COMP-SCI 5565

**Introduction to
Statistical Learning**

COURSE SYLLABUS

UNIVERSITY OF MISSOURI - KANSAS CITY

2023 Fall Semester

Instructor Information

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Office Hours
Monday 10 AM - 11 AM

Course Details

COMP-SCI 5565
Credit Hours: 3
Meeting Location: EDUC-119
Exam:

Course Description

Introduction to Machine Learning; Multivariate Distributions; Information Theory; Linear Algebra (Eigenanalysis); Supervised/Unsupervised Learning, Classification/Regression; Linear/Non-linear Learning; Introduction to Bayesian Learning (Bayes rule, Prior, Posterior, Maximum Likelihood);

Parametric/Non-parametric Estimation. Recommended preparation: MATH 300; Familiarity with MATLAB. Prerequisites: COMP-SCI 394R.

A student who takes this course will have an opportunity to learn and attain some general student learning outcomes (some specific outcomes and their performance indicators follow below). This is a Senior/Graduate level course suitable for science majors that introduce students to the field of data science and machine learning. Students passing the course will have the ability to solve real-world problems involving prediction and inference and be better prepared for graduate courses on Machine Learning & Big Data.

Course Details

Attendance Verification
Maintaining accurate enrollment records throughout the term is a partnership between instructors and students. Instructors are responsible for verifying student attendance and participation within the first three weeks (16 week course) through the Attendance Verification Survey (administered through UMKC Connect) as well as maintain records of participation throughout the term so that the last date of attendance for students with recorded "F" or "W" final grades may be submitted. Because student plans for enrollment sometimes change prior to the semester start, students not engaging in courses through the initial weeks of each course may be administratively dropped. Visit the [undergraduate catalog](#) for more detailed information regarding the policy.

Recording Class Sessions
Students are not permitted to record class sessions without written consent from the course instructor. Contact your instructor to request permission.Instructor(s) may record class sessions for the sole purpose of sharing the recording with students who can't attend class. Instructor(s) will take care not to disclose personally identifiable information from the student education records during the recorded lesson.

Recommended Technology
You will need access to the computing resources necessary to complete this course through personal and/or University channels (e.g., computer labs). Our course will take place within the Canvas LMS and utilizing various software technologies that facilitate interaction and communication. Below is a list of some helpful computer requirements for full participation in this class:

- The latest version of Java
- The latest version of QuickTime
- The latest version of Adobe Reader

- A current version of word processing software

- A headset with microphone

- A webcam

- Google Chrome, Firefox, or Edge for Windows computers

- Google Chrome, Firefox, or Safari for Apple computers

Broadband Internet connection is preferred. Examples of broadband Internet connection are high-speed DSL or a Cable modem.

Technology Assistance

The links below will connect you with answers and information for the most common technical questions and issues students experience.

- [UM System Student Learning Support](#)

- [UM System Teaching Tools](#)

Required and Recommended Materials

An Introduction to Statistical Learning: with Applications in R
Authors: Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani
Publisher: Springer
Publication Date: 2013

Supplemental Instruction

Recommended: A First Course in Machine Learning: Simon Rogers & Mark Girolami, CRC Press.

Reference: The Elements of Statistical Learning: Trevor Hastie, Robert Tibshirani, Jerome Friedman: Springer, 2008

Course Topics:

1. **Intro to Statistical Learning:** What is statistical learning? Assessing Model Accuracy, Introduction to Python

2. **Linear Regression:** Simple Linear Regression, Multiple Linear Regression, and Other Considerations in the Regression Model

3. **Classification:** Logistic Regression, Linear Discriminant Analysis, Comparison of Classification Methods

4. **Resampling Methods:** Cross-Validation, Bootstrap

5. **Linear Model Selection and Regularization:** Subset Selection, Shrinkage Methods, Dimension Reduction Methods, Considerations in High Dimensions

6. **Moving Beyond Linearity:** Polynomial Regression, Step Functions, Basis Functions, Regression Splines, Smoothing Splines, Local Regression, Generalized Additive Models

7. **Tree-Based Methods:** Decision Trees, Bagging, Random Forests, Boosting

8. **Support Vector Machines:** Maximal Margin Classifier, Support Vector Classifiers, Support Vector Machines

9. **Unsupervised Learning:** Principal Component Analysis, K-means clustering, Hierarchical Clustering (Dendrograms)

10. **Deep Learning:** Neural network, Convolutional neural network, fitting/training neural network

This course will have the benefit of peer-assisted academic support in the form of supplemental instruction (SI). Please note that a supplemental instructor is not the same as a Teaching Assistant. To learn more about SI in general, please visit the [Supplemental Instruction](#)website.

