Evidencia 02

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4/29/2020

PARTE 1 - Video

Link del video

https://youtu.be/8UQ6i1RccZQ (https://youtu.be/8UQ6i1RccZQ)

PARTE 2 - Código

Librerías

```
library(ape)
library(phytools)
```

```
## Loading required package: maps
```

```
library(Biostrings)
```

```
## Loading required package: BiocGenerics
```

```
## Loading required package: parallel
```

```
##
## Attaching package: 'BiocGenerics'
```

```
## The following objects are masked from 'package:parallel':
##
##     clusterApply, clusterApplyLB, clusterCall, clusterEvalQ,
##     clusterExport, clusterMap, parApply, parCapply, parLapply,
##     parLapplyLB, parRapply, parSapply, parSapplyLB
```

```
## The following objects are masked from 'package:stats':
##
##     IQR, mad, sd, var, xtabs
```

```
## The following objects are masked from 'package:base':
##
##     anyDuplicated, append, as.data.frame, basename, cbind, colnames,
##     dirname, do.call, duplicated, eval, evalq, Filter, Find, get, grep,
##     grepl, intersect, is.unsorted, lapply, Map, mapply, match, mget,
##     order, paste, pmax, pmax.int, pmin, pmin.int, Position, rank,
##     rbind, Reduce, rownames, sapply, setdiff, sort, table, tapply,
##     union, unique, unsplit, which, which.max, which.min
```

```
## Loading required package: S4Vectors
```

```
## Loading required package: stats4
```

```
##
## Attaching package: 'S4Vectors'
```

```
## The following object is masked from 'package:base':
##
##     expand.grid
```

```
## Loading required package: IRanges
```

```
##
## Attaching package: 'IRanges'
```

```
## The following object is masked from 'package:grDevices':
##
##     windows
```

```
## Loading required package: XVector
```

```
##
## Attaching package: 'Biostrings'
```

```
## The following object is masked from 'package:ape':
##
##     complement
```

```
## The following object is masked from 'package:base':
##
##     strsplit
```

```
library(seqinr)
```

```
##
## Attaching package: 'seqinr'
```

```
## The following object is masked from 'package:Biostrings':
##
##     translate
```

```
## The following objects are masked from 'package:ape':
##
##     as.alignment, consensus
```

```
library(adegenet)
```

```
## Loading required package: ade4
```

```
##
## Attaching package: 'ade4'
```

```
## The following object is masked from 'package:Biostrings':
##
##     score
```

```
## The following object is masked from 'package:BiocGenerics':
##
##     score
```

```
## Registered S3 method overwritten by 'spdep':
##   method   from
##   plot.mst ape
```

```
##
##    /// adegenet 2.1.2 is loaded ////////////
##
##    > overview: '?adegenet'
##    > tutorials/doc/questions: 'adegenetWeb()'
##    > bug reports/feature requests: adegenetIssues()
```

```
library(ggtree)
```

```
## Registered S3 method overwritten by 'treeio':
##   method     from
##   root.phylo ape
```

```
## ggtree v2.0.4  For help: https://yulab-smu.github.io/treedata-book/
##
## If you use ggtree in published research, please cite the most appropriate paper(s):
##
## [36m-[39m Guangchuang Yu, Tommy Tsan-Yuk Lam, Huachen Zhu, Yi Guan. Two methods f
or mapping and visualizing associated data on phylogeny using ggtree. Molecular Biolog
y and Evolution 2018, 35(12):3041-3043. doi: 10.1093/molbev/msy194
## [36m-[39m Guangchuang Yu, David Smith, Huachen Zhu, Yi Guan, Tommy Tsan-Yuk Lam.
ggtree: an R package for visualization and annotation of phylogenetic trees with their
covariates and other associated data. Methods in Ecology and Evolution 2017, 8(1):28-3
6, doi:10.1111/2041-210X.12628
```

```
##
## Attaching package: 'ggtree'
```

```
## The following object is masked from 'package:Biostrings':
##
##     collapse
```

```
## The following object is masked from 'package:IRanges':
##
##     collapse
```

```
## The following object is masked from 'package:S4Vectors':
##
##     expand
```

```
## The following object is masked from 'package:ape':
##
##     rotate
```

```
library(DECIPHER)
```

```
## Loading required package: RSQLite
```

```
library(viridis)
```

```
## Loading required package: viridisLite
```

```
library(ggplot2)
```

Variantes de influenza de México y del mundo.

```
#LAs variantes de influenza utilizando el segmento 4 del virus (HA)
virus<-c("CY049836.1","EF382359.1","EF101749.1","CY009892.1","JQ290156.1","CY002954.
1","CY050198.1","KT889237.1","CY125728.1")

virus_sequences <- read.GenBank(virus)
```

```
attr(virus_sequences, "species")
```

```
## [1] "Influenza_A_virus_(A/Bogota/WR0090N/2009(H1N1))"
## [2] "Influenza_A_virus_(A/Egypt/0636-NAMRU3/2007(H5N1))"
## [3] "Influenza_A_virus_(A/Thailand/271/2005(H1N1))"
## [4] "Influenza_A_virus_(A/swine/Spain/50047/2003(H1N1))"
## [5] "Influenza_A_virus_(A/Minnesota/19/2011(H1N2))"
## [6] "Influenza_A_virus_(A/Ashburton/280/2004(H3N2))"
## [7] "Influenza_A_virus_(A/Mexico_City/001/2009(H1N1))"
## [8] "Influenza_A_virus_(A/Mexico_City/1514A00905313N/2013(H3N2))"
## [9] "Influenza_A_virus_(A/Mexico/InDRE7218/2012(H7N3))"
```

```
attr(virus_sequences, "description")
```

```
## [1] "CY049836.1 Influenza A virus (A/Bogota/WR0090N/2009(H1N1)) segment 4 sequence"
## [2] "EF382359.1 Influenza A virus (A/Egypt/0636-NAMRU3/2007(H5N1)) hemagglutinin (H
A) mRNA, complete cds"
## [3] "EF101749.1 Influenza A virus (A/Thailand/271/2005(H1N1)) hemagglutinin gene, c
omplete cds"
## [4] "CY009892.1 Influenza A virus (A/Swine/Spain/50047/2003(H1N1)) segment 4, compl
ete sequence"
## [5] "JQ290156.1 Influenza A virus (A/Minnesota/19/2011(H1N2)) segment 4 hemagglutin
in (HA) gene, complete cds"
## [6] "CY002954.1 Influenza A virus (A/Ashburton/280/2004(H3N2)) segment 4, complete
sequence"
## [7] "CY050198.1 Influenza A virus (A/Mexico City/001/2009(H1N1)) segment 4, complet
e sequence"
## [8] "KT889237.1 Influenza A virus (A/Mexico City/1514A00905313N/2013(H3N2)) segment
4 hemagglutinin (HA) gene, complete cds"
## [9] "CY125728.1 Influenza A virus (A/Mexico/InDRE7218/2012(H7N3)) hemagglutinin (H
A) gene, complete cds"
```

Número de bases de cada variante

```
#Número de bases de H1N5 de África
print(length(virus_sequences[[1]]))
```

```
## [1] 1698
```

```
#Número de bases de H1N1 de Asia
print(length(virus_sequences[[2]]))
```

```
## [1] 1749
```

```
#Número de bases de H1N1 de Europa
print(length(virus_sequences[[3]]))
```

```
## [1] 1778
```

```
#Número de bases de H1N2 de América del Norte
print(length(virus_sequences[[4]]))
```

```
## [1] 1742
```

```
#Número de bases de H1N1 de América del Sur
print(length(virus_sequences[[5]]))
```

```
## [1] 1731
```

```
#Número de bases de H3N2 de Oceanía
print(length(virus_sequences[[6]]))
```

```
## [1] 1742
```

```
#Número de bases de A(H1N1) México
print(length(virus_sequences[[7]]))
```

```
## [1] 1733
```

```
#Número de bases de A(H3N2) México
print(length(virus_sequences[[8]]))
```

```
## [1] 1701
```

```
#Número de bases de A(H7N3) México
print(length(virus_sequences[[9]]))
```

```
## [1] 1757
```

