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DEPARTMENT OF
GEOGRAPHY AND PLANNING

GPHY 855- Spatial Analysis

Contact Time	Three-hour lecture and seminar
Format	Lectures, seminar, discussions, labs and a final project
Class Assessment	Lab report and reading assignments: 25% Final Quiz: 20% Class discussion and presentation: 15% Final research project: 40%

COURSE OVERVIEW

This course examines the scientific methods used to derive useful information from spatial data. Emphasis will be placed on different types of data analysis models (vector, raster, network, and surface) used in GIS and methodologies for integrating various spatial analysis and modeling techniques with GIS for environmental/urban/social-economic/health applications (e.g. watershed and hydrology analysis, land use/cover classification, dynamic urban growth models, location-allocation models. health service). Practical applications and theoretical/technical aspects of related issues will be introduced and discussed. Students are required to read papers and develop a research project..

LEARNING OUTCOMES

Those who successfully complete the course are able to

- Understand the different data formats/structures and their corresponding analysis functions and methods in GIS.
- Be able to use the model builder to organize various functions and working flows for a GIS project.
- Select and run appropriate functions and extensions for an application.
- Have a basic understanding on uncertainty, MAUP and other issues of spatial data and analysis.

COURSE TOPICS

Spatial data, information, GIS, spatial sampling and interpolation, exploratory data analysis, spatial statistics, spatial regression, location-allocation modeling, uncertainty and error modeling, dynamic modeling, MAUP, ecological and environmental modeling, etc.

COURSE READINGS

Anselin, L. and A. Getis (1992). "Spatial statistical analysis and geographic information systems." *Annals of Regional Science* (26): 19-33

Diaz-Varela, R. A., R. Colombo, M. Meroni, M. S. Calvo-Iglesias, A. Buffoni, A. Tagliaferri. 2010. Spatial-temporal analysis of alpine ecotones: a spatial explicit model targeting altitudinal vegetation shifts. *Ecological modeling* 221:621-633.

Goodchild , M. F. (2009). Geographic information systems and science: today and tomorrow. *Annals of GIS*, 15(1):3-9

ESRI (2013). SpatialLABS. ESRI press.

Haining, R. (2010). The nature of georeferenced data. In *Handbook of Applied Spatial Analysis: Software Tools, Methods and Applications*. Edited by M. Fischer and A. Getis. Springer, pp. 197-217.

Lin, C-H. and T-H. Wen. 2011. Using geographically weighted regression (GWR) to explore spatial varying relationships of immature mosquitos and human densities with the incidence of Dengue. *International Journal of Environmental Research and Public Health*. 8:2798-2815.

Longley,P.A., M.F. Goodchild, D.J. Maquire, D.W. Rhind, (2017) Geographic Information Science and Systems, John Wiley & Sons. 477p.

Lo, C.P., A. K.W. Yeung, (2006). Concepts and Techniques of Geographic Information Science. Prentice Hall. 544p.

Crosetto, M. and S. Tarantola. 2002. Uncertainty and sensitivity analysis: tools for GIS-based model implementation. *International Journal of Geographical Information Systems*. 15(5):415-437.

Dark, S. J. and D. Bram. 2007. The modifiable areal unit problem (MAUP) in physical geography. *Progress in Physical Geography*, 31(5):471-479