

ceu1kg: resources for exploring the 1000 genomes data on individuals of central European ancestry in Bioconductor

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October 2, 2011

1 Introduction

Using results of next generation sequencing experiments, a consortium of geneticists produced calls for SNP at approximately 8 million loci of the genomes of individuals of central European ancestry.

Full genotype calls are held in a folder of SnpMatrix instances:

```
> library(ceu1kg)
> dir(system.file("parts", package = "ceu1kg"))

[1] "chr1.rda" "chr10.rda" "chr11.rda" "chr12.rda" "chr13.rda" "chr14.rda"
[7] "chr15.rda" "chr16.rda" "chr17.rda" "chr18.rda" "chr19.rda" "chr2.rda"
[13] "chr20.rda" "chr21.rda" "chr22.rda" "chr3.rda" "chr4.rda" "chr5.rda"
[19] "chr6.rda" "chr7.rda" "chr8.rda" "chr9.rda"

> lk = load(dir(system.file("parts", package = "ceu1kg"), full = TRUE)[1])
> c1gt = get(lk)
> c1gt
```

```
A SnpMatrix with 60 rows and 605756 columns
Row names: NA06985 ... NA12874
Col names: chr1:533 ... chr1:247196267
```

Metadata about the loci are provided in GRanges instances available from SNPlocs packages. Here we consider the 2010 November release.

```
> library(SNPlocs.Hsapiens.dbSNP.20101109)
> if (!exists("c1loc")) c1loc = getSNPlocs("ch1", as.GRanges = TRUE)
> c1loc
```

GRanges with 1849438 ranges and 2 elementMetadata values

	seqnames	ranges	strand	RefSNP_id
	<Rle>	<IRanges>	<Rle>	<character>
[1]	ch1	[10327, 10327]	*	112750067
[2]	ch1	[10440, 10440]	*	112155239
[3]	ch1	[10469, 10469]	*	117577454
[4]	ch1	[10492, 10492]	*	55998931
[5]	ch1	[10519, 10519]	*	62636508
[6]	ch1	[10533, 10533]	*	114315702
[7]	ch1	[10583, 10583]	*	58108140
[8]	ch1	[10828, 10828]	*	10218492
[9]	ch1	[10904, 10904]	*	10218493
...
[1849430]	ch1	[249232572, 249232572]	*	28814364
[1849431]	ch1	[249232633, 249232633]	*	28783738
[1849432]	ch1	[249232665, 249232665]	*	28623457
[1849433]	ch1	[249232726, 249232726]	*	28836020
[1849434]	ch1	[249232732, 249232732]	*	80129254
[1849435]	ch1	[249232742, 249232742]	*	28850958
[1849436]	ch1	[249232749, 249232749]	*	77296965
[1849437]	ch1	[249232757, 249232757]	*	28782254
[1849438]	ch1	[249232758, 249232758]	*	28837504

	alleles_as_ambig
	<character>
[1]	Y
[2]	M
[3]	S
[4]	Y
[5]	S
[6]	S
[7]	R
[8]	R
[9]	R
...	...
[1849430]	R
[1849431]	K
[1849432]	R
[1849433]	K
[1849434]	R
[1849435]	S
[1849436]	R
[1849437]	Y

[1849438]

R

```
seqlengths
```

```
  ch1 ch2 ch3 ch4 ch5 ch6 ch7 ch8 ... ch19 ch20 ch21 ch22 chX chY chMT
    NA  NA  NA  NA  NA  NA  NA  NA ...  NA  NA  NA  NA  NA  NA  NA
```

```
> rsn1 = paste("rs", elementMetadata(c1loc)$RefSNP_id, sep = "")
> length(intersect(rsn1, colnames(c1gt)))
```

```
[1] 401489
```

```
> ext1 = grep("chr", colnames(c1gt))
> ext1 = as.numeric(gsub("chr1:", "", colnames(c1gt)[ext1]))
> length(intersect(ext1, start(c1loc)))
```

```
[1] 1608
```

The last computation shows that most of the 1KG locations are not in dbSNP.

The Bioconductor *GGdata* package includes HapMap phase II genotypes on 90 CEU individuals in 30 trios, coupled with expression data as distributed at the Sanger GENEVAR project (<ftp://ftp.sanger.ac.uk/pub/genevar/>). The 1KG genotypes are available for 43 of these 90 and the associated genotype plus expression data for these 43 can be acquired using `getSS`, for any chromosome or set of chromosomes.

```
> c20 = getSS("ceu1kg", "chr20")
> c20
```

The above code throws warning because the genotype data are present for 60 individuals, but only 43 have expression values. To create the same structure without a warning:

```
> data(eset)
> c1m = c1gt[sampleNames(ex), ]
> c1ss = make_smlSet(ex, list(chr1 = c1m))
> c1ss
```

SnpMatrix-based genotype set:

number of samples: 43

number of chromosomes present: 1

annotation: illuminaHumanv1.db

Expression data dims: 47293 x 43

Phenodata: An object of class "AnnotatedDataFrame"

sampleNames: NA06985 NA06994 ... NA12874 (43 total)

varLabels: famid persid ... male (7 total)

varMetadata: labelDescription

2 Session information

```
> sessionInfo()
```

```
R version 2.13.2 (2011-09-30)
```

```
Platform: x86_64-unknown-linux-gnu (64-bit)
```

```
locale:
```

```
[1] LC_CTYPE=en_US.UTF-8      LC_NUMERIC=C
[3] LC_TIME=en_US.UTF-8      LC_COLLATE=C
[5] LC_MONETARY=C            LC_MESSAGES=en_US.UTF-8
[7] LC_PAPER=en_US.UTF-8    LC_NAME=C
[9] LC_ADDRESS=C            LC_TELEPHONE=C
[11] LC_MEASUREMENT=en_US.UTF-8 LC_IDENTIFICATION=C
```

```
attached base packages:
```

```
[1] tools      splines    stats      graphics  grDevices  utils      datasets
[8] methods    base
```

```
other attached packages:
```

```
[1] SNPlocs.Hsapiens.dbSNP.20101109_0.99.2
[2] ceu1kg_0.0.25
[3] GGtools_3.10.2
[4] ff_2.2-3
[5] bit_1.1-7
[6] GenomicRanges_1.4.8
[7] org.Hs.eg.db_2.5.0
[8] rtracklayer_1.12.4
[9] RCurl_1.6-10
[10] bitops_1.0-4.1
[11] IRanges_1.10.6
[12] annotate_1.30.1
[13] AnnotationDbi_1.14.1
[14] GGBase_3.12.0
[15] RSQLite_0.9-4
[16] DBI_0.2-5
[17] snpStats_1.2.1
[18] Matrix_0.9996875-3
[19] lattice_0.19-33
[20] survival_2.36-9
[21] Biobase_2.12.2
```

```
loaded via a namespace (and not attached):
```

[1] BSgenome_1.20.0 Biostrings_2.20.4 XML_3.4-3 grid_2.13.2
[5] xtable_1.5-6