LIST OF SYMBOLS

(IN ORDER OR APPEARANCE)

y_{ij}	:	response of i^{th} subject at j^{th} measurement occasion
i	:	subject index
j	:	measurement occasion index
N	:	total number of subjects
n_i	:	number of observations on subject i
β_0	:	intercept parameter
β_1	:	coefficient term for variable 1
β_{2i}	:	coefficient term for variable 2 specific to subject i
β_{3j}	:	coefficient term for variable 3 specific to measurement occasion j
ε_{ij}	:	random error of subject i at measurement occasion j
δ_i	:	indicator variable for condition on subject i
y_i^+	:	response feature of subject i
ε_i^+	:	random error of response feature of subject i
$\mathbf{y}_i$	:	$(n_i\times 1)$ vector of responses for subject i
$\mathbf{X}_i$	:	$(n_i\times p)$ fixed effects regressor matrix for subject i
$\boldsymbol{\beta}$	:	$(p\times 1)$ vector of fixed effects parameters
$\mathbf{Z}_i$	:	$(n_i\times q)$ random effects regressor matrix for subject i
$\mathbf{b}_i$	:	$(q\times 1)$ vector of random effects parameters
$\boldsymbol{\varepsilon}_i$	:	$(n_i\times 1)$ vector of random errors for subject i
$\boldsymbol{\Sigma}$	:	covariance matrix of random effects

$\sigma^2\mathbf{I}$	:	covariance matrix of random errors under Laird and Ware model (1982), where σ^2 is the variance parameter
N_h	:	number of subjects in group h
h	:	group index
s	:	number of groups
y_{hij}	:	response of subject i in group h at j^{th} measurement occasion
t	:	number of measurement occasions when the number of measurement occasions is the same for all subjects
β_{h0}	:	intercept term for group h
$\beta_{h1}\ldots\beta_{h,\nu-1}$	:	model coefficients for group h
e_{hij}	:	random error term for subject i in group h at j^{th} measurement occasion
ν-1	:	highest degree of polynomial in time
$\mathbf{y}_{hi}$	:	$(t\times1)$ vector of responses for subject i in group h
$\mathbf{e}_{hi}$	:	$(t\times1)$ vector of random errors for subject i in group h
$\mathbf{Y}$	:	$(N\times t)$ matrix of responses, with rows containing each subject's responses
$\mathbf{E}$	:	$(N\times t)$ matrix of random errors, with rows containing each subject's random errors
$\mathbf{X}$	:	$(N\times s)$ across-individual design matrix
$\mathbf{B}$	:	$(s\times v)$ matrix of model coefficients, with rows containing model coefficients for group h
$\mathbf{T}$	:	$(v\times t)$ within-individual design matrix
$\mathbf{I}_n$	:	$(n\times n)$ identity matrix

$\mathbf{0}_n$	:	$(n\times1)$ vector of zeros
$\mathbf{x}_{ij}$	:	vector of independent variables for subject i at the j^{th} measurement occasion
$\text{var}(y_{ij})$	:	variance of y_{ij}
σ_b^2	:	variance parameter for independent random effects
σ_e^2	:	variance parameter for independent random errors
$\boldsymbol{\omega}_i$	:	arbitrary covariance matrix of random errors
$f(\mathbf{y}_i \mid \mathbf{b}_i)$	:	conditional density function of $\mathbf{y}_i$ of $\mathbf{b}_i$
$f(\mathbf{y}_i)$	:	marginal density function of $\mathbf{y}_i$
$\mathbf{V}_i$	:	covariance matrix of marginal response vector
$\boldsymbol{\tau}$	:	vector of all variance and covariance parameters
$\boldsymbol{\theta}$	:	vector of all fixed effects and random effects parameters
$L_{ML}(\boldsymbol{\theta})$	:	marginal likelihood function
$\mathbf{W}_i$	:	$\frac{1}{\mathbf{V}_i}$
π	:	pi = 3.14159265
$\prod_{i=1}^{N}$	:	product of terms i through to N
$\sum_{i=1}^{N}$	:	sum of terms i through to N
$\hat{\boldsymbol{\beta}}$	:	vector of estimated fixed effects parameter values
$\lvert\mathbf{X}\rvert$	:	Jacobian of matrix $\mathbf{X}$
$\mathbf{X}'$	:	transpose of matrix $\mathbf{X}$
L_{REML}	:	REML likelihood function
$\mathbf{1}_n$	:	vector of ones of length n

