

BIOS6901: SPATIAL DATA ANALYSIS

Effective Term

Semester B 2024/25

Part I Course Overview

Course Title

Spatial Data Analysis

Subject Code

BIOS - Biostatistics

Course Number

6901

Academic Unit

Biostatistics (BIOS)

College/School

College of Computing (CC)

Course Duration

One Semester

Credit Units

3

Level

P5, P6 - Postgraduate Degree

Medium of Instruction

English

Medium of Assessment

English

Prerequisites

Nil

Precursors

Nil

Equivalent Courses

Nil

Exclusive Courses

Nil

Part II Course Details

Abstract

This course aims to introduce the students to the science and art in dealing with geostatistical data and point patterns, with particular focus on making sense out of the data through design, inference, and diagnostics. Topics covered include

geostatistics (with applications to epidemiology), estimation of variogram, ordinary and universal kriging, point process theory, space-time point patterns.

Course Intended Learning Outcomes (CILOs)

CILOs		Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Appreciate the issues involved in choosing appropriate statistical methods for spatial data	15	x	x	
2	Formulate statistical models for spatial phenomena, and perform parameter estimation under these models by use of suitable computer software	50	x	x	x
3	Understand the pros and cons of different methods with ability to critically assess and improve models	35	x	x	x

A1: Attitude

Develop an attitude of discovery/innovation/creativity, as demonstrated by students possessing a strong sense of curiosity, asking questions actively, challenging assumptions or engaging in inquiry together with teachers.

A2: Ability

Develop the ability/skill needed to discover/innovate/create, as demonstrated by students possessing critical thinking skills to assess ideas, acquiring research skills, synthesizing knowledge across disciplines or applying academic knowledge to real-life problems.

A3: Accomplishments

Demonstrate accomplishment of discovery/innovation/creativity through producing /constructing creative works/new artefacts, effective solutions to real-life problems or new processes.

Learning and Teaching Activities (LTAs)

LTAs		Brief Description	CILO No.	Hours/week (if applicable)
1	Teaching	Learning through teaching is primarily based on lectures	1, 2, 3	3 hours/ week
2	Assignments	Learning through assignments (including computer assignments) allows students toperform critical problem analysis and develop hands-on skills using software	1, 2, 3	

Assessment Tasks / Activities (ATs)

ATs		CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)
1	Assignments/Project	1, 2, 3	30	
2	Midterm	1, 2, 3	20	
3	Class Participation	1, 2, 3	10	

Continuous Assessment (%)

Examination (%)

40

Examination Duration (Hours)

2

Assessment Rubrics (AR)

Assessment Task

Assignments/Project (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion

Problem solving skills and software knowledge

Excellent

(A+, A, A-) Consistently demonstrates a thorough understanding of spatial data analysis concepts and applies them to complex problems

Good

(B+, B, B-) Adequately demonstrates an understanding of spatial data analysis concepts and applies them to moderately complex problems

Fair

(C+, C, C-) Demonstrates some understanding of spatial data analysis concepts and applies them to simple problems

Marginal

(D) Demonstrates little understanding of spatial data analysis concepts, or is unable to apply them to simple problems

Failure

(F) Demonstrates little understanding of spatial data analysis concepts and is unable to apply them to problems

Assessment Task

Class Participation (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion

Communication skills

Excellent

(A+, A, A-) Actively participates in class discussions, group work, and activities, and consistently contributes to the learning of others

Good

(B+, B, B-) Participates in class discussions, group work, and activities, but not consistently or actively, and occasionally contributes to the learning of others

Fair

(C+, C, C-) Minimally participates in class discussions, group work, and activities, and rarely contributes to the learning of others

Marginal

(D) Rarely participates in class discussions, group work, and activities, or does not contribute to the learning of others

Failure

(F) Rarely participates in class discussions, group work, and activities, and does not contribute to the learning of others

Assessment Task

Midterm Exam (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion

Problem solving based on comprehensive understanding

Excellent

(A+, A, A-) Demonstrates a comprehensive understanding of spatial data analysis concepts and applies them to complex problems

Good

(B+, B, B-) Adequately demonstrates an understanding of spatial data analysis concepts and applies them to moderately complex problems

Fair

(C+, C, C-) Demonstrates some understanding of spatial data analysis concepts and applies them to simple problems

Marginal

(D) Demonstrates little understanding of spatial data analysis concepts, or is unable to apply them to problems

Failure

(F) Demonstrates little understanding of spatial data analysis concepts and is unable to apply them to problems

Assessment Task

Final Exam (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion

Problem solving based on comprehensive understanding

Excellent

(A+, A, A-) Consistently demonstrates a comprehensive understanding of spatial data analysis concepts and applies them to complex problems

Good

(B+, B, B-) Adequately demonstrates an understanding of spatial data analysis concepts and applies them to moderately complex problems

Fair

(C+, C, C-) Demonstrates some understanding of spatial data analysis concepts and applies them to simple problems

Marginal

(D) Demonstrates little understanding of spatial data analysis concepts, or is unable to apply them to problems

Failure

(F) Demonstrates little understanding of spatial data analysis concepts and is unable to apply them to problems

Assessment Task

Assignments/Project (for students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion

Problem solving skills and software knowledge

Excellent

(A+, A, A-) Consistently demonstrates a thorough understanding of spatial data analysis concepts and applies them to complex problems

Good

(B+, B) Adequately demonstrates an understanding of spatial data analysis concepts and applies them to moderately complex problems

Marginal

(B-, C+, C) Demonstrates some understanding of spatial data analysis concepts and applies them to simple problems

Failure

(F) Demonstrates little understanding of spatial data analysis concepts and is unable to apply them to problems

Assessment Task

Class Participation (for students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion

Communication skills

Excellent

(A+, A, A-) Actively participates in class discussions, group work, and activities, and consistently contributes to the learning of others

Good

(B+, B) Participates in class discussions, group work, and activities, but not consistently or actively, and occasionally contributes to the learning of others

Marginal

(B-, C+, C) Minimally participates in class discussions, group work, and activities, and rarely contributes to the learning of others

Failure

(F) Rarely participates in class discussions, group work, and activities, and does not contribute to the learning of others

Assessment Task

Midterm Exam (for students admitted from Semester A 2022/23 to Summer Term 2024)

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Part III Other Information

Keyword Syllabus

Stationarity, variograms, kriging, spatial regression, space-time models, Gibbs-Markov fields, spatial auto-regression, point processes

Reading List**Compulsory Readings**

Title	
1	Nil

Additional Readings

Title	
1	Statistics for Spatial Data, by Noel Cressie
2	Spatial Statistics and Modeling, by Gaetan, Carlo, Guyon, Xavier