

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

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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 metadata columns:

	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("ceulk", "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) # assume ceulk is first in line, yields ex in global
> 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
Total number of SNP: 605756
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 2.15.1 (2012-06-22)
```

```
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=en_US.UTF-8  LC_MESSAGES=en_US.UTF-8
[7] LC_PAPER=C                LC_NAME=C
[9] LC_ADDRESS=C             LC_TELEPHONE=C
[11] LC_MEASUREMENT=en_US.UTF-8 LC_IDENTIFICATION=C
```

```
attached base packages:
```

```
[1] stats4      splines      stats        graphics    grDevices   utils        datasets
[8] methods     base
```

```
other attached packages:
```

```
[1] SNPlocs.Hsapiens.dbSNP.20101109_0.99.6
[2] ceu1kg_0.0.31
[3] Biobase_2.18.0
[4] GGtools_4.6.0
[5] Rsamtools_1.10.0
[6] Biostrings_2.26.0
[7] GenomicRanges_1.10.0
[8] IRanges_1.16.0
[9] BiocGenerics_0.4.0
[10] GGBase_3.20.0
[11] snpStats_1.8.0
[12] Matrix_1.0-9
[13] lattice_0.20-10
[14] survival_2.36-14
```

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

```
[1] AnnotationDbi_1.20.0    BSgenome_1.26.0      DBI_0.2-5
[4] GenomicFeatures_1.10.0 RCurl_1.91-1         RSQlite_0.11.2
[7] VariantAnnotation_1.4.0 XML_3.95-0           annotate_1.36.0
[10] biomaRt_2.14.0         bit_1.1-8            bitops_1.0-4.1
[13] ff_2.2-7               genefilter_1.40.0    grid_2.15.1
[16] parallel_2.15.1       rtracklayer_1.18.0  tools_2.15.1
[19] xtable_1.7-0          zlibbioc_1.4.0
```