhold(tA=s$A, tV=s$V, tAV=s$AV, delta, nboot)
} # rmi.vtest

# Uncomment to generate example data in C:\RTDATA\obs01.txt
# set.seed(1234)
# tA  = cbind(Cond='A', RT=round(rnorm(60, 100, 15)))
# tV  = cbind('V', round(rnorm(80, 100, 15)))
# tAV = cbind('AV', round(pmin(rnorm(100, 100, 15), rnorm(100, 100, 15))))
# write.table(rbind(tA, tV, tAV), 'C:/RTDATA/obs01.txt', quote=FALSE,
#     row.names=FALSE, sep='\t')

# Example use (requires valid results file in C:\RTDATA\obs01.txt)
rmi.vtest(fname='C:/RTDATA/obs01.txt', delta=0.05, nboot=9999)
```