Part 2 Application *for* Science, Technology, Engineering, Mathematics (STEM), and Social Sciences Theses

First complete Part 1. Upload this file as part of Part 2 in the Scholars Thesis Submittal System at
https://scholarsthesis.tamu.edu.

Section 1: Contact Information

Student Applicant

Arghamitra	Click or tap here to enter text.	Talukder	726007850
First Name	*Middle Name*	*Last Name*	*9-digit UIN*

Type "X" in the appropriate section below to indicate your thesis type:

Type an "X" for Team Thesis.	X
Team Thesis	Individual Thesis

Faculty Advisor(s)

Primary Advisor:

Yang	Shen	ECEN	yshen@tamu.edu
First Name (and Middle Initial)	*Last Name*	*Department*	*Email Address*

Secondary Advisor (if applicable):

Click or tap here to enter text.	Click or tap here to enter text.	Click or tap here to enter text.	Click or tap here to enter text.
First Name (and Middle Initial)	*Last Name*	*Department*	*Email Address*

Tertiary Advisor (if applicable):

Click or tap here to enter text.	Click or tap here to enter text.	Click or tap here to enter text.	Click or tap here to enter text.
First Name (and Middle Initial)	*Last Name*	*Department*	*Email Address*

Section 2: Proposal

Section 2: Proposal – Project Summary

Project Summary Instructions:

IN LESS THAN 200 WORDS, briefly describe what you propose to do and how you propose to do it. The project summary should contain:

1. A statement of your research question.
2. Justification and importance of your research topic(s).
3. Make sure you understand the previous research that has been done in your field. How is your project(s) different or how does it/do they build on previous research? Be specific.
4. Expected outcome(s).

Proposal Title:

Multimodal Data Fusion and Machine Learning for Deciphering Protein-Protein Interactions

Project Summary:

The structural interactions between proteins can be considered as the core of cellular processes and the partnership provides a lot of answers to decode Molecular Biology. Though from time to time various experimental and computational methods have been applied to predict identities of protein-protein interactions (PPIs), a knowledge gap is there to understand their interactions in 3-dimensional (3D) space. This research project aims to use existing protein data in multiple modalities and advanced machine learning techniques to develop an algorithm for better prediction of PPI in 3D. The algorithm will use multimodal data fusion and machine learning to construct predictive models. The success matric of the algorithm will be the accuracy of the testing and validation group of data; it also aims to cover a broad range of scope making it more versatile.

Science, Technology, Engineering, Mathematics, and Social Sciences Thesis Application

Section 2: Proposal – Introduction

IN A FEW HUNDRED WORDS USING PARAGRAPHS, expand and describe your common research theme and why it is an important object of scholarly inquiry in the context of your research field. The Introduction usually requires a discussion of your literature review and a summary of the pertinent previous research in your field that shows the relationship between your project(s) and the material you cite. In the Introduction, be sure that you are:

- Using in-text citations and that you are citing the material correctly according to your citation style guide. Failure to use appropriate in-text citations will result in your proposal being returned to you for revisions.
- Demonstrating that you have surveyed the state of knowledge in your research area and that you understand how your outcomes will make an important contribution to your field.
- Introducing your thesis statement.

Introduction:

A functional human body is made of a lot of active organs, different macro and micro molecules. One of the most important cellular molecules is protein. Protein contributes in most biological processes including genetic expression, intercellular communication, morphology, nutrition absorption and so on (Thomas et al). A protein sequence can be represented as a character string where the characters represent amino acids. The amino acids bond together in a linear chain to express the specific functionalities as proteins. As the mechanisms of the human body are unrevealed, one context was very clear that most of the proteins interact with each other and to understand their behaviors they should be analyzed from the perspective of protein-protein interaction (PPI). There are experimental methods as well as computational methods. Given various challenges often faced by experimental techniques like affinity purification, yeast two hybrid, co-immunoprecipitation, computational methods are providing important alternatives .