Exam Proctoring

Some assessments (such as tests and/or quizzes) in this course require the use of auto proctoring, which is an online, remote proctoring system that uses advanced machine learning and identity-verification technology to ensure test integrity.

You must have a laptop or desktop computer with a webcam and a microphone; you cannot use a smartphone or tablet. You must have a stable internet to take the assessment. The University recognizes that not all students may be able meet the minimum requirements. If you do not have access to the minimum technology requirements, or if you have disabilities that require the use of a screen reader or keyboard navigation shortcuts, please inform your instructor before the quiz or test so that ADA accommodations or arrangements, as appropriate, may be made.

Please be aware that:

- You, your computer, and physical test-taking environment may be recorded.

- As you may be recorded, please dress appropriately.

- You may be asked to show a picture ID to the camera.

- You will need a quiet place to take the assessment -- both for your concentration and as interruptions (voices, another person on camera) may be flagged for potential cheating.

See the [Teaching Tools website](#) for your specific software to learn how to:

- Install any needed extensions;

- Set up your assessment environment; and

- Complete the pre-assessment checks.

Course Expectations

Academic misconduct is not acceptable behavior and will not be tolerated. Academic misconduct includes, but is not limited to cheating, fabrication and falsification, plagiarism, or facilitating academic misconduct. If a student engages in academic misconduct it will result in a failing grade for the assignment in question and possible dismissal from UMKC. See the [Student Conduct Policy](#) for full details.

Policy on late assignments

Late work is not accepted unless documented extenuating circumstances prevent the submission by the posted deadline.

Evaluation and Grading

Assessment items	Weight (%)
Homework/Labs	40
Exam 1 (Mid-term exam)	20
Project	10
Exam 2 (Final exam)	30

Percentage of Points Earned	Letter Grade Earned
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-
0-59%	F

Final Exam Date and Time

The schedule can be found on the Final Exam website which updates as changes are made to the times, dates and rooms that final exams are held. Make sure to check this website again as you near final exams to ensure that you have the most current information about the time and date of your exam for this course.

Important Dates - 16 week session

January 17	Classes Begin (full 16 week session) (first 8 week session)
January 23	Last day to add courses without an instructor signature (full 16 week session)
January 23	Last day to register without paying a late registration fee
January 23	Last day to change a course from Audit to Credit (full 16 week session)
January 23	Last day for a 100% Refund (full 16 week session)
February 13	Last day to drop a course and not have it appear on your transcript (full 16 week session)
February 13	Last day for a 50% refund (full 16 week session)
February 13	Last day to change a course from Credit to Audit (undergraduate- full 16 week session)
March 10	Last day for a 25% refund (full 16 week session)
March 10	Last day to withdraw with a "W" (graduate/professional - full 16 week session)
March 27	Spring break

March 31	Deadline to apply for spring 2023 graduation
April 3	Fall 2023 Priority Registration Begins
April 14	Last day to withdraw with a "W" (undergraduate - full 16 week session)
April 24	Fall 2023 Open Registration Begins
April 28	Last day of classes (Law - full 16 week session)
May 1	Finals Week (Law - full 16 week session)
May 4	School of Humanities and Social Sciences Reading Days
May 5	Last day to withdraw with a "W" or "WF" (graduate/professional - full 16 week session)
May 5	Last day to change a course from Credit to Audit (graduate/professional - full 16 week session)
May 5	Last day of classes (All Academic Units, except LAW - full 16 week session)
May 6	Finals Week (All Academic Units, except LAW - full 16 week session)

Important Dates - first 8 week session

January 18	Classes Begin (full 16 week session) (first 8 week session)
January 19	Last day to add courses without an instructor signature (first 8 week session)
January 19	Last day to change a course from Audit to Credit (first 8 week session)
January 19	Last day for a 100% Refund (first 8 week session)
January 30	Last day to drop a course and not have it appear on your transcript (first 8 week session)
January 30	Last day for a 50% refund (first 8 week session)
January 30	Last day to change a course from Credit to Audit (undergraduate - first 8 week session)
February 13	Last day for a 25% refund (first 8 week session)
February 13	Last day to withdraw with a "W" (graduate/professional - first 8 week session)
February 27	Last day to withdraw with a "W" (undergraduate - first 8 week session)
March 10	Last day to withdraw with a "W" or "WF" (graduate/professional - first 8 week session)
March 10	Last day to change a course from Credit to Audit (graduate/professional - first 8 week session)
March 10	Last day of classes (first 8 week session)