Comparación entre variantes del virus y las bases del ADN que lo componen

```
# Ids de cada virus
virus_GenBank_IDs <- paste(attr(virus_sequences, "species"), names(virus_sequences), s
ep ="_HA_")
virus_GenBank_IDs
```

```
## [1] "Influenza_A_virus_(A/Bogota/WR0090N/2009(H1N1))_HA_CY049836.1"
## [2] "Influenza_A_virus_(A/Egypt/0636-NAMRU3/2007(H5N1))_HA_EF382359.1"
## [3] "Influenza_A_virus_(A/Thailand/271/2005(H1N1))_HA_EF101749.1"
## [4] "Influenza_A_virus_(A/swine/Spain/50047/2003(H1N1))_HA_CY009892.1"
## [5] "Influenza_A_virus_(A/Minnesota/19/2011(H1N2))_HA_JQ290156.1"
## [6] "Influenza_A_virus_(A/Ashburton/280/2004(H3N2))_HA_CY002954.1"
## [7] "Influenza_A_virus_(A/Mexico_City/001/2009(H1N1))_HA_CY050198.1"
## [8] "Influenza_A_virus_(A/Mexico_City/1514A00905313N/2013(H3N2))_HA_KT889237.1"
## [9] "Influenza_A_virus_(A/Mexico/InDRE7218/2012(H7N3))_HA_CY125728.1"
```

```
# Archivo del GenBank a FASTA con todas las secuencias:
write.dna(virus_sequences,  file ="virus_seqs.fasta", format = "fasta", append = FALS
E)
```

```
# Lectura de archivo Fasta para procesarlo
virus_seq_no_alineadas <- read.fasta("virus_seqs.fasta", seqtype = "DNA", as.string =
TRUE, forceDNAtolower = FALSE)
virus_seq_no_alineadas
```

```
## $CY049836.1
## [1] "atgaaggcaa tactagtagt tctgctatat acatttgcaa ccgcaaatgc agacacattatgtataggtt at
catgcgaa caattcaaca gacactgtag acacagtact agaaaagaatgtaacagtaa cacactctgt taaccttcta g
aagacaagc ataacgggaa actatgcaaactaagagggg tagccccatt gcatttgggt aaatgtaaca ttgctggctg
gatcctgggaaatccagagt gtgaatcact ctccacagca agctcatggt cctacattgt ggaaacatctagttcagaca
atggaacgtg ttacccagga gatttcatcg attatgagga gctaagagagcaattgagct cagtgtcatc atttgaaaga
tttgagatat tccccaagac aagttcatggcccaatcatg actcgaacaa aggtgtaacg gcagcatgtc ctcatgctgg
agcaaaaagcttctacaaaa atttaatatg gctagttaaa aaaggaaatt catacccaaa gctcagcaaatcctacatta
atgataaagg gaaagaagtc ctcgtgctat ggggcattca ccatccatctactagtgctg accaacaaag tctctatcag
aatgcagatg catatgtttt tgtggggacatcaagataca gtaagaagtt caagccggaa atagcaataa gacccaaagt
gagggatcaagaagggagaa tgaactatta ctggacacta gtagagccgg gagacaaaat aacattcgaagcaactggaa
atctagtggt accgagatat gcattcgcaa tggaaagaaa tgctggatctggtattatca tttcagatac accagtccac
aattgcaata caacttgtca gacacccaagggtgctataa acaccagcct cccatttcag aatatacatc cgatcacaat
tggaaaatgtccaaaatatg taaaaagcac aaaattgaga ctggccacag gattgaggaa tgtcccgtctattcaatcta
gaggcctatt tggggccatt gccggtttca ttgaaggggg gtggacagggatggtagatg gatggtacgg ttatcaccat
caaaatgagc aggggtcagg atatgcagccgatctgaaga gcacacagaa tgccattgac gagattacta acaaagtaaa
ttctgttattgaaaagatga atacacagtt cacagcagta ggtaaagagt tcaaccacct ggaaaaaagaatagagaatt
taaataaaaa agttgatgat ggtttcctgg acatttggac ttacaatgccgaactgttgg ttctattgga aaatgaaaga
actttggact accacgattc aaatgtgaagaacttatatg aaaaggtaag aagccagtta aaaaacaatg ccaaggaaat
tggaaacggctgctttgaat tttaccacaa atgcgataac acgtgcatgg aaagtgtcaa aaatgggacttatgactacc
caaaatactc agaggaagca aaattaaaca gagaagaaat agatggggtaaagctggaat caacaaggat ttaccagatt
ttggcgatct attcaactgt cgccagttcattggtactgg tagtctccct gggggcaatc agtttctgga tgtgctctgg
tcatctacagtgtagaatat gtatttaa"
## attr(,"name")
## [1] "CY049836.1"
## attr(,"Annot")
## [1] ">CY049836.1"
## attr(,"class")
## [1] "SeqFastadna"
##
## $EF382359.1
## [1] "atggagaaaa tagtgcttct tcttgcaata gtcagtcttg ttaaaagtga tcagatttgcattggttacc at
gcaaacaa ctcgacagag caggttgaca caataatgga aaagaacgtcactgttacac acgcccaaga catactggaa a
agacacaca acgggaaact ctgcaatctaaatggagtga agcctctaat tttaagagat tgtagtgtag ctggatggct
cctcgggaacccaatgtgtg acgaattcct caatgtgccg gaatggtctt acatagtgga gaagatcaatccagccaatg
acctctgtta tccagggaat ttcaacgact atgaagaact gaaacacctattgagcagaa taaaccattt tgagaaaatt
cagatcatcc ccaaaaattc ttggtcagatcatgaagcct caggagtgag ctcagcatgt ccataccagg gaagatcctc
ctttttttagaaatgtggtat ggcttaccaa aaaggacaat gcatacccaa caataaagag aagttacaataataccaacc
aagaagatct tttggtacta tgggggattc accatccaaa tgatgcggcagagcagacaa ggctctatca aaacccaact
acctatattt ccgttgggac atcaacactaaaccagagat tggtaccaaa aatagctgct agatctaagg taaacgggca
aagtggaaggatggagttct tttggacaat tttaaaatcg aatgatgcaa taaactttga gagtaatggaaatttcattg
ctccagaaaa tgcatacaaa attgtcaaga aaggggactc aacaattatgaaaagtgagt tggaatatgg taactgcaac
accaagtgtc agactccaat aggggcgataaactccagta tgccattcca caacatccac cctctcacca tcggggaatg
ccccaaatatgtgaaatcaa acagattagt ccttgctact gggctcagaa atagccctca aggagagagaagaagaaaaa
agagaggact atttggagct atagcaggtt ttatagaggg aggatggcagggaatggtag atggttggta tgggtaccac
catagcaacg agcaggggag tgggtacgctgcagacaaag aatccactca aaaggcaata gatggagtca ccaataaggt
caactcgatcattgacaaaa tgaacactca gtttgaggct gttggaaggg aatttaataa cttagaaaggagaatagaaa
atttaaacaa gaagatggaa gacggattcc tagatgtctg gacttataatgctgaacttc tggttctcat ggaaaatgag
```

```
agaactctag actttcatga ctcaaatgtcaagaaccttt acgacaaggt ccgattacag cttagggata atgcaaagga
gcttggtaacggttgtttcg agttctatca cagatgtgat aatgaatgta tggaaagtgt aagaaacggaacgtatgact
acccgcagta ttcagaagaa gcaagattaa aaagagagga aataagtggagtaaaattgg agtcaatagg aacttaccaa
atactgtcaa tttattcaac agtggcgagctccctagcac tggcaatcat ggtggctggt ctatttttat ggatgtgctc
caatggatcgttacaatgca gaatttgcat ttaaatttgt gagttcaaat tgtagttaaa aacacctttgtttcctact"
## attr(,"name")
## [1] "EF382359.1"
## attr(,"Annot")
## [1] ">EF382359.1"
## attr(,"class")
## [1] "SeqFastadna"
##
## $EF101749.1
## [1] "agcaaaagca ggggaaaata aaagcaacca gaatgaaggc aatactacta gtcttgctatgcacacttgc ag
cagcaaat gcagacacac tgtgtatagg ttatcatgca aataattcaactgacactgt tgatacaata ttagaaaaga a
tgttacagt aacacactct gttaaccttctagaagacag gcacaatggg aagctatgta acctaagggg ggaagcccca
ctgcatttgggtaaatgtaa cattgccgga tggctcctag gaaacccaga atgcgaatta ctatttgcagtaaactcatg
gtcttacatt gtggaaacat cgaactcaga caatgggaca tgttacccaggagatttcac cagttatgaa gagctaagag
aacaattgag ctcagtgtca tcatttgaaagattcgagat attccccaaa gcaagctctt ggcccaacca tgaaacaaac
agaggtgtaacggcagcatg cccttatgct ggaacaaaca gcttctacag gaatttgata tggctagtaaaaaagggaaa
ctcatatcca aagctcagta aatcctatgt taataataag aagaaggaagtccttgtact atggggcatc caccatccac
ccaccaatgc tgatcaacaa agtctctaccagaatgcaga tgcctatgtt tttgtgggat catcaaaata taacaagaaa
ttcaaaccagaaatagcaaa aagacccaag gtgaggggtc aagcaggaag aatgaactat tattggacattagtagagcc
tggagacaca ataacatttg aagcaactgg aaatctagtg gcaccaagatatgcttttgc aatgaataga gatcctggat
caggtatcat aacatcggat gcaccaatccatgactgtaa tgcgacttgt caaacaccca agggtgccat aaacaccagc
ctcccatttcagaatattca tccaatcact attggagaat gtccaaaata tgtcaaaagc acaagactaagaatggccac
aggattaaga aatatccctt ctattcaatc tagaggtctg tttggggctattgccggttt tattgaagga ggatggacag
gaatgataga tgggtggtac ggttatcaccatcagaatgg acaaggatca ggatatgcag cggaccaaaa gagcacacag
aatgccatcgataggataac taacaaggta aattctgtta ttgaaaagat gaacatacaa ttcacagcagtgggtaaaga
atttaaccac ttagaaagaa gaatagaaaa cttgaacaaa aaggttgatgatggattttt ggatgtttgg acatacaatg
ccgaattgtt agtcctattg gaaaatgagagaactttgga tttccatgat tcaaatgtaa aaaccctata tgaaaaggta
aagacccagctaaggaacaa tgccaaagaa attgggaatg gctgctttga attctatcac aaatgtgatgacacatgcat
ggagagcatc aaaaatggga cttacgatta ccccaaatac tcaaaagaatcaaaactaaa cagagaggaa atagatggag
tacaactgga gtcaacaagg ctttaccagattttggcgat ctattcaact gccgccagtt cactggtact gttggtctcc
ctgggggcaatcggtttctg gatgtgctcc aatgggtctt tgcagtgcag aatatgtatt aaaaactaggatttcagaga
catgagaaaa aacacccttg tttctact"
## attr(,"name")
## [1] "EF101749.1"
## attr(,"Annot")
## [1] ">EF101749.1"
## attr(,"class")
## [1] "SeqFastadna"
##
## $CY009892.1
## [1] "aaaattaaat caaccaaaat ggaagtaaaa ctgtttgtat tattctgtgc attcactgcactgaaagctg ac
accatttg tgtaggctat catgctaaca attccacaga cactgtcgacacaatactgg agaagaatgt gactgttacc c
attcagtta acttactaga aaacaaccataatggaaaac tttgtagcct gaatggaaag gccccttac aactggggaa
ctgcaacgtagcaggatgga tccttggcaa cccagaatgt gacttgttgc tcacagcgaa ttcgtggtcttacataatag
agacttcaaa ttcaaaaaat ggagcatgct acccaggaga attcgctgattatgaagaat taagggagca gctgagtaca
```

```
gtctcttcat ttgaaagatt tgaaattttcccaaaagcaa cctcatggcc aaaccatgat acaaccagag gtaccacagt
tgcatgctcccattctggag ccaacagttt ttatcggaac ttgctatgga tagtaaagaa aggaaactcctatcctaagc
tcagcaagtc atacacaaac aacaaaggga aagaagtgct tgtaatctggggagtgcacc accctccgac tgacagggac
caacagaccc tctaccagaa taatcacacatatatttcag ttggatcatc aaaatactac caaaggttca caccagaaat
agtagccagacctaaagtca gagaacaagc aggcagaatg aattattatt ggacactgtt agatcagggagacaccataa
cttttgaagc cactgggaat ttaatagcac catggcacgc atttgcattgaataagggct ctagttctgg aattatgatg
tcggatgctc atgttcacaa ttgcaccacaaagtgccaaa ctcctcatgg ggccttgaaa agcaatcttc cttttcagaa
cgtacatcccatcactattg gagaatgccc caaatatgtt aaaagcaccc aactaagaat ggcaacaggattaaggaaca
tcccctctgt tcaatccaga ggacttttg gggcaattgc cggattcattgaaggaggat ggacaggaat gatagatgga
tggtatggat atcaccatca aaatgagcagggatctggtt acgcagcaga tcagaagagc acacagatcg caattgatgg
gatcagcaacaaagtgaact cagtaattga aaaaatgaac actcaattta cttcagtggg caaggagttcaatgatctag
agaaacggat tgagaatttg aacaagaagg tcgatgatgg atttttggatgtatggacat ataatgctga gttgctcatt
ctactcgaga acgaaaggac tctagatttccatgacttta acgtaaaaaa tttatatgaa aaggtcaaat ctcaactgag
aaacaatgccaaggaaatcg gaaatggctg ttttgagttc taccacaaat gtgataatga atgcatggaaagcgtaaaga
atggcacata taattatccc aagtattcag aagaatccaa attgaatagagaggaaatag acggtgtgaa actagaatca
atgggagttc accagatttt ggcgatctactccacagtcg ccagttccct ggtcttgtta gtctccctgg gggcaatcag
cttctggatgtgttctaatg ggtcattgca atgcagagta tgcatttaag acttgaatct caaaatgtacgg"
## attr(,"name")
## [1] "CY009892.1"
## attr(,"Annot")
## [1] ">CY009892.1"
## attr(,"class")
## [1] "SeqFastadna"
##
## $JQ290156.1
## [1] "atgaaagtaa aactactgac cctgttttgt acatttacag ctacatatgc ggacacaatatgtataggat ac
catgccaa caactcaacc gacactgttg acacagtact tgaaaagaacgtgacagtga cacactctgt caacctactt g
aggacagtc acaatgggaa gctgtgcctactaaagggga tagcccccct acaattgggt aattgcagcg ttgccggatg
gatattaggaaacccagaat gcgaatcact gatttccaag aaatcatggt cctatattgt agaaacaccaaatcctgaga
atggagcatg ttacccaggg gagttcgccg actatgagga gctaagggagcaattgagtt cagtatcttc atttgagaga
ttcgaaatat tccccaaaga aagctcatggcccaaccaca ctgcaaccgg agtgtcagcc tcatgctccc ataatgggga
aaggagtttttacagaaatc tgatatggct gacagtgaaa aatggtttgt acccgaacct gagcaagtcctatgaaaacg
acaaagagaa agaagtcctt atactatggg gtgttcatca tccgcctaacatagagaacc aaaggaccct ctatcacaca
gaaaatgctt atgtctctgt agtgtcttcacattatagcg gaagattcac cccagaaata accaaaaggc ccaaagtaag
agatcaggaaggaagaatca actactactg gactctgctg gaacccgggg atacaataat atttgaggcaaatggaaatc
taatagcgcc atggtatgct ttcacactga gtagaggcct tggatcaggaatcatcacct ctaatgcacc aatggacgaa
tgtgattcga agtgtcaaac acctcaaggagctataaaca gcagtcttcc tttccagaat gtacacccag tcacaatagg
agaatgtccaaagtatgtca ggagtgcaaa attaaggatg gttacaggac taaggaacat cccatccattcaatccagag
gtttgtttgg ggccattgcc ggtttcattg aaggggggtg gactggaatggtagatgggt ggtatggtta tcaccatcag
aatgagcagg gatctggcta tgctgcagatcaagaaagca cacaaaatgc cattaacggg atcacaaaca aggtgaattc
tgtaattgagaaaatgaaca ctcaattcac agctgtgggc aaggaattca acaaattgga aagaaggatggaaaacttaa
acaaaaaggt tgatgatggg tttctagaca tttggacata caatgcagagttgttggttc tactggaaaa tgaaagaact
ttggacttcc acgactccaa tgtgaagagtctgtacgaga aagtaaaaag ccaattaaag aataatgcta aagaaatagg
gaatgggtgctttgaattct atcacaagtg taacaacgaa tgcatggaga gtgtgaaaaa tggaacttatgactatccaa
agtattatga agaatcaaag ttaaacaggg aaaaaattga tggagttaaattggactcaa tgggggtcta tcggattctg
gcgatctact caactgtcgc cagttccctggttcttttgg tctccctggg ggcaatcagc ttctggatgt gttccaatgg
gtctttgcaatgtagaatat gcatctgaga tcaaaatttc agaaatataa gaaaaaacac c"
## attr(,"name")
## [1] "JQ290156.1"
```

```
## attr(,"Annot")
## [1] ">JQ290156.1"
## attr(,"class")
## [1] "SeqFastadna"
##
## $CY002954.1
## [1] "gcaggggata attctattaa ccatgaagac tatcattgct ttgagctaca ttctatgtctggttttcgct ca
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gtcctcatcagatccttgat ggagaaaact gcacactaat agatgctcta ttgggagacc ctcagtgtgatggcttccaa
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ccttaggtca ctagttgcct catccggcacactggagttt aacaatgaaa gcttcaattg gactggagtc actcaaaatg
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ttcaaaatgtaaacaggatc acatatgggg cctgtcccag atatgttaag caaaacactc tgaaattggcaacagggatg
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tcaaccaaatcaatgggaag ctgaataggt tgatcgggaa aaccaacgag aaattccatc agattgaaaaagaattctca
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tcttgttgcc ctggagaacc aacatacaattgatctaact gactcagaaa tgaacaaact gtttgaaaga acaaagaagc
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atcagaaatg gaacttatga ccatgatgta tacagagatg aagcattaaacaaccggttc cagatcaaag gtgttgagct
gaagtcagga tacaaagatt ggatcctatggatttccttt gccatatcat gttttttgct ttgtgttgct ttgttggggt
tcatcatgtgggcctgccaa aaaggcaaca ttaggtgcaa catttgcatt tgagtgcatt aattaaaaacac"
## attr(,"name")
## [1] "CY002954.1"
## attr(,"Annot")
## [1] ">CY002954.1"
## attr(,"class")
## [1] "SeqFastadna"
##
## $CY050198.1
## [1] "aaaagcaaca aaaatgaagg caatactagt agttctgcta tatacatttg caaccgcaaatgcagacaca tt
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gttaacctt ctagaagaca agcataacgggaaactatgc aaactaagag gggtagcccc attgcatttg ggtaaatgta
acattgctggctggatcctg ggaaatccag agtgtgaatc actctccaca gcaagctcat ggtcctacattgtggaaaca
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aaatcctaca ttaatgataa agggaaagaa gtcctcgtgc tatggggcattcaccatcca tctactagtg ctgaccaaca
aagtctctat cagaatgcag atgcatatgtttttgtgggg tcatcaagat acagcaagaa gttcaagccg gaaatagcaa
taagacccaaagtgagggat caagaaggga gaatgaacta ttactggaca ctagtagagc cgggagacaaaataacattc
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tacaccagtc cacgattgca atacaacttgtcagacaccc aagggtgcta taaacaccag cctcccattt cagaatatac
atccgatcacaattggaaaa tgtccaaaat atgtaaaaag cacaaaattg agactggcca caggattgaggaatgtcccg
```

```
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ctaacaaagtaaattctgtt attgaaaaga tgaatacaca gttcacagca gtaggcaaag agttcaaccacctggaaaaa
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ggaaaatgaa agaactttgg actaccacgattcaaatgtg aagaacttat atgaaaaggt aagaagccag ttaaaaaaca
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ggatgtgctctaatgggtct ctacagtgta gaatatgtat ttaacattag gatttcagaa gca"
## attr(,"name")
## [1] "CY050198.1"
## attr(,"Annot")
## [1] ">CY050198.1"
## attr(,"class")
## [1] "SeqFastadna"
##
## $KT889237.1
## [1] "atgaagacta tcattgcttt gagctacatt ctatgtctgg ttttcgctca aaaacttcctggaaatgaca at
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aagttacta atgctactga gctggttcagaattcctcaa taggtgaaat atgcgacagt cctcatcaga tccttgatgg
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tccggcacac tggagtttaa caatgaaagcttcaattgga ctggagtcac tcaaaacgga acaagttctg cttgcataag
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tatgctcaat catcaggaag aatcacagtatctaccaaaa gaagccaaca agctgtaatc ccgaatatcg gatctagacc
cagaataaggaatatcccta gcagaataag catctattgg acaatagtaa aaccgggaga catacttttgattaacagca
cagggaatct aattgctcct aggggttact tcaaaatacg aagtgggaaaagctcaataa tgagatcaga tgcacccatt
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atcctatgga tttcctttgc catatcatgttttttgcttt gtgttgcttt gttggggttc atcatgtggg cctgccaaaa
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## attr(,"name")
## [1] "KT889237.1"
## attr(,"Annot")
## [1] ">KT889237.1"
## attr(,"class")
## [1] "SeqFastadna"
##
## $CY125728.1
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ggagataa aatatgtctt gggcaccatg ctgtggcaaa tggaacaaaagtgaacacat taacagagag aggaatcgaa g
```

```
tagtaaatg ccacagaaac ggtggagactgcaaatacta agaaaatatg cactcagggg aaaagaccaa cagatctggg
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ttctact"
## attr(,"name")
## [1] "CY125728.1"
## attr(,"Annot")
## [1] ">CY125728.1"
## attr(,"class")
## [1] "SeqFastadna"
```

```
# Sobre escribir el archivo con más datos
write.fasta(sequences = virus_seq_no_alineadas, names = virus_GenBank_IDs, nbchar = 1
0, file.out = "virus_seqs.fasta")
```

```
# Volver a cargar los datos en formato FASTA
virus_seq_no_alineadas <- read.fasta("virus_seqs.fasta", seqtype = "DNA", as.string =
FALSE, forceDNAtolower = FALSE)
virus_seq_no_alineadas
```

```
## $`Influenza_A_virus_(A/Bogota/WR0090N/2009(H1N1))_HA_CY049836.1`
##    [1] "a" "t" "g" "a" "a" "g" "g" "c" "a" "a" " " "t" "a" "c" "t" "a" "g" "t"
##   [19] "a" "g" "t" " " "t" "c" "t" "g" "c" "t" "a" "t" "a" "t" " " "a" "c" "a"
##   [37] "t" "t" "t" "g" "c" "a" "a" " " "c" "c" "g" "c" "a" "a" "a" "t" "g" "c"
##   [55] " " "a" "g" "a" "c" "a" "c" "a" "t" "t" "a" "t" "g" "t" "a" "t" "a" "g"
##   [73] "g" "t" "t" " " "a" "t" "c" "a" "t" "g" "c" "g" "a" "a" " " "c" "a" "a"
##   [91] "t" "t" "c" "a" "a" "c" "a" " " "g" "a" "c" "a" "c" "t" "g" "t" "a" "g"
##  [109] " " "a" "c" "a" "c" "a" "g" "t" "a" "c" "t" " " "a" "g" "a" "a" "a" "a"
##  [127] "g" "a" "a" "t" "g" "t" "a" "a" "c" "a" "g" "t" "a" "a" " " "c" "a" "c"
##  [145] "a" "c" "t" "c" "t" "g" "t" " " "t" "a" "a" "c" "c" "t" "t" "c" "t" "a"
##  [163] " " "g" "a" "a" "g" "a" "c" "a" "a" "g" "c" " " "a" "t" "a" "a" "c" "g"
##  [181] "g" "g" "a" "a" " " "a" "c" "t" "a" "t" "g" "c" "a" "a" "a" "c" "t" "a"
##  [199] "a" "g" "a" "g" "g" "g" "g" " " "t" "a" "g" "c" "c" "c" "c" "a" "t" "t"
##  [217] " " "g" "c" "a" "t" "t" "t" "g" "g" "g" "t" " " "a" "a" "a" "t" "g" "t"
##  [235] "a" "a" "c" "a" " " "t" "t" "g" "c" "t" "g" "g" "c" "t" "g" " " "g" "a"
##  [253] "t" "c" "c" "t" "g" "g" "g" "a" "a" "a" "t" "c" "c" "a" "g" "a" "g" "t"
##  [271] " " "g" "t" "g" "a" "a" "t" "c" "a" "c" "t" " " "c" "t" "c" "c" "a" "c"
##  [289] "a" "g" "c" "a" " " "a" "g" "c" "t" "c" "a" "t" "g" "g" "t" " " "c" "c"
##  [307] "t" "a" "c" "a" "t" "t" "g" "t" " " "g" "g" "a" "a" "a" "c" "a" "t" "c"
##  [325] "t" "a" "g" "t" "t" "c" "a" "g" "a" "c" "a" " " "a" "t" "g" "g" "a" "a"
##  [343] "c" "g" "t" "g" " " "t" "t" "a" "c" "c" "c" "a" "g" "g" "a" " " "g" "a"
##  [361] "t" "t" "t" "c" "a" "t" "c" "g" " " "a" "t" "t" "a" "t" "g" "a" "g" "g"
##  [379] "a" " " "g" "c" "t" "a" "a" "g" "a" "g" "a" "g" "c" "a" "a" "t" "t" "g"
##  [397] "a" "g" "c" "t" " " "c" "a" "g" "t" "g" "t" "c" "a" "t" "c" " " "a" "t"
##  [415] "t" "t" "g" "a" "a" "a" "g" "a" " " "t" "t" "t" "g" "a" "g" "a" "t" "a"
##  [433] "t" " " "t" "c" "c" "c" "c" "a" "a" "g" "a" "c" " " "a" "a" "g" "t" "t"
##  [451] "c" "a" "t" "g" "g" "c" "c" "c" "a" "a" "t" "c" "a" "t" "g" " " "a" "c"
##  [469] "t" "c" "g" "a" "a" "c" "a" "a" " " "a" "g" "g" "t" "g" "t" "a" "a" "c"
##  [487] "g" " " "g" "c" "a" "g" "c" "a" "t" "g" "t" "c" " " "c" "t" "c" "a" "t"
##  [505] "g" "c" "t" "g" "g" " " "a" "g" "c" "a" "a" "a" "a" "a" "g" "c" "t" "t"
##  [523] "c" "t" "a" "c" "a" "a" "a" "a" " " "a" "t" "t" "t" "a" "a" "t" "a" "t"
##  [541] "g" " " "g" "c" "t" "a" "g" "t" "t" "a" "a" "a" " " "a" "a" "a" "g" "g"
##  [559] "a" "a" "a" "t" "t" " " "c" "a" "t" "a" "c" "c" "c" "a" "a" "a" " " "g"
##  [577] "c" "t" "c" "a" "g" "c" "a" "a" "a" "t" "c" "c" "t" "a" "c" "a" "t" "t"
##  [595] "a" " " "a" "t" "g" "a" "t" "a" "a" "a" "g" "g" " " "g" "a" "a" "a" "g"
##  [613] "a" "a" "g" "t" "c" " " "c" "t" "c" "g" "t" "g" "c" "t" "a" "t" " " "g"
##  [631] "g" "g" "g" "c" "a" "t" "t" "c" "a" " " "c" "c" "a" "t" "c" "c" "a" "t"
##  [649] "c" "t" "a" "c" "t" "a" "g" "t" "g" "c" "t" "g" " " "a" "c" "c" "a" "a"
##  [667] "c" "a" "a" "a" "g" " " "t" "c" "t" "c" "t" "a" "t" "c" "a" "g" " " "a"
##  [685] "a" "t" "g" "c" "a" "g" "a" "t" "g" " " "c" "a" "t" "a" "t" "g" "t" "t"
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##  [721] "a" "t" "a" "c" "a" " " "g" "t" "a" "a" "g" "a" "a" "g" "t" "t" " " "c"
##  [739] "a" "a" "g" "c" "c" "g" "g" "a" "a" " " "a" "t" "a" "g" "c" "a" "a" "t"
##  [757] "a" "a" " " "g" "a" "c" "c" "c" "a" "a" "a" "g" "t" " " "g" "a" "g" "g"
##  [775] "g" "a" "t" "c" "a" "a" "g" "a" "a" "g" "g" "g" "a" "g" "a" "a" " " "t"
##  [793] "g" "a" "a" "c" "t" "a" "t" "t" "a" " " "c" "t" "g" "g" "a" "c" "a" "c"
##  [811] "t" "a" " " "g" "t" "a" "g" "a" "g" "c" "c" "g" "g" " " "g" "a" "g" "a"
##  [829] "c" "a" "a" "a" "a" "t" " " "a" "a" "c" "a" "t" "t" "c" "g" "a" "a" "g"
```

```
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##  [865] "g" "t" " " "a" "c" "c" "g" "a" "g" "a" "t" "a" "t" " " "g" "c" "a" "t"
##  [883] "t" "c" "g" "c" "a" "a" " " "t" "g" "g" "a" "a" "a" "g" "a" "a" "a" " "
##  [901] "t" "g" "c" "t" "g" "g" "a" "t" "c" "t" "g" "g" "t" "a" "t" "t" "a" "t"
##  [919] "c" "a" " " "t" "t" "t" "c" "a" "g" "a" "t" "a" "c" " " "a" "c" "c" "a"
##  [937] "g" "t" "c" "c" "a" "c" " " "a" "a" "t" "t" "g" "c" "a" "a" "t" "a" " "
##  [955] "c" "a" "a" "c" "t" "t" "g" "t" "c" "a" " " "g" "a" "c" "a" "c" "c" "c"
##  [973] "a" "a" "g" "g" "g" "t" "g" "c" "t" "a" "t" "a" "a" " " "a" "c" "a" "c"
##  [991] "c" "a" "g" "c" "c" "t" " " "c" "c" "c" "a" "t" "t" "t" "c" "a" "g" " "
## [1009] "a" "a" "t" "a" "t" "a" "c" "a" "t" "c" " " "c" "g" "a" "t" "c" "a" "c"
## [1027] "a" "a" "t" " " "t" "g" "g" "a" "a" "a" "a" "t" "g" "t" "c" "c" "a" "a"
## [1045] "a" "a" "t" "a" "t" "g" " " "t" "a" "a" "a" "a" "a" "g" "c" "a" "c" " "
## [1063] "a" "a" "a" "a" "t" "t" "g" "a" "g" "a" " " "c" "t" "g" "g" "c" "c" "a"
## [1081] "c" "a" "g" " " "g" "a" "t" "t" "g" "a" "g" "g" "a" "a" " " "t" "g" "t"
## [1099] "c" "c" "c" "g" "t" "c" "t" "a" "t" "t" "c" "a" "a" "t" "c" "t" "a" " "
## [1117] "g" "a" "g" "g" "c" "c" "t" "a" "t" "t" " " "t" "g" "g" "g" "g" "c" "c"
## [1135] "a" "t" "t" " " "g" "c" "c" "g" "g" "t" "t" "t" "c" "a" " " "t" "t" "g"
## [1153] "a" "a" "g" "g" "g" "g" "g" " " "g" "t" "g" "g" "a" "c" "a" "g" "g" "g"
## [1171] "a" "t" "g" "g" "t" "a" "g" "a" "t" "g" " " "g" "a" "t" "g" "g" "t" "a"
## [1189] "c" "g" "g" " " "t" "t" "a" "t" "c" "a" "c" "c" "a" "t" " " "c" "a" "a"
## [1207] "a" "a" "t" "g" "a" "g" "c" " " "a" "g" "g" "g" "g" "t" "c" "a" "g" "g"
## [1225] " " "a" "t" "a" "t" "g" "c" "a" "g" "c" "c" "g" "a" "t" "c" "t" "g" "a"
## [1243] "a" "g" "a" " " "g" "c" "a" "c" "a" "c" "a" "g" "a" "a" " " "t" "g" "c"
## [1261] "c" "a" "t" "t" "g" "a" "c" " " "g" "a" "g" "a" "t" "t" "a" "c" "t" "a"
## [1279] " " "a" "c" "a" "a" "a" "g" "t" "a" "a" "a" " " "t" "t" "c" "t" "g" "t"
## [1297] "t" "a" "t" "t" "g" "a" "a" "a" "a" "g" "a" "t" "g" "a" " " "a" "t" "a"
## [1315] "c" "a" "c" "a" "g" "t" "t" " " "c" "a" "c" "a" "g" "c" "a" "g" "t" "a"
## [1333] " " "g" "g" "t" "a" "a" "a" "g" "a" "g" "t" " " "t" "c" "a" "a" "c" "c"
## [1351] "a" "c" "c" "t" " " "g" "g" "a" "a" "a" "a" "a" "a" "g" "a" "a" "t" "a"
## [1369] "g" "a" "g" "a" "a" "t" "t" " " "t" "a" "a" "a" "t" "a" "a" "a" "a" "a"
## [1387] " " "a" "g" "t" "t" "g" "a" "t" "g" "a" "t" " " "g" "g" "t" "t" "t" "c"
## [1405] "c" "t" "g" "g" " " "a" "c" "a" "t" "t" "t" "g" "g" "a" "c" " " "t" "t"
## [1423] "a" "c" "a" "a" "t" "g" "c" "c" "g" "a" "a" "c" "t" "g" "t" "t" "g" "g"
## [1441] " " "t" "t" "c" "t" "a" "t" "t" "g" "g" "a" " " "a" "a" "a" "t" "g" "a"
## [1459] "a" "a" "g" "a" " " "a" "c" "t" "t" "t" "g" "g" "a" "c" "t" " " "a" "c"
## [1477] "c" "a" "c" "g" "a" "t" "t" "c" " " "a" "a" "a" "t" "g" "t" "g" "a" "a"
## [1495] "g" "a" "a" "c" "t" "t" "a" "t" "a" "t" "g" " " "a" "a" "a" "a" "g" "g"
## [1513] "t" "a" "a" "g" " " "a" "a" "g" "c" "c" "a" "g" "t" "t" "a" " " "a" "a"
## [1531] "a" "a" "a" "c" "a" "a" "t" "g" " " "c" "c" "a" "a" "g" "g" "a" "a" "a"
## [1549] "t" " " "t" "g" "g" "a" "a" "a" "c" "g" "g" "c" "t" "g" "c" "t" "t" "t"
## [1567] "g" "a" "a" "t" " " "t" "t" "t" "a" "c" "c" "a" "c" "a" "a" " " "a" "t"
## [1585] "g" "c" "g" "a" "t" "a" "a" "c" " " "a" "c" "g" "t" "g" "c" "a" "t" "g"
## [1603] "g" " " "a" "a" "a" "g" "t" "g" "t" "c" "a" "a" " " "a" "a" "a" "t" "g"
## [1621] "g" "g" "a" "c" "t" "t" "a" "t" "g" "a" "c" "t" "a" "c" "c" " " "c" "a"
## [1639] "a" "a" "a" "t" "a" "c" "t" "c" " " "a" "g" "a" "g" "g" "a" "a" "g" "c"
## [1657] "a" " " "a" "a" "a" "t" "t" "a" "a" "a" "c" "a" " " "g" "a" "g" "a" "a"
## [1675] "g" "a" "a" "a" "t" " " "a" "g" "a" "t" "g" "g" "g" "g" "t" "a" "a" "a"
## [1693] "g" "c" "t" "g" "g" "a" "a" "t" " " "c" "a" "a" "c" "a" "a" "g" "g" "a"
## [1711] "t" " " "t" "t" "a" "c" "c" "a" "g" "a" "t" "t" " " "t" "t" "g" "g" "c"
```

```
## [1729] "g" "a" "t" "c" "t" " " "a" "t" "t" "c" "a" "a" "c" "t" "g" "t" " " "c"
## [1747] "g" "c" "c" "a" "g" "t" "t" "c" "a" "t" "t" "g" "g" "t" "a" "c" "t" "g"
## [1765] "g" " " "t" "a" "g" "t" "c" "t" "c" "c" "c" "t" " " "g" "g" "g" "g" "g"
## [1783] "c" "a" "a" "t" "c" " " "a" "g" "t" "t" "t" "c" "t" "g" "g" "a" " " "t"
## [1801] "g" "t" "g" "c" "t" "c" "t" "g" "g" " " "t" "c" "a" "t" "c" "t" "a" "c"
## [1819] "a" "g" "t" "g" "t" "a" "g" "a" "a" "t" "a" "t" " " "g" "t" "a" "t" "t"
## [1837] "t" "a" "a"
## attr(,"name")
## [1] "Influenza_A_virus_(A/Bogota/WR0090N/2009(H1N1))_HA_CY049836.1"
## attr(,"Annot")
## [1] ">Influenza_A_virus_(A/Bogota/WR0090N/2009(H1N1))_HA_CY049836.1"
## attr(,"class")
## [1] "SeqFastadna"
##
## $`Influenza_A_virus_(A/Egypt/0636-NAMRU3/2007(H5N1))_HA_EF382359.1`
##    [1] "a" "t" "g" "g" "a" "g" "a" "a" "a" "a" " " "t" "a" "g" "t" "g" "c" "t"
##   [19] "t" "c" "t" " " "t" "c" "t" "t" "g" "c" "a" "a" "t" "a" " " "g" "t" "c"
##   [37] "a" "g" "t" "c" "t" "t" "g" " " "t" "t" "a" "a" "a" "a" "g" "t" "g" "a"
##   [55] " " "t" "c" "a" "g" "a" "t" "t" "t" "g" "c" "a" "t" "t" "g" "g" "t" "t"
##   [73] "a" "c" "c" " " "a" "t" "g" "c" "a" "a" "a" "c" "a" "a" " " "c" "t" "c"
##   [91] "g" "a" "c" "a" "g" "a" "g" " " "c" "a" "g" "g" "t" "t" "g" "a" "c" "a"
##  [109] " " "c" "a" "a" "t" "a" "a" "t" "g" "g" "a" " " "a" "a" "a" "g" "a" "a"
##  [127] "c" "g" "t" "c" "a" "c" "t" "g" "t" "t" "a" "c" "a" "c" " " "a" "c" "g"
##  [145] "c" "c" "c" "a" "a" "g" "a" " " "c" "a" "t" "a" "c" "t" "g" "g" "a" "a"
##  [163] " " "a" "a" "g" "a" "c" "a" "c" "a" "c" "a" " " "a" "c" "g" "g" "g" "a"
##  [181] "a" "a" "c" "t" " " "c" "t" "g" "c" "a" "a" "t" "c" "t" "a" "a" "a" "t"
##  [199] "g" "g" "a" "g" "t" "g" "a" " " "a" "g" "c" "c" "t" "c" "t" "a" "a" "t"
##  [217] " " "t" "t" "t" "a" "a" "g" "a" "g" "a" "t" " " "t" "g" "t" "a" "g" "t"
##  [235] "g" "t" "a" "g" " " "c" "t" "g" "g" "a" "t" "g" "g" "c" "t" " " "c" "c"
##  [253] "t" "c" "g" "g" "g" "a" "a" "c" "c" "c" "a" "a" "t" "g" "t" "g" "t" "g"
##  [271] " " "a" "c" "g" "a" "a" "t" "t" "c" "c" "t" " " "c" "a" "a" "t" "g" "t"
##  [289] "g" "c" "c" "g" " " "g" "a" "a" "t" "g" "g" "t" "c" "t" "t" " " "a" "c"
##  [307] "a" "t" "a" "g" "t" "g" "g" "a" " " "g" "a" "a" "g" "a" "t" "c" "a" "a"
##  [325] "t" "c" "c" "a" "g" "c" "c" "a" "a" "t" "g" " " "a" "c" "c" "t" "c" "t"
##  [343] "g" "t" "t" "a" " " "t" "c" "c" "a" "g" "g" "g" "a" "a" "t" " " "t" "t"
##  [361] "c" "a" "a" "c" "g" "a" "c" "t" " " "a" "t" "g" "a" "a" "g" "a" "a" "c"
##  [379] "t" " " "g" "a" "a" "a" "c" "a" "c" "c" "t" "a" "t" "t" "g" "a" "g" "c"
##  [397] "a" "g" "a" "a" " " "t" "a" "a" "a" "c" "c" "a" "t" "t" "t" " " "t" "g"
##  [415] "a" "g" "a" "a" "a" "a" "t" "t" " " "c" "a" "g" "a" "t" "c" "a" "t" "c"
##  [433] "c" " " "c" "c" "a" "a" "a" "a" "a" "t" "t" "c" " " "t" "t" "g" "g" "t"
##  [451] "c" "a" "g" "a" "t" "c" "a" "t" "g" "a" "a" "g" "c" "c" "t" " " "c" "a"
##  [469] "g" "g" "a" "g" "t" "g" "a" "g" " " "c" "t" "c" "a" "g" "c" "a" "t" "g"
##  [487] "t" " " "c" "c" "a" "t" "a" "c" "c" "a" "g" "g" " " "g" "a" "a" "g" "a"
##  [505] "t" "c" "c" "t" "c" " " "c" "t" "t" "t" "t" "t" "t" "a" "g" "a" "a" "a"
##  [523] "t" "g" "t" "g" "g" "t" "a" "t" " " "g" "g" "c" "t" "t" "a" "c" "c" "a"
##  [541] "a" " " "a" "a" "a" "g" "g" "a" "c" "a" "a" "t" " " "g" "c" "a" "t" "a"
##  [559] "c" "c" "c" "a" "a" " " "c" "a" "a" "t" "a" "a" "a" "g" "a" "g" " " "a"
##  [577] "a" "g" "t" "t" "a" "c" "a" "a" "t" "a" "a" "t" "a" "c" "c" "a" "a" "c"
##  [595] "c" " " "a" "a" "g" "a" "a" "g" "a" "t" "c" "t" " " "t" "t" "t" "g" "g"
```

