

# Fixed Linear Effects Models

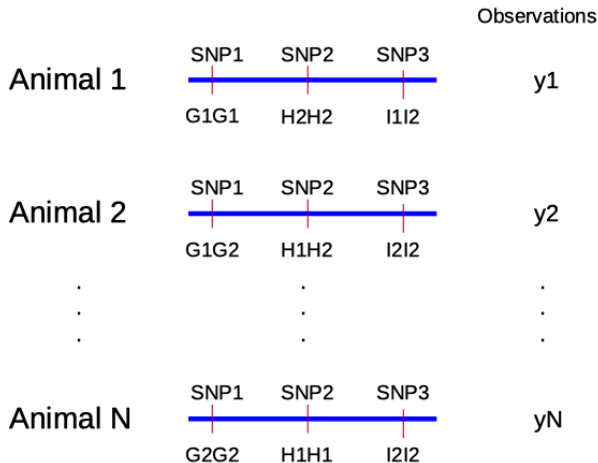
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# Background

- ▶ Given a population of  $N$  animals
- ▶ Each animal has information on genotypes at loci  $G$ ,  $H$  and  $I$
- ▶ Each animal has an observation for one quantitative trait of interest  $y$
- ▶ **Goal:** Predict genomic breeding values

# Data



# Two Types Of Models

1. **Genetic** Model: How can we decompose the phenotype into genetic part and non-genetic environmental part
2. **Statistical** Model: How to estimate unknown parameters from a dataset

## Goals:

1. Use genetic model to show how observations and genetic information can be used to predict breeding values.
2. Use statistical techniques to do the prediction

# Genetic Model

- ▶ simple model from quantitative genetics to split phenotypic observation into
  - ▶ genetic part  $g$  and
  - ▶ environmental part  $e$

$$y = g + e$$

- ▶ environment: split into
  - ▶ known environmental factors: herd, year, ... ( $\beta$ )
  - ▶ unknown random error ( $\epsilon$ )
- ▶ polygenic model: use a finite number of loci to model genetic part of phenotypic observation

## Genetic Model (II)

