MINI-SCHOOL

NITheCS
National Institute for Theoretical and Computational Sciences

Monitoring Biodiversity using Data Cubes: Techniques and Applications for Open Science

Dr Sandra MacFadyen (Stellenbosch University) & Maarten Trekels (Stellenbosch University)

Attend online: Wed 4, 11, 18 & 25 June 2025 @ 14h00-15h00 SAST

Presented by NITheCS' Complexity in Biological Systems (E5) research programme, work package 1: **Ecological Complexity & Biodiversity**, this 4-lecture Mini-school aims to empower researchers, students, and practitioners with cutting-edge skills in biodiversity informatics and ecological modelling through the innovative application of data cubes. Participants will gain practical expertise in using data cubes for biodiversity monitoring and ecological analysis, fostering collaboration and openness within the scientific community. Each session is linked to one or more of the 17 Sustainable Development Goals (SDGs).

LECTURE 1 (4 June)

Introduction to Data Cubes: Fundamentals and Applications

Gain a foundational understanding of data cubes, their structure, and their applications in biodiversity monitoring. This lecture will provide essential skills and knowledge for sustainable development (SDG 4: Quality Education).

LECTURE 2 (11 June)

Building Data Cubes with GBIF: A Hands-On Guide for Biodiversity Monitoring

This lecture will offer a guide to constructing data cubes using data from the Global Biodiversity Information Facility (GBIF), promoting techniques for biodiversity monitoring and sustainable use of ecosystems (SDG 15: Life on Land).

LECTURE 3 (18 June)

Analysing Data Cubes: Techniques and Tools for Ecological Modelling

In this lecture, participants will explore advanced analytical techniques and tools for ecological modelling using data cubes, with a focus on understanding climate-related impacts and adaptation strategies (SDG 13: Climate Action).

LECTURE 4 (25 June)

Open Science: Sharing and Disseminating Results from Data Cubes

The final lecture will cover the principles and practices of open science, including effective data sharing and dissemination of research findings, emphasizing collaboration and data sharing for sustainable development (SDG 17: Partnerships for the Goals).

SPEAKER BIOGRAPHIES

Sandra MacFadyen is a research fellow with the Mathematical Biosciences Lab (BioMath) at Stellenbosch University (SU). She earned a joint PhD in Botany from SU and Landscape Ecology from Vrije University Amsterdam in 2018, alongside an MSc in Geographic Information Science and postgraduate degrees in Nature Conservation. Sandra is a core member of the EU-funded Biodiversity Building Blocks for Policy programme, a NITheCS Associate, and the work package leader for **Ecological Complexity & Biodiversity** (WP1) in NITheCS' Complexity in Biological Systems (E5) research programme. Based in the Kruger National Park with the SANParks Savanna Science Unit, she specialises in macroscale ecosystem dynamics and applied spatial statistics for biodiversity conservation. Through her roles at BioMath and NITheCS, she focuses on advancing novel mathematical models to tackle critical ecological challenges.

Maarten Trekels is a Biodiversity Data Scientist and project coordinator at Meise Botanic Garden, Belgium. With a background in Physics and industry experience in aerospace and medical fields, he shifted to biodiversity data through developing standards for the Biodiversity Information Standards organisation under EU-funded projects related to the DiSSCo research infrastructure. He currently coordinates a local implementation of the research infrastructure in Flanders and contributes to FAIR data strategies and interdomain interoperability as a member of the Research Data Alliance. Maarten is also a work package leader in the EU-funded Biodiversity Building Blocks for Policy programme and is pursuing a PhD at SU, focusing on community ecology.

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