Delights of directional statistics: (a) free-lunch learning, (b) crystals, earthquakes and orthogonal axial frames Prof. Dr. Peter Jupp (St. Andrews University)

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Observations that are directions, axes, or rotations require the techniques of directional statistics. This talk aims to illustrate the special flavour of this area through glimpses at two topics.

(a) Free-lunch learning

Free-lunch learning (FLL) is a phenomenon in which relearning partiallyforgotten mental associations induces recovery of other associations. When memory is modelled in terms of an artificial neural network, the extent of FLL can be quantified in geometrical terms and involves Grassmann manifolds of subspaces of the weight space. Joint work with Jim Stone (Psychology, Sheffield) will be described, in which simple properties of uniform distributions yield results on the expected amount of FLL. The form of forgetting plays an important role.

(b) Crystals, earthquakes and orthogonal axial frames

Orthogonal axial frames are (ordered) sets of orthogonal axes. They arise as (i) key geometrical elements (known in seismology as 'focal mechanisms') of earthquakes, (ii) principal axes of certain physical tensors (e.g. stress tensors), (iii) axes of orthorhombic crystals. Some tools for the analysis of data that are orthogonal axial frames will be will be described. This is joint work with Richard Arnold (Wellington).