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##  [613] "t" "a" "c" "t" "a" " " "t" "g" "g" "g" "g" "g" "a" "t" "t" "c" " " "a"
##  [631] "c" "c" "a" "t" "c" "c" "a" "a" "a" " " "t" "g" "a" "t" "g" "c" "g" "g"
##  [649] "c" "a" "g" "a" "g" "c" "a" "g" "a" "c" "a" "a" " " "g" "g" "c" "t" "c"
##  [667] "t" "a" "t" "c" "a" " " "a" "a" "a" "c" "c" "c" "a" "a" "c" "t" " " "a"
##  [685] "c" "c" "t" "a" "t" "a" "t" "t" "t" " " "c" "c" "g" "t" "t" "g" "g" "g"
##  [703] "a" "c" " " "a" "t" "c" "a" "a" "c" "a" "c" "t" "a" "a" "a" "c" "c" "a"
##  [721] "g" "a" "g" "a" "t" " " "t" "g" "g" "t" "a" "c" "c" "a" "a" "a" " " "a"
##  [739] "a" "t" "a" "g" "c" "t" "g" "c" "t" " " "a" "g" "a" "t" "c" "t" "a" "a"
##  [757] "g" "g" " " "t" "a" "a" "a" "c" "g" "g" "g" "c" "a" " " "a" "a" "g" "t"
##  [775] "g" "g" "a" "a" "g" "g" "a" "t" "g" "g" "a" "g" "t" "t" "c" "t" " " "t"
##  [793] "t" "t" "g" "g" "a" "c" "a" "a" "t" " " "t" "t" "t" "a" "a" "a" "a" "t"
##  [811] "c" "g" " " "a" "a" "t" "g" "a" "t" "g" "c" "a" "a" " " "t" "a" "a" "a"
##  [829] "c" "t" "t" "t" "g" "a" " " "g" "a" "g" "t" "a" "a" "t" "g" "g" "a" "a"
##  [847] "a" "t" "t" "t" "c" "a" "t" "t" "g" " " "c" "t" "c" "c" "a" "g" "a" "a"
##  [865] "a" "a" " " "t" "g" "c" "a" "t" "a" "c" "a" "a" "a" " " "a" "t" "t" "g"
##  [883] "t" "c" "a" "a" "g" "a" " " "a" "a" "g" "g" "g" "g" "a" "c" "t" "c" " "
##  [901] "a" "a" "c" "a" "a" "t" "t" "a" "t" "g" "a" "a" "a" "a" "g" "t" "g" "a"
##  [919] "g" "t" " " "t" "g" "g" "a" "a" "t" "a" "t" "g" "g" " " "t" "a" "a" "c"
##  [937] "t" "g" "c" "a" "a" "c" " " "a" "c" "c" "a" "a" "g" "t" "g" "t" "c" " "
##  [955] "a" "g" "a" "c" "t" "c" "c" "a" "a" "t" " " "a" "g" "g" "g" "g" "c" "g"
##  [973] "a" "t" "a" "a" "a" "c" "t" "c" "c" "a" "g" "t" "a" " " "t" "g" "c" "c"
##  [991] "a" "t" "t" "c" "c" "a" " " "c" "a" "a" "c" "a" "t" "c" "c" "a" "c" " "
## [1009] "c" "c" "t" "c" "t" "c" "a" "c" "c" "a" " " "t" "c" "g" "g" "g" "g" "a"
## [1027] "a" "t" "g" " " "c" "c" "c" "c" "a" "a" "a" "t" "a" "t" "g" "t" "g" "a"
## [1045] "a" "a" "t" "c" "a" "a" " " "a" "c" "a" "g" "a" "t" "t" "a" "g" "t" " "
## [1063] "c" "c" "t" "t" "g" "c" "t" "a" "c" "t" " " "g" "g" "g" "c" "t" "c" "a"
## [1081] "g" "a" "a" " " "a" "t" "a" "g" "c" "c" "c" "t" "c" "a" " " "a" "g" "g"
## [1099] "a" "g" "a" "g" "a" "g" "a" "a" "g" "a" "a" "g" "a" "a" "a" "a" "a" " "
## [1117] "a" "g" "a" "g" "a" "g" "g" "a" "c" "t" " " "a" "t" "t" "t" "g" "g" "a"
## [1135] "g" "c" "t" " " "a" "t" "a" "g" "c" "a" "g" "g" "t" "t" " " "t" "t" "a"
## [1153] "t" "a" "g" "a" "g" "g" "g" " " "a" "g" "g" "a" "t" "g" "g" "c" "a" "g"
## [1171] "g" "g" "a" "a" "t" "g" "g" "t" "a" "g" " " "a" "t" "g" "g" "t" "t" "g"
## [1189] "g" "t" "a" " " "t" "g" "g" "g" "t" "a" "c" "c" "a" "c" " " "c" "a" "t"
## [1207] "a" "g" "c" "a" "a" "c" "g" " " "a" "g" "c" "a" "g" "g" "g" "g" "a" "g"
## [1225] " " "t" "g" "g" "g" "t" "a" "c" "g" "c" "t" "g" "c" "a" "g" "a" "c" "a"
## [1243] "a" "a" "g" " " "a" "a" "t" "c" "c" "a" "c" "t" "c" "a" " " "a" "a" "a"
## [1261] "g" "g" "c" "a" "a" "t" "a" " " "g" "a" "t" "g" "g" "a" "g" "t" "c" "a"
## [1279] " " "c" "c" "a" "a" "t" "a" "a" "g" "g" "t" " " "c" "a" "a" "c" "t" "c"
## [1297] "g" "a" "t" "c" "a" "t" "t" "g" "a" "c" "a" "a" "a" "a" " " "t" "g" "a"
## [1315] "a" "c" "a" "c" "t" "c" "a" " " "g" "t" "t" "t" "g" "a" "g" "g" "c" "t"
## [1333] " " "g" "t" "t" "g" "g" "a" "a" "g" "g" "g" " " "a" "a" "t" "t" "t" "a"
## [1351] "a" "t" "a" "a" " " "c" "t" "t" "a" "g" "a" "a" "a" "g" "g" "a" "g" "a"
## [1369] "a" "t" "a" "g" "a" "a" "a" " " "a" "t" "t" "t" "a" "a" "a" "c" "a" "a"
## [1387] " " "g" "a" "a" "g" "a" "t" "g" "g" "a" "a" " " "g" "a" "c" "g" "g" "a"
## [1405] "t" "t" "c" "c" " " "t" "a" "g" "a" "t" "g" "t" "c" "t" "g" " " "g" "a"
## [1423] "c" "t" "t" "a" "t" "a" "a" "t" "g" "c" "t" "g" "a" "a" "c" "t" "t" "c"
## [1441] " " "t" "g" "g" "t" "t" "c" "t" "c" "a" "t" " " "g" "g" "a" "a" "a" "a"
## [1459] "t" "g" "a" "g" " " "a" "g" "a" "a" "c" "t" "c" "t" "a" "g" " " "a" "c"
## [1477] "t" "t" "t" "c" "a" "t" "g" "a" " " "c" "t" "c" "a" "a" "a" "t" "g" "t"
```

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## [1495] "c" "a" "a" "g" "a" "a" "c" "c" "t" "t" "t" " " "a" "c" "g" "a" "c" "a"
## [1513] "a" "g" "g" "t" " " "c" "c" "g" "a" "t" "t" "a" "c" "a" "g" " " "c" "t"
## [1531] "t" "a" "g" "g" "g" "a" "t" "a" " " "a" "t" "g" "c" "a" "a" "a" "g" "g"
## [1549] "a" " " "g" "c" "t" "t" "g" "g" "t" "a" "a" "c" "g" "g" "t" "t" "g" "t"
## [1567] "t" "t" "c" "g" " " "a" "g" "t" "t" "c" "t" "a" "t" "c" "a" " " "c" "a"
## [1585] "g" "a" "t" "g" "t" "g" "a" "t" " " "a" "a" "t" "g" "a" "a" "t" "g" "t"
## [1603] "a" " " "t" "g" "g" "a" "a" "a" "g" "t" "g" "t" " " "a" "a" "g" "a" "a"
## [1621] "a" "c" "g" "g" "a" "a" "c" "g" "t" "a" "t" "g" "a" "c" "t" " " "a" "c"
## [1639] "c" "c" "g" "c" "a" "g" "t" "a" " " "t" "t" "c" "a" "g" "a" "a" "g" "a"
## [1657] "a" " " "g" "c" "a" "a" "g" "a" "t" "t" "a" "a" " " "a" "a" "a" "g" "a"
## [1675] "g" "a" "g" "g" "a" " " "a" "a" "t" "a" "a" "g" "t" "g" "g" "a" "g" "t"
## [1693] "a" "a" "a" "a" "t" "t" "g" "g" " " "a" "g" "t" "c" "a" "a" "t" "a" "g"
## [1711] "g" " " "a" "a" "c" "t" "t" "a" "c" "c" "a" "a" " " "a" "t" "a" "c" "t"
## [1729] "g" "t" "c" "a" "a" " " "t" "t" "t" "a" "t" "t" "c" "a" "a" "c" " " "a"
## [1747] "g" "t" "g" "g" "c" "g" "a" "g" "c" "t" "c" "c" "c" "t" "a" "g" "c" "a"
## [1765] "c" " " "t" "g" "g" "c" "a" "a" "t" "c" "a" "t" " " "g" "g" "t" "g" "g"
## [1783] "c" "t" "g" "g" "t" " " "c" "t" "a" "t" "t" "t" "t" "t" "a" "t" " " "g"
## [1801] "g" "a" "t" "g" "t" "g" "c" "t" "c" " " "c" "a" "a" "t" "g" "g" "a" "t"
## [1819] "c" "g" "t" "t" "a" "c" "a" "a" "t" "g" "c" "a" " " "g" "a" "a" "t" "t"
## [1837] "t" "g" "c" "a" "t" " " "t" "t" "a" "a" "a" "t" "t" "t" "g" "t" " " "g"
## [1855] "a" "g" "t" "t" "c" "a" "a" "a" "t" " " "t" "g" "t" "a" "g" "t" "t" "a"
## [1873] "a" "a" " " "a" "a" "c" "a" "c" "c" "t" "t" "t" "g" "t" "t" "t" "c" "c"
## [1891] "t" "a" "c" "t"
## attr(,"name")
## [1] "Influenza_A_virus_(A/Egypt/0636-NAMRU3/2007(H5N1))_HA_EF382359.1"
## attr(,"Annot")
## [1] ">Influenza_A_virus_(A/Egypt/0636-NAMRU3/2007(H5N1))_HA_EF382359.1"
## attr(,"class")
## [1] "SeqFastadna"
##
## $`Influenza_A_virus_(A/Thailand/271/2005(H1N1))_HA_EF101749.1`
##    [1] "a" "g" "c" "a" "a" "a" "a" "g" "c" "a" " " "g" "g" "g" "g" "a" "a" "a"
##   [19] "a" "t" "a" " " "a" "a" "a" "g" "c" "a" "a" "c" "c" "a" " " "g" "a" "a"
##   [37] "t" "g" "a" "a" "g" "g" "c" " " "a" "a" "t" "a" "c" "t" "a" "c" "t" "a"
##   [55] " " "g" "t" "c" "t" "t" "g" "c" "t" "a" "t" "g" "c" "a" "c" "a" "c" "t"
##   [73] "t" "g" "c" " " "a" "g" "c" "a" "g" "c" "a" "a" "a" "t" " " "g" "c" "a"
##   [91] "g" "a" "c" "a" "c" "a" "c" " " "t" "g" "t" "g" "t" "a" "t" "a" "g" "g"
##  [109] " " "t" "t" "a" "t" "c" "a" "t" "g" "c" "a" " " "a" "a" "t" "a" "a" "t"
##  [127] "t" "c" "a" "a" "c" "t" "g" "a" "c" "a" "c" "t" "g" "t" " " "t" "g" "a"
##  [145] "t" "a" "c" "a" "a" "t" "a" " " "t" "t" "a" "g" "a" "a" "a" "a" "g" "a"
##  [163] " " "a" "t" "g" "t" "t" "a" "c" "a" "g" "t" " " "a" "a" "c" "a" "c" "a"
##  [181] "c" "t" "c" "t" " " "g" "t" "t" "a" "a" "c" "c" "t" "t" "c" "t" "a" "g"
##  [199] "a" "a" "g" "a" "c" "a" "g" " " "g" "c" "a" "c" "a" "a" "t" "g" "g" "g"
##  [217] " " "a" "a" "g" "c" "t" "a" "t" "g" "t" "a" " " "a" "c" "c" "t" "a" "a"
##  [235] "g" "g" "g" "g" " " "g" "g" "a" "a" "g" "c" "c" "c" "c" "a" " " "c" "t"
##  [253] "g" "c" "a" "t" "t" "t" "g" "g" "g" "t" "a" "a" "a" "t" "g" "t" "a" "a"
##  [271] " " "c" "a" "t" "t" "g" "c" "c" "g" "g" "a" " " "t" "g" "g" "c" "t" "c"
##  [289] "c" "t" "a" "g" " " "g" "a" "a" "a" "c" "c" "c" "a" "g" "a" " " "a" "t"
##  [307] "g" "c" "g" "a" "a" "t" "t" "a" " " "c" "t" "a" "t" "t" "t" "g" "c" "a"
```

