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Statistical Methods for Functional Data

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Chapter 3
Introduction to the RISC Dataset

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Chapter 4
A Multivariate Functional Mixed Model for Kinematic Data from Recreational Runners

Development of a model for the average sagittal-plane hip and knee angle functions from the RISC data

Quantify fixed effects of scalar covariates

Model dependence among bilateral observations from the same subject

Chapter 5
A Multivariate Multilevel Longitudinal Functional Model for Repeatedly-Observed Human-Movement Data

Extend the model from Chapter 4 to include the hip, knee and ankle angles from every stride in the RISC data

Development of novel multilevel longitudinal approach to capture serial correlation among adjacent strides

Fixed effects of scalar covariates and predictions of individual trajectories

Chapter 6
An Understanding of Principal Differential Analysis

Re-examination of PDA as a generative statistical model

Development iterative bias-reduction algorithm to improve parameter estimates

Perspective of PDA as a time-varying linearised approximation to a non-linear ODE model

Demonstrations on simulated examples and kinematic data from the RISC dataset

Chapter 7
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Concluding Remarks