

Using SNP BLUP REL software for prediction reliability of DGV in Poland

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- ▶ The efficiency of the software regarding the size of the data
- ▶ CPU memory usage and time
- ▶ Differences with ~~currently~~ (before EG) used national methods
- ▶ Results using the attached test data set

Traits:

- ▶ Protein yield (PRO) $-h^2 = 0.29$
- ▶ Non return rate of heifers (HCO) $-h^2 = 0.02$

Animals:

- ▶ 31 968 individuals for PRO
- ▶ 29 458 individuals for HCO

Genotype:

- ▶ 46 267 SNPs after selection based on $MAF > 1\%$ and call rate $> 95\%$



The size of the attached data

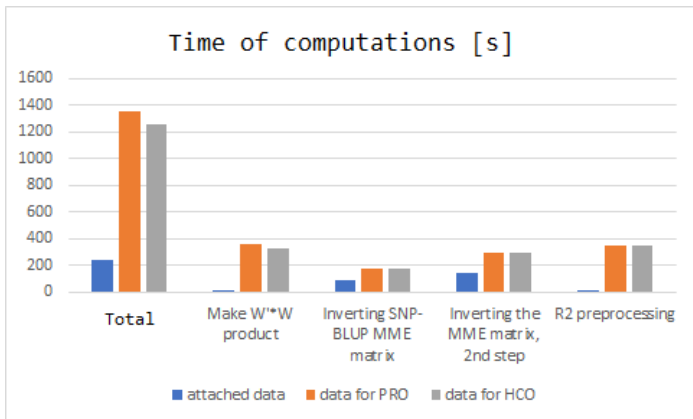
Animals:

- ▶ 345 individuals

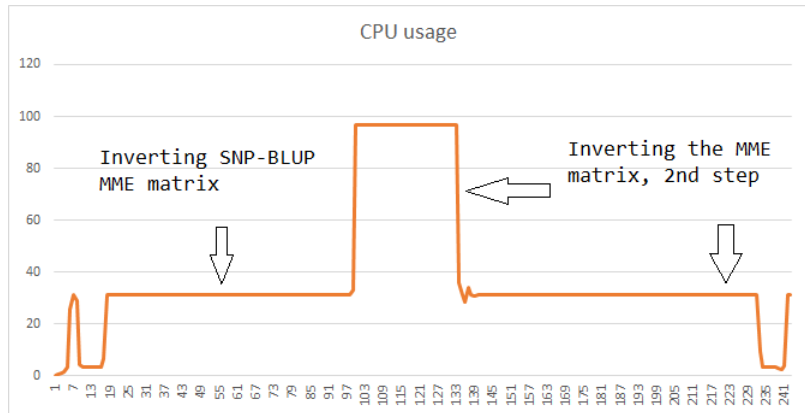
Genotype:

- ▶ 35 573 SNPs

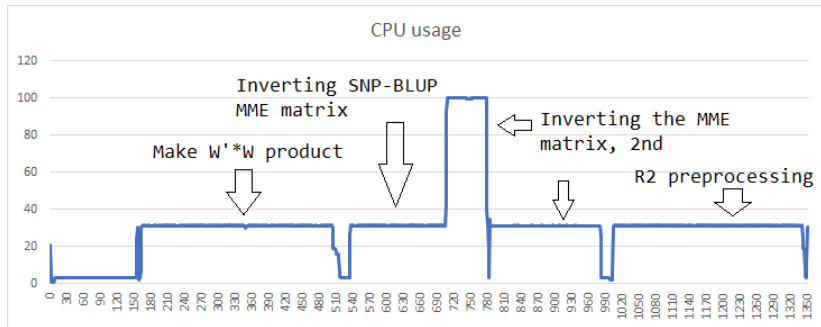
The efficiency of the software regarding the size of data - time



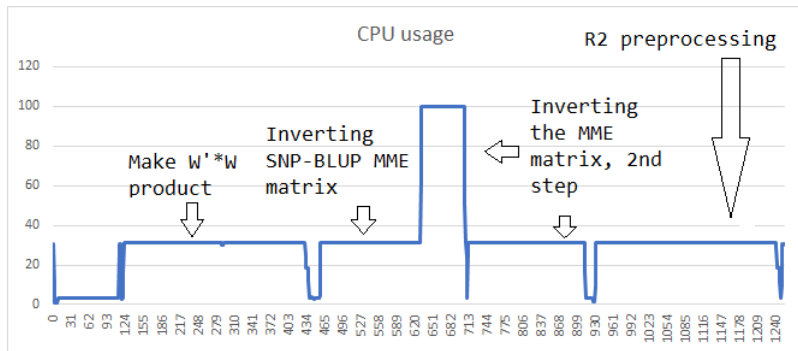
The efficiency of the software (attached data) - CPU