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##  [325] "g" "t" "a" "a" "a" "c" "t" "c" "a" "t" "g" " " "g" "t" "c" "t" "t" "a"
##  [343] "c" "a" "t" "t" " " "g" "t" "g" "g" "a" "a" "a" "c" "a" "t" " " "c" "g"
##  [361] "a" "a" "c" "t" "c" "a" "g" "a" " " "c" "a" "a" "t" "g" "g" "g" "a" "c"
##  [379] "a" " " "t" "g" "t" "t" "a" "c" "c" "c" "a" "g" "g" "a" "g" "a" "t" "t"
##  [397] "t" "c" "a" "c" " " "c" "a" "g" "t" "t" "a" "t" "g" "a" "a" " " "g" "a"
##  [415] "g" "c" "t" "a" "a" "g" "a" "g" " " "a" "a" "c" "a" "a" "t" "t" "g" "a"
##  [433] "g" " " "c" "t" "c" "a" "g" "t" "g" "t" "c" "a" " " "t" "c" "a" "t" "t"
##  [451] "t" "g" "a" "a" "a" "g" "a" "t" "t" "c" "g" "a" "g" "a" "t" " " "a" "t"
##  [469] "t" "c" "c" "c" "c" "a" "a" "a" " " "g" "c" "a" "a" "g" "c" "t" "c" "t"
##  [487] "t" " " "g" "g" "c" "c" "c" "a" "a" "c" "c" "a" " " "t" "g" "a" "a" "a"
##  [505] "c" "a" "a" "a" "c" " " "a" "g" "a" "g" "g" "t" "g" "t" "a" "a" "c" "g"
##  [523] "g" "c" "a" "g" "c" "a" "t" "g" " " "c" "c" "c" "t" "t" "a" "t" "g" "c"
##  [541] "t" " " "g" "g" "a" "a" "c" "a" "a" "a" "c" "a" " " "g" "c" "t" "t" "c"
##  [559] "t" "a" "c" "a" "g" " " "g" "a" "a" "t" "t" "t" "g" "a" "t" "a" " " "t"
##  [577] "g" "g" "c" "t" "a" "g" "t" "a" "a" "a" "a" "a" "a" "g" "g" "g" "a" "a"
##  [595] "a" " " "c" "t" "c" "a" "t" "a" "t" "c" "c" "a" " " "a" "a" "g" "c" "t"
##  [613] "c" "a" "g" "t" "a" " " "a" "a" "t" "c" "c" "t" "a" "t" "g" "t" " " "t"
##  [631] "a" "a" "t" "a" "a" "t" "a" "a" "g" " " "a" "a" "g" "a" "a" "g" "g" "a"
##  [649] "a" "g" "t" "c" "c" "t" "t" "g" "t" "a" "c" "t" " " "a" "t" "g" "g" "g"
##  [667] "g" "c" "a" "t" "c" " " "c" "a" "c" "c" "a" "t" "c" "c" "a" "c" " " "c"
##  [685] "c" "a" "c" "c" "a" "a" "t" "g" "c" " " "t" "g" "a" "t" "c" "a" "a" "c"
##  [703] "a" "a" " " "a" "g" "t" "c" "t" "c" "t" "a" "c" "c" "a" "g" "a" "a" "t"
##  [721] "g" "c" "a" "g" "a" " " "t" "g" "c" "c" "t" "a" "t" "g" "t" "t" " " "t"
##  [739] "t" "t" "g" "t" "g" "g" "g" "a" "t" " " "c" "a" "t" "c" "a" "a" "a" "a"
##  [757] "t" "a" " " "t" "a" "a" "c" "a" "a" "g" "a" "a" "a" " " "t" "t" "c" "a"
##  [775] "a" "a" "c" "c" "a" "g" "a" "a" "a" "t" "a" "g" "c" "a" "a" "a" " " "a"
##  [793] "a" "g" "a" "c" "c" "c" "a" "a" "g" " " "g" "t" "g" "a" "g" "g" "g" "g"
##  [811] "t" "c" " " "a" "a" "g" "c" "a" "g" "g" "a" "a" "g" " " "a" "a" "t" "g"
##  [829] "a" "a" "c" "t" "a" "t" " " "t" "a" "t" "t" "g" "g" "a" "c" "a" "t" "t"
##  [847] "a" "g" "t" "a" "g" "a" "g" "c" "c" " " "t" "g" "g" "a" "g" "a" "c" "a"
##  [865] "c" "a" " " "a" "t" "a" "a" "c" "a" "t" "t" "t" "g" " " "a" "a" "g" "c"
##  [883] "a" "a" "c" "t" "g" "g" " " "a" "a" "a" "t" "c" "t" "a" "g" "t" "g" " "
##  [901] "g" "c" "a" "c" "c" "a" "a" "g" "a" "t" "a" "t" "g" "c" "t" "t" "t" "t"
##  [919] "g" "c" " " "a" "a" "t" "g" "a" "a" "t" "a" "g" "a" " " "g" "a" "t" "c"
##  [937] "c" "t" "g" "g" "a" "t" " " "c" "a" "g" "g" "t" "a" "t" "c" "a" "t" " "
##  [955] "a" "a" "c" "a" "t" "c" "g" "g" "a" "t" " " "g" "c" "a" "c" "c" "a" "a"
##  [973] "t" "c" "c" "a" "t" "g" "a" "c" "t" "g" "t" "a" "a" " " "t" "g" "c" "g"
##  [991] "a" "c" "t" "t" "g" "t" " " "c" "a" "a" "a" "c" "a" "c" "c" "c" "a" " "
## [1009] "a" "g" "g" "g" "t" "g" "c" "c" "a" "t" " " "a" "a" "a" "c" "a" "c" "c"
## [1027] "a" "g" "c" " " "c" "t" "c" "c" "c" "a" "t" "t" "t" "c" "a" "g" "a" "a"
## [1045] "t" "a" "t" "t" "c" "a" " " "t" "c" "c" "a" "a" "t" "c" "a" "c" "t" " "
## [1063] "a" "t" "t" "g" "g" "a" "g" "a" "a" "t" " " "g" "t" "c" "c" "a" "a" "a"
## [1081] "a" "t" "a" " " "t" "g" "t" "c" "a" "a" "a" "a" "g" "c" " " "a" "c" "a"
## [1099] "a" "g" "a" "c" "t" "a" "a" "g" "a" "a" "t" "g" "g" "c" "c" "a" "c" " "
## [1117] "a" "g" "g" "a" "t" "t" "a" "a" "g" "a" " " "a" "a" "t" "a" "t" "c" "c"
## [1135] "c" "t" "t" " " "c" "t" "a" "t" "t" "c" "a" "a" "t" "c" " " "t" "a" "g"
## [1153] "a" "g" "g" "t" "c" "t" "g" " " "t" "t" "t" "g" "g" "g" "g" "c" "t" "a"
## [1171] "t" "t" "g" "c" "c" "g" "g" "t" "t" "t" " " "t" "a" "t" "t" "g" "a" "a"
## [1189] "g" "g" "a" " " "g" "g" "a" "t" "g" "g" "a" "c" "a" "g" " " "g" "a" "a"
```

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## [1207] "t" "g" "a" "t" "a" "g" "a" " " "t" "g" "g" "g" "t" "g" "g" "t" "a" "c"
## [1225] " " "g" "g" "t" "t" "a" "t" "c" "a" "c" "c" "a" "t" "c" "a" "g" "a" "a"
## [1243] "t" "g" "g" " " "a" "c" "a" "a" "g" "g" "a" "t" "c" "a" " " "g" "g" "a"
## [1261] "t" "a" "t" "g" "c" "a" "g" " " "c" "g" "g" "a" "c" "c" "a" "a" "a" "a"
## [1279] " " "g" "a" "g" "c" "a" "c" "a" "c" "a" "g" " " "a" "a" "t" "g" "c" "c"
## [1297] "a" "t" "c" "g" "a" "t" "a" "g" "g" "a" "t" "a" "a" "c" " " "t" "a" "a"
## [1315] "c" "a" "a" "g" "g" "t" "a" " " "a" "a" "t" "t" "c" "t" "g" "t" "t" "a"
## [1333] " " "t" "t" "g" "a" "a" "a" "a" "g" "a" "t" " " "g" "a" "a" "c" "a" "t"
## [1351] "a" "c" "a" "a" " " "t" "t" "c" "a" "c" "a" "g" "c" "a" "g" "t" "g" "g"
## [1369] "g" "t" "a" "a" "a" "g" "a" " " "a" "t" "t" "t" "a" "a" "c" "c" "a" "c"
## [1387] " " "t" "t" "a" "g" "a" "a" "a" "g" "a" "a" " " "g" "a" "a" "t" "a" "g"
## [1405] "a" "a" "a" "a" " " "c" "t" "t" "g" "a" "a" "c" "a" "a" "a" " " "a" "a"
## [1423] "g" "g" "t" "t" "g" "a" "t" "g" "a" "t" "g" "g" "a" "t" "t" "t" "t" "t"
## [1441] " " "g" "g" "a" "t" "g" "t" "t" "t" "g" "g" " " "a" "c" "a" "t" "a" "c"
## [1459] "a" "a" "t" "g" " " "c" "c" "g" "a" "a" "t" "t" "g" "t" "t" " " "a" "g"
## [1477] "t" "c" "c" "t" "a" "t" "t" "g" " " "g" "a" "a" "a" "a" "t" "g" "a" "g"
## [1495] "a" "g" "a" "a" "c" "t" "t" "t" "g" "g" "a" " " "t" "t" "t" "c" "c" "a"
## [1513] "t" "g" "a" "t" " " "t" "c" "a" "a" "a" "t" "g" "t" "a" "a" " " "a" "a"
## [1531] "a" "c" "c" "c" "t" "a" "t" "a" " " "t" "g" "a" "a" "a" "a" "g" "g" "t"
## [1549] "a" " " "a" "a" "g" "a" "c" "c" "c" "a" "g" "c" "t" "a" "a" "g" "g" "a"
## [1567] "a" "c" "a" "a" " " "t" "g" "c" "c" "a" "a" "a" "g" "a" "a" " " "a" "t"
## [1585] "t" "g" "g" "g" "a" "a" "t" "g" " " "g" "c" "t" "g" "c" "t" "t" "t" "g"
## [1603] "a" " " "a" "t" "t" "c" "t" "a" "t" "c" "a" "c" " " "a" "a" "a" "t" "g"
## [1621] "t" "g" "a" "t" "g" "a" "c" "a" "c" "a" "t" "g" "c" "a" "t" " " "g" "g"
## [1639] "a" "g" "a" "g" "c" "a" "t" "c" " " "a" "a" "a" "a" "a" "t" "g" "g" "g"
## [1657] "a" " " "c" "t" "t" "a" "c" "g" "a" "t" "t" "a" " " "c" "c" "c" "c" "a"
## [1675] "a" "a" "t" "a" "c" " " "t" "c" "a" "a" "a" "a" "g" "a" "a" "t" "c" "a"
## [1693] "a" "a" "a" "c" "t" "a" "a" "a" " " "c" "a" "g" "a" "g" "a" "g" "g" "a"
## [1711] "a" " " "a" "t" "a" "g" "a" "t" "g" "g" "a" "g" " " "t" "a" "c" "a" "a"
## [1729] "c" "t" "g" "g" "a" " " "g" "t" "c" "a" "a" "c" "a" "a" "g" "g" " " "c"
## [1747] "t" "t" "t" "a" "c" "c" "a" "g" "a" "t" "t" "t" "t" "g" "g" "c" "g" "a"
## [1765] "t" " " "c" "t" "a" "t" "t" "c" "a" "a" "c" "t" " " "g" "c" "c" "g" "c"
## [1783] "c" "a" "g" "t" "t" " " "c" "a" "c" "t" "g" "g" "t" "a" "c" "t" " " "g"
## [1801] "t" "t" "g" "g" "t" "c" "t" "c" "c" " " "c" "t" "g" "g" "g" "g" "g" "c"
## [1819] "a" "a" "t" "c" "g" "g" "t" "t" "t" "c" "t" "g" " " "g" "a" "t" "g" "t"
## [1837] "g" "c" "t" "c" "c" " " "a" "a" "t" "g" "g" "g" "t" "c" "t" "t" " " "t"
## [1855] "g" "c" "a" "g" "t" "g" "c" "a" "g" " " "a" "a" "t" "a" "t" "g" "t" "a"
## [1873] "t" "t" " " "a" "a" "a" "a" "a" "c" "t" "a" "g" "g" "a" "t" "t" "t" "c"
## [1891] "a" "g" "a" "g" "a" " " "c" "a" "t" "g" "a" "g" "a" "a" "a" "a" " " "a"
## [1909] "a" "c" "a" "c" "c" "c" "t" "t" "g" " " "t" "t" "t" "c" "t" "a" "c" "t"
## attr(,"name")
## [1] "Influenza_A_virus_(A/Thailand/271/2005(H1N1))_HA_EF101749.1"
## attr(,"Annot")
## [1] ">Influenza_A_virus_(A/Thailand/271/2005(H1N1))_HA_EF101749.1"
## attr(,"class")
## [1] "SeqFastadna"
##
## $`Influenza_A_virus_(A/swine/Spain/50047/2003(H1N1))_HA_CY009892.1`
##    [1] "a" "a" "a" "a" "t" "t" "a" "a" "a" "t" " " " " "c" "a" "a" "c" "c" "a" "a"
```

```
##   [19] "a" "a" "t" " " "g" "g" "a" "a" "g" "t" "a" "a" "a" "a" " " "c" "t" "g"
##   [37] "t" "t" "t" "g" "t" "a" "t" " " "t" "a" "t" "t" "c" "t" "g" "t" "g" "c"
##   [55] " " "a" "t" "t" "c" "a" "c" "t" "g" "c" "a" "c" "t" "g" "a" "a" "a" "g"
##   [73] "c" "t" "g" " " "a" "c" "a" "c" "c" "a" "t" "t" "t" "g" " " "t" "g" "t"
##   [91] "a" "g" "g" "c" "t" "a" "t" " " "c" "a" "t" "g" "c" "t" "a" "a" "c" "a"
##  [109] " " "a" "t" "t" "c" "c" "a" "c" "a" "g" "a" " " "c" "a" "c" "t" "g" "t"
##  [127] "c" "g" "a" "c" "a" "c" "a" "a" "t" "a" "c" "t" "g" "g" " " "a" "g" "a"
##  [145] "a" "g" "a" "a" "t" "g" "t" " " "g" "a" "c" "t" "g" "t" "t" "a" "c" "c"
##  [163] " " "c" "a" "t" "t" "c" "a" "g" "t" "t" "a" " " "a" "c" "t" "t" "a" "c"
##  [181] "t" "a" "g" "a" " " "a" "a" "a" "c" "a" "a" "c" "c" "a" "t" "a" "a" "t"
##  [199] "g" "g" "a" "a" "a" "a" "c" " " "t" "t" "t" "g" "t" "a" "g" "c" "c" "t"
##  [217] " " "g" "a" "a" "t" "g" "g" "a" "a" "a" "g" " " "g" "c" "c" "c" "c" "c"
##  [235] "t" "t" "a" "c" " " "a" "a" "c" "t" "g" "g" "g" "g" "a" "a" " " "c" "t"
##  [253] "g" "c" "a" "a" "c" "g" "t" "a" "g" "c" "a" "g" "g" "a" "t" "g" "g" "a"
##  [271] " " "t" "c" "c" "t" "t" "g" "g" "c" "a" "a" " " "c" "c" "c" "a" "g" "a"
##  [289] "a" "t" "g" "t" " " "g" "a" "c" "t" "t" "g" "t" "t" "g" "c" " " "t" "c"
##  [307] "a" "c" "a" "g" "c" "g" "a" "a" " " "t" "t" "c" "g" "t" "g" "g" "t" "c"
##  [325] "t" "t" "a" "c" "a" "t" "a" "a" "t" "a" "g" " " "a" "g" "a" "c" "t" "t"
##  [343] "c" "a" "a" "a" " " "t" "t" "c" "a" "a" "a" "a" "a" "a" "t" " " "g" "g"
##  [361] "a" "g" "c" "a" "t" "g" "c" "t" " " "a" "c" "c" "c" "a" "g" "g" "a" "g"
##  [379] "a" " " "a" "t" "t" "c" "g" "c" "t" "g" "a" "t" "t" "a" "t" "g" "a" "a"
##  [397] "g" "a" "a" "t" " " "t" "a" "a" "g" "g" "g" "a" "g" "c" "a" " " "g" "c"
##  [415] "t" "g" "a" "g" "t" "a" "c" "a" " " "g" "t" "c" "t" "c" "t" "t" "c" "a"
##  [433] "t" " " "t" "t" "g" "a" "a" "a" "g" "a" "t" "t" " " "t" "g" "a" "a" "a"
##  [451] "t" "t" "t" "t" "c" "c" "c" "a" "a" "a" "a" "g" "c" "a" "a" " " "c" "c"
##  [469] "t" "c" "a" "t" "g" "g" "c" "c" " " "a" "a" "a" "c" "c" "a" "t" "g" "a"
##  [487] "t" " " "a" "c" "a" "a" "c" "c" "a" "g" "a" "g" " " "g" "t" "a" "c" "c"
##  [505] "a" "c" "a" "g" "t" " " "t" "g" "c" "a" "t" "g" "c" "t" "c" "c" "c" "a"
##  [523] "t" "t" "c" "t" "g" "g" "a" "g" " " "c" "c" "a" "a" "c" "a" "g" "t" "t"
##  [541] "t" " " "t" "t" "a" "t" "c" "g" "g" "a" "a" "c" " " "t" "t" "g" "c" "t"
##  [559] "a" "t" "g" "g" "a" " " "t" "a" "g" "t" "a" "a" "a" "g" "a" "a" " " "a"
##  [577] "g" "g" "a" "a" "a" "c" "t" "c" "c" "t" "a" "t" "c" "c" "t" "a" "a" "g"
##  [595] "c" " " "t" "c" "a" "g" "c" "a" "a" "g" "t" "c" " " "a" "t" "a" "c" "a"
##  [613] "c" "a" "a" "a" "c" " " "a" "a" "c" "a" "a" "a" "g" "g" "g" "a" " " "a"
##  [631] "a" "g" "a" "a" "g" "t" "g" "c" "t" " " "t" "g" "t" "a" "a" "t" "c" "t"
##  [649] "g" "g" "g" "g" "a" "g" "t" "g" "c" "a" "c" "c" " " "a" "c" "c" "c" "t"
##  [667] "c" "c" "g" "a" "c" " " "t" "g" "a" "c" "a" "g" "g" "g" "a" "c" " " "c"
##  [685] "a" "a" "c" "a" "g" "a" "c" "c" "c" " " "t" "c" "t" "a" "c" "c" "a" "g"
##  [703] "a" "a" " " "t" "a" "a" "t" "c" "a" "c" "a" "c" "a" "t" "a" "t" "a" "t"
##  [721] "t" "t" "c" "a" "g" " " "t" "t" "g" "g" "a" "t" "c" "a" "t" "c" " " "a"
##  [739] "a" "a" "a" "t" "a" "c" "t" "a" "c" " " "c" "a" "a" "a" "g" "g" "t" "t"
##  [757] "c" "a" " " "c" "a" "c" "c" "a" "g" "a" "a" "a" "t" " " "a" "g" "t" "a"
##  [775] "g" "c" "c" "a" "g" "a" "c" "c" "t" "a" "a" "a" "g" "t" "c" "a" " " "g"
##  [793] "a" "g" "a" "a" "c" "a" "a" "g" "c" " " "a" "g" "g" "c" "a" "g" "a" "a"
##  [811] "t" "g" " " "a" "a" "t" "t" "a" "t" "t" "a" "t" "t" " " "g" "g" "a" "c"
##  [829] "a" "c" "t" "g" "t" "t" " " "a" "g" "a" "t" "c" "a" "g" "g" "g" "a" "g"
##  [847] "a" "c" "a" "c" "c" "a" "t" "a" "a" " " "c" "t" "t" "t" "t" "g" "a" "a"
##  [865] "g" "c" " " "c" "a" "c" "t" "g" "g" "g" "a" "a" "t" " " "t" "t" "a" "a"
##  [883] "t" "a" "g" "c" "a" "c" " " "c" "a" "t" "g" "g" "c" "a" "c" "g" "c" " "
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##  [901] "a" "t" "t" "t" "g" "c" "a" "t" "t" "g" "a" "a" "t" "a" "a" "g" "g" "g"
##  [919] "c" "t" " " "c" "t" "a" "g" "t" "t" "c" "t" "g" "g" " " "a" "a" "t" "t"
##  [937] "a" "t" "g" "a" "t" "g" " " "t" "c" "g" "g" "a" "t" "g" "c" "t" "c" " "
##  [955] "a" "t" "g" "t" "t" "c" "a" "c" "a" "a" " " "t" "t" "g" "c" "a" "c" "c"
##  [973] "a" "c" "a" "a" "a" "g" "t" "g" "c" "c" "a" "a" "a" " " "c" "t" "c" "c"
##  [991] "t" "c" "a" "t" "g" "g" " " "g" "g" "c" "c" "t" "t" "g" "a" "a" "a" " "
## [1009] "a" "g" "c" "a" "a" "t" "c" "t" "t" "c" " " "c" "t" "t" "t" "t" "c" "a"
## [1027] "g" "a" "a" " " "c" "g" "t" "a" "c" "a" "t" "c" "c" "c" "a" "t" "c" "a"
## [1045] "c" "t" "a" "t" "t" "g" " " "g" "a" "g" "a" "a" "t" "g" "c" "c" "c" " "
## [1063] "c" "a" "a" "a" "t" "a" "t" "g" "t" "t" " " "a" "a" "a" "a" "g" "c" "a"
## [1081] "c" "c" "c" " " "a" "a" "c" "t" "a" "a" "g" "a" "a" "t" " " "g" "g" "c"
## [1099] "a" "a" "c" "a" "g" "g" "a" "t" "t" "a" "a" "g" "g" "a" "a" "c" "a" " "
## [1117] "t" "c" "c" "c" "c" "t" "c" "t" "g" "t" " " "t" "c" "a" "a" "t" "c" "c"
## [1135] "a" "g" "a" " " "g" "g" "a" "c" "t" "t" "t" "t" "t" "g" " " "g" "g" "g"
## [1153] "c" "a" "a" "t" "t" "g" "c" " " "c" "g" "g" "a" "t" "t" "c" "a" "t" "t"
## [1171] "g" "a" "a" "g" "g" "a" "g" "g" "a" "t" " " "g" "g" "a" "c" "a" "g" "g"
## [1189] "a" "a" "t" " " "g" "a" "t" "a" "g" "a" "t" "g" "g" "a" " " "t" "g" "g"
## [1207] "t" "a" "t" "g" "g" "a" "t" " " "a" "t" "c" "a" "c" "c" "a" "t" "c" "a"
## [1225] " " "a" "a" "a" "t" "g" "a" "g" "c" "a" "g" "g" "g" "a" "t" "c" "t" "g"
## [1243] "g" "t" "t" " " "a" "c" "g" "c" "a" "g" "c" "a" "g" "a" " " "t" "c" "a"
## [1261] "g" "a" "a" "g" "a" "g" "c" " " "a" "c" "a" "c" "a" "g" "a" "t" "c" "g"
## [1279] " " "c" "a" "a" "t" "t" "g" "a" "t" "g" "g" " " "g" "a" "t" "c" "a" "g"
## [1297] "c" "a" "a" "c" "a" "a" "a" "g" "t" "g" "a" "a" "c" "t" " " "c" "a" "g"
## [1315] "t" "a" "a" "t" "t" "g" "a" " " "a" "a" "a" "a" "a" "t" "g" "a" "a" "c"
## [1333] " " "a" "c" "t" "c" "a" "a" "t" "t" "t" "a" " " "c" "t" "t" "c" "a" "g"
## [1351] "t" "g" "g" "g" " " "c" "a" "a" "g" "g" "a" "g" "t" "t" "c" "a" "a" "t"
## [1369] "g" "a" "t" "c" "t" "a" "g" " " "a" "g" "a" "a" "a" "c" "g" "g" "a" "t"
## [1387] " " "t" "g" "a" "g" "a" "a" "t" "t" "t" "g" " " "a" "a" "c" "a" "a" "g"
## [1405] "a" "a" "g" "g" " " "t" "c" "g" "a" "t" "g" "a" "t" "g" "g" " " "a" "t"
## [1423] "t" "t" "t" "t" "g" "g" "a" "t" "g" "t" "a" "t" "g" "g" "a" "c" "a" "t"
## [1441] " " "a" "t" "a" "a" "t" "g" "c" "t" "g" "a" " " "g" "t" "t" "g" "c" "t"
## [1459] "c" "a" "t" "t" " " "c" "t" "a" "c" "t" "c" "g" "a" "g" "a" " " "a" "c"
## [1477] "g" "a" "a" "a" "g" "g" "a" "c" " " "t" "c" "t" "a" "g" "a" "t" "t" "t"
## [1495] "c" "c" "a" "t" "g" "a" "c" "t" "t" "t" "a" " " "a" "c" "g" "t" "a" "a"
## [1513] "a" "a" "a" "a" " " "t" "t" "t" "a" "t" "a" "t" "g" "a" "a" " " "a" "a"
## [1531] "g" "g" "t" "c" "a" "a" "a" "t" " " "c" "t" "c" "a" "a" "c" "t" "g" "a"
## [1549] "g" " " "a" "a" "a" "c" "a" "a" "t" "g" "c" "c" "a" "a" "g" "g" "a" "a"
## [1567] "a" "t" "c" "g" " " "g" "a" "a" "a" "t" "g" "g" "c" "t" "g" " " "t" "t"
## [1585] "t" "t" "g" "a" "g" "t" "t" "c" " " "t" "a" "c" "c" "a" "c" "a" "a" "a"
## [1603] "t" " " "g" "t" "g" "a" "t" "a" "a" "t" "g" "a" " " "a" "t" "g" "c" "a"
## [1621] "t" "g" "g" "a" "a" "a" "g" "c" "g" "t" "a" "a" "a" "g" "a" " " "a" "t"
## [1639] "g" "g" "c" "a" "c" "a" "t" "a" " " "t" "a" "a" "t" "t" "a" "t" "c" "c"
## [1657] "c" " " "a" "a" "g" "t" "a" "t" "t" "c" "a" "g" " " "a" "a" "g" "a" "a"
## [1675] "t" "c" "c" "a" "a" " " "a" "t" "t" "g" "a" "a" "t" "a" "g" "a" "g" "a"
## [1693] "g" "g" "a" "a" "a" "t" "a" "g" " " "a" "c" "g" "g" "t" "g" "t" "g" "a"
## [1711] "a" " " "a" "c" "t" "a" "g" "a" "a" "t" "c" "a" " " "a" "t" "g" "g" "g"
## [1729] "a" "g" "t" "t" "c" " " "a" "c" "c" "a" "g" "a" "t" "t" "t" "t" " " "g"
## [1747] "g" "c" "g" "a" "t" "c" "t" "a" "c" "t" "c" "c" "a" "c" "a" "g" "t" "c"
## [1765] "g" " " "c" "c" "a" "g" "t" "t" "c" "c" "c" "t" " " "g" "g" "t" "c" "t"
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## [1783] "t" "g" "t" "t" "a" " " "g" "t" "c" "t" "c" "c" "c" "t" "g" "g" " " "g"
## [1801] "g" "g" "c" "a" "a" "t" "c" "a" "g" " " "c" "t" "t" "c" "t" "g" "g" "a"
## [1819] "t" "g" "t" "g" "t" "t" "c" "t" "a" "a" "t" "g" " " "g" "g" "t" "c" "a"
## [1837] "t" "t" "g" "c" "a" " " "a" "t" "g" "c" "a" "g" "a" "g" "t" "a" " " "t"
## [1855] "g" "c" "a" "t" "t" "t" "a" "a" "g" " " "a" "c" "t" "t" "g" "a" "a" "t"
## [1873] "c" "t" " " "c" "a" "a" "a" "a" "t" "g" "t" "a" "c" "g" "g"
## attr(,"name")
## [1] "Influenza_A_virus_(A/swine/Spain/50047/2003(H1N1))_HA_CY009892.1"
## attr(,"Annot")
## [1] ">Influenza_A_virus_(A/swine/Spain/50047/2003(H1N1))_HA_CY009892.1"
## attr(,"class")
## [1] "SeqFastadna"
##
## $`Influenza_A_virus_(A/Minnesota/19/2011(H1N2))_HA_JQ290156.1`
##    [1] "a" "t" "g" "a" "a" "a" "g" "t" "a" "a" " " "a" "a" "c" "t" "a" "c" "t"
##   [19] "g" "a" "c" " " "c" "c" "t" "g" "t" "t" "t" "t" "g" "t" " " "a" "c" "a"
##   [37] "t" "t" "t" "a" "c" "a" "g" " " "c" "t" "a" "c" "a" "t" "a" "t" "g" "c"
##   [55] " " "g" "g" "a" "c" "a" "c" "a" "a" "t" "a" "t" "g" "t" "a" "t" "a" "g"
##   [73] "g" "a" "t" " " "a" "c" "c" "a" "t" "g" "c" "c" "a" "a" " " "c" "a" "a"
##   [91] "c" "t" "c" "a" "a" "c" "c" " " "g" "a" "c" "a" "c" "t" "g" "t" "t" "g"
##  [109] " " "a" "c" "a" "c" "a" "g" "t" "a" "c" "t" " " "t" "g" "a" "a" "a" "a"
##  [127] "g" "a" "a" "c" "g" "t" "g" "a" "c" "a" "g" "t" "g" "a" " " "c" "a" "c"
##  [145] "a" "c" "t" "c" "t" "g" "t" " " "c" "a" "a" "c" "c" "t" "a" "c" "t" "t"
##  [163] " " "g" "a" "g" "g" "a" "c" "a" "g" "t" "c" " " "a" "c" "a" "a" "t" "g"
##  [181] "g" "g" "a" "a" " " "g" "c" "t" "g" "t" "g" "c" "c" "t" "a" "c" "t" "a"
##  [199] "a" "a" "g" "g" "g" "g" "a" " " "t" "a" "g" "c" "c" "c" "c" "c" "c" "t"
##  [217] " " "a" "c" "a" "a" "t" "t" "g" "g" "g" "t" " " "a" "a" "t" "t" "g" "c"
##  [235] "a" "g" "c" "g" " " "t" "t" "g" "c" "c" "g" "g" "a" "t" "g" " " "g" "a"
##  [253] "t" "a" "t" "t" "a" "g" "g" "a" "a" "a" "c" "c" "c" "a" "g" "a" "a" "t"
##  [271] " " "g" "c" "g" "a" "a" "t" "c" "a" "c" "t" " " "g" "a" "t" "t" "t" "c"
##  [289] "c" "a" "a" "g" " " "a" "a" "a" "t" "c" "a" "t" "g" "g" "t" " " "c" "c"
##  [307] "t" "a" "t" "a" "t" "t" "g" "t" " " "a" "g" "a" "a" "a" "c" "a" "c" "c"
##  [325] "a" "a" "a" "t" "c" "c" "t" "g" "a" "g" "a" " " "a" "t" "g" "g" "a" "g"
##  [343] "c" "a" "t" "g" " " "t" "t" "a" "c" "c" "c" "a" "g" "g" "g" " " "g" "a"
##  [361] "g" "t" "t" "c" "g" "c" "c" "g" " " "a" "c" "t" "a" "t" "g" "a" "g" "g"
##  [379] "a" " " "g" "c" "t" "a" "a" "g" "g" "g" "a" "g" "c" "a" "a" "t" "t" "g"
##  [397] "a" "g" "t" "t" " " "c" "a" "g" "t" "a" "t" "c" "t" "t" "c" " " "a" "t"
##  [415] "t" "t" "g" "a" "g" "a" "g" "a" " " "t" "t" "c" "g" "a" "a" "a" "t" "a"
##  [433] "t" " " "t" "c" "c" "c" "c" "a" "a" "a" "g" "a" " " "a" "a" "g" "c" "t"
##  [451] "c" "a" "t" "g" "g" "c" "c" "c" "a" "a" "c" "c" "a" "c" "a" " " "c" "t"
##  [469] "g" "c" "a" "a" "c" "c" "g" "g" " " "a" "g" "t" "g" "t" "c" "a" "g" "c"
##  [487] "c" " " "t" "c" "a" "t" "g" "c" "t" "c" "c" "c" " " "a" "t" "a" "a" "t"
##  [505] "g" "g" "g" "g" "a" " " "a" "a" "g" "g" "a" "g" "t" "t" "t" "t" "t" "a"
##  [523] "c" "a" "g" "a" "a" "a" "t" "c" " " "t" "g" "a" "t" "a" "t" "g" "g" "c"
##  [541] "t" " " "g" "a" "c" "a" "g" "t" "g" "a" "a" "a" " " "a" "a" "t" "g" "g"
##  [559] "t" "t" "t" "g" "t" " " "a" "c" "c" "c" "g" "a" "a" "c" "c" "t" " " "g"
##  [577] "a" "g" "c" "a" "a" "g" "t" "c" "c" "t" "a" "t" "g" "a" "a" "a" "a" "c"
##  [595] "g" " " "a" "c" "a" "a" "a" "g" "a" "g" "a" "a" " " "a" "g" "a" "a" "g"
##  [613] "t" "c" "c" "t" "t" " " "a" "t" "a" "c" "t" "a" "t" "g" "g" "g" " " "g"
```

