StratAG
Strategic Research in Advanced Geotechnologies
Taighde Straitéiseach sna hArd-Gheoteicneolaíochtaí

Three-day Workshop:

Modelling Spatial Heterogeneity with Geographically Weighted Models

* introducing the new GWmodel R and python packages *

National Centre for Geocomputation, National University of Ireland Maynooth, Ireland, 24-26 April 2013

Instructors: Martin Charlton[a], Chris Brunsdon[b], Binbin Lu[a], Isabella Gollini[a] and Paul Harris[a]

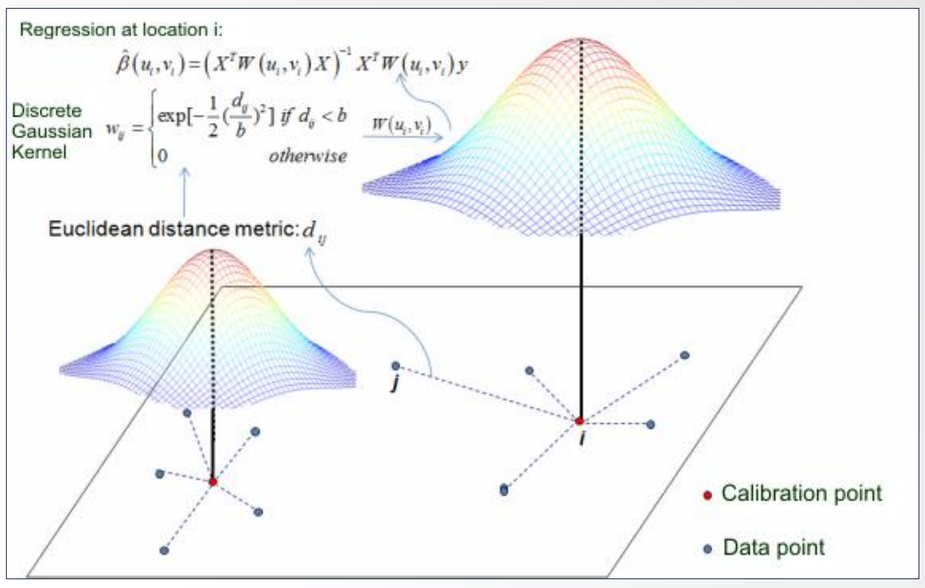
1. Workshop objectives

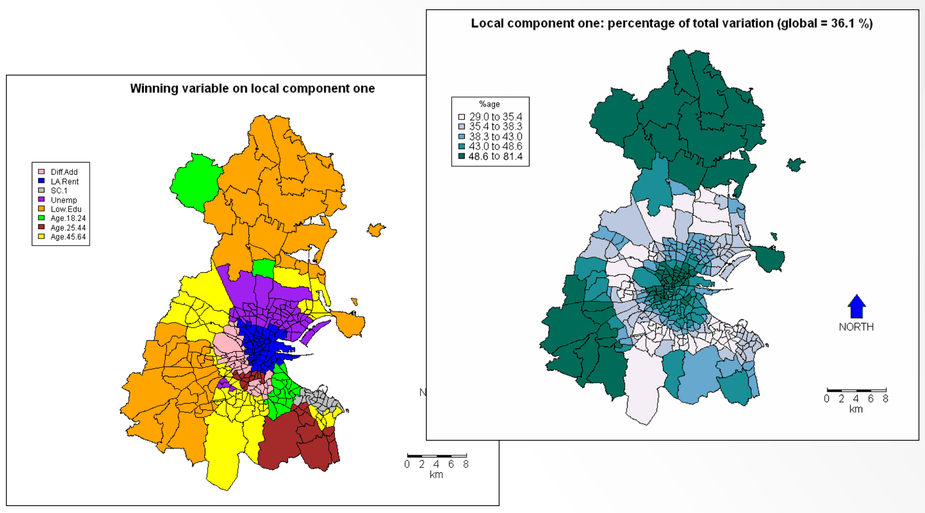
Spatial statistics is a growing discipline providing important analytical techniques in a wide range of disciplines in the natural and social/economic sciences. In this workshop, we introduce techniques from a particular branch of spatial statistics, termed geographically weighted (GW) models.

GW models suit situations when data are not described well by some global model, but where there are spatial regions where a suitably localised calibration provides a better description. The approach uses a moving window weighting technique, where localised models are found at target locations. Commonly, outputs are mapped to provide a useful exploratory tool into the nature of the data's spatial heterogeneity.

Key GW techniques include: GW summary statistics, GW boxplots, GW principal components analysis (PCA), GW regression, GW generalised linear models, GW discriminant analysis and GW variograms.

Of all the GW techniques, GW regression is the most popular and has been widely applied. This workshop now expands the GW model paradigm to other GW forms, providing hands-on exercises such that participants can apply the GW techniques themselves. Emphasis is firmly on applications rather than statistical theory.





2. Organisation, admission and registration

The workshop will take place at the National Centre for Geocomputation (NCG) of the National University of Ireland Maynooth and will be given by experienced instructors from Ireland and the UK. The workshop will be held over three days from Wednesday 24 to Friday 26 April 2013 in morning and afternoon sessions.

The workshop is designed for a maximum of 25 professionals with a university degree and with some knowledge of basic statistical concepts and techniques. Familiarity with the R statistical programming language is useful, but not essential. This will be our second GW model workshop and has a registration fee of €50. This sum covers tuition fees only and participants are expected to pay for their own accommodation/food/travel costs.

For queries and to register for the course, please contact Melina Lawless – e-mail: stratag@nuim.ie. Registration is on a 'first come first serve' basis with a deadline of 31 March 2013. Further details, including an accommodation guide will be sent out to those registered.

3. Workshop programme

The workshop requires personal work and interaction among the participants and instructors. Each component of the workshop will consist of a lecture followed by a computer practical using R, where real case studies in the natural and social/economic sciences will be used. The workshop programme will consist of the following six components:

i. **Introductions (Charlton/Harris)** - course agenda; GW modelling overview; case study data sets; bibliography and resources.

ii. **Introduction to GW modelling (Lu)** - nonparametric models; kernel weighting functions; univariate GW summary statistics; visualisation techniques; kernel bandwidth selection; distance metric selection; the GWmodel R package.

iii. **GW models for the exploration of bivariate relationships (Gollini)** - GW correlation; GW regression with one covariate; multiple hypothesis testing; other tests.

iv. **GW PCA for the exploration of multivariate relationships (Brunsdon)** - GW PCA bandwidth selection and visualisation.

v. **GW regression for the exploration of multivariate relationships (Charlton)** - GW regression with multiple covariates; investigating and addressing local collinearity; locally-compensated GW regression models.

vi. **Further topics (Harris)** - GW models for spatial prediction; robust GW models and outlier detection; GW models for sample re-design.

This workshop stems from research funded by a Strategic Research Cluster Grant (07/SRC/I1168) by Science Foundation Ireland under the National Development Plan. The authors gratefully acknowledge this support.

[a] National Centre for Geocomputation, NUIM, Maynooth, Ireland
[b] Department of Geography, Liverpool University, Liverpool, UK

NUI MAYNOOTH
Ollscoil na hÉireann Má Nuad
UCD DUBLIN
DIT
StratAG
Strategic Research in Advanced Geotechnologies
Taighde Straitéiseach sna hArd-Gheoteicneolaíochtaí
NCG
sfi science foundation ireland fondúireacht eolaíochta éireann
NDP National Development Plan 2007 - 2013