The efficiency of the software (PRO) - CPU

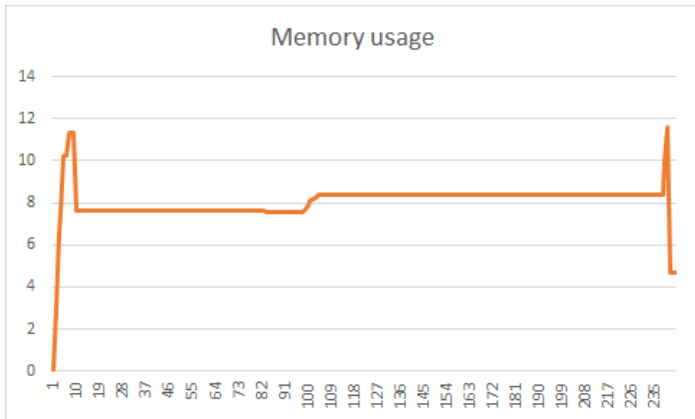


The efficiency of the software (HCO) - CPU

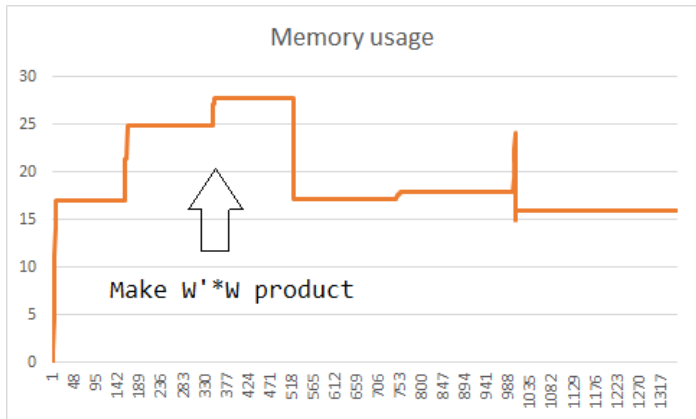




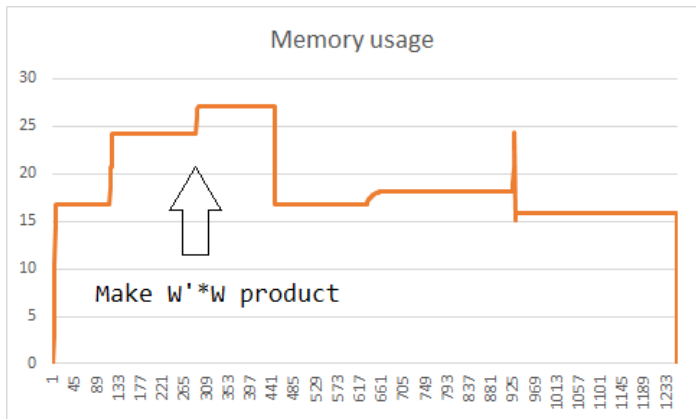
The efficiency of the software (attached data) - MEM



The efficiency of the software (PRO) - MEM

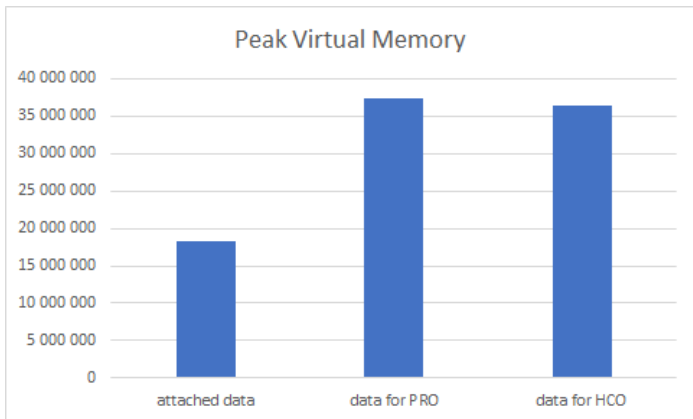


The efficiency of the software (HCO) - MEM





The efficiency of the software - VMEM



SNP effect estimation:

$$y = \mu + Zq + \epsilon,$$

- ▶ y - deregressed EBV
- ▶ μ - overall mean
- ▶ q - random SNP effect $\sim \mathcal{N}(0, I \cdot \frac{\hat{\sigma}_\alpha^2}{N_{SNP}})$
- ▶ $N_{SNP} = 46\,267$
- ▶ $Z = \{-1, 0, 1\}$
- ▶ ϵ - error term $\sim \mathcal{N}(0, D \cdot \hat{\sigma}_\epsilon^2)$

$$\widehat{DGV} = \hat{\mu} + Z \cdot \hat{q}$$

Calculation of reliability:

$$Rel = diag \left\{ \left(Q - \frac{\hat{\sigma}_\epsilon^2}{\hat{\sigma}_\alpha^2} C^{22} \right) Q^{-1} \right\},$$

- ▶ C^{22} - inverse of coefficient matrix for MME
- ▶ $Q = ZZ^T \frac{1}{p_{het}^b}$
- ▶ p_{het}^b - sum over all SNP of heterozygous genotype frequencies in base population



Reliability comparison - reference bulls

PRO	Common Animals	3 687
	New method	Previous method
mean	0.6552	0.8700
sd	0.0178	0.1187
min	0.6118	0.4290
max	0.7309	0.9990

HCO	Common Animals	3 582
	New method	Previous method
mean	0.2261	0.5532
sd	0.0179	0.1269
min	0.1716	0.2590
max	0.5723	0.9750



Reliability comparison - candidates

PRO	Common Animals	659
	New method	Previous method
mean	0.6256	0.6004
sd	0.0097	0.0563
min	0.5852	0.2384
max	0.6550	0.8461

HCO	Common Animals	694
	New method	Previous method
mean	0.2234	0.3838
sd	0.0143	0.0594
min	0.1882	0.2569
max	0.3095	0.7666

Thank you for your attention!