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##  [631] "t" "g" "t" "t" "c" "a" "t" "c" "a" " " "t" "c" "c" "g" "c" "c" "t" "a"
##  [649] "a" "c" "a" "t" "a" "g" "a" "g" "a" "a" "c" "c" " " "a" "a" "a" "g" "g"
##  [667] "a" "c" "c" "c" "t" " " "c" "t" "a" "t" "c" "a" "c" "a" "c" "a" " " "g"
##  [685] "a" "a" "a" "a" "t" "g" "c" "t" "t" " " "a" "t" "g" "t" "c" "t" "c" "t"
##  [703] "g" "t" " " "a" "g" "t" "g" "t" "c" "t" "t" "c" "a" "c" "a" "t" "t" "a"
##  [721] "t" "a" "g" "c" "g" " " "g" "a" "a" "g" "a" "t" "t" "c" "a" "c" " " "c"
##  [739] "c" "c" "a" "g" "a" "a" "a" "t" "a" " " "a" "c" "c" "a" "a" "a" "a" "g"
##  [757] "g" "c" " " "c" "c" "a" "a" "a" "g" "t" "a" "a" "g" " " "a" "g" "a" "t"
##  [775] "c" "a" "g" "g" "a" "a" "g" "g" "a" "a" "g" "a" "a" "t" "c" "a" " " "a"
##  [793] "c" "t" "a" "c" "t" "a" "c" "t" "g" " " "g" "a" "c" "t" "c" "t" "g" "c"
##  [811] "t" "g" " " "g" "a" "a" "c" "c" "c" "g" "g" "g" "g" " " "a" "t" "a" "c"
##  [829] "a" "a" "t" "a" "a" "t" " " "a" "t" "t" "t" "g" "a" "g" "g" "c" "a" "a"
##  [847] "a" "t" "g" "g" "a" "a" "a" "t" "c" " " "t" "a" "a" "t" "a" "g" "c" "g"
##  [865] "c" "c" " " "a" "t" "g" "g" "t" "a" "t" "g" "c" "t" " " "t" "t" "c" "a"
##  [883] "c" "a" "c" "t" "g" "a" " " "g" "t" "a" "g" "a" "g" "g" "c" "c" "t" " "
##  [901] "t" "g" "g" "a" "t" "c" "a" "g" "g" "a" "a" "t" "c" "a" "t" "c" "a" "c"
##  [919] "c" "t" " " "c" "t" "a" "a" "t" "g" "c" "a" "c" "c" " " "a" "a" "t" "g"
##  [937] "g" "a" "c" "g" "a" "a" " " "t" "g" "t" "g" "a" "t" "t" "c" "g" "a" " "
##  [955] "a" "g" "t" "g" "t" "c" "a" "a" "a" "c" " " "a" "c" "c" "t" "c" "a" "a"
##  [973] "g" "g" "a" "g" "c" "t" "a" "t" "a" "a" "a" "c" "a" " " "g" "c" "a" "g"
##  [991] "t" "c" "t" "t" "c" "c" " " "t" "t" "t" "c" "c" "a" "g" "a" "a" "t" " "
## [1009] "g" "t" "a" "c" "a" "c" "c" "c" "a" "g" " " "t" "c" "a" "c" "a" "a" "t"
## [1027] "a" "g" "g" " " "a" "g" "a" "a" "t" "g" "t" "c" "c" "a" "a" "a" "g" "t"
## [1045] "a" "t" "g" "t" "c" "a" " " "g" "g" "a" "g" "t" "g" "c" "a" "a" "a" " "
## [1063] "a" "t" "t" "a" "a" "g" "g" "a" "t" "g" " " "g" "t" "t" "a" "c" "a" "g"
## [1081] "g" "a" "c" " " "t" "a" "a" "g" "g" "a" "a" "c" "a" "t" " " "c" "c" "c"
## [1099] "a" "t" "c" "c" "a" "t" "t" "c" "a" "a" "t" "c" "c" "a" "g" "a" "g" " "
## [1117] "g" "t" "t" "t" "g" "t" "t" "t" "g" "g" " " "g" "g" "c" "c" "a" "t" "t"
## [1135] "g" "c" "c" " " "g" "g" "t" "t" "t" "c" "a" "t" "t" "g" " " "a" "a" "g"
## [1153] "g" "g" "g" "g" "g" "t" "g" " " "g" "a" "c" "t" "g" "g" "a" "a" "t" "g"
## [1171] "g" "t" "a" "g" "a" "t" "g" "g" "g" "t" " " "g" "g" "t" "a" "t" "g" "g"
## [1189] "t" "t" "a" " " "t" "c" "a" "c" "c" "a" "t" "c" "a" "g" " " "a" "a" "t"
## [1207] "g" "a" "g" "c" "a" "g" "g" " " "g" "a" "t" "c" "t" "g" "g" "c" "t" "a"
## [1225] " " "t" "g" "c" "t" "g" "c" "a" "g" "a" "t" "c" "a" "a" "g" "a" "a" "a"
## [1243] "g" "c" "a" " " "c" "a" "c" "a" "a" "a" "a" "t" "g" "c" " " "c" "a" "t"
## [1261] "t" "a" "a" "c" "g" "g" "g" " " "a" "t" "c" "a" "c" "a" "a" "a" "c" "a"
## [1279] " " "a" "g" "g" "t" "g" "a" "a" "t" "t" "c" " " "t" "g" "t" "a" "a" "t"
## [1297] "t" "g" "a" "g" "a" "a" "a" "a" "t" "g" "a" "a" "c" "a" " " "c" "t" "c"
## [1315] "a" "a" "t" "t" "c" "a" "c" " " "a" "g" "c" "t" "g" "t" "g" "g" "g" "c"
## [1333] " " "a" "a" "g" "g" "a" "a" "t" "t" "c" "a" " " "a" "c" "a" "a" "a" "t"
## [1351] "t" "g" "g" "a" " " "a" "a" "g" "a" "a" "g" "g" "a" "t" "g" "g" "a" "a"
## [1369] "a" "a" "c" "t" "t" "a" "a" " " "a" "c" "a" "a" "a" "a" "a" "g" "g" "t"
## [1387] " " "t" "g" "a" "t" "g" "a" "t" "g" "g" "g" " " "t" "t" "t" "c" "t" "a"
## [1405] "g" "a" "c" "a" " " "t" "t" "t" "g" "g" "a" "c" "a" "t" "a" " " "c" "a"
## [1423] "a" "t" "g" "c" "a" "g" "a" "g" "t" "t" "g" "t" "t" "g" "g" "t" "t" "c"
## [1441] " " "t" "a" "c" "t" "g" "g" "a" "a" "a" "a" " " "t" "g" "a" "a" "a" "g"
## [1459] "a" "a" "c" "t" " " "t" "t" "g" "g" "a" "c" "t" "t" "c" "c" " " "a" "c"
## [1477] "g" "a" "c" "t" "c" "c" "a" "a" " " "t" "g" "t" "g" "a" "a" "g" "a" "g"
## [1495] "t" "c" "t" "g" "t" "a" "c" "g" "a" "g" "a" " " "a" "a" "g" "t" "a" "a"
```

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## [1513] "a" "a" "a" "g" " " "c" "c" "a" "a" "t" "t" "a" "a" "a" "g" " " "a" "a"
## [1531] "t" "a" "a" "t" "g" "c" "t" "a" " " "a" "a" "g" "a" "a" "a" "t" "a" "g"
## [1549] "g" " " "g" "a" "a" "t" "g" "g" "g" "t" "g" "c" "t" "t" "t" "g" "a" "a"
## [1567] "t" "t" "c" "t" " " "a" "t" "c" "a" "c" "a" "a" "g" "t" "g" " " "t" "a"
## [1585] "a" "c" "a" "a" "c" "g" "a" "a" " " "t" "g" "c" "a" "t" "g" "g" "a" "g"
## [1603] "a" " " "g" "t" "g" "t" "g" "a" "a" "a" "a" "a" " " "t" "g" "g" "a" "a"
## [1621] "c" "t" "t" "a" "t" "g" "a" "c" "t" "a" "t" "c" "c" "a" "a" " " "a" "g"
## [1639] "t" "a" "t" "t" "a" "t" "g" "a" " " "a" "g" "a" "a" "t" "c" "a" "a" "a"
## [1657] "g" " " "t" "t" "a" "a" "a" "c" "a" "g" "g" "g" " " "a" "a" "a" "a" "a"
## [1675] "a" "t" "t" "g" "a" " " "t" "g" "g" "a" "g" "t" "t" "a" "a" "a" "t" "t"
## [1693] "g" "g" "a" "c" "t" "c" "a" "a" " " "t" "g" "g" "g" "g" "g" "t" "c" "t"
## [1711] "a" " " "t" "c" "g" "g" "a" "t" "t" "c" "t" "g" " " "g" "c" "g" "a" "t"
## [1729] "c" "t" "a" "c" "t" " " "c" "a" "a" "c" "t" "g" "t" "c" "g" "c" " " "c"
## [1747] "a" "g" "t" "t" "c" "c" "c" "t" "g" "g" "t" "t" "c" "t" "t" "t" "t" "g"
## [1765] "g" " " "t" "c" "t" "c" "c" "c" "t" "g" "g" "g" " " "g" "g" "c" "a" "a"
## [1783] "t" "c" "a" "g" "c" " " "t" "t" "c" "t" "g" "g" "a" "t" "g" "t" " " "g"
## [1801] "t" "t" "c" "c" "a" "a" "t" "g" "g" " " "g" "t" "c" "t" "t" "t" "g" "c"
## [1819] "a" "a" "t" "g" "t" "a" "g" "a" "a" "t" "a" "t" " " "g" "c" "a" "t" "c"
## [1837] "t" "g" "a" "g" "a" " " "t" "c" "a" "a" "a" "a" "t" "t" "t" "c" " " "a"
## [1855] "g" "a" "a" "a" "t" "a" "t" "a" "a" " " "g" "a" "a" "a" "a" "a" "a" "c"
## [1873] "a" "c" " " "c"
## attr(,"name")
## [1] "Influenza_A_virus_(A/Minnesota/19/2011(H1N2))_HA_JQ290156.1"
## attr(,"Annot")
## [1] ">Influenza_A_virus_(A/Minnesota/19/2011(H1N2))_HA_JQ290156.1"
## attr(,"class")
## [1] "SeqFastadna"
##
## $`Influenza_A_virus_(A/Ashburton/280/2004(H3N2))_HA_CY002954.1`
##    [1] "g" "c" "a" "g" "g" "g" "g" "a" "t" "a" " " "a" "t" "t" "c" "t" "a" "t"
##   [19] "t" "a" "a" " " "c" "c" "a" "t" "g" "a" "a" "g" "a" "c" " " "t" "a" "t"
##   [37] "c" "a" "t" "t" "g" "c" "t" " " "t" "t" "g" "a" "g" "c" "t" "a" "c" "a"
##   [55] " " "t" "t" "c" "t" "a" "t" "g" "t" "c" "t" "g" "g" "t" "t" "t" "t" "c"
##   [73] "g" "c" "t" " " "c" "a" "a" "a" "a" "a" "c" "t" "t" "c" " " "c" "c" "g"
##   [91] "g" "a" "a" "a" "t" "g" "a" " " "c" "a" "a" "c" "a" "g" "c" "a" "c" "g"
##  [109] " " "g" "c" "a" "a" "c" "g" "c" "t" "g" "t" " " "g" "c" "c" "t" "t" "g"
##  [127] "g" "g" "c" "a" "c" "c" "a" "t" "g" "c" "a" "g" "t" "a" " " "c" "c" "a"
##  [145] "a" "a" "c" "g" "g" "a" "a" " " "c" "g" "a" "t" "a" "g" "t" "g" "a" "a"
##  [163] " " "a" "a" "c" "a" "a" "t" "c" "a" "c" "g" " " "a" "a" "t" "g" "a" "c"
##  [181] "c" "a" "a" "a" " " "t" "t" "g" "a" "a" "g" "t" "t" "a" "c" "t" "a" "a"
##  [199] "t" "g" "c" "t" "a" "c" "t" " " "g" "a" "g" "c" "t" "g" "g" "t" "t" "c"
##  [217] " " "a" "g" "a" "g" "t" "t" "c" "a" "t" "c" " " "a" "a" "c" "a" "g" "g"
##  [235] "t" "g" "g" "a" " " "a" "t" "a" "t" "g" "c" "g" "a" "c" "a" " " "g" "t"
##  [253] "c" "c" "t" "c" "a" "t" "c" "a" "g" "a" "t" "c" "c" "t" "t" "g" "a" "t"
##  [271] " " "g" "g" "a" "g" "a" "a" "a" "a" "c" "t" " " "g" "c" "a" "c" "a" "c"
##  [289] "t" "a" "a" "t" " " "a" "g" "a" "t" "g" "c" "t" "c" "t" "a" " " "t" "t"
##  [307] "g" "g" "g" "a" "g" "a" "c" "c" " " "c" "t" "c" "a" "g" "t" "g" "t" "g"
##  [325] "a" "t" "g" "g" "c" "t" "t" "c" "c" "a" "a" " " "a" "a" "t" "a" "a" "g"
##  [343] "a" "a" "a" "t" " " "g" "g" "g" "a" "c" "c" "t" "t" "t" "t" " " "t" "g"
```

```
##  [361] "t" "t" "g" "a" "a" "c" "g" "c" " " "a" "g" "c" "a" "a" "a" "g" "c" "c"
##  [379] "t" " " "a" "c" "a" "g" "c" "a" "a" "c" "t" "g" "t" "t" "a" "c" "c" "c"
##  [397] "t" "t" "a" "t" " " "g" "a" "t" "g" "t" "g" "c" "c" "g" "g" " " "a" "t"
##  [415] "t" "a" "t" "g" "c" "c" "t" "c" " " "c" "c" "t" "t" "a" "g" "g" "t" "c"
##  [433] "a" " " "c" "t" "a" "g" "t" "t" "g" "c" "c" "t" " " "c" "a" "t" "c" "c"
##  [451] "g" "g" "c" "a" "c" "a" "c" "t" "g" "g" "a" "g" "t" "t" "t" " " "a" "a"
##  [469] "c" "a" "a" "t" "g" "a" "a" "a" " " "g" "c" "t" "t" "c" "a" "a" "t" "t"
##  [487] "g" " " "g" "a" "c" "t" "g" "g" "a" "g" "t" "c" " " "a" "c" "t" "c" "a"
##  [505] "a" "a" "a" "t" "g" " " "g" "a" "a" "c" "a" "a" "g" "c" "t" "c" "t" "g"
##  [523] "c" "t" "t" "g" "c" "a" "a" "a" " " "a" "g" "g" "a" "g" "a" "t" "c" "t"
##  [541] "a" " " "a" "t" "a" "a" "c" "a" "g" "t" "t" "t" " " "c" "t" "t" "t" "a"
##  [559] "g" "t" "a" "g" "a" " " "t" "t" "g" "a" "a" "t" "t" "g" "g" "t" " " "t"
##  [577] "g" "a" "c" "c" "c" "a" "c" "t" "t" "a" "a" "a" "a" "t" "t" "c" "a" "a"
##  [595] "a" " " "t" "a" "c" "c" "c" "a" "g" "c" "a" "t" " " "t" "g" "a" "a" "c"
##  [613] "g" "t" "g" "a" "c" " " "t" "a" "t" "g" "c" "c" "a" "a" "a" "c" " " "a"
##  [631] "a" "t" "g" "a" "a" "a" "a" "a" "t" " " "t" "t" "g" "a" "c" "a" "a" "a"
##  [649] "t" "t" "g" "t" "a" "c" "a" "t" "t" "t" "g" "g" " " "g" "g" "g" "g" "t"
##  [667] "t" "c" "a" "c" "c" " " "a" "c" "c" "c" "g" "g" "g" "t" "a" "c" " " "g"
##  [685] "g" "a" "c" "a" "a" "t" "g" "a" "c" " " "c" "a" "a" "a" "t" "c" "a" "g"
##  [703] "c" "c" " " "t" "a" "t" "a" "t" "g" "c" "t" "c" "a" "a" "g" "c" "a" "c"
##  [721] "c" "a" "g" "g" "a" " " "a" "g" "a" "a" "t" "c" "a" "c" "a" "g" " " "t"
##  [739] "c" "t" "c" "c" "a" "c" "c" "a" "a" " " "a" "a" "g" "a" "a" "g" "c" "c"
##  [757] "a" "a" " " "c" "a" "a" "a" "c" "t" "g" "t" "a" "a" " " "t" "c" "c" "c"
##  [775] "g" "a" "a" "t" "a" "t" "c" "g" "g" "a" "t" "c" "t" "a" "g" "a" " " "c"
##  [793] "c" "c" "a" "g" "g" "g" "t" "a" "a" " " "g" "g" "g" "a" "t" "a" "t" "c"
##  [811] "c" "c" " " "c" "a" "g" "c" "a" "g" "a" "a" "t" "a" " " "a" "g" "c" "a"
##  [829] "t" "c" "t" "a" "t" "t" " " "g" "g" "a" "c" "a" "a" "t" "a" "g" "t" "a"
##  [847] "a" "a" "a" "c" "c" "g" "g" "g" "a" " " "g" "a" "c" "a" "t" "a" "c" "t"
##  [865] "t" "t" " " "t" "g" "a" "t" "t" "a" "a" "c" "a" "g" " " "c" "a" "c" "a"
##  [883] "g" "g" "g" "a" "a" "t" " " "c" "t" "a" "a" "t" "t" "g" "c" "t" "c" " "
##  [901] "c" "t" "c" "g" "g" "g" "g" "t" "t" "a" "c" "t" "t" "c" "a" "a" "a" "a"
##  [919] "t" "a" " " "c" "g" "a" "a" "g" "t" "g" "g" "g" "a" " " "a" "a" "a" "g"
##  [937] "c" "t" "c" "a" "a" "t" " " "a" "a" "t" "g" "a" "g" "a" "t" "c" "a" " "
##  [955] "g" "a" "t" "g" "c" "a" "c" "c" "c" "a" " " "t" "t" "g" "g" "c" "a" "a"
##  [973] "a" "t" "g" "c" "a" "a" "t" "t" "c" "t" "g" "a" "a" " " "t" "g" "c" "a"
##  [991] "t" "c" "a" "c" "t" "c" " " "c" "a" "a" "a" "t" "g" "g" "a" "a" "g" " "
## [1009] "c" "a" "t" "t" "c" "c" "c" "a" "a" "t" " " "g" "a" "c" "a" "a" "a" "c"
## [1027] "c" "a" "t" " " "t" "t" "c" "a" "a" "a" "a" "t" "g" "t" "a" "a" "a" "c"
## [1045] "a" "g" "g" "a" "t" "c" " " "a" "c" "a" "t" "a" "t" "g" "g" "g" "g" " "
## [1063] "c" "c" "t" "g" "t" "c" "c" "c" "a" "g" " " "a" "t" "a" "t" "g" "t" "t"
## [1081] "a" "a" "g" " " "c" "a" "a" "a" "a" "c" "a" "c" "t" "c" " " "t" "g" "a"
## [1099] "a" "a" "t" "t" "g" "g" "c" "a" "a" "c" "a" "g" "g" "g" "a" "t" "g" " "
## [1117] "c" "g" "a" "a" "a" "t" "g" "t" "a" "c" " " "c" "a" "g" "a" "g" "a" "a"
## [1135] "a" "c" "a" " " "a" "a" "c" "t" "a" "g" "a" "g" "g" "c" " " "a" "t" "a"
## [1153] "t" "t" "t" "g" "g" "c" "g" " " "c" "a" "a" "t" "c" "g" "c" "g" "g" "g"
## [1171] "t" "t" "t" "c" "a" "t" "a" "g" "a" "a" " " "a" "a" "t" "g" "g" "t" "t"
## [1189] "g" "g" "g" " " "a" "g" "g" "g" "a" "a" "t" "g" "g" "t" " " "g" "g" "a"
## [1207] "t" "g" "g" "t" "t" "g" "g" " " "t" "a" "c" "g" "g" "t" "t" "t" "c" "a"
## [1225] " " "g" "g" "c" "a" "t" "c" "a" "a" "a" "a" "t" "t" "c" "t" "g" "a" "g"
```

