# Atrial Fibrillation found after Stroke: Cause or consequence?

Stroke is a leading cause of death and disability worldwide. While there are various risk factors, strokes are often associated with a heart condition known as atrial fibrillation (AF). In AF the heart beats irregularly and abnormally fast and can cause blood clots in the heart. These clots can break free and become lodged in the blood vessels of the brain, causing a stroke. However, some authors argue that--if AF wasn't present before the stroke--AF can instead be a result of a stroke, due to an imbalance in the body's autonomic control systems induced by a stroke. In particular, they hypothesize that damage to a particular brain region, the insular cortex, could give rise to AF, in mechanism called "neurogenic AF".

Lesion Incidence in Patients with AF

Lesion Incidence in AF-free Patients
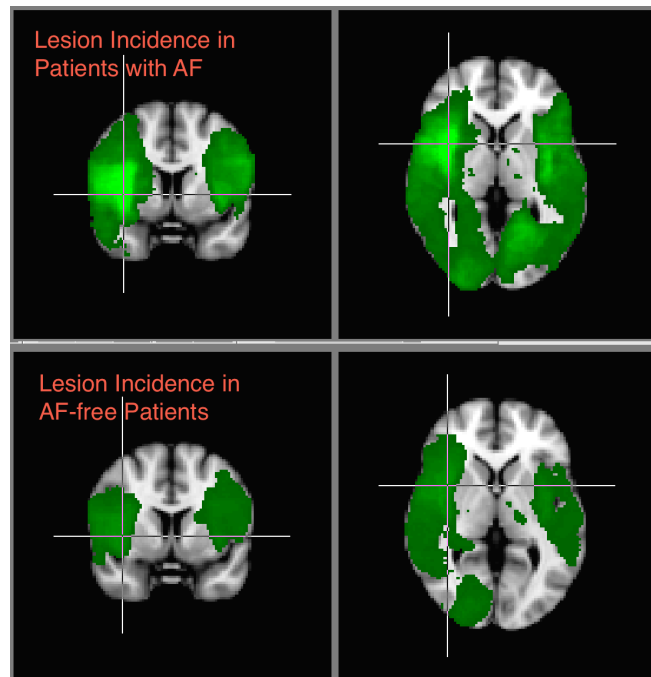
The purpose of this project is to assess evidence of neurogenic AF. If AF only causes strokes, stoke lesions should occur through out the brain. In contrast, if stokes cause neurogenic AF, we may see more stokes in the insular cortex. We have maps of stroke lesions on 582 subjects, some with or with out AF, and with AF broken down into "existing AF" or "new AF". The data consists of 3D binary brain maps (0 no stroke, 1 stroke lesion, at each voxel), which will require exploratory data analysis as well as modelling that accounts for the discrete nature of the data. My group has already developed tools for Bayesian spatial probit regression (Ge et al., 2014; simiar to logistic regression, but with spatial regularisation). The student will use these tools, and others as they see fit, to examine the evidence for or against neurogeneic AF.

The project will consist of background reading on stroke and AF, and on the spatial Bayesian models used to analyze dichotomous spatial data. There is flexibility between using the existing computational tools and developing new tools.

Ge, T., Muller-Lenke, N., Bendfeldt, K., Nichols, T. E., & Johnson, T. D. (2014). Analysis Of Multiple Sclerosis Lesions Via Spatially Varying Coefficients. The Annals of Applied Statistics, 8(2), 1095-1118. doi:10.1214/14-AOAS718. http://warwick.ac.uk/tenichols/software/BSGLMM

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