**GIS4938/6938: Disease Mapping with Kriging**

**Instructor:** Dr. Liang Mao **E-mail:** liangmao@ufl.edu

**Office room:** Turlington Hall 3412 **Office hour:** Thursday 1-3pm

* ***Course description:***

The Kriging method has been increasingly used in public health to estimate and map disease risks and environmental exposures. The course is intended to introduce basic concepts and applications of the Kriging method, which addresses optimal spatial interpolation. The course emphasizes the applied side of the Kriging, particularly for mapping health issues. A lab component is included to help students gain hands-on experience of using Geostatistical Analyst in ArcGIS.

The Kriging method is closely related to statistics and GIS, and students with such background can take a step further to learn a more sophisticated approach. The method can be useful in students' immediate and future needs such as students' own theses and dissertations, or projects for their current or potential employers.

* ***Prerequisites:***

Entry level knowledge of both statistics (STA2023, GEO3162C, or equivalent) and GIS (GIS3043 or equivalent), or the consent of the instructor.

* ***Lectures and Labs:***

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| **Week** |  **Lecture Topics** |  |
| **1** | Introduction to Kriging |  |
| **2** | Spatial Description |  |
| **3** | Spatial Continuity |  |
| **4** | Concepts of spatial estimation |  |
| **5** | Random function models | Lab 1: Data preparation |
| **6** | Global estimation |  |
| **7** | Point estimation | Lab 2: Plot semi-viarogram |
| **8** | Ordinary Kriging  |  |
| **9** | Block Kriging | Lab 3: Ordinary Kriging |
| **10**  | Search Strategy& Cross-validation  |  |
| **11** | Modeling the sample variogram Lab 4: Cross-validation |
| **12** | Co-Kriging |  |
| **13** | Disease mapping basics |  |
| **14** | Mapping disease risks | Lab 5: Mapping the risk of PM2.5 exposure |
| **15** | Mapping environmental exposures | Help session on individual project |
|  **16** Individual project presentation  |
| **17** | Individual project presentation  |  |

* ***Textbook and additional readings:***

# Strongly Recommended Textbook:

Applied Geostatistics. Oxford University Press, New York, by Isaaks, Edward.H., and R.Mohan. Srivastava, 1989.

* ***Grading Policies***

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| **Items** | **Grade (points)**  |
| Lab Assignments | 40 |
| Annotated bibliography | 15 |
| Individual project report | 30 |
| Final presentation | 15 |
| **Total** | **100** |

The grading scale for this course consists of the standard scale, including minus grades, below:

93 - 100 = A 90 - 92 = A- 87 - 89 = B+ 83 - 86 = B 80 - 82 = B-

77 - 79 = C+ 73 - 76 = C 70 - 72 = C- 67 - 69 = D+ 63 - 66 = D

60 - 62 = D- Below 60 = E

“Please note that C- is not considered a passing grade for major, minor, Gen Ed, Gordon Rule, or basic distribution requirements.”

More information on current UF grading policies for assigning grade points can be accessed by the following link:

[http://www.registrar.ufl.edu/catalog/policies/regulationgrades.html](http://www.registrar.ufl.edu/catalog/policies/regulationgrades.html%20)

**Lab assignments:** There will be 5 assignments for lab exercises, with 10 points for each assignment. The assignments should be handed in by due date. Otherwise 2 point will be deducted per day after due date. If something unexpected happens, please inform the instructor in advance.

**Annotated bibliography:** Each student will review 5 articles and develop an annotated bibliography for each article. The 5 articles should cover one topic of student's interest in spatial modeling and public health. The bibliography should briefly describe (1) the reference of the article, (2) the purpose of the study, (3) the data used for the study, (4) the models used for the study, and (5) your evaluation/critics of the study.

**Individual project:** Students are asked to select specific topics based on their interests, and complete a Kriging estimation project with ArcGIS. After the final class, each student needs to hand in a 10-15 page project report in a designated format.

**Final presentation:** Students are expected to give a 15 minute presentation about their individual projects.

**Attendance/Participation:** Attendance is mandatory for all students. To encourage uninterrupted participation in class, it is expected that cell phone and pagers be TURNED OFF prior to entering the classroom. Absences may be excused if they are documentable. For expected absences, students must provide at least two business days advance notice of the absence. Acceptable reasons for absences include but are not limited to personal or family illness or emergency, religious holidays, etc. Oversleeping, missing the bus, etc., are not excusable excuses. Students may be required to provide written documentation in order to receive an excused absence.

If absence is excused, students are responsible for material missed during any class session (lab or lecture). S/he should obtain notes from a peer for the material covered in class. If the absence is unexcused, assignments not turned in at the assigned time will be considered late and a penalty applied.

* ***Other Important Information***

**Academic Integrity:** Each student is bound by the academic honesty guidelines of the University and the student conduct code printed in the Student Guide and on the University website: <http://www.registrar.ufl.edu/catalog/policies/students.html>

Cheating or plagiarism in any form is unacceptable and inexcusable behavior. The Honor Code states: “We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honesty and integrity. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: On my honor, I have neither given nor received unauthorized aid in doing this assignment.”

**Policy on Make-Up Work:** Students are allowed to make up assignments ONLY as the result of illness or other unanticipated circumstances warranting a medical excuse and resulting in the student missing a homework or exam, consistent with College policy. Documentation from a health care provider is required. Assignments and exams missed for any other reason will receive a grade of zero.

**Accommodations for Students with Disabilities:** Students requiring accommodations must first register with the Dean of Students' Office. The Dean of Students' Office will provide documentation to the student, who must then provide this documentation to the faculty member when requesting accommodation. If students experience personal, academic, and social issues, please consider either of the following assistances:

University Counseling Services (P301 Peabody Hall – 392-1575)

<http://www.counsel.ufl.edu/base.asp?include=counselingServices.inc>

Student Mental Health Services in the Student Health Care Center (Room 245, Infirmary Bldg. – 392-1171)

<http://www.health.ufl.edu/shcc>