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## [1243] "g" "g" "a" " " "a" "t" "a" "g" "g" "a" "c" "a" "a" "g" " " "c" "a" "g"
## [1261] "c" "a" "g" "a" "t" "c" "t" " " "c" "a" "a" "a" "a" "g" "c" "a" "c" "t"
## [1279] " " "c" "a" "a" "g" "c" "a" "g" "c" "a" "a" " " "t" "c" "a" "a" "c" "c"
## [1297] "a" "a" "a" "t" "c" "a" "a" "t" "g" "g" "g" "a" "a" "g" " " "c" "t" "g"
## [1315] "a" "a" "t" "a" "g" "g" "t" " " "t" "g" "a" "t" "c" "g" "g" "g" "a" "a"
## [1333] " " "a" "a" "c" "c" "a" "a" "c" "g" "a" "g" " " "a" "a" "a" "t" "t" "c"
## [1351] "c" "a" "t" "c" " " "a" "g" "a" "t" "t" "g" "a" "a" "a" "a" "a" "g" "a"
## [1369] "a" "t" "t" "c" "t" "c" "a" " " "g" "a" "a" "g" "t" "a" "g" "a" "a" "g"
## [1387] " " "g" "g" "a" "g" "a" "a" "t" "t" "c" "a" " " "g" "g" "a" "c" "c" "t"
## [1405] "t" "g" "a" "g" " " "a" "a" "a" "t" "a" "t" "g" "t" "t" "g" " " "a" "g"
## [1423] "g" "a" "c" "a" "c" "t" "a" "a" "a" "a" "t" "a" "g" "a" "t" "c" "t" "c"
## [1441] " " "t" "g" "g" "t" "c" "a" "t" "a" "c" "a" " " "a" "c" "g" "c" "g" "g"
## [1459] "a" "g" "c" "t" " " "t" "c" "t" "t" "g" "t" "t" "g" "c" "c" " " "c" "t"
## [1477] "g" "g" "a" "g" "a" "a" "c" "c" " " "a" "a" "c" "a" "t" "a" "c" "a" "a"
## [1495] "t" "t" "g" "a" "t" "c" "t" "a" "a" "c" "t" " " "g" "a" "c" "t" "c" "a"
## [1513] "g" "a" "a" "a" " " "t" "g" "a" "a" "c" "a" "a" "a" "c" "t" " " "g" "t"
## [1531] "t" "t" "g" "a" "a" "a" "g" "a" " " "a" "c" "a" "a" "a" "g" "a" "a" "g"
## [1549] "c" " " "a" "a" "c" "t" "g" "a" "g" "g" "g" "a" "a" "a" "a" "t" "g" "c"
## [1567] "t" "g" "a" "g" " " "g" "a" "t" "a" "t" "g" "g" "g" "c" "a" " " "a" "t"
## [1585] "g" "g" "t" "t" "g" "t" "t" "t" " " "c" "a" "a" "a" "a" "t" "a" "t" "a"
## [1603] "c" " " "c" "a" "c" "a" "a" "a" "t" "g" "t" "g" " " "a" "c" "a" "a" "t"
## [1621] "g" "c" "c" "t" "g" "c" "a" "t" "a" "g" "g" "g" "t" "c" "a" " " "a" "t"
## [1639] "c" "a" "g" "a" "a" "a" "t" "g" " " "g" "a" "a" "c" "t" "t" "a" "t" "g"
## [1657] "a" " " "c" "c" "a" "t" "g" "a" "t" "g" "t" "a" " " "t" "a" "c" "a" "g"
## [1675] "a" "g" "a" "t" "g" " " "a" "a" "g" "c" "a" "t" "t" "a" "a" "a" "c" "a"
## [1693] "a" "c" "c" "g" "g" "t" "t" "c" " " "c" "a" "g" "a" "t" "c" "a" "a" "a"
## [1711] "g" " " "g" "t" "g" "t" "t" "g" "a" "g" "c" "t" " " "g" "a" "a" "g" "t"
## [1729] "c" "a" "g" "g" "a" " " "t" "a" "c" "a" "a" "a" "g" "a" "t" "t" " " "g"
## [1747] "g" "a" "t" "c" "c" "t" "a" "t" "g" "g" "a" "t" "t" "t" "c" "c" "t" "t"
## [1765] "t" " " "g" "c" "c" "a" "t" "a" "t" "c" "a" "t" " " "g" "t" "t" "t" "t"
## [1783] "t" "t" "g" "c" "t" " " "t" "t" "g" "t" "g" "t" "t" "g" "c" "t" " " "t"
## [1801] "t" "g" "t" "t" "g" "g" "g" "g" "t" " " "t" "c" "a" "t" "c" "a" "t" "g"
## [1819] "t" "g" "g" "g" "c" "c" "t" "g" "c" "c" "a" "a" " " "a" "a" "a" "g" "g"
## [1837] "c" "a" "a" "c" "a" " " "t" "t" "a" "g" "g" "t" "g" "c" "a" "a" " " "c"
## [1855] "a" "t" "t" "t" "g" "c" "a" "t" "t" " " "t" "g" "a" "g" "t" "g" "c" "a"
## [1873] "t" "t" " " "a" "a" "t" "t" "a" "a" "a" "a" "a" "c" "a" "c"
## attr(,"name")
## [1] "Influenza_A_virus_(A/Ashburton/280/2004(H3N2))_HA_CY002954.1"
## attr(,"Annot")
## [1] ">Influenza_A_virus_(A/Ashburton/280/2004(H3N2))_HA_CY002954.1"
## attr(,"class")
## [1] "SeqFastadna"
##
## $`Influenza_A_virus_(A/Mexico_City/001/2009(H1N1))_HA_CY050198.1`
##    [1] "a" "a" "a" "a" "g" "c" "a" "a" "c" "a" " " "a" "a" "a" "a" "t" "g" "a"
##   [19] "a" "g" "g" " " "c" "a" "a" "t" "a" "c" "t" "a" "g" "t" " " "a" "g" "t"
##   [37] "t" "c" "t" "g" "c" "t" "a" " " "t" "a" "t" "a" "c" "a" "t" "t" "t" "g"
##   [55] " " "c" "a" "a" "c" "c" "g" "c" "a" "a" "a" "t" "g" "c" "a" "g" "a" "c"
##   [73] "a" "c" "a" " " "t" "t" "a" "t" "g" "t" "a" "t" "a" "g" " " "g" "t" "t"
```

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##   [91] "a" "t" "c" "a" "t" "g" "c" " " "g" "a" "a" "c" "a" "a" "t" "t" "c" "a"
##  [109] " " "a" "c" "a" "g" "a" "c" "a" "c" "t" "g" " " "t" "a" "g" "a" "c" "a"
##  [127] "c" "a" "g" "t" "a" "c" "t" "a" "g" "a" "a" "a" "a" "g" " " "a" "a" "t"
##  [145] "g" "t" "a" "a" "c" "a" "g" " " "t" "a" "a" "c" "a" "c" "a" "c" "t" "c"
##  [163] " " "t" "g" "t" "t" "a" "a" "c" "c" "t" "t" " " "c" "t" "a" "g" "a" "a"
##  [181] "g" "a" "c" "a" " " "a" "g" "c" "a" "t" "a" "a" "c" "g" "g" "g" "a" "a"
##  [199] "a" "c" "t" "a" "t" "g" "c" " " "a" "a" "a" "c" "t" "a" "a" "g" "a" "g"
##  [217] " " "g" "g" "g" "t" "a" "g" "c" "c" "c" "c" " " "a" "t" "t" "g" "c" "a"
##  [235] "t" "t" "t" "g" " " "g" "g" "t" "a" "a" "a" "t" "g" "t" "a" " " "a" "c"
##  [253] "a" "t" "t" "g" "c" "t" "g" "g" "c" "t" "g" "g" "a" "t" "c" "c" "t" "g"
##  [271] " " "g" "g" "a" "a" "a" "t" "c" "c" "a" "g" " " "a" "g" "t" "g" "t" "g"
##  [289] "a" "a" "t" "c" " " "a" "c" "t" "c" "t" "c" "c" "a" "c" "a" " " "g" "c"
##  [307] "a" "a" "g" "c" "t" "c" "a" "t" " " "g" "g" "t" "c" "c" "t" "a" "c" "a"
##  [325] "t" "t" "g" "t" "g" "g" "a" "a" "a" "c" "a" " " "t" "c" "t" "a" "g" "t"
##  [343] "t" "c" "a" "g" " " "a" "c" "a" "a" "t" "g" "g" "a" "a" "c" " " "g" "t"
##  [361] "g" "t" "t" "a" "c" "c" "c" "a" " " "g" "g" "a" "g" "a" "t" "t" "t" "c"
##  [379] "a" " " "t" "c" "g" "a" "t" "t" "a" "t" "g" "a" "g" "g" "a" "g" "c" "t"
##  [397] "a" "a" "g" "a" " " "g" "a" "g" "c" "a" "a" "t" "t" "g" "a" " " "g" "c"
##  [415] "t" "c" "a" "g" "t" "g" "t" "c" " " "a" "t" "c" "a" "t" "t" "t" "g" "a"
##  [433] "a" " " "a" "g" "g" "t" "t" "t" "g" "a" "g" "a" " " "t" "a" "t" "t" "c"
##  [451] "c" "c" "c" "a" "a" "g" "a" "c" "a" "a" "g" "t" "t" "c" "a" " " "t" "g"
##  [469] "g" "c" "c" "c" "a" "a" "t" "c" " " "a" "t" "g" "a" "c" "t" "c" "g" "a"
##  [487] "a" " " "c" "a" "a" "a" "g" "g" "t" "g" "t" "a" " " "a" "c" "g" "g" "c"
##  [505] "a" "g" "c" "a" "t" " " "g" "t" "c" "c" "t" "c" "a" "t" "g" "c" "t" "g"
##  [523] "g" "a" "g" "c" "a" "a" "a" "a" " " "a" "g" "c" "t" "t" "c" "t" "a" "c"
##  [541] "a" " " "a" "a" "a" "a" "t" "t" "t" "a" "a" "t" " " "a" "t" "g" "g" "c"
##  [559] "t" "a" "g" "t" "t" " " "a" "a" "a" "a" "a" "a" "g" "g" "a" "a" " " "a"
##  [577] "t" "t" "c" "a" "t" "a" "c" "c" "c" "a" "a" "a" "g" "c" "t" "c" "a" "g"
##  [595] "c" " " "a" "a" "a" "t" "c" "c" "t" "a" "c" "a" " " "t" "t" "a" "a" "t"
##  [613] "g" "a" "t" "a" "a" " " "a" "g" "g" "g" "a" "a" "a" "g" "a" "a" " " "g"
##  [631] "t" "c" "c" "t" "c" "g" "t" "g" "c" " " "t" "a" "t" "g" "g" "g" "g" "c"
##  [649] "a" "t" "t" "c" "a" "c" "c" "a" "t" "c" "c" "a" " " "t" "c" "t" "a" "c"
##  [667] "t" "a" "g" "t" "g" " " "c" "t" "g" "a" "c" "c" "a" "a" "c" "a" " " "a"
##  [685] "a" "g" "t" "c" "t" "c" "t" "a" "t" " " "c" "a" "g" "a" "a" "t" "g" "c"
##  [703] "a" "g" " " "a" "t" "g" "c" "a" "t" "a" "t" "g" "t" "t" "t" "t" "t" "g"
##  [721] "t" "g" "g" "g" "g" " " "t" "c" "a" "t" "c" "a" "a" "g" "a" "t" " " "a"
##  [739] "c" "a" "g" "c" "a" "a" "g" "a" "a" " " "g" "t" "t" "c" "a" "a" "g" "c"
##  [757] "c" "g" " " "g" "a" "a" "a" "t" "a" "g" "c" "a" "a" " " "t" "a" "a" "g"
##  [775] "a" "c" "c" "c" "a" "a" "a" "g" "t" "g" "a" "g" "g" "g" "a" "t" " " "c"
##  [793] "a" "a" "g" "a" "a" "g" "g" "g" "a" " " "g" "a" "a" "t" "g" "a" "a" "c"
##  [811] "t" "a" " " "t" "t" "a" "c" "t" "g" "g" "a" "c" "a" " " "c" "t" "a" "g"
##  [829] "t" "a" "g" "a" "g" "c" " " "c" "g" "g" "g" "a" "g" "a" "c" "a" "a" "a"
##  [847] "a" "t" "a" "a" "c" "a" "t" "t" "c" " " "g" "a" "a" "g" "c" "a" "a" "c"
##  [865] "t" "g" " " "g" "a" "a" "a" "t" "c" "t" "a" "g" "t" " " "g" "g" "t" "a"
##  [883] "c" "c" "g" "a" "g" "a" " " "t" "a" "t" "g" "c" "a" "t" "t" "c" "g" " "
##  [901] "c" "a" "a" "t" "g" "g" "a" "a" "a" "g" "a" "a" "a" "t" "g" "c" "t" "g"
##  [919] "a" "a" " " "t" "c" "t" "g" "g" "t" "a" "t" "t" "a" " " "t" "c" "a" "t"
##  [937] "t" "t" "c" "a" "g" "a" " " "t" "a" "c" "a" "c" "c" "a" "g" "t" "c" " "
##  [955] "c" "a" "c" "g" "a" "t" "t" "g" "c" "a" " " "a" "t" "a" "c" "a" "a" "c"
```

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##  [973] "t" "t" "g" "t" "c" "a" "g" "a" "c" "a" "c" "c" "c" " " "a" "a" "g" "g"
##  [991] "g" "t" "g" "c" "t" "a" " " "t" "a" "a" "a" "c" "a" "c" "c" "a" "g" " "
## [1009] "c" "c" "t" "c" "c" "c" "a" "t" "t" "t" " " "c" "a" "g" "a" "a" "t" "a"
## [1027] "t" "a" "c" " " "a" "t" "c" "c" "g" "a" "t" "c" "a" "c" "a" "a" "t" "t"
## [1045] "g" "g" "a" "a" "a" "a" " " "t" "g" "t" "c" "c" "a" "a" "a" "a" "t" " "
## [1063] "a" "t" "g" "t" "a" "a" "a" "a" "a" "g" " " "c" "a" "c" "a" "a" "a" "a"
## [1081] "t" "t" "g" " " "a" "g" "a" "c" "t" "g" "g" "c" "c" "a" " " "c" "a" "g"
## [1099] "g" "a" "t" "t" "g" "a" "g" "g" "a" "a" "t" "g" "t" "c" "c" "c" "g" " "
## [1117] "t" "c" "t" "a" "t" "t" "c" "a" "a" "t" " " "c" "t" "a" "g" "a" "g" "g"
## [1135] "c" "c" "t" " " "a" "t" "t" "t" "g" "g" "g" "g" "c" "c" " " "a" "t" "t"
## [1153] "g" "c" "c" "g" "g" "t" "t" " " "t" "c" "a" "t" "t" "g" "a" "a" "g" "g"
## [1171] "g" "g" "g" "g" "t" "g" "g" "a" "c" "a" " " "g" "g" "g" "a" "t" "g" "g"
## [1189] "t" "a" "g" " " "a" "t" "g" "g" "a" "t" "g" "g" "t" "a" " " "c" "g" "g"
## [1207] "t" "t" "a" "t" "c" "a" "c" " " "c" "a" "t" "c" "a" "a" "a" "a" "t" "g"
## [1225] " " "a" "g" "c" "a" "g" "g" "g" "g" "t" "c" "a" "g" "g" "a" "t" "a" "t"
## [1243] "g" "c" "a" " " "g" "c" "c" "g" "a" "c" "c" "t" "g" "a" " " "a" "g" "a"
## [1261] "g" "c" "a" "c" "a" "c" "a" " " "g" "a" "a" "t" "g" "c" "c" "a" "t" "t"
## [1279] " " "g" "a" "c" "g" "a" "g" "a" "t" "t" "a" " " "c" "t" "a" "a" "c" "a"
## [1297] "a" "a" "g" "t" "a" "a" "a" "t" "t" "c" "t" "g" "t" "t" " " "a" "t" "t"
## [1315] "g" "a" "a" "a" "a" "g" "a" " " "t" "g" "a" "a" "t" "a" "c" "a" "c" "a"
## [1333] " " "g" "t" "t" "c" "a" "c" "a" "g" "c" "a" " " "g" "t" "a" "g" "g" "c"
## [1351] "a" "a" "a" "g" " " "a" "g" "t" "t" "c" "a" "a" "c" "c" "a" "c" "c" "t"
## [1369] "g" "g" "a" "a" "a" "a" "a" " " "a" "g" "a" "a" "t" "a" "g" "a" "g" "a"
## [1387] " " "a" "t" "t" "t" "a" "a" "a" "t" "a" "a" " " "a" "a" "a" "a" "g" "t"
## [1405] "t" "g" "a" "t" " " "g" "a" "t" "g" "g" "t" "t" "t" "c" "c" " " "t" "g"
## [1423] "g" "a" "c" "a" "t" "t" "t" "g" "g" "a" "c" "t" "t" "a" "c" "a" "a" "t"
## [1441] " " "g" "c" "c" "g" "a" "a" "c" "t" "g" "t" " " "t" "g" "g" "t" "t" "c"
## [1459] "t" "a" "t" "t" " " "g" "g" "a" "a" "a" "a" "t" "g" "a" "a" " " "a" "g"
## [1477] "a" "a" "c" "t" "t" "t" "g" "g" " " "a" "c" "t" "a" "c" "c" "a" "c" "g"
## [1495] "a" "t" "t" "c" "a" "a" "a" "t" "g" "t" "g" " " "a" "a" "g" "a" "a" "c"
## [1513] "t" "t" "a" "t" " " "a" "t" "g" "a" "a" "a" "a" "g" "g" "t" " " "a" "a"
## [1531] "g" "a" "a" "g" "c" "c" "a" "g" " " "t" "t" "a" "a" "a" "a" "a" "a" "c"
## [1549] "a" " " "a" "t" "g" "c" "c" "a" "a" "g" "g" "a" "a" "a" "t" "t" "g" "g"
## [1567] "a" "a" "a" "c" " " "g" "g" "c" "t" "g" "c" "t" "t" "t" "g" " " "a" "a"
## [1585] "t" "t" "t" "t" "a" "c" "c" "a" " " "c" "a" "a" "a" "t" "g" "c" "g" "a"
## [1603] "t" " " "a" "a" "c" "a" "c" "g" "t" "g" "c" "a" " " "t" "g" "g" "a" "a"
## [1621] "a" "g" "t" "g" "t" "c" "a" "a" "a" "a" "a" "t" "g" "g" "g" " " "a" "c"
## [1639] "t" "t" "a" "t" "g" "a" "c" "t" " " "a" "c" "c" "c" "a" "a" "a" "a" "t"
## [1657] "a" " " "c" "t" "c" "a" "g" "a" "g" "g" "a" "a" " " "g" "c" "a" "a" "a"
## [1675] "a" "t" "t" "a" "a" " " "a" "c" "a" "g" "a" "g" "a" "a" "g" "a" "a" "a"
## [1693] "t" "a" "g" "a" "t" "g" "g" "g" " " "g" "t" "a" "a" "a" "g" "c" "t" "g"
## [1711] "g" " " "a" "a" "t" "c" "a" "a" "c" "a" "a" "g" " " "g" "a" "t" "t" "t"
## [1729] "a" "c" "c" "a" "g" " " "a" "t" "t" "t" "t" "g" "g" "c" "g" "a" " " "t"
## [1747] "c" "t" "a" "t" "t" "c" "a" "a" "c" "t" "g" "t" "c" "g" "c" "c" "a" "g"
## [1765] "t" " " "t" "c" "a" "t" "t" "g" "g" "t" "a" "c" " " "t" "g" "g" "t" "a"
## [1783] "g" "t" "c" "t" "c" " " "c" "c" "t" "g" "g" "g" "g" "g" "c" "a" " " "a"
## [1801] "t" "c" "a" "g" "t" "t" "t" "c" "t" " " "g" "g" "a" "t" "g" "t" "g" "c"
## [1819] "t" "c" "t" "a" "a" "t" "g" "g" "g" "t" "c" "t" " " "c" "t" "a" "c" "a"
## [1837] "g" "t" "g" "t" "a" " " "g" "a" "a" "t" "a" "t" "g" "t" "a" "t" " " "t"
```