b_n^*	:	parameter for time-dependent random effects for i^{th} subject
$\mathbf{K}_i$	:	$(n_i \times p)$ matrix of known covariates
$E(y_{ij}) = \mu_{ij}$	:	expected value of y_{ij}
$g(\mu_{ij})$	:	link function
ϕ	:	scale parameter
$v(\mu_{ij})$	:	variance function of the mean
$E(y_{ij} \mid \mathbf{b}_i)$	:	expected value of y_{ij} conditional on $\mathbf{b}_i$
$\mathbf{R}(\boldsymbol{\alpha})$	:	working correlation matrix
$\boldsymbol{\alpha}$	:	vector which fully characterises $\mathbf{R}(\boldsymbol{\alpha})$
$\mathbf{A}_{\mathrm{i}}$	:	block diagonal matrix with elements $\phi\,\mathrm{var}(\mathbf{y}_i)$
$\mathbf{d}_i$	:	$\dfrac{\partial E(\mathbf{y}_i)}{\partial \boldsymbol{\beta}}$
$\mathbf{s}_i$	:	$\mathbf{y}_{\mathrm{i}} - E(\mathbf{y}_i)$
$\mathbf{r}_i$	:	vector of marginal residuals for subject i
A	:	normalising constant
$\int$	:	indefinite integral
$\hat{\mathbf{b}}_i$	:	vector of estimated random effects for subject i
σ^2	:	variance parameter of errors in an ordinary regression model
ρ	:	correlation parameter between two observations one time unit apart
$\hat{l}$	:	maximised log-likelihood
c	:	number of parameters in the fitted model

$\hat{\mathbf{V}}_i$	:	estimated variance of responses for subject *i*
$\mathbf{r}_i^*$	:	Cholesky residuals
$\mathbf{L}_i$	:	lower triangular matrix used in Cholesky transformation decomposition of residuals
r_{ij}^*	:	Cholesky residual of subject *i* at measurement occasion *j*
$\hat{\mu}_{ij}^*$	:	transformed predicted value for subject *i* at measurement occasion *j*
$\hat{\boldsymbol{\mu}}_i$	:	vector of expected values for subject *i*
$\mathbf{y}_i^*$	:	vector of transformed responses for subject *i*
$\mathbf{X}_i^*$	:	transformed regressor matrix for fixed effects for subject *i*
$\mathbf{r}_{ci}$	:	conditional residuals for subject *i*
∞	:	infinity
λ	:	$\lambda^2 = \frac{\lVert \boldsymbol{\theta} \rVert^2}{2}$ is a parameter for the penalised likelihood
H	:	$H = c(\ln(\lVert \hat{\boldsymbol{\theta}} \rVert^2 / c) - 1)$ is a parameter used to calculate the HAIC
$\hat{\boldsymbol{\beta}}_{LS}$	:	vector of least squares estimates for fixed effects parameters
$\lVert \boldsymbol{\theta} \rVert^2$	:	norm of vector $\boldsymbol{\theta}$
d_i	:	Mahalanobis distance
$\gamma(h_{ijk})$	:	semi-variogram where elapsed time between j^{th} observation and k^{th} observation is *h* for subject *i*

$\mathrm{cov}(r_{ij}, r_{ik})$	:	covariance between r_{ij} and r_{ik}
k	:	index for second measurement occasion when used in conjunction with j
k	:	index for iteration when used alone
$\mathbf{g}_k$	:	gradient function of likelihood at iteration k
$\mathbf{H}_k$	:	Hessian of likelihood function at iteration k
$\mathbf{h}$	:	vector of linear equation coefficients
a_{11}	:	matrix element at position (1,1)
π	:	coverage probability of 95% confidence interval
$\hat{\pi}$	:	estimated coverage probability of the 95% confidence interval
ς	:	number of data sets where true parameter value falls within the 95% confidence interval
n	:	total number of data sets required for calculation of coverage probability
z	:	$100(1-\alpha/2)^{\text{th}}$ percentile of the standard normal distribution
$\tilde{\varsigma}$	:	$\tilde{\varsigma} = \varsigma + z^2/2$
$\tilde{n}$	:	$\tilde{n} = n + z^2$
$\tilde{\pi}$	:	$\tilde{\pi} = \tilde{\varsigma}/\tilde{n}$