Prague University of Economics and Business
Faculty of Informatics and Statistics

Automatic detection of life events in animal tracking data

MASTER THESIS

Study program: Knowledge and Web Technologies
Specialization: Quantitative Analysis
Field of study: studijní obor

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Acknowledgements

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Abstrakt

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Klíčová slova

geospatial timeseries

JEL klasifikace

JEL1, JEL2, JEL3

Abstract

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Keywords

geospatial timeseries, animal tracking

JEL classification

JEL1, JEL2, JEL3

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List of abbreviations

BCC Blind Carbon Copy
CC Carbon Copy
CERT Computer Emergency Response Team
CSS Cascading Styleheets
DOI Digital Object Identifier
HTML Hypertext Markup Language
REST Representational State Transfer
SOAP Simple Object Access Protocol
URI Uniform Resource Identifier
URL Uniform Resource Locator
XML eXtended Markup Language

Introduction

Traditionally, the study of animal movements and life cycles has been a domain of great uncertainty, owing to varying levels of difficulty in observing the full range of animal behaviour in the wild. This has been especially difficult for ornithologists studying migratory birds. With the advent of small electronic circuitry, global telecommunications and positioning systems, it has become easier to acquire the required primary data for study. With the increasing sophisticatedness of GPS loggers, energy efficient solar panels, batteries and faster communication networks, another common problem has arisen, especially for larger studies. Modern animal movement loggers can hundreds, if not thousands, of positions per day, multiple times. It has become increasingly difficult for field experts to make sense of their data manually, while comprehensive data analysis providing useful results is not a trivial task.

Speedy detection of animal life events, such as mortality or nesting, is crucial for actionable instructions for animal conservation fieldwork experts. For example, speedy detection of animal death is very important for helping to establish the cause of the mortality event, since specific causes will be more difficult to establish later. Other life events

The goal of this diploma thesis is to provide animal conservation experts with reliable methods of filtering unreliable data, simplifying or clustering too complex datasets for interpretation and finally, detecting important life events from these filtered and clustered data. The structure of this diploma thesis roughly follows the CRISP-DM methodology, and the resulting models will be released on GitHub and integrated into the Anitra platform for animal conservation experts.

1. Problem context

1.1 Animal tracking

define animal tracking, brief history, problems, communication flow / time delays

1.2 Geospatial data

define geospatial data, precision problems, put it into context of animal tracking

1.3 Timeseries data

define timeseries, problems with existing methods for this problem (non-continuous sampling), possible solutions

2. Data understanding

describe data sources, available columns, data ingestion

2.0.1 Provenance

2.0.2 Data description

gnss datetime, latitude, longitude, temperature

2.0.3 Data enrichment

elevation, temperatures, pressure

3. Data preparation

data cleansing - normalisation, outlier detection (rules), interpolation, ordering, simplification?

4. Modeling

created models

reinforcement learning?

4.0.1 Stationary position clustering

kernel density estimation, cluster statistics

4.0.2 Cluster classification

4.0.3 Mortality detection

General mortality detection

Device specific mortality detection

5. Evaluation

???

6. Deployment

???

Závěr

Závěr je povinnou částí bakalářské/diplomové práce. Obsahuje shrnutí práce a vyjadřuje se k míře splnění cíle, který byl v práci stanoven, případně shrnuje odpovědi na otázky, které byly položeny v úvodu práce.

Závěr k diplomové práci musí být propracovanější – podrobněji to je uvedeno v Náležitostech diplomové práce v rámci Intranetu pro studenty FIS.

Závěr je vnímán jako kapitola (chapter), která začíná na samostatné stránce a která má název Závěr. Název Závěr se nečísluje. Samotný text závěru je členěn do odstavců.

Appendices

A. Formulář v plném znění

B. Zdrojové kódy výpočetních procedur