

THE CAMBRIDGE STATISTICS DISCUSSION GROUP

**Please note the slightly earlier start time**

**Monday 5th February 2024 7:00 for 7:30**

Department of Applied Mathematics and Theoretical Physics,  
Centre for Mathematical Sciences,  
Wilberforce Road,  
Cambridge, CB3 0WB

## **Wildlife from Space: Detecting, monitoring and studying wildlife using satellite imagery**

**Peter Fretwell**

British Antarctic Survey

**Abstract:** The advent of Very High Resolution optical satellite imagery has enabled us to find and study wildlife in places and in ways that have not previously been possible. In theory, any large animal (>1m) in open terrain that has a high contrast with its surrounding environment could be monitored by satellite. The technology is particularly useful in remote and hard to access locations, or where multiple records would be difficult to acquire through other means. The availability of large amounts of coverage from satellites also enables regional and continental scale studies regardless of terrain, borders, or bureaucracy. Additionally, satellites do not disrupt behavior or disturb animals in ways that ships, ground, aircraft, or UAVs often do. In future traditional wildlife line-transect populations studies could be replaced by total area studies from automated VHR satellite imagery.

However, the extensive amounts of data that can be collected, coupled with the relatively low spatial resolution, offer unique challenges and questions; is multiple low-resolution data of everywhere better than high-quality sparse data? Cost of imagery and analytical pipelines will also have to be addressed before optimal use of the technology can be made, both by the satellite providers and the users. To utilize the full capacity of the technology it will need interdisciplinary solutions using novel and groundbreaking machine learning techniques and big data pipelines. Although often the techniques and methodologies can be transferred between species, many user cases show that behavioral knowledge of each species is still key to understanding results. Conservation users, remote sensing experts and machine learning practitioners will need to work together to build these data streams.

In this talk we will present several groundbreaking examples from a decade of developing automated solutions using VHR and medium resolution satellite imagery focusing initially on the recent case of emperor penguin breeding failure and moving on its use in seals, whales, albatrosses and other species. We will discuss challenges, advantages and future directions of the use of this potentially revolutionary tool in an era of dynamic change for the population of many species.

**Speaker:** Geographic information Scientist at British Antarctic Survey (BAS). Originally a Quaternary Scientist specializing in analyzing Holocene sea-level change. I was first employed at BAS in 2002 as a cartographer. Since that time I have specialized in GIS and remote sensing with recent highlights such as leading the Bedmap2 project [http://www.antarctica.ac.uk/bas\\_research/our\\_research/az/bedmap2/](http://www.antarctica.ac.uk/bas_research/our_research/az/bedmap2/) and using remote sensing techniques to identify and count penguins and other seabirds. This technology has recently been transferred to count southern right whales, a breakthrough that may have large implications for how we estimate cetacean numbers <http://www.bbc.co.uk/news/science-environment-26075274>

**Directions:** The main entrance is reached from Clarkson Road by going along the footpath to the right of the Newton Institute, and turning left through the gatehouse towards the main building (Pavilion A), which has a glass front and a curved grassed roof. Coffee before the talk will be in the

common room in Pavilion G, and the talk will be in Meeting Room 15 in Pavilion G. The main entrance is in the middle of the glass front. Free Parking is available after 5pm on Clarkson and Wilberforce Roads and by entering the site off Clarkson Road. Admittance may be difficult after 7:30.

**Provisional Next Meetings:**

21st March – Klaudia Walter (Sanger).

16th April – Fabio Rigat (AstraZeneca).

2nd May – Roger Sewell on ‘Monitoring Vaccine Effectiveness: can we trust results from parties with a vested interest’.

8th October – Fabio Rigat (AstraZeneca)/Peter Treasure (National Cancer Registration and Analysis Service).

4th November – Mihaela van der Schaar (Cambridge Centre for AI in Medicine).

**Supper:** Some members eat regularly in the Mill pub (Mill Lane) before each meeting at **5-15pm**. Feel free to join them.

**Subscriptions:** of 1 pound are now due for attending the 2023-2024 session.

**Secretary:** Peter Watson, MRC Cognition and Brain Sciences Unit, 15 Chaucer Road, Cambridge CB2 7EF; telephone 01223 769479; E-mail [peter.watson@mrc-cbu.cam.ac.uk](mailto:peter.watson@mrc-cbu.cam.ac.uk).

**Slides and .mp3 files of old talks:** <http://www.mrc-cbu.cam.ac.uk/people/peter.watson/csdg.html>