



# NITheCS

National Institute for  
Theoretical and Computational Sciences

## COLLOQUIUM

# Beyond Linear Thinking: Statistical Approaches for Directional Data

Dr Priyanka Nagar (Stellenbosch University)

**DATE:** Monday, 23 March 2026 | 16h00–17h00 SAST

- VENUES:**
- **Stellenbosch University:** Neelsie Cinema
  - **University of the Witwatersrand:** Room P215, 2nd Floor, Physics Building
  - **North-West University:** Seminar Room K310, Physics Building G5
  - **Online**

--- A recording of the talk will be published on the NITheCS YouTube channel afterwards ---

### ABSTRACT

Many scientific applications involve data that do not lie in Euclidean space but instead occur on manifolds such as circles, spheres, hyperspheres, cylinders, or tori. Directional statistics provides a framework for analysing such data by accounting for their inherent periodicity and geometric constraints. A key challenge arises from the non-linear nature of these sample spaces, which precludes the direct use of conventional linear methods. Despite this, directional variables are still frequently treated as linear in applied research, often leading to inappropriate inference. This presentation outlines the foundations of directional statistics and motivates the need for methods that respect the topology of the underlying space. The presentation will include established distributions and estimation procedures for the different manifolds, as well as recent developments. Selected topics will include circular regression models, joint axial-circular density estimation, and inference on poly-cylindrical structures, emphasising how these methods arise from the geometry of the underlying space. To illustrate the practical relevance of these methods, the presentation will highlight selected applications involving wind data, pollution data, and biomechanical movement data, drawn from scientific domains in which directional data is fundamental. These examples demonstrate how manifold-aware modelling can yield more accurate interpretations and improved analytical outcomes.

### BIOGRAPHY

Dr Priyanka Nagar is a Senior Lecturer in the Department of Statistics and Actuarial Science at Stellenbosch University. Her research examines how to analyse data that arise on curved or non-Euclidean spaces, such as circular or angular measurements. She works on developing statistical frameworks that capture patterns in directional data, contributing to studies in environmental and ecological systems, biomechanics, and renewable energy.



**REGISTER  
TO ATTEND**

<https://bit.ly/4sOmEfl>



**LIKE / FOLLOW  
NITheCS:**



[nithecs.ac.za](https://www.nithecs.ac.za)

[info@nithecs.ac.za](mailto:info@nithecs.ac.za)