Modeling individual growth using stochastic differential equations

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In this work, we aim to continue developing the research that the team has been conducting on the topic of individual growth modeling using stochastic differential equations, which has already resulted in several international publications and presentations.

The goal is for the student to complete ongoing research tasks, particularly the development of a model using mixed-effects stochastic differential equations where the parameters of growth rate and maturity weight are correlated. This will involve using the delta approximation method for parameter estimation. Additionally, another aim is to develop a mixed model where the parameters of growth rate and/or maturity weight are influenced by multiple genetic values, employing variable selection methods.

Other open topics of interest include the development of mixed models where the growth rate parameter follows a non-Gaussian distribution and prediction methods for mixed models with one or two random parameters, with or without correlation between them.

Furthermore, there is a goal to optimize the profit from selling an animal considering the costs involved in the weaning process of cattle, under more general assumptions. This optimization will utilize the estimation methods already developed to optimize the breeder's profit and determine the optimal age for slaughter.

Ultimately, there is an overarching objective to develop an R package that includes both mixed and non-mixed models, utilizing closed-form methods as well as the delta approximation method. The package will also include methods for predicting animal weight.