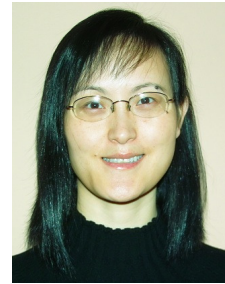


**Review: Geographically Weighted Regression Training  
Prof Stewart Fotheringham and Dr. Urška Demšar  
University of Dundee, 8-9 December 2011**

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The two-day training course, led by Professor A. Stewart Fotheringham, provided an excellent introduction to Geographically Weighted Regression (GWR), a local statistical technique to analyse spatial variation in relationships. The course was well attended by people from various disciplinary backgrounds, such as geography, public health, demography, social sciences, economics, and accounting and finance. As a complete beginner of GWR, I found the course informative, easy to follow and extremely interesting.

The course started with a regression model of election 'turnout' and proportion of households in owner-occupied housing, using data from 322 electoral districts in Dublin in 2002. The standardised residuals were then displayed in a map, showing obvious patterns of spatial auto-correlation which resulted in problems for inference. One explanation for spatially auto-correlated residuals was that the data generation process may vary over space. The course proceeded to introduce GWR as a direct and efficient way of examining spatial variation in relationships. Rather than using spatial lags or spatial error terms in spatial econometric models, GWR estimates coefficients for each data point, using other data points weighted by distance between regression point and data point. Thus the technique estimates a continuous surface of coefficients.

The course provided six justifications for using GWR in social science research. Besides being useful in removing spatial auto-correlation in residuals, effective in detecting model misspecification, and easy to extend to poisson and logit models, the technique has strength in local analysis. It is described as a 'spatial microscope', which allows us to see variations in relationships that were unobservable in global models. An example was provided on the effect of floor space on house prices, derived for different bandwidths (sizes of area) corresponding to 400, 350, 250, 200, 150, 100 and 50 nearest neighbours. It was fascinating to see the more and more detailed local patterns that emerged when bandwidth was reduced. This enabled us to identify interesting locations for further investigation.

Following the introduction of GWR and its mechanics, the afternoon sessions covered practical information about the software 'GWR 4.0', its operation, interpretation of its outputs, as well as mapping geocoded outputs in ArcGIS. In the subsequent practical sessions we had opportunities of running GWR models and mapping results in ArcGIS. The public lecture in the evening, which examined spatial variation in the determinants of population change during the Famine decade in Ireland, provided an excellent example of applying GWR in social science research.

The second day focused on model selection, mixed and semi-parametric GWR, validity test, and an extension to Poisson and logit models. A key question when choosing global and local models concerns 'whether the measured variation in relationships over space is merely sampling variation or intrinsic differing spatial processes'. Several tests were introduced to throw light on

this question, including Monte-Carlo test, local t-test and variability test of local parameter estimates. It was pointed out at the end of the lectures that we should always obtain a global model (ie a model with the same parameters for all areas) at its best before running GWR, as GWR is unlikely to be able to rescue a poorly-specified global model. The lab sessions in the afternoon offered hand-on exercises on poisson and logit GWR models.

Overall I think the training event was successful in terms of both organisation and delivery; the courses were informative, inspiring and thought-provoking. There was substantial interest in GWR among participants. The lectures, practical exercises and question and answer sessions provided lots of interaction between lecturers and participants, which I found particularly useful. The event also provided wonderful opportunities of meeting people who were interested in using quantitative methods in social science research. I enjoyed the training course very much, and left with enormous interest in learning more about GWR, and thinking about how to apply this 'spatial microscope' to my own research.