

Handling pedigrees

Facundo Muñoz

2017-04-12 breedR version: 0.12

Contents

What is a *pedigree*

- A 3-column `data.frame` or `matrix` with the codes for each individual and its parents
- A **family** effect is easily translated into a pedigree:
 - use the **family code** as the identification of a fictitious **mother**
 - use 0 or NA as codes for the **unknown fathers**
- A pedigree sintetizes **any kind of (genetic) relationship** between individuals from one or more generations

self	dad	mum
69	0	64
70	0	41
71	0	56
72	0	55
73	0	22
74	0	50

Checking pedigrees

- For computational reasons, the pedigree needs to meet certain conditions:
 - Completeness: all the individuals (also parents) must have an entry
 - * with possibly unknown parents (code 0 or NA)
 - The offspring must follow the parents
 - The codes must be sorted increasingly
 - The codes must be consecutive
- So, not every 3-column `data.frame` or `matrix` with codes is a proper pedigree:

```
set.seed(123); n.ped <- 5
ped.nightmare <- matrix(sample(30, n.ped*3), n.ped, 3,
                        dimnames = list(NULL, c('self', 'sire', 'dam')))
check_pedigree(ped.nightmare)
```

```
##          full_ped  offsp_follows  codes_sorted codes_consecutive
##          FALSE          FALSE          FALSE          FALSE
```

Building pedigrees

- **breedR** implements a *pedigree constructor* that completes, sorts and recodes as necessary
- The resulting object, of class **pedigree** is guranteed to meet the conditions

```
ped.fix <- build_pedigree(1:3, data = ped.nightmare)

## Warning in build_pedigree(1:3, data = ped.nightmare): The pedigree has been
## recoded. Check attr(ped, 'map').

check_pedigree(ped.fix)

##           full_ped   offsp_follows   codes_sorted codes_consecutive
##           TRUE           TRUE           TRUE           TRUE
attr(ped.fix, 'map') # map from old to new codes

## [1] NA  1 NA NA NA NA NA NA  3  4 NA  7  8 NA NA NA NA NA NA  2  5  6 10
## [24] 13 15 14 11 NA 12  9
```

self	sire	dam
9	2	20
23	13	30
12	21	22
24	27	29
25	10	26

self	sire	dam
1	NA	NA
2	NA	NA
3	1	2
4	NA	NA
5	NA	NA
6	NA	NA
7	5	6
8	NA	NA
9	NA	NA
10	8	9
11	NA	NA
12	NA	NA
13	11	12
14	NA	NA
15	4	14

Using a pedigree in an additive genetic effect

- just include your original pedigree information and let **breedR** fix it for you

```
test.dat <- data.frame(ped.nightmare, y = rnorm(n.ped))
res.raw <- remlf90(fixed = y ~ 1,
  genetic = list(model = 'add_animal',
    pedigree = ped.nightmare,
    # pedigree = test.dat[, 1:3], # same thing
    var.ini = 1,
    id = 'self'),
  var.ini = list(resid = 1),
  data = test.dat)
```

```
## Warning in build_pedigree(1:3, data = ped.df): The pedigree has been
## recoded. Check attr(ped, 'map').
## pedigree has been recoded!
length(ranef(res.raw)$genetic)

## [1] 15
## The pedigree used in the model matches the one manually built
identical(ped.fix, get_pedigree(res.raw))

## [1] TRUE
```

Recovering Breeding Values in the original coding

```
## Predicted Breeding Values of the observed individuals
## Left-multiplying the vector of BLUP by the incidence matrix
## gives the BLUP of the observations in the right order.
Za <- model.matrix(res.raw)$genetic # incidence matrix
gen.blup <- with(ranef(res.raw),
  cbind(value=genetic,
        's.e.'=attr(genetic, 'se'))))
PBVs <- Za %*% gen.blup
rownames(PBVs) <- test.dat$self
```

	value	s.e.
9	0.21	0.89
23	-1.29	0.89
12	0.42	0.89
24	-0.18	0.89
25	0.84	0.89