# Random effects deep learning

Use of random effects for taking into account dependencies in data is a well-established approach for linear regression models:

$$Y_{j,i} = f(\boldsymbol{x}_{j,i}; \boldsymbol{\beta}) + \eta_j + \varepsilon_{i,j}, \quad j = 1, ..., J, i = 1, ..., n_j$$
$$f(\boldsymbol{x}; \boldsymbol{\beta}) = \boldsymbol{x}^T \boldsymbol{\beta}$$

were $\eta_j \sim N(0, \sigma_\eta^2)$ while $\varepsilon_{j,i} \sim N(0, \sigma_\varepsilon^2)$. Here $j$ is an index for group while $i$ is an index for observations within groups.

Random effects combined with more modern machine learning approaches, in which case more flexible functions $f(\boldsymbol{x}; \boldsymbol{\beta})$ are allowed, has been less explored. In this project we will explore the methods available for such combinations and experiment with such models on a relative large data set of lamb weights, a total of $1\,358\,139$ observations from 182 municipalities in Norway, with some covariates that are on individual level (e.g. age, age of mother) while others are on regional level (e.g. elevation).

This project requires STK2100 or similar background. STK3100 is also an advantage.