Important Dates - second 8 week session

March 13	Classes Begin (second 8 week session)
March 15	Last day to add courses without an instructor signature (second 8 week session)
March 15	Last day to change a course from Audit to Credit (second 8 week session)
March 15	Last day for a 100% refund (second 8 week session)
March 24	Last day to drop a course and not have it appear on your transcript (second 8 week session)
March 24	Last day for a 50% refund (second 8 week session)
March 24	Last day to change a course from Credit to Audit (undergraduate - second 8 week session)
March 27	Spring break
March 31	Deadline to apply for spring 2023 graduation
April 3	Fall 2023 Priority Registration Begins
April 14	Last day for a 25% refund (second 8 week session)
April 14	Last day to withdraw with a "W" (graduate/professional - second 8 week session)
April 24	Fall 2023 Open Registration Begins
April 28	Last day to withdraw with a "W" (undergraduate - second 8 week session)
May 12	Last day to withdraw with a "W" or "WF" (graduate/professional - second 8 week session)
May 12	Last day to change a course from Credit to Audit (graduate/professional - second 8 week session)
May 12	Last day of classes (second 8 week session)

Basic Needs

It can be challenging to do your best in class if you have trouble meeting basic needs like safe shelter, sleep, and nutrition. If you have difficulty affording groceries or accessing sufficient food to eat every day, or lack a safe and stable place to live, UMKC is here to help. The UMKC Basic Needs webpage has information on resources for food assistance, housing assistance and financial literacy. The Kangaroo Pantry is a free resource for all UMKC students that provides food and other items to those in need. Check out the Kangaroo Pantry website for details on hours and locations. I strongly encourage you to set up an appointment with UMKC Basic Needs and/or me if you have a need for this type of assistance.

Academic Calendar

Students are encouraged to review important add, drop or withdraw dates in the [UMKCAcademic Calendar](#) site.

Academic Integrity

The Board of Curators of the University of Missouri recognizes that academic honesty is essential for the intellectual life of the University. Faculty members have a special obligation to expect high standards of academic honesty in all student work. Students have a special obligation to adhere to such standards. Academic dishonesty, including cheating, plagiarism or sabotage, is adjudicated through the University of Missouri Student Conduct Code and Rules of Procedures in Student Conduct Matters.

Academic Support and Mentoring

The department of Academic Support and Mentoring (ASM) offers a wide range of services and programs to help students meet their academic goals. ASM offers peer tutoring, writing and presentation assistance, SI study groups, instructional videos and many more resources that are valuable to your success in this class. Information can be found on the [ASM website.](#) You can use [RooLearning+](#) for scheduling appointments and viewing when support for this class is available. Access RooLearning+ by downloading the app from the [App Store](#) (Apple) or [Google Play](#) (Android) and sign in with your SSO. The URL for the RooLearning+ site is [umkc.tedu.app/student.](#)

Attendance Policy

Students are expected to attend and participate in classes as indicated by the course modality (Classroom based, Online, etc. available on Pathway). For more information on [UMKC course modalities](#), please visit the Registrar's page.

In order to comply with federal regulations associated with eligibility rules for federal financial aid, students not attending/participating a course during the first three weeks of the term will be administratively dropped from the specific course. Advance notice of attendance policies of academic units and individual instructors should be given, and such notice should be in writing. Students should notify instructors of excused absences in advance, where possible. Students who have an excused absence are expected to make arrangements with instructors for alternative or make-up work. Such arrangements should be made in advance of the absence, where possible. Instructors should accommodate excused absences to the extent that an accommodation can be made that does not unreasonably interfere with the learning objectives of the course or unduly burden the instructor. Attendance policies shall be applied in a non-

discriminatory manner. Enrollment as a student is required to attend any class unless otherwise pre-approved by the instructor. Instructors are responsible for verifying student attendance and participation within the first three weeks (16 week course) through the Attendance Verification Survey (administered through UMKC Connect) as well as maintain records of participation throughout the term so that the last date of attendance for students with recorded "F" or "W" final grades may be submitted.

Campus Safety

Inclement weather, mass notification, and emergency response guide can be found on the [UMKC Alert](#) page.