The computational method adopted homology-based approaches like interolog search. Interolog search is based on the principle that interactions are conserved and interlogs are homologous pairs of protein interactions across different species. The homology-based method also includes phylogenetic similarities which relates to the common ancestor proteins among species (Abbasi et al). The simulation-based methods include protein docking. Protein docking is molecular modeling which predicts the mutual orientation (Tradigo et al). A lot of machine learning techniques have been also applied based on protein sequence, structure and function. The limitations with these approaches are the difficulties to model any conformational changes and lack of thorough understanding of the binding mechanism (Abbasi et al).

This project offers a computational method to predict how the proteins interact in 3-dimensional space. An accurate PPI prediction model will serve several objectives including pathways for unknown proteins, different binding modes, specificity of protein based multiple targets, effectiveness of drugs, design of new proteins etc.

Science, Technology, Engineering, Mathematics, and Social Sciences Thesis Application

Section 2: Proposal – Objective(s)/Goal(s)

Objective(s)/Goal(s) Instructions:

1-2 SENTENCES, define your research objective(s) and/or goal(s) clearly and succinctly. State your hypothesis or research question so that a reader from any research background can understand what it is you are trying to accomplish.

Do not explain your methods in this section. Explain your anticipated outcomes and what you hope to achieve with your project. Here you will describe the purpose, scope, rationale, and motivation for this research. Articulate how your research contributes to the ongoing discussion in your research field.

Objective(s)/ Goal(s):

The goal of this project is to develop an algorithm using machine learning to predict the physical protein-protein interactions by representing, integrating and learning protein data in various modalities such as text, graph and image.

Science, Technology, Engineering, Mathematics, and Social Sciences Thesis Application

Section 2: Proposal – Methodology

IN ONE SHORT PARAGRAPH, suggest how you propose to tackle your research question, what research methodologies you will employ. In this section, you should describe the approach, techniques, and/or procedures you will take to complete your project. Also describe the resources you need to do your research (e.g., laboratory, library or other space, documents or books you need to reference, databases you need access to) and people you will interact with during the research process. This section should align with the steps you describe in your customized timeline on the following pages.

Methodology:

We are proposing a novel perspective to approach the protein-protein interaction (PPI) using multiple protein modalities. Though a large amount of data is available on the identities of PPI, there is a gap to know how different proteins interact with each other in 3-dimensional space. This project is focused on developing a new algorithm to predict PPI interaction in 3d space by leveraging the present tools of artificial intelligence and data science. Our methodology involves representations of proteins and PPIs in different modalities like text, graph and image. The goal of the project is to extend the state of art with multimodal data fusion and machine learning. The success of the algorithm will be demonstrated by its prediction accuracy for the testing dataset (or how well it can replicate PPI in 3D) in comparison to other methods. The success metric of the algorithm is also dependent on the scope of its applicability (or how widely it applies to PPIs). **Identify the data sources and acquire the data:** I will make a list of the data I need. I will evaluate if I can use all the data. It also needs to be determined which dataset can prove the proposed algorithm and which dataset can contradict the theory. **Develop a baseline model and then explore other models to shortlist the best ones:** Next step would be trying the dataset with the very common models like linear regression alongside with the successful papers and procedures on PPI like ComplexContact, FilterDCA and Ouroboros.With the trial I can shortlist the state of art depending on the performance. **Fine-tune shortlisted models and check for ensemble methods:** I can hyperparameter tuning using cross-validation. I will be developing the method and the model with individual proof of concept. In case the model is working as expected, I need to investigate the reason or parameters which make a difference or make the results good. **Document Code and Communicate the solution:** I will be documenting each step in an organized way to keep track of the project (Tyagi).

Science, Technology, Engineering, Mathematics, and Social Sciences Thesis Application

Section 2: Proposal – References/Works Cited

Include a list of references for ALL the literature cited in the text of your proposal. This might also include your literature review and text that you intend to consult. Choose a citation style appropriate for your field. At least 4-5 references are expected.

