MS Data Science Requirements

Admission Requirements: While there is some flexibility in our requirements, we generally require:

- A bachelor's degree from an accredited college or university. BS in Computer Science or Data Science recommended.
- A 3.0 GPA for the last 60 semester credits
- GRE scores above the 40th percentile on the verbal section and 80th percentile on the quantitative section. Those whose quantitative score on the GRE general test is less than the 80th percentile will need to show compensating strength in their background to be considered
- TOEFL score of 79 or IELTS overall score of 6.0 and a minimum score of 5 on each subscale (international students)
- Demonstrated use and proficiency in Python, a course in Data Structures and Algorithms (CS 2420), and coursework in statistics (STAT 3000)
- These are in addition to the School of Graduate Studies' (SGS's) requirements that can be found at: http://rgs.usu.edu/graduateschool/admissions

Declare Plan: All Data Science MS students are pursuing the Plan A (thesis) option. This is officially declared as part of submitting the Supervisory Committee Approval Form (SCAF).

Supervisory Committee Approval Form (SCAF): During the first semester of their program, all MS Data Science students must complete their SCAF. A SCAF confirms the individuals who will serve on the student's committee. Required committee members (must be indicated on the form):

- Major Professor (or advisor) – must be from within the department issuing the student's degree
- Committee member – may be co-chair if necessary and approved
- Outside member – outside area of emphasis, may be from within the student's department.

An MS Data Science committee must include three faculty members who have been approved to serve as graduate faculty by the department head and college dean. The major professor (or advisor), and one committee member must be from the department, and the outside member must be from outside the area of emphasis (but may be from the student's department). The student may have additional committee members if necessary. If the form does not have all required committee roles filled, it will be denied.

Program of Study (POS): The POS is a contract among the student, committee members, and the SGS outlining which courses the student will take to meet the SGS's requirements and complete their degree program. Students joining the department in a Fall semester will need to submit a POS by April 1st of their second semester. Students joining the department in a Spring semester will need to submit a POS by November 1st of their second semester. In order to be approved, the POS must follow the Data Science MS degree requirements listed on the USU Catalog.

The current catalog listing for the Data Science MS in the 2021-2022 academic year is as follows:

Requirements for the Master of Science in Data Science are listed below. Students must complete 30 credit hours, 12 of which must be at the 6000 level or above (excluding CS 6900, CS 6250, CS

6970, STAT 6250, and STAT 6970). All students will complete a Plan A MS which includes the completion of a thesis that will be reviewed by their committee. The overall GPA must be at least 3.0 for degree-program courses, and grades of C+ or lower will not be accepted.

Required Courses:
Students are required to complete 6 credits of either CS 6970 or STAT 6970 and CS 6900 (a 1 credit seminar course). Furthermore, students must take 9 credits from the following list of courses (excluding CS 6970, CS 6900, and STAT 6970):

- CS 5665 - Introduction to Data Science **3**
- CS 5800 - Introduction to Database Systems **3**

- CS 5830 - Data Science Incubator **3 or**
- CS 6830 - Data Science Incubator **3**

- CS 6665 - Data Mining **3**
- CS 6675 - Advanced Data Mining **3**
- CS 6900 - Seminar **1**

- CS 6970 - Thesis and Research **1-9 or**
- STAT 6970 - Thesis and Research **1-6**

- CS 6685 Deep Learning Theory and Applications **3 or**
- STAT 6685 - Deep Learning Theory and Applications **3**

- MATH 5710 - Introduction to Probability **3**
- STAT 5050 - Introduction to R **1**
- STAT 5100 - Modern Regression Methods (CI/QI) **3**
- STAT 5650 - Statistical Learning and Data Mining I **2**

Elective Courses:
Students may complete the course credits for the degree by choosing courses from the required or elective list of courses. Only 3 credits of CS 5950 or CS 6950 are allowed. CS 6890 and STAT 5810 are allowed only if the topic is in the field of Data Science. Only 3 credits of CS 6250 or STAT 6250 are allowed.