```
## [1855] "t" "a" "a" "c" "a" "t" "t" "a" "g" " " "g" "a" "t" "t" "t" "c" "a" "g"
## [1873] "a" "a" " " "g" "c" "a"
## attr(,"name")
## [1] "Influenza_A_virus_(A/Mexico_City/001/2009(H1N1))_HA_CY050198.1"
## attr(,"Annot")
## [1] ">Influenza_A_virus_(A/Mexico_City/001/2009(H1N1))_HA_CY050198.1"
## attr(,"class")
## [1] "SeqFastadna"
##
## $`Influenza_A_virus_(A/Mexico_City/1514A00905313N/2013(H3N2))_HA_KT889237.1`
##    [1] "a" "t" "g" "a" "a" "g" "a" "c" "t" "a" " " "t" "c" "a" "t" "t" "g" "c"
##   [19] "t" "t" "t" " " "g" "a" "g" "c" "t" "a" "c" "a" "t" "t" " " "c" "t" "a"
##   [37] "t" "g" "t" "c" "t" "g" "g" " " "t" "t" "t" "t" "c" "g" "c" "t" "c" "a"
##   [55] " " "a" "a" "a" "a" "c" "t" "t" "c" "c" "t" "g" "g" "a" "a" "a" "t" "g"
##   [73] "a" "c" "a" " " "a" "t" "a" "g" "c" "a" "c" "g" "g" "c" " " "a" "a" "c"
##   [91] "g" "c" "t" "g" "t" "g" "c" " " "c" "t" "t" "g" "g" "g" "c" "a" "c" "c"
##  [109] " " "a" "t" "g" "c" "a" "g" "t" "a" "c" "c" " " "a" "a" "a" "c" "g" "g"
##  [127] "a" "a" "c" "g" "a" "t" "a" "g" "t" "g" "a" "a" "a" "a" " " "c" "a" "a"
##  [145] "t" "c" "a" "c" "g" "a" "a" " " "t" "g" "a" "c" "c" "g" "a" "a" "t" "t"
##  [163] " " "g" "a" "a" "g" "t" "t" "a" "c" "t" "a" " " "a" "t" "g" "c" "t" "a"
##  [181] "c" "t" "g" "a" " " "g" "c" "t" "g" "g" "t" "t" "c" "a" "g" "a" "a" "t"
##  [199] "t" "c" "c" "t" "c" "a" "a" " " "t" "a" "g" "g" "t" "g" "a" "a" "a" "t"
##  [217] " " "a" "t" "g" "c" "g" "a" "c" "a" "g" "t" " " "c" "c" "t" "c" "a" "t"
##  [235] "c" "a" "g" "a" " " "t" "c" "c" "t" "t" "g" "a" "t" "g" "g" " " "a" "g"
##  [253] "a" "a" "a" "a" "c" "t" "g" "c" "a" "c" "a" "c" "t" "a" "a" "t" "a" "g"
##  [271] " " "a" "t" "g" "c" "t" "c" "t" "a" "t" "t" " " "g" "g" "g" "a" "g" "a"
##  [289] "c" "c" "c" "t" " " "c" "a" "g" "t" "g" "t" "g" "a" "t" "g" " " "g" "c"
##  [307] "t" "t" "t" "c" "a" "a" "a" "a" " " "t" "a" "a" "g" "a" "a" "a" "t" "g"
##  [325] "g" "g" "a" "c" "c" "t" "t" "t" "t" "t" "g" " " "t" "t" "g" "a" "a" "c"
##  [343] "g" "a" "a" "g" " " "c" "a" "a" "a" "g" "c" "c" "t" "a" "c" " " "a" "g"
##  [361] "t" "a" "a" "c" "t" "g" "t" "t" " " "a" "c" "c" "c" "t" "t" "a" "t" "g"
##  [379] "a" " " "t" "g" "t" "g" "c" "c" "g" "g" "a" "t" "t" "a" "t" "g" "c" "c"
##  [397] "t" "c" "c" "c" " " "t" "t" "a" "g" "g" "t" "c" "a" "c" "t" " " "a" "g"
##  [415] "t" "t" "g" "c" "c" "t" "c" "a" " " "t" "c" "c" "g" "g" "c" "a" "c" "a"
##  [433] "c" " " "t" "g" "g" "a" "g" "t" "t" "t" "a" "a" " " "c" "a" "a" "t" "g"
##  [451] "a" "a" "a" "g" "c" "t" "t" "c" "a" "a" "t" "t" "g" "g" "a" " " "c" "t"
##  [469] "g" "g" "a" "g" "t" "c" "a" "c" " " "t" "c" "a" "a" "a" "a" "c" "g" "g"
##  [487] "a" " " "a" "c" "a" "a" "g" "t" "t" "c" "t" "g" " " "c" "t" "t" "g" "c"
##  [505] "a" "t" "a" "a" "g" " " "g" "a" "a" "a" "t" "c" "t" "a" "a" "t" "a" "g"
##  [523] "t" "a" "g" "t" "t" "t" "c" "t" " " "t" "t" "a" "g" "t" "a" "g" "a" "t"
##  [541] "t" " " "a" "a" "a" "t" "t" "g" "g" "t" "t" "g" " " "a" "c" "c" "c" "a"
##  [559] "c" "t" "t" "a" "a" " " "a" "c" "t" "t" "c" "a" "a" "a" "t" "a" " " "c"
##  [577] "c" "c" "a" "g" "c" "a" "t" "t" "g" "a" "a" "c" "g" "t" "g" "a" "c" "t"
##  [595] "a" " " "t" "g" "c" "c" "a" "a" "a" "c" "a" "a" " " "t" "g" "a" "a" "c"
##  [613] "a" "a" "t" "t" "t" " " "g" "a" "c" "a" "a" "a" "t" "t" "g" "t" " " "a"
##  [631] "c" "a" "t" "t" "t" "g" "g" "g" "g" " " "g" "g" "t" "t" "c" "a" "c" "c"
##  [649] "a" "c" "c" "c" "g" "g" "g" "t" "a" "c" "g" "g" " " "a" "c" "a" "a" "g"
##  [667] "g" "a" "c" "c" "a" " " "a" "a" "t" "c" "t" "t" "c" "c" "t" "g" " " "t"
##  [685] "a" "t" "g" "c" "t" "c" "a" "a" "t" " " "c" "a" "t" "c" "a" "g" "g" "a"
```

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##  [703] "a" "g" " " "a" "a" "t" "c" "a" "c" "a" "g" "t" "a" "t" "c" "t" "a" "c"
##  [721] "c" "a" "a" "a" "a" " " "g" "a" "a" "g" "c" "c" "a" "a" "c" "a" " " "a"
##  [739] "g" "c" "t" "g" "t" "a" "a" "t" "c" " " "c" "c" "g" "a" "a" "t" "a" "t"
##  [757] "c" "g" " " "g" "a" "t" "c" "t" "a" "g" "a" "c" "c" " " "c" "a" "g" "a"
##  [775] "a" "t" "a" "a" "g" "g" "a" "a" "t" "a" "t" "c" "c" "c" "t" "a" " " "g"
##  [793] "c" "a" "g" "a" "a" "t" "a" "a" "g" " " "c" "a" "t" "c" "t" "a" "t" "t"
##  [811] "g" "g" " " "a" "c" "a" "a" "t" "a" "g" "t" "a" "a" " " "a" "a" "c" "c"
##  [829] "g" "g" "g" "a" "g" "a" " " "c" "a" "t" "a" "c" "t" "t" "t" "t" "g" "a"
##  [847] "t" "t" "a" "a" "c" "a" "g" "c" "a" " " "c" "a" "g" "g" "g" "a" "a" "t"
##  [865] "c" "t" " " "a" "a" "t" "t" "g" "c" "t" "c" "c" "t" " " "a" "g" "g" "g"
##  [883] "g" "t" "t" "a" "c" "t" " " "t" "c" "a" "a" "a" "a" "t" "a" "c" "g" " "
##  [901] "a" "a" "g" "t" "g" "g" "g" "a" "a" "a" "a" "g" "c" "t" "c" "a" "a" "t"
##  [919] "a" "a" " " "t" "g" "a" "g" "a" "t" "c" "a" "g" "a" " " "t" "g" "c" "a"
##  [937] "c" "c" "c" "a" "t" "t" " " "g" "g" "c" "a" "a" "a" "t" "g" "c" "a" " "
##  [955] "a" "g" "t" "c" "t" "g" "a" "a" "t" "g" " " "c" "a" "t" "c" "a" "c" "t"
##  [973] "c" "c" "a" "a" "a" "t" "g" "g" "a" "a" "g" "c" "a" " " "t" "t" "c" "c"
##  [991] "c" "a" "a" "t" "g" "a" " " "c" "a" "a" "a" "c" "c" "a" "t" "t" "c" " "
## [1009] "c" "a" "a" "a" "a" "t" "g" "t" "a" "a" " " "a" "c" "a" "g" "g" "a" "t"
## [1027] "c" "a" "c" " " "a" "t" "a" "c" "g" "g" "g" "g" "c" "c" "t" "g" "t" "c"
## [1045] "c" "c" "a" "g" "a" "t" " " "a" "t" "g" "t" "t" "a" "a" "g" "c" "a" " "
## [1063] "a" "a" "g" "c" "a" "c" "t" "c" "t" "g" " " "a" "a" "a" "t" "t" "g" "g"
## [1081] "c" "a" "a" " " "c" "a" "g" "g" "a" "a" "t" "g" "c" "g" " " "a" "a" "a"
## [1099] "t" "g" "t" "a" "c" "c" "a" "g" "a" "g" "a" "a" "a" "c" "a" "a" "a" " "
## [1117] "c" "t" "a" "g" "a" "g" "g" "c" "a" "t" " " "a" "t" "t" "t" "g" "g" "c"
## [1135] "g" "c" "a" " " "a" "t" "a" "g" "c" "g" "g" "g" "t" "t" " " "t" "c" "a"
## [1153] "t" "a" "g" "a" "a" "a" "a" " " "t" "g" "g" "t" "t" "g" "g" "g" "a" "g"
## [1171] "g" "g" "a" "a" "t" "g" "g" "t" "g" "g" " " "a" "t" "g" "g" "t" "t" "g"
## [1189] "g" "t" "a" " " "c" "g" "g" "t" "t" "t" "c" "a" "g" "g" " " "c" "a" "t"
## [1207] "c" "a" "a" "a" "a" "t" "t" " " "c" "t" "g" "a" "g" "g" "g" "a" "a" "g"
## [1225] " " "a" "g" "g" "a" "c" "a" "a" "g" "c" "a" "g" "c" "a" "g" "a" "t" "c"
## [1243] "t" "c" "a" " " "a" "a" "a" "g" "c" "a" "c" "t" "c" "a" " " "a" "g" "c"
## [1261] "a" "g" "c" "a" "a" "t" "c" " " "g" "a" "t" "c" "a" "a" "a" "t" "c" "a"
## [1279] " " "a" "t" "g" "g" "g" "a" "a" "g" "c" "t" " " "g" "a" "a" "t" "c" "g"
## [1297] "a" "t" "t" "g" "a" "t" "c" "g" "g" "g" "a" "a" "a" "a" " " "c" "c" "a"
## [1315] "a" "c" "g" "a" "g" "a" "a" " " "a" "t" "t" "c" "c" "a" "t" "c" "a" "g"
## [1333] " " "a" "t" "t" "g" "a" "a" "a" "a" "a" "g" " " "a" "a" "t" "t" "c" "t"
## [1351] "c" "a" "g" "a" " " "a" "g" "t" "a" "g" "a" "a" "g" "g" "g" "a" "g" "a"
## [1369] "a" "t" "t" "c" "a" "g" "g" " " "a" "c" "c" "t" "t" "g" "a" "g" "a" "a"
## [1387] " " "a" "t" "a" "t" "g" "t" "t" "g" "a" "g" " " "g" "a" "c" "a" "c" "t"
## [1405] "a" "a" "a" "a" " " "t" "a" "g" "a" "t" "c" "t" "c" "t" "g" " " "g" "t"
## [1423] "c" "a" "t" "a" "c" "a" "a" "c" "g" "c" "g" "g" "a" "g" "c" "t" "t" "c"
## [1441] " " "t" "t" "g" "t" "t" "g" "c" "c" "c" "t" " " "g" "g" "a" "g" "a" "a"
## [1459] "c" "c" "a" "a" " " "c" "a" "t" "a" "c" "a" "a" "t" "t" "g" " " "a" "t"
## [1477] "c" "t" "a" "a" "c" "t" "g" "a" " " "c" "t" "c" "a" "g" "a" "a" "a" "t"
## [1495] "g" "a" "a" "c" "a" "a" "a" "c" "t" "g" "t" " " "t" "t" "g" "a" "a" "a"
## [1513] "a" "a" "a" "c" " " "a" "a" "a" "g" "a" "a" "g" "c" "a" "a" " " "c" "t"
## [1531] "g" "a" "g" "g" "g" "a" "a" "a" " " "a" "t" "g" "c" "t" "g" "a" "g" "g"
## [1549] "a" " " "t" "a" "t" "g" "g" "g" "c" "a" "a" "t" "g" "g" "t" "t" "g" "t"
## [1567] "t" "t" "c" "a" " " "a" "a" "a" "t" "a" "t" "a" "c" "c" "a" " " "c" "a"
```

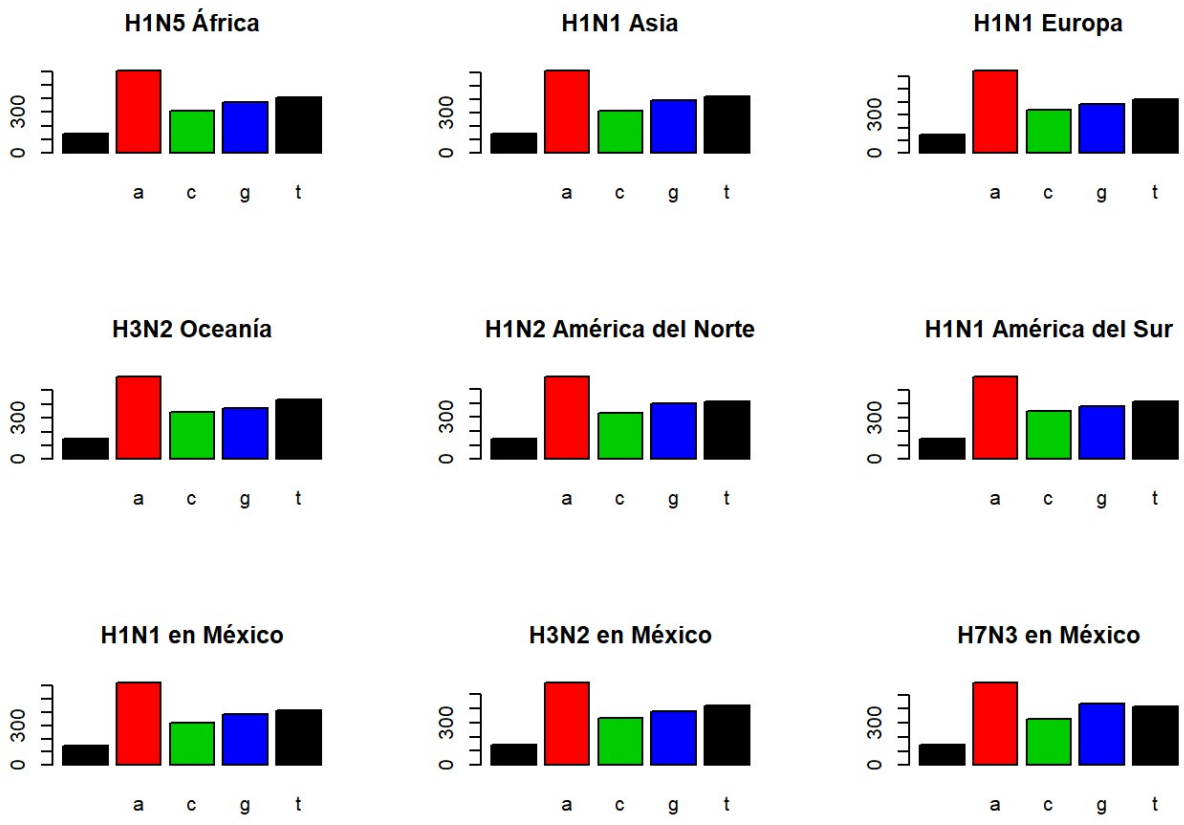
```
## [1585] "a" "a" "t" "g" "t" "g" "a" "c" " " "a" "a" "t" "g" "c" "c" "t" "g" "c"
## [1603] "a" " " "t" "a" "g" "g" "a" "t" "c" "a" "a" "t" " " "c" "a" "g" "a" "a"
## [1621] "a" "t" "g" "g" "a" "a" "c" "t" "t" "a" "t" "g" "a" "c" "c" " " "a" "c"
## [1639] "g" "a" "t" "g" "t" "a" "t" "a" " " "c" "a" "g" "g" "g" "a" "t" "g" "a"
## [1657] "a" " " "g" "c" "a" "t" "t" "a" "a" "a" "c" "a" " " "a" "c" "c" "g" "g"
## [1675] "t" "t" "t" "c" "a" " " "g" "a" "t" "c" "a" "a" "g" "g" "g" "a" "g" "t"
## [1693] "t" "g" "a" "g" "c" "t" "g" "a" " " "a" "g" "t" "c" "a" "g" "g" "g" "t"
## [1711] "a" " " "c" "a" "a" "a" "g" "a" "t" "t" "g" "g" " " "a" "t" "c" "c" "t"
## [1729] "a" "t" "g" "g" "a" " " "t" "t" "t" "c" "c" "t" "t" "t" "g" "c" " " "c"
## [1747] "a" "t" "a" "t" "c" "a" "t" "g" "t" "t" "t" "t" "t" "t" "g" "c" "t" "t"
## [1765] "t" " " "g" "t" "g" "t" "t" "g" "c" "t" "t" "t" " " "g" "t" "t" "g" "g"
## [1783] "g" "g" "t" "t" "c" " " "a" "t" "c" "a" "t" "g" "t" "g" "g" "g" " " "c"
## [1801] "c" "t" "g" "c" "c" "a" "a" "a" "a" " " "g" "g" "g" "c" "a" "a" "c" "a"
## [1819] "t" "t" "a" "g" "g" "t" "g" "c" "a" "a" "c" "a" " " "t" "t" "t" "g" "c"
## [1837] "a" "t" "t" "t" "g" " " "a"
## attr(,"name")
## [1] "Influenza_A_virus_(A/Mexico_City/1514A00905313N/2013(H3N2))_HA_KT889237.1"
## attr(,"Annot")
## [1] ">Influenza_A_virus_(A/Mexico_City/1514A00905313N/2013(H3N2))_HA_KT889237.1"
## attr(,"class")
## [1] "SeqFastadna"
##
## $`Influenza_A_virus_(A/Mexico/InDRE7218/2012(H7N3))_HA_CY125728.1`
##    [1] "a" "g" "c" "a" "a" "a" "a" "g" "c" "a" " " "g" "g" "g" "g" "a" "t" "a"
##   [19] "c" "a" "a" " " "a" "a" "t" "g" "a" "a" "c" "a" "c" "t" " " "c" "a" "a"
##   [37] "a" "t" "t" "t" "t" "g" "g" " " "c" "a" "c" "t" "c" "a" "t" "t" "g" "c"
##   [55] " " "t" "t" "g" "t" "a" "t" "g" "c" "t" "g" "a" "t" "t" "g" "g" "a" "g"
##   [73] "c" "t" "a" " " "a" "a" "g" "g" "a" "g" "a" "t" "a" "a" " " "a" "a" "t"
##   [91] "a" "t" "g" "t" "c" "t" "t" " " "g" "g" "g" "c" "a" "c" "c" "a" "t" "g"
##  [109] " " "c" "t" "g" "t" "g" "g" "c" "a" "a" "a" " " "t" "g" "g" "a" "a" "c"
##  [127] "a" "a" "a" "a" "g" "t" "g" "a" "a" "c" "a" "c" "a" "t" " " "t" "a" "a"
##  [145] "c" "a" "g" "a" "g" "a" "g" " " "a" "g" "g" "a" "a" "t" "c" "g" "a" "a"
##  [163] " " "g" "t" "a" "g" "t" "a" "a" "a" "t" "g" " " "c" "c" "a" "c" "a" "g"
##  [181] "a" "a" "a" "c" " " "g" "g" "t" "g" "g" "a" "g" "a" "c" "t" "g" "c" "a"
##  [199] "a" "a" "t" "a" "c" "t" "a" " " "a" "g" "a" "a" "a" "a" "t" "a" "t" "g"
##  [217] " " "c" "a" "c" "t" "c" "a" "g" "g" "g" "g" " " "a" "a" "a" "a" "g" "a"
##  [235] "c" "c" "a" "a" " " "c" "a" "g" "a" "t" "c" "t" "g" "g" "g" " " "a" "c"
##  [253] "a" "a" "t" "g" "c" "g" "g" "a" "c" "t" "t" "c" "t" "a" "g" "g" "a" "a"
##  [271] " " "c" "c" "c" "t" "a" "a" "t" "a" "g" "g" " " "a" "c" "c" "t" "c" "c"
##  [289] "c" "c" "a" "a" " " "t" "g" "c" "g" "a" "t" "c" "a" "a" "t" " " "t" "t"
##  [307] "c" "t" "g" "g" "a" "a" "t" "t" " " "t" "g" "a" "c" "g" "c" "t" "g" "a"
##  [325] "t" "t" "t" "a" "a" "t" "a" "a" "t" "t" "g" " " "a" "a" "c" "g" "a" "a"
##  [343] "g" "a" "g" "a" " " "a" "g" "g" "a" "a" "c" "c" "g" "a" "t" " " "g" "t"
##  [361] "g" "t" "g" "t" "t" "a" "t" "c" " " "c" "c" "g" "g" "g" "a" "a" "g" "t"
##  [379] "t" " " "c" "a" "c" "a" "a" "a" "t" "g" "a" "a" "g" "a" "a" "t" "c" "a"
##  [397] "c" "t" "g" "a" " " "g" "g" "c" "a" "a" "a" "t" "c" "c" "t" " " "t" "c"
##  [415] "g" "a" "g" "g" "g" "t" "c" "a" " " "g" "g" "a" "g" "g" "a" "a" "t" "t"
##  [433] "g" " " "a" "t" "a" "a" "a" "g" "a" "g" "t" "c" " " "a" "a" "t" "g" "g"
##  [451] "g" "t" "t" "t" "c" "a" "c" "c" "t" "a" "t" "a" "g" "t" "g" " " "g" "a"
```

```
##  [469] "a" "t" "a" "a" "g" "a" "a" "c" " " "c" "a" "a" "t" "g" "g" "g" "g" "c"
##  [487] "g" " " "a" "c" "a" "a" "g" "t" "g" "c" "t" "t" " " "g" "c" "a" "g" "a"
##  [505] "a" "g" "a" "t" "c" " " "a" "g" "g" "t" "t" "c" "t" "t" "c" "c" "t" "t"
##  [523] "c" "t" "a" "t" "g" "c" "g" "g" " " "a" "g" "a" "t" "g" "a" "a" "g" "t"
##  [541] "g" " " "g" "t" "t" "a" "c" "t" "g" "t" "c" "g" " " "a" "a" "t" "t" "c"
##  [559] "a" "g" "a" "c" "a" " " "a" "t" "g" "c" "g" "g" "c" "t" "t" "t" " " "t"
##  [577] "c" "c" "c" "c" "a" "a" "a" "t" "g" "a" "c" "t" "a" "a" "g" "t" "c" "g"
##  [595] "t" " " "a" "c" "a" "g" "a" "a" "a" "t" "c" "c" " " "c" "a" "g" "g" "a"
##  [613] "a" "c" "a" "a" "a" " " "c" "c" "a" "g" "c" "t" "c" "t" "g" "a" " " "t"
##  [631] "a" "a" "t" "t" "t" "g" "g" "g" "g" " " "a" "g" "t" "g" "c" "a" "t" "c"
##  [649] "a" "t" "t" "c" "t" "g" "g" "a" "t" "c" "g" "g" " " "c" "t" "a" "c" "t"
##  [667] "g" "a" "g" "c" "a" " " "g" "a" "c" "c" "a" "a" "a" "c" "t" "c" " " "t"
##  [685] "a" "t" "g" "g" "g" "a" "g" "t" "g" " " "g" "a" "a" "a" "c" "a" "a" "g"
##  [703] "t" "t" " " "g" "a" "t" "a" "a" "c" "a" "g" "t" "a" "g" "g" "a" "a" "g"
##  [721] "c" "t" "c" "g" "a" " " "a" "a" "t" "a" "c" "c" "a" "g" "c" "a" " " "g"
##  [739] "t" "c" "a" "t" "t" "c" "a" "c" "c" " " "c" "c" "a" "a" "g" "c" "c" "c"
##  [757] "g" "g" " " "g" "g" "g" "c" "a" "c" "g" "a" "c" "c" " " "a" "c" "a" "g"
##  [775] "g" "t" "g" "a" "a" "t" "g" "g" "g" "c" "a" "a" "t" "c" "a" "g" " " "g"
##  [793] "a" "a" "g" "g" "a" "t" "t" "g" "a" " " "c" "t" "t" "t" "c" "a" "c" "t"
##  [811] "g" "g" " " "c" "t" "a" "c" "t" "c" "c" "t" "t" "g" " " "a" "t" "c" "c"
##  [829] "c" "a" "a" "t" "g" "a" " " "c" "a" "c" "a" "g" "t" "g" "a" "c" "c" "t"
##  [847] "t" "c" "a" "c" "a" "t" "t" "c" "a" " " "a" "t" "g" "g" "g" "g" "c" "a"
##  [865] "t" "t" " " "c" "a" "t" "a" "g" "c" "t" "c" "c" "t" " " "g" "a" "c" "a"
##  [883] "g" "a" "g" "c" "a" "a" " " "g" "t" "t" "t" "c" "t" "t" "t" "a" "g" " "
##  [901] "a" "g" "g" "a" "g" "a" "g" "t" "c" "a" "a" "t" "a" "g" "g" "a" "g" "t"
##  [919] "t" "c" " " "a" "g" "a" "g" "t" "g" "a" "t" "g" "t" " " "t" "c" "c" "t"
##  [937] "t" "t" "g" "g" "a" "t" " " "t" "c" "t" "g" "g" "t" "t" "g" "t" "g" " "
##  [955] "a" "g" "g" "g" "g" "g" "a" "t" "t" "g" " " "c" "t" "t" "c" "c" "a" "c"
##  [973] "a" "a" "t" "g" "g" "g" "g" "g" "t" "a" "c" "g" "a" " " "t" "a" "g" "t"
##  [991] "g" "a" "g" "t" "t" "c" " " "c" "c" "t" "g" "c" "c" "a" "t" "t" "c" " "
## [1009] "c" "a" "g" "a" "a" "c" "a" "t" "c" "a" " " "a" "c" "c" "c" "t" "a" "g"
## [1027] "a" "a" "c" " " "a" "g" "t" "g" "g" "g" "a" "a" "a" "a" "t" "g" "c" "c"
## [1045] "c" "t" "c" "g" "a" "t" " " "a" "t" "g" "t" "c" "a" "a" "a" "c" "a" " "
## [1063] "g" "a" "c" "a" "a" "g" "c" "c" "t" "c" " " "c" "t" "t" "t" "t" "g" "g"
## [1081] "c" "t" "a" " " "c" "a" "g" "g" "g" "a" "t" "g" "a" "g" " " "a" "a" "a"
## [1099] "c" "g" "t" "c" "c" "c" "a" "g" "a" "g" "a" "a" "c" "c" "c" "c" "a" " "
## [1117] "a" "g" "g" "a" "t" "a" "g" "g" "a" "a" " " "g" "a" "g" "c" "c" "g" "a"
## [1135] "c" "a" "t" " " "c" "g" "a" "a" "g" "g" "a" "c" "c" "a" " " "g" "a" "g"
## [1153] "g" "c" "c" "t" "t" "t" "t" " " "t" "g" "g" "a" "g" "c" "g" "a" "t" "t"
## [1171] "g" "c" "t" "g" "g" "a" "t" "t" "c" "a" " " "t" "a" "g" "a" "g" "a" "a"
## [1189] "t" "g" "g" " " "a" "t" "g" "g" "g" "a" "a" "g" "g" "t" " " "c" "t" "c"
## [1207] "a" "t" "t" "g" "a" "t" "g" " " "g" "a" "t" "g" "g" "t" "a" "t" "g" "g"
## [1225] " " "t" "t" "t" "c" "a" "g" "a" "c" "a" "t" "c" "a" "a" "a" "a" "t" "g"
## [1243] "c" "a" "c" " " "a" "a" "g" "g" "a" "g" "a" "a" "g" "g" " " "a" "a" "c"
## [1261] "t" "g" "c" "a" "g" "c" "t" " " "g" "a" "t" "t" "a" "c" "a" "a" "a" "a"
## [1279] " " "g" "c" "a" "c" "t" "c" "a" "a" "t" "c" " " "t" "g" "c" "g" "a" "t"
## [1297] "a" "g" "a" "t" "c" "a" "g" "a" "t" "c" "a" "c" "a" "g" " " "g" "c" "a"
## [1315] "a" "a" "t" "t" "g" "a" "a" " " "t" "c" "g" "t" "c" "t" "a" "a" "t" "t"
## [1333] " " "g" "a" "c" "a" "a" "a" "a" "c" "a" "a" " " "a" "t" "c" "a" "g" "c"
```

```
## [1351] "a" "g" "t" "t" " " "t" "g" "a" "a" "c" "t" "g" "a" "t" "a" "g" "a" "c"
## [1369] "a" "a" "c" "g" "a" "a" "t" " " "t" "c" "a" "g" "t" "g" "a" "a" "a" "t"
## [1387] " " "a" "g" "a" "a" "c" "a" "a" "c" "a" "a" " " "a" "t" "t" "g" "g" "g"
## [1405] "a" "a" "t" "g" " " "t" "c" "a" "t" "t" "a" "a" "c" "t" "g" " " "g" "a"
## [1423] "c" "a" "c" "g" "a" "g" "a" "t" "t" "c" "a" "a" "t" "g" "a" "c" "t" "g"
## [1441] " " "a" "g" "g" "t" "a" "t" "g" "g" "t" "c" " " "g" "t" "a" "c" "a" "a"
## [1459] "t" "g" "c" "t" " " "g" "a" "a" "t" "t" "g" "c" "t" "g" "g" " " "t" "a"
## [1477] "g" "c" "t" "a" "t" "g" "g" "a" " " "a" "a" "a" "t" "c" "a" "g" "c" "a"
## [1495] "c" "a" "c" "a" "a" "t" "a" "g" "a" "t" "c" " " "t" "t" "g" "c" "a" "g"
## [1513] "a" "c" "t" "c" " " "a" "g" "a" "a" "a" "t" "g" "a" "a" "c" " " "a" "a"
## [1531] "a" "c" "t" "t" "t" "a" "t" "g" " " "a" "g" "c" "g" "t" "g" "t" "a" "a"
## [1549] "g" " " "g" "a" "a" "a" "c" "a" "a" "c" "t" "g" "a" "g" "g" "g" "a" "g"
## [1567] "a" "a" "t" "g" " " "c" "t" "g" "a" "a" "g" "a" "g" "g" "a" " " "t" "g"
## [1585] "g" "g" "a" "c" "t" "g" "g" "a" " " "t" "g" "c" "t" "t" "t" "g" "a" "a"
## [1603] "a" " " "t" "a" "t" "t" "t" "c" "a" "t" "a" "a" " " "g" "t" "g" "t" "g"
## [1621] "a" "t" "g" "a" "t" "c" "a" "g" "t" "g" "c" "a" "t" "g" "g" " " "a" "g"
## [1639] "a" "g" "c" "a" "t" "c" "a" "g" " " "g" "a" "a" "c" "a" "a" "c" "a" "c"
## [1657] "t" " " "t" "a" "t" "g" "a" "c" "c" "a" "t" "a" " " "c" "t" "c" "a" "a"
## [1675] "t" "a" "c" "a" "g" " " "a" "g" "c" "g" "g" "a" "g" "t" "c" "a" "t" "t"
## [1693] "g" "c" "a" "g" "a" "a" "t" "a" " " "g" "a" "a" "t" "a" "c" "a" "g" "a"
## [1711] "t" " " "a" "g" "a" "c" "c" "c" "a" "g" "t" "g" " " "a" "a" "a" "t" "t"
## [1729] "g" "a" "g" "t" "a" " " "g" "t" "g" "g" "a" "t" "a" "c" "a" "a" " " "a"
## [1747] "g" "a" "c" "a" "t" "a" "a" "t" "c" "t" "t" "a" "t" "g" "g" "t" "t" "t"
## [1765] "a" " " "g" "c" "t" "t" "c" "g" "g" "g" "g" "c" " " "a" "t" "c" "a" "t"
## [1783] "g" "t" "t" "t" "t" " " "c" "t" "t" "c" "t" "t" "c" "t" "a" "g" " " "c"
## [1801] "c" "a" "t" "t" "g" "c" "a" "a" "t" " " "g" "g" "g" "a" "t" "t" "g" "g"
## [1819] "t" "t" "t" "t" "c" "a" "t" "t" "t" "g" "c" "a" " " "t" "a" "a" "a" "g"
## [1837] "a" "a" "t" "g" "g" " " "a" "a" "a" "c" "a" "t" "g" "c" "g" "g" " " "t"
## [1855] "g" "c" "a" "c" "t" "a" "t" "t" "t" " " "g" "t" "a" "t" "a" "t" "a" "g"
## [1873] "t" "t" " " "t" "g" "a" "g" "a" "a" "a" "a" "a" "a" "a" "c" "a" "c" "c"
## [1891] "c" "t" "t" "g" "t" " " "t" "t" "c" "t" "a" "c" "t"
## attr(,"name")
## [1] "Influenza_A_virus_(A/Mexico/InDRE7218/2012(H7N3))_HA_CY125728.1"
## attr(,"Annot")
## [1] ">Influenza_A_virus_(A/Mexico/InDRE7218/2012(H7N3))_HA_CY125728.1"
## attr(,"class")
## [1] "SeqFastadna"
```

```
# Función de la gráfica
comparacion <- function(s1,s2,s3,s4,s5,s6, s7, s8, s9){
  par(mfrow=c(3,3))
  barplot(table(s1), col = 1:4, main = "H1N5 África")
  barplot(table(s2), col = 1:4, main = "H1N1 Asia")
  barplot(table(s3), col = 1:4, main = "H1N1 Europa")
  barplot(table(s4), col = 1:4, main = "H3N2 Oceanía")
  barplot(table(s5), col = 1:4, main = "H1N2 América del Norte")
  barplot(table(s6), col = 1:4, main = "H1N1 América del Sur")
  barplot(table(s7), col = 1:4, main = "H1N1 en México")
  barplot(table(s8), col = 1:4, main = "H3N2 en México")
  barplot(table(s9), col = 1:4, main = "H7N3 en México")

}
#Gráfica
comparacion(virus_seq_no_alineadas[[1]],virus_seq_no_alineadas[[2]],virus_seq_no_aline
adas[[3]],virus_seq_no_alineadas[[4]],virus_seq_no_alineadas[[5]],virus_seq_no_alinead
as[[6]],virus_seq_no_alineadas[[7]],virus_seq_no_alineadas[[8]],virus_seq_no_alineadas
[[9]])
```