UMKC Connect

Important information is available to undergraduate students in [UMKC Connect](#) a central location for faculty, advisors, student services and students to communicate and collaborate on a strategic plan for each student's academic success. Throughout the term, students may receive emails regarding course grades or academic performance. Students should regularly check their Connect dashboard and are expected to address information posted in a timely manner. This information may be shared with the student's Success Network made up of his or her academic advisor(s) and other campus resources so that UMKC may fully support the student's success. Students may schedule appointments to meet with members of their Success Network through UMKC Connect.

Grade Appeal Policy

The [University grade appeal procedure](#) is available only for the review of allegedly capricious grading and not for review of the instructor's evaluation of the student's academic performance. Capricious grading, as that term is used here, comprises any of the following:

- The assignment of a grade to a particular student on some basis other than the performance in the course;
- The assignment of a grade to a particular student according to more exacting or demanding standards than were applied to other students in the course; (Note: Additional or different grading criteria may be applied to graduate students enrolled for graduate credit in 300- and 400-level courses.)
- The assignment of a grade by a substantial departure from the instructor's previously announced standards.

Privacy Policies

Privacy Policy

Webcam Policy

Student Disability Services and Accommodations

To obtain disability related accommodations and/or auxiliary aids, students with disabilities must contact Student Disability Services as soon as possible by calling 816-235-5612. Once verified, our office will notify the course instructor and outline the accommodation and/or auxiliary aids to be provided. You are also welcomed to contact Scott Laurent at the Office of Disability Services as soon as possible by calling (816) 235-5696 or via email at laurentr@umkc.edu.

Counseling Services and Student Health & Wellness

UMKC students may experience many challenges in their lives while attending college – stress, depression, suicidality, trauma, relationship issues, health concerns, etc. As an institution, we care about your success and well-being, and want to make you aware of some helpful resources on campus. UMKC Counseling Services, located at Brookside 51 Building, 5110 Oak Street, Suite 201, offers a wide range of supportive services to students. Appointments can be made by calling 816-235-1635. UMKC Student Health and Wellness, located at Brookside 51 Building, 5110 Oak Street, Suite 201, offers a full range of supportive services to students. Appointments can be made by calling 816-235-1635.

UMKC Student Health and Wellness , located at Brookside 51 Building, 5110 Oak Street, Suite 237, offers a full range of health care and promotion services. Appointments can be scheduled online or by calling 816-235-6133.

The MindBody Connection is located in the Student Union, 3rd floor, room 303G & 303H. The MindBody Connection provides space for students to learn how to relieve stress and learn more about mindfulness. Featuring massage chairs, art supplies, and a quiet space, the MindBody Connection is a great place for students to unwind and get back in touch with their minds and bodies and offers a variety of stress-reduction services.

Students are encouraged to review UMKC's Policy on Suicide Prevention Resources, which provides resources, referral information, and training opportunities to help recognize signs of distress in yourself and your peers as well as how to make appropriate referrals for support and assistance.

Students may contact the UMKC Student HelpLine (or call 816-235-2222) with any questions or concerns. Students may also utilize the Complaint Policy to file a complaint online.

Equal Opportunity & Educational Access

UMKC is committed to providing equal opportunities to all students without unlawful discrimination on the basis of a protected identity, including race, color, national origin, ancestry, religion, sex, pregnancy, sexual orientation, gender identity, gender expression, age, disability, protected veteran status, or any other status protected by applicable state or federal law.

Discrimination & Harassment: Compliance with UM System Collected Rules and Regulations (CRRs) 600.000 is monitored by the Office of Equity & Title IX , but it is the responsibility of the entire university community to provide equal opportunity through relevant practices, initiatives, and programs. If you or someone you know has experienced discrimination or harassment based on their protected identity, we encourage you to visit Making a Report.

CRR 600.010 prohibits protected identity discrimination and harassment. It also prohibits sexual harassment and sexual misconduct by a student, employee, volunteer, or visitor that is not covered under CRR 600.020 and Title IX (see below), that occurs within a UMKC educational program or activity, on- or off-campus, including when the conduct occurs off-campus and interferes with or limits the ability of any person to participate in or benefit from UMKC's educational programs or activities or employment. For those who have experienced discrimination or harassment, please see the Support and Connections pages of our Equity & Title IX website for a list of campus and community support services.