- CS 5950 - Independent Study **3 or**
- CS 6950 - Directed Readings in Computer Science **3**

- CS 6250 - Cooperative Work Experience, Graduate **1-9 or**
- STAT 6250 - Graduate Internship/Co-op **1-8**

- CS 6600 - Intelligent Systems **4**
- CS 6680 - Computer Vision: Foundations and Applications **3**
- CS 6800 - Advanced Database Systems **3**
- CS 6890 - Topics in Computer Science (Topic) **1-4**
- MATH 5720 - Introduction to Mathematical Statistics **3**
- STAT 5550 - Statistical Visualization I **2**

- STAT 5560 - Statistical Visualization II **2 or**
- STAT 6560 - Statistical Visualization II **2**

- STAT 5810 - Topics in Statistics **1-3**
- STAT 6080 - Data Technologies **2**
- STAT 6100 - Advanced Regression Analysis **2**
- STAT 6150 - SAS Predictive Analytics **2**
- STAT 6410 - Applied Spatial Statistics **2**
- STAT 6550 - Statistical Computing **3**
- STAT 6650 - Stat Learning: Multivariate Stat Analysis for Bioinformatics, Data Mining, and Machine Learning **3**
- STAT 6710 - Mathematical Statistics I **3**
- STAT 6720 - Mathematical Statistics II **3**
- STAT 6910 - Seminar in Statistics **1-3** (Principles of Machine Learning and/or Statistical Computing)

Requirements may change from time to time, so students are advised to check with the department or their advisor to determine whether the requirements at the time of graduation or in the first semester of registration as a graduate student will have an effect.

Individual Development Plan (IDP) & Annual Reviews: Once per year, students should complete an IDP. This is a College of Science requirement. Information on IDPs can be found at https://www.usu.edu/science/pages/students/graduate-individual-development-plan. In addition, Plan A students must complete an annual review with their major professor to ensure progress in their program.

Thesis/Project Approval (TPA): The Master's TPA form confirms you successfully defended a research proposal and have the necessary regulatory approvals to conduct the proposed research.

Responsible Conduct of Research (RCR): CITI Training is available for master's students whose committee deems it appropriate for the student's thesis/project.

For updates on Institution Review Boards (IRB) regulations and to determine whether your research requires IRB approval, visit the IRB website.

You, your major professor, committee members, department head, Vice Provost of Graduate Studies, and IRB (if needed) will receive an email notification from ServiceNow, to review and approve the TPA form. Once all signatures are obtained electronically, all parties will receive a final email from ServiceNow with a completed form.

Appointment for Examination (AFE): Students should schedule their final defense during their final semester. At least four weeks prior to the defense, students should give a copy of the thesis to each member of the supervisory committee for approval or corrections. After tentatively scheduling a time for the defense with their committee, the AFE form must be completed by the student and submitted to the SGS to officially schedule the defense of the thesis. It must be

submitted at least 10 business days prior to the student's defense. Submitting the AFE form allows the SGS to confirm that all required paperwork is complete and committee members have read the thesis ahead of time and agree that it's ready to be defended.

Defense (Plan A and B only):

- Any final defense held without following the proper procedures is invalid
- All defenses are public
- You must be registered for at least 3 credits the semester of defense (to be considered full-time at 3 credits, a Full-Time at 3 credits form must be approved).
    - If *all* credit requirements on an approved POS are met, you may qualify to register for 1 credit in the semester of defense. Registering for 1 credit will not qualify you to be considered as a full-time student (i.e. you will not qualify for an assistantship).
    - International students should check in with the Office of Global Engagement when making decisions on the number of credits needed.
- Your supervisory committee cannot be changed in the 6 weeks prior to the defense.
- All committee members *must* attend the defense at the date and time registered with the SGS
    - Up to 1 member of a master's committee may participate remotely (i.e. via Zoom or Skype). NOTE: This limit is currently suspended due to COVID precautions.
- No committee member should agree to proceed with a defense until they have carefully read and approved the thesis
    - If the paper is not ready to be defended, notify the Major Professor and student, then reschedule the defense
- The student should be informed of the defense results after the defense
- Plan A students should review the Thesis/Dissertation requirements
- If the defense is not successful, the student will need to schedule a new defense and will need to be registered for the semester of redefense.

Record of Exam (ROE): Once a student has completed their defense, the major professor must email the GPC the outcome of the defense. The GPC will submit the ROE.

Authorship & Copyright: The Authorship form specifies plans for publication. You must discuss your plans for publication with your chairperson and your committee to avoid misunderstanding about co-authorship or other acknowledgments as you publish parts or all of your thesis/dissertation. The form also asks for a date by which an acceptable draft will be submitted to your major professor or other USU faculty with whom you will publish. Establishing this timeline is crucial as it is important to get contributions to knowledge into the literature promptly. If the date for submission is not met, the faculty member may prepare the first draft of a manuscript for submission and, consequently, be listed as the first author. Your signature and those of your committee members indicate that you have discussed the plans and all are in agreement.