References/ Work Cited:

Tradigo, Giuseppe, et al. "Algorithms for Structure Comparison and Analysis: Docking." *Encyclopedia of Bioinformatics and Computational Biology*, Academic Press, 6 Sept. 2018, www.sciencedirect.com/science/article/pii/B9780128096338204858.

Abbasi, Wajid Arshad & Minhas, Fayyaz ul Amir Afsar. (2018). Problems in Protein-Protein Interactions (A Literature Review).

Thomas, Neil, et al. "Can We Learn the Language of Proteins?" *The Berkeley Artificial Intelligence Research Blog*, 4 Nov. 2019, bair.berkeley.edu/blog/2019/11/04/proteins/.

Tyagi, Harshit. "Task Cheat Sheet for Almost Every Machine Learning Project" 4 July, 2020, https://towardsdatascience.com/task-cheatsheet-for-almost-every-machine-learning-project-d0946861c6d0

Science, Technology, Engineering, Mathematics, and Social Sciences Thesis Application

Section 3: Research Compliance Acknowledgement

Section 3: Research Compliance Acknowledgement – Instructions

Research Compliance Acknowledgement Instructions:

Faculty advisors who mentor undergraduates in the URS thesis program are solely responsible for advising and verifying student research compliance, research ethics, and necessary training. Faculty advisors are required to review and approve all aspects of URS applications and final theses, including the student's Research Compliance Acknowledgement.

Regulatory research committee (IRB and/or IBC and/or IACUC) approval is required **before** research activities involving human subjects, animals, or biohazards can commence. This requirement applies to activities conducted at Texas A&M and to activities at non-Texas A&M facilities and institutions. In both cases, students are responsible for working with Texas A&M's office of Research Compliance & Biosafety to ensure and document that all Texas A&M compliance obligations are met **before** the research begins. Students and faculty advisors are encouraged to reach out to the appropriate research compliance committee **as early as possible**.

The Research Compliance Acknowledgement section of the URS application is necessary to document the following:

1. Faculty advisor(s) approval of the proposed research
2. Student awareness and action to address any and all compliance issues for research involving human subjects, animals, and biohazards with the office of Research Compliance & Biosafety while conducting research

Resources: Research Compliance & Biosafety

- Red Flags List
- Activities that Require IRB Review
- Contact Information

Required Research Compliance Acknowledgement

By checking the box below, you are acknowledging the URS Research Compliance Acknowledgement form and certify that all research compliance requirements related to this proposal have been addressed with your faculty advisor(s) prior to submission. If any approvals or training are needed, you agree not to collect any data until approvals have been obtained and required training has been completed. You and your faculty advisor(s) understand that if the scope of the proposed research project changes, those changes must be addressed with the office of Research Compliance & Biosafety prior to implementation.

Type "X" below to acknowledge the above statement:

X
_____
Acknowledge

Enter your name, UIN, and date to complete your acknowledgement.

Arghamitra Talukder	726007850	09/14/2020
Name	**UIN**	**Date**

Science, Technology, Engineering, Mathematics, and Social Sciences Thesis Application

Section 4: COVID-19 Contingency Plan

Section 4: COVID-19 Contingency Plan – Instructions

COVID-19 Contingency Plan Instructions:

Due to COVID-19, students are required to apply with a contingency plan that describes how the URS project will be completed if you are unable to follow the scope of the original project proposal. The purpose of this contingency plan is to help you complete the URS thesis program on time and to fulfill graduation or other program requirements, such as Honors.

Depending on the project, this contingency plan could address, but is not limited to, the following:

- Lack of physical access to research space, data, or other resources
- Limited and/or restricted travel
- Inability to hold in-person meetings
- Partial or incomplete data, trials, experiments, reviews, analyses, design, etc.
- Virtual project completion if moved fully online

Give a detailed description of a contingency plan that will guide you as you plan ahead for potential disruptions and/or unanticipated impacts of COVID-19 on your URS thesis.

COVID-19 Contingency Plan:

Possible disruptions	Necessary actions
Lack of physical access to research space	I kept it in mind before I designed my senior