Sexual Harassment under Title IX: UM System Collected Rules and Regulations (CRRs) 600.020 prohibits all students, employees, volunteers, and visitors from engaging in sexual harassment, including sexual assault, dating violence, domestic violence, and stalking, in a university education program or activity against a person in the United States. If you or someone you know has experienced sexual harrassment, please visit the Support and Connection pages of our Equity & Title IX website for a list of support services on campus and in the community. For information on how to make a report to the university, visit Making a Report.

Failure to Accommodate Students with Disabilities: UM System Collected Rules and Regulations (CRRs) 600.010 prohibits discrimination against students with disabilities and ensures these students receive educational accommodations as issued by Student Disability Services. If you believe an employee of the university has failed to accommodate your disability, visit Making a Report or contact the Office of Equity and Title IX at (816) 235-1771 or eqtix@umkc.edu.

Accommodating Pregnancy & Related Conditions: UMKC provides reasonable accommodations to students related to pregnancy and childbirth, including adjustments to

attendance requirements, course due dates, leaves of absence, and other accommodations. If you have questions or would like to request arrangements, please visit Pregnancy & Related Accommodations or contact the Office of Equity & Title IX at (816) 235-1771 or eqtix@umkc.edu.

Mandated Reporting: Nearly all UMKC employees, including your course instructors, advisors, and other support staff, are required to report all information related to any known or suspected discrimination, harassment, or sexual misconduct to the Office of Equity & Title IX and cannot offer confidentiality. However, students may seek confidential support from RISE: Resources, Intervention, Support, & Education, Counseling Services, and Student Health & Wellness.

Employees of these offices are exempt from mandated reporting so long as the disclosure of prohibited conduct occurs in a confidential communication while they are acting as support advocates, professional counselors, or medical personnel. An exemption does not extend to these employees when the disclosure is made in non-confidential setting. If you have a question about confidentiality when making a disclosure to RISE, Counseling Services, or Student Health & Wellness, you should first ask whether the exemption applies.

Right to Free Expression

It is vitally important for UMKC to foster and maintain an educational environment that promotes free discussion, inquiry and expression by students inside the classroom and beyond, without fear that their exercise of such rights will have negative repercussions in areas over which the university has responsibility. It is equally important that students understand the narrow line separating their First Amendment rights and the legal and privacy rights of others so that students can exercise those rights within appropriate boundaries.

Per UM System Collected Rules and Regulations (CRRs) 200.015 your instructors should encourage free discussion, inquiry, and expression in courses, conferences and meetings. Student performance shall be evaluated solely on an academic basis, not on opinions or conduct in matters unrelated to academic standards.

Classroom Expectations: In exercising your right to free expression, UMKC requests students adhere to these five guidelines:

- Share responsibility for including all voices in the conversation, leaving sufficient time for others to engage in the discussion. Listen respectfully, avoiding interruptions or distractions.
- Recognize how your own identity and experiences inform your opinions and reactions to others. Be open to changing your perspectives when exposed to the ideas of others.
- Speak with care, acknowledging that your words may be perceived as disrespectful, marginalizing, biased, or harmful.

- Understand that everyone makes mistakes; view these mistakes as valuable in the learning process. Notice your own defensive reactions, and channel them into furthering a productive discussion.
- Differentiate between safety and comfort; accept discomfort as necessary for learning and exploring ideas through a social justice lens.

Although your right to free expression is protected, your instructors have the authority to take action under CRR 200.010 when they believe the conduct of any student unreasonably disrupts the classroom environment and prevents others from learning or threatens or endangers the health or safety of any person. If you feel your instructor was in error in taking action under CRR 200.010 related to your right to free expression, visit Making a Report.

Expressions of Perceived Bias

UMKC is committed to equity, diversity, inclusion and respectful interaction. In support of our campus community, the university provides the opportunity for students, employees, volunteers, and visitors to report expressions of perceived bias and to request UMKC respond to such expressions.

An expression of perceived bias may occur when someone believes that they have been subjected to harassment, bullying, stereotyping, microaggressions, abuse, marginalization, or any other form of targeted misconduct because they identify or are associated with a particular group. If you believe you have experienced an expression of bias or you become aware of such an expression, visit Making a Report.

Support: If the conduct of others prevents you from fully participating in the classroom or in university activities, UMKC offers confidential support through Counseling Services and RISE: Resources, Intervention, Support, & Education. Additional campus and community support services are listed on the Support and Connections pages of our Equity & Title IX website.