IMPORTANT: This syllabus form should be submitted to OAA (gsbs_academic_affairs@uth.tmc.edu) a week before the start of each semester.

NOTE to STUDENTS: If you need any accommodations related to attending/enrolling in this course, please contact one of the Graduate School's 504 Coordinators, Cheryl Spitzenberger or Natalie Sirisaengtaksin. We ask that you notify GSBS in advance (preferably at least 3 days before the start of the semester) so we can make appropriate arrangements.

Term and Year: Spring 2023

Course Number and Course Title:
GS01 1273 Modern Nonparametrics

Credit Hours: 3 credits

Meeting Location: Gallick Classroom (S3.8367) or
Building/Room#: Schissler Library (S3.8351) (TBD)

WebEx/Zoom Link:

Program Required Course: [ ] Yes [x] No

Approval Code: [x] Yes [ ] No

(If yes, the Course Director or the Course Designee will provide the approval code.)

Audit Permitted: [x] Yes [ ] No

Classes Begin: Jan 9, 2023

Classes End: April 28, 2023

Final Exam Week: May 1 - 5, 2023

Class Meeting Schedule

Day	Time
Monday	1:00pm - 4:00pm

Course Director
Name and Degree: Peng Wei, PhD
Title: Professor
Department: Biostatistics
Institution: [ ] *UTH* [x] *MDACC*
Email Address: pwei2@mdanderson.org
Contact Number: 713-563-4285

Course Co-Director/s: (if any)
Name and Degree: Yisheng Li, PhD
Title: Professor
Department: Biostatistics
Institution: [ ] *UTH* [x] *MDACC*
Email Address: ysli@mdanderson.org
Contact Number: 713-563-4243

Office Hours: TBA

Instructor/s (Use additional page as needed)

1. Name and Degree: Jian Wang, PhD
   Institution: MDACC
   Email Address : jianwang@mdanderson.org

2. Name and Degree: Peng Wei, PhD
   Institution: MDACC
   Email Address : pwei2@mdanderson.org

3. Name and Degree: Yisheng Li, PhD
   Institution: MDACC
   Email Address: ysli@mdanderson.org

Teaching Assistant: (if any) Name and Email Address Name and Email Address	

Course description:

This course seeks to introduce students to the many developments in modern nonparametrics, including resampling methods, nonparametric and semiparametric regression models that have occurred over the last several decades. Topics include the bootstrap, jackknife, cross-validation, permutation tests, classification tree, random forests, nonparametric smoothing and regression, spline regression, and functional data analysis. While the course will focus on applications, time will be devoted to derivations and theoretical justifications of methods. The statistical software R will be used for the homework exercises.

Textbook/Supplemental Reading Materials (if any)

- Efron, B. and Tibshirani, R. (1994) An introduction to the bootstrap. Chapman & Hall: New York.
- Ruppert, D., Wand, M.P., Carroll, C.J. (2003) Semiparametric regression. Cambridge University Press.
- Hastie, T., Tibshirani, R., and and Friedman, J. (2009) The Elements of Statistical Learning. 2nd Edition. Springer-Verlag.
- Lecture notes

Course Objective/s:

Upon successful completion of this course, students will

be able to apply the many developments in modern nonparametrics, including resampling methods, nonparametric and semiparametric regression models, and tree methods, to biomedical problems.

***Specific Learning Objectives*:**

1. Apply the bootstrap properly to standard error estimation, confidence interval and hypothesis testing
2. Apply the permutation tests properly to independent and dependent data
3. Choose and apply appropriate nonparametric regression techniques to biomedical problems
4. Report and present results from the application of resampling and nonparametric regression techniques

Student responsibilities and expectations:

Students are expected to participate in-class activities, complete homework assignments on time, apply the methods covered in the course to solve a quantitative biomedical problem, and summarize and present the results as a final course project.

Grading System: [X] Letter Grade (A-F) [ ] Pass/Fail	
Student Assessment and Grading Criteria : (May include the following:)	
Homework (25 %)	Description There will be about bi-weekly homework assignments. There will be a 20% penalty per day for late homework unless you provide a written medical excuse for not turning in homework on time.
Quiz (%)	Description
Presentation (15%)	Description In-class presentation for the final project
Midterm Exams (30 %)	Description Take-home exam
Final Exam (30 %)	Description Written report for the final project
Workshop or Breakout-Session (%)	Description
Participation and/or Attendance (%)	Description

CLASS SCHEDULE

Day/Date	Duration [Hour(s) taught by lecturer]	Lecture Topic	Lecturer/s
1/9	3 hours	Review of probability and statistics; Empirical distribution and plug-in estimators	Wei
1/16		Martin Luther King Holiday (no classes)	
1/23	3 hours	Bootstrap estimate of standard error	Wei
1/30	3 hours	Bootstrap for regression models; confidence intervals	Wei
2/6	3 hours	Confidence intervals	Wei
2/13	3 hours	Permutation and bootstrap-based hypothesis testing	Wei
2/20	3 hours	Miscellaneous topics in bootstrap; take-home midterm exam	Wei

2/27	3 hours	Tree based methods	Wang
3/6	3 hours	Tree based methods	Wang
3/13		Spring Break (no classes)	
3/20	3 hours	Review of linear and linear mixed models	Li
3/27	3 hours	Scatterplot smoothing; penalized splines	Li
4/3	3 hours	Penalized splines	Li
4/10	3 hours	Semiparametric models	Li
4/17	3 hours	General and generalized additive models	Li
4/24	3 hours	Miscellaneous topics in semiparametrics	Li
5/1	3 hours	Final project in-class presentation	