The rights to copyright and data are especially of concern if your thesis /dissertation research is carried out as part of a project with a Principal Investigator (PI) or in a laboratory using supplies and equipment furnished for you. Under certain circumstances, data gathered for use as part of a research project are the property of a federal, state, or private agency, Utah State University, or the principal investigator(s). Students using such data may be required to waive the right of ownership

and/or the privilege of copyrighting the thesis/dissertation early in your program. You should discuss the ownership and the right to the data to be utilized in your thesis/dissertation with your committee chairperson and, if your thesis/dissertation involves work on a project or in a lab, with the PI or lab director.

Format & Style:

Format:

- **Monograph Format**: This, the 'traditional' format, consists of a multi-chapter document that uses the same style throughout. A single chapter is not acceptable for a thesis or dissertation.
- **Multiple-Paper Format**: A thesis or dissertation using this format consists of at least two chapters, typically written as independent papers, preceded by an introductory chapter that sets the context for the research, and followed by a summary and conclusions chapter that integrates all of the studies.

Style:

- The style defines the way that text is presented on the page (e.g., fonts, font sizes, margins, indents, line spacing, page numbering). For a document in the monograph format, the style should be consistent throughout the document. For a document in the multiple-paper format, the style may differ for chapters that are targeted for publication in different journals, However, the style should be consistent within each chapter. The style in which a thesis/dissertation is written is dependent upon the student's departmental guidelines and the specifications of this document. The terms 'journal style' or 'manual style' refer only to the style guide a graduate student follows for citations, a reference list, headings/subheadings, table titles, figure captions, mathematical symbols, and other stylistic elements not specified by the USU Publication Guide. A journal style or a conventional style manual (such as APA or MLA) may be used as a guide for either a multiple-paper or a monograph format.
- The USU Publication Guide *and* department-approved style manuals are the final authority for format and style. Do not use previously approved theses or dissertations as models. Handling of special problems/materials not covered by this guide or by the departmental style manual should be discussed with and approved by the thesis and dissertation reviewer for the SGS (currently Erika Beckstrand).
- The USU publication guide *is not* a style guide. It should be referenced for your front matter and appendices.
- Individual departments have jurisdiction over stylistic elements not covered in the SGS Publication Guide. In Computer Science, the department requires its dissertations, theses, and reports to use the IEEE Transactions citation reference. The guide for IEEE citations can be found at http://www.ieee.org/documents/ieeecitationref.pdf
- In cases where the USU Publication Guide is unclear on stylistic elements, students are encouraged to confer with the IEEE author toolkit found at http://www.ieee.org/documents/info_authors_kit.pdf

You, your major professor and your supervisory committee should agree on the format and style of your thesis or dissertation early in the writing process. The Dissertation/Thesis Format and Style form communicates which format and style have been chosen.

You are responsible for proofreading your thesis/dissertation and having it read and approved by all committee members and the department reviewer before having the GPC submit an electronic version (PDF format) of the document to Box.

The thesis and dissertation reviewer in the SGS will review your thesis or dissertation for proper format and conformity to departmental and SGS standards. If corrections are required, an annotated copy of the electronic file will be uploaded to Box where it can be accessed by the student, the major professor, and the department reviewer.

Signed Title Page: Once your committee has approved your thesis, they will need to sign the title page. Title pages are now signed digitally using the form on ServiceNow. By approving the form, the committee members agree that the student's final document is ready to be put before the SGS and the Vice Provost for final approval.

Final Draft Submission: Once your committee has approved your thesis, submit the final draft to the Computer Science GPC. The GPC will review it and submit it to graduate school for their review. You will be informed if corrections need to be made. Once it has been approved, you will need to order two bound copies for the department: one copy for your major professor and one copy for the CS conference room. Please send the receipt to the GPC showing that you paid for them.

Graduation Paperwork: Students are eligible to graduate when they have completed all coursework on an approved POS and successfully defended their thesis. If they have submitted all the above forms by the deadline for submitting paperwork (typically 3 weeks before the end of the semester), then they will be emailed the link for graduation paperwork. Students must submit an application for graduation and pay the application fee before their degree can be awarded.