Análisis jerárquico global obtenido de las

secuencias (árbol filogenético).

```
# Archivo en formato DNAStringSet
virus_seq_no_alineadas <- readDNAStringSet("virus_seqs.fasta", format = "fasta")
```

```
## Warning in .Call2("fasta_index", filexp_list, nrec, skip, seek.first.rec, :
## reading FASTA file virus_seqs.fasta: ignored 1302 invalid one-letter sequence
## codes
```

```
virus_seq_no_alineadas
```

```
##   A DNAStringSet instance of length 9
##     width seq                                                 names
## [1]  1698 ATGAAGGCAATACTAGTAGTTCT...TACAGTGTAGAATATGTATTTAA Influenza_A_virus...
## [2]  1749 ATGGAGAAAATAGTGCTTCTTCT...TAAAAACACCTTTGTTTCCTACT Influenza_A_virus...
## [3]  1778 AGCAAAAGCAGGGGAAAATAAAA...GAAAAAACACCCTTGTTTCTACT Influenza_A_virus...
## [4]  1742 AAAATTAAATCAACCAAAATGGA...GACTTGAATCTCAAAATGTACGG Influenza_A_virus...
## [5]  1731 ATGAAAGTAAAACTACTGACCCT...TCAGAAATATAAGAAAAAACACC Influenza_A_virus...
## [6]  1742 GCAGGGGATAATTCTATTAACCA...TTGAGTGCATTAATTAAAAACAC Influenza_A_virus...
## [7]  1733 AAAAGCAACAAAAATGAAGGCAA...TTAACATTAGGATTTCAGAAGCA Influenza_A_virus...
## [8]  1701 ATGAAGACTATCATTGCTTTGAG...TTAGGTGCAACATTTGCATTTGA Influenza_A_virus...
## [9]  1757 AGCAAAAGCAGGGGATACAAAAT...AAAAAAACACCCTTGTTTCTACT Influenza_A_virus...
```

```
# Orientación de secuencia
virus_seq_no_alineadas <- OrientNucleotides(virus_seq_no_alineadas)
```

```
## ================================================================================
================================================================================
================================
##
## Time difference of 0.06 secs
```

```
# Alineamiento de las secuencias
virus_align_seqs <- AlignSeqs(virus_seq_no_alineadas)
```

```
## Determining distance matrix based on shared 9-mers:
## ================================================================================
##
## Time difference of 0.01 secs
##
## Clustering into groups by similarity:
## ================================================================================
##
## Time difference of 0.01 secs
##
## Aligning Sequences:
## ================================================================================
##
## Time difference of 1.41 secs
##
## Iteration 1 of 2:
##
## Determining distance matrix based on alignment:
## ================================================================================
##
## Time difference of 0 secs
##
## Reclustering into groups by similarity:
## ================================================================================
##
## Time difference of 0 secs
##
## Realigning Sequences:
## ================================================================================
##
## Time difference of 0.01 secs
##
## Alignment converged - skipping remaining iteration.
##
## Refining the alignment:
## ================================================================================
##
## Time difference of 0.85 secs
```

```
# Guardar el archivo y leer las secuencias alineadas
writeXStringSet(virus_align_seqs, file = "virus_align_seq.fasta")
virus_aligned <- read.alignment("virus_align_seq.fasta", format = "fasta")
virus_aligned
```

```
## $nb
## [1] 9
##
## $nam
## [1] "Influenza_A_virus_(A/Bogota/WR0090N/2009(H1N1))_HA_CY049836.1"
## [2] "Influenza_A_virus_(A/Egypt/0636-NAMRU3/2007(H5N1))_HA_EF382359.1"
## [3] "Influenza_A_virus_(A/Thailand/271/2005(H1N1))_HA_EF101749.1"
## [4] "Influenza_A_virus_(A/swine/Spain/50047/2003(H1N1))_HA_CY009892.1"
## [5] "Influenza_A_virus_(A/Minnesota/19/2011(H1N2))_HA_JQ290156.1"
## [6] "Influenza_A_virus_(A/Ashburton/280/2004(H3N2))_HA_CY002954.1"
## [7] "Influenza_A_virus_(A/Mexico_City/001/2009(H1N1))_HA_CY050198.1"
## [8] "Influenza_A_virus_(A/Mexico_City/1514A00905313N/2013(H3N2))_HA_KT889237.1"
## [9] "Influenza_A_virus_(A/Mexico/InDRE7218/2012(H7N3))_HA_CY125728.1"
##
## $seq
## $seq[[1]]
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agaatagaatacagatagacccagtgaaattgagtagtggatacaaagacataatcttatggtttagcttcggggcatcatgtttt
cttcttctagccattgcaatgggattggttttcatttgcat---aaagaatggaaacatgcggtgcactatttgtatata------
----------gtttgagaaaaaaacacccttgtttctact"
##
##
## $com
## [1] NA
##
## attr(,"class")
## [1] "alignment"
```

```
# Matriz de distancia entre las secuencias
matriz_distancia <- dist.alignment(virus_aligned, matrix = "similarity")
```

```
# Crear árbol filogenético
virus_filogenetico <- nj(matriz_distancia)
class(virus_filogenetico)
```

```
## [1] "phylo"
```

```
# visualización del árbol
virus_plot_filogenetico <- ladderize(virus_filogenetico)
plot(virus_plot_filogenetico, font = 20, cex = 0.8)
title("Arbol filogenético de variantes de influenza segmento 4")
```

Interpretación de la gráficas

Gráfica 1: Comparación entre variantes del virus y las bases del ADN que lo componen

Como se puede observar, los nucleótidos que aparecen con menos frecuencia en este tipo de virus son la citosina y guanina (excepto en la de México H7N3), y los que aparecen con mayor frecuencia son la timina y adenina. Esto significa que su punto de fusión es menor que si tuvieran mayor CG y sus

enlaces no son tan difíciles de romper. Es importante mencionar que todos los virus de la influenza constan del ARN de cadena simple a diferencia del ADN de cadena doble. Los genes del ARN de los virus de la influenza están constituidos por cadenas de nucleótidos que están unidas entre si.

También es importante añadir que la comparación de la composición de nucleótidos en el gen de un virus con el orden de los nucleótidos de otro gen puede demostrar ciertas variaciones entre los dos virus. Si bien, como se puede observar en la gráfica, la composición de nucleótidos en todas las variaciones anteriormente analizadas son muy parecidas y todas tienen casi la misma cantidad de bases, es fundamental analizar sus diferencias. Se puede observar que en la secuencia de nucleótidos de las variantes A(H1N1) y A(H2N3) se tienen casi la misma cantidad y distribución de bases, lo cual indica que son mucho más parecidas entre sí que la variante A(H7N3). En cuanto, a las variantes de los virus de los demás contienentes, es muy interesante observar que aunque se utilizan variantes diferentes del virus de influenza tipo A, la distribución de bases nitrogenadas no cambia mucho con respecto a la de los demás continentes. También, se observa que la gráfica de América del Norte es muy parecida a la de América del Sur (aún siendo diferentes variantes), posiblemente debido a la cercanía geográfica. Las variaciones genéticas son importantes porque pueden influir directamente en la estructura de las proteínas superficiales del virus de la influenza. La sustitución de un aminoácido por otro puede afectar las características de un virus, como por ejemplo cuán bien se propaga un virus entre las personas y cuán susceptible es el virus a los medicamentos antivirales o a las vacunas actuales.

Gráfica 2: Análisis jerárquico (árbol filogenético)

A partir del alineamiento de secuencias anteriormente presentadas, se puede elaborar este árbol filogenético. Este árbol representa las nueve variantes de virus analizadas anteriormente. El patrón en el que se conectan ramas representa la forma en que evolucionaron los virus a partir de una serie de ancestros comunes. Cada punto de ramificación (nodo interno) representa un punto de divergencia o separación de un grupo en dos grupos descendientes. Por lo tanto, la secuencia más divergente sería la influenza A(H1N2) de Minnesota, EU, lo cual, tiene sentido ya que se cree que varias variantes de influeza que han llegado a México y otros países proviene de Estados Unidos.

El árbol filogenético anteriormente presentado, permite observar como los virus han ido evolucionando a partir de ancestros comunes. El árbol nos dice que las especies más relacionadas entre sí son las que tienen un ancestro común más reciente (mientras más a la derecha esten, más recientes son), por ejemplo, el H3N2 de la Ciudad de México con el de Ashburton o H1N1 de México con Bogotá. Esto, en el caso de México y Bogotá, probablemente se deba a su cercanía geográfica, ya que se encuentran en América, por lo que tienen facilidad para transportarse de un país a otro.

Así mismo, los componentes que están menos relacionados son aquellos que tienen un ancestro común menos reciente. Por ejemplo, se puede observar que el ancestro menos reciente es la Influenza A en Minnesota, seguido de H1N1 en Tailandia y H1N1 en España. También, es importante mencionar que los datos en los arboles filogenéticos son hipótesis, no hechos definitivos.

Citas de paquetes utilizados

```
citation("ape")
```

```
##
## To cite ape in a publication use:
##
##   Paradis E. & Schliep K. 2018. ape 5.0: an environment for modern
##   phylogenetics and evolutionary analyses in R. Bioinformatics 35:
##   526-528.
##
## A BibTeX entry for LaTeX users is
##
##   @Article{,
##     title = {ape 5.0: an environment for modern phylogenetics and evolutionary anal
yses in {R}},
##     author = {E. Paradis and K. Schliep},
##     journal = {Bioinformatics},
##     year = {2018},
##     volume = {35},
##     pages = {526-528},
##   }
##
## As ape is evolving quickly, you may want to cite also its version
## number (found with 'library(help = ape)' or 'packageVersion("ape")').
```

```
citation("seqinr")
```

```
##
## To cite seqinr in publications use:
##
##   Charif, D. and Lobry, J.R. (2007)
##
## A BibTeX entry for LaTeX users is
##
##   @InCollection{,
##     author = {D. Charif and J.R. Lobry},
##     title = {Seqin{R} 1.0-2: a contributed package to the {R} project for statistic
al computing devoted to biological sequences retrieval and analysis.},
##     booktitle = {Structural approaches to sequence evolution: Molecules, networks,
populations},
##     year = {2007},
##     editor = {U. Bastolla and M. Porto and H.E. Roman and M. Vendruscolo},
##     series = {Biological and Medical Physics, Biomedical Engineering},
##     pages = {207-232},
##     address = {New York},
##     publisher = {Springer Verlag},
##     note = {{ISBN :} 978-3-540-35305-8},
##   }
```

```
citation("phangorn")
```

```
##
## Use 2011 to cite phangorn in a publication; 2017 for plotting
## phylogenetic networks. As phangorn is evolving quickly, you may want to
## cite also its version number (phangorn 2.5.5).
##
##   Schliep K.P. 2011. phangorn: phylogenetic analysis in R.
##   Bioinformatics, 27(4) 592-593
##
##   Schliep, K., Potts, A. J., Morrison, D. A., Grimm, G. W. (2017),
##   Intertwining phylogenetic trees and networks. Methods in Ecology and
##   Evolution, 8: 1212--1220. doi: 10.1111/2041-210X.12760
##
## To see these entries in BibTeX format, use 'print(<citation>,
## bibtex=TRUE)', 'toBibtex(.)', or set
## 'options(citation.bibtex.max=999)'.
```

```
citation("phytools")
```

```
##
## To cite phytools in publication use:
##
##   Revell, L. J. (2012) phytools: An R package for phylogenetic
##   comparative biology (and other things). Methods Ecol. Evol. 3
##   217-223. doi:10.1111/j.2041-210X.2011.00169.x
##
## A BibTeX entry for LaTeX users is
##
##   @Article{,
##     title = {phytools: An R package for phylogenetic comparative biology (and other
things).},
##     author = {Liam J. Revell},
##     journal = {Methods in Ecology and Evolution},
##     year = {2012},
##     volume = {3},
##     pages = {217-223},
##   }
##
## As phytools is continually evolving, you may want to cite its version
## number. Find it with 'help(package=phytools)'.
```

```
citation("geiger")
```

```
##
## To cite medusa, auteur, or geiger in a publication use:
##
## medusa
##
##   Alfaro Michael E, Francesco Santini, Chad Brock, Hugo Alamillo, Alex
##   Dornburg, Daniel L Rabosky, Giorgio Carnevale, and Luke J Harmon.
##   2009. Nine exceptional radiations plus high turnover explain species
##   diversity in jawed vertebrates. PNAS 106:13410-13414.
##
## auteur
##
##   Eastman Jonathan M, Michael E Alfaro, Paul Joyce, Andrew L Hipp, and
##   Luke J Harmon. 2011. A novel comparative method for identifying
##   shifts in the rate of character evolution on trees. Evolution
##   65:3578-3589.
##
## MECCA
##
##   Slater Graham J, Luke J Harmon, Daniel Wegmann, Paul Joyce, Liam J
##   Revell, and Michael E Alfaro. 2012. Fitting models of continuous
##   trait evolution to incompletely sampled comparative data using
##   approximate Bayesian computation. Evolution 66:752-762.
##
## geiger-orig
##
##   Harmon Luke J, Jason T Weir, Chad D Brock, Richard E Glor, and
##   Wendell Challenger. 2008. GEIGER: investigating evolutionary
##   radiations. Bioinformatics 24:129-131.
##
## geiger
##
##   Pennell Matthew W, Jonathan M Eastman, Graham J Slater, Joseph W
##   Brown, Josef C Uyeda, Richard G FitzJohn, Michael E Alfaro, and Luke
##   J Harmon. 2014. geiger v2.0: an expanded suite of methods for fitting
##   macroevolutionary models to phylogenetic trees. Bioinformatics
##   30:2216-2218.
##
## To see these entries in BibTeX format, use 'print(<citation>,
## bibtex=TRUE)', 'toBibtex(.)', or set
## 'options(citation.bibtex.max=999)'.
```

```
citation("Biostrings")
```

```
##
## To cite package 'Biostrings' in publications use:
##
##   H. Pagès, P. Aboyoun, R. Gentleman and S. DebRoy (2019). Biostrings:
##   Efficient manipulation of biological strings. R package version
##   2.54.0.
##
## A BibTeX entry for LaTeX users is
##
##   @Manual{,
##     title = {Biostrings: Efficient manipulation of biological strings},
##     author = {H. Pagès and P. Aboyoun and R. Gentleman and S. DebRoy},
##     year = {2019},
##     note = {R package version 2.54.0},
##   }
##
## ATTENTION: This citation information has been auto-generated from the
## package DESCRIPTION file and may need manual editing, see
## 'help("citation")'.
```

```
citation("adegenet")
```

```
##
## To cite the adegenet package:
##
##   Jombart, T. (2008) adegenet: a R package for the multivariate
##   analysis of genetic markers. Bioinformatics 24: 1403-1405. doi:
##   10.1093/bioinformatics/btn129
##
##   Jombart T. and Ahmed I. (2011) adegenet 1.3-1: new tools for the
##   analysis of genome-wide SNP data. Bioinformatics. doi:
##   10.1093/bioinformatics/btr521
##
## To see these entries in BibTeX format, use 'print(<citation>,
## bibtex=TRUE)', 'toBibtex(.)', or set
## 'options(citation.bibtex.max=999)'.
```

```
citation("ggtree")
```

```
##
## To cite ggtree in publications use:
##
##   Guangchuang Yu, David Smith, Huachen Zhu, Yi Guan, Tommy Tsan-Yuk
##   Lam. ggtree: an R package for visualization and annotation of
##   phylogenetic trees with their covariates and other associated data.
##   Methods in Ecology and Evolution 2017, 8(1):28-36
##
##   Guangchuang Yu, Tommy Tsan-Yuk Lam, Huachen Zhu, Yi Guan. Two methods
##   for mapping and visualizing associated data on phylogeny using
##   ggtree. Molecular Biology and Evolution 2018, 35(2):3041-3043. doi:
##   10.1093/molbev/msy194
##
## To see these entries in BibTeX format, use 'print(<citation>,
## bibtex=TRUE)', 'toBibtex(.)', or set
## 'options(citation.bibtex.max=999)'.
```

```
citation("DECIPHER")
```

```
##
## Wright ES (2016). "Using DECIPHER v2.0 to Analyze Big Biological
## Sequence Data in R." _The R Journal_, *8*(1), 352-359.
##
## A BibTeX entry for LaTeX users is
##
##   @Article{,
##     title = {Using DECIPHER v2.0 to Analyze Big Biological Sequence Data in R},
##     author = {Erik S. Wright},
##     journal = {The R Journal},
##     year = {2016},
##     volume = {8},
##     number = {1},
##     pages = {352-359},
##   }
```

```
citation("viridis")
```

```
##
## To cite package 'viridis' in publications use:
##
##   Simon Garnier (2018). viridis: Default Color Maps from 'matplotlib'.
##   R package version 0.5.1. https://CRAN.R-project.org/package=viridis
##
## A BibTeX entry for LaTeX users is
##
##   @Manual{,
##     title = {viridis: Default Color Maps from 'matplotlib'},
##     author = {Simon Garnier},
##     year = {2018},
##     note = {R package version 0.5.1},
##     url = {https://CRAN.R-project.org/package=viridis},
##   }
```

```
citation("ggplot2")
```

```
##
## To cite ggplot2 in publications, please use:
##
##   H. Wickham. ggplot2: Elegant Graphics for Data Analysis.
##   Springer-Verlag New York, 2016.
##
## A BibTeX entry for LaTeX users is
##
##   @Book{,
##     author = {Hadley Wickham},
##     title = {ggplot2: Elegant Graphics for Data Analysis},
##     publisher = {Springer-Verlag New York},
##     year = {2016},
##     isbn = {978-3-319-24277-4},
##     url = {https://ggplot2.tidyverse.org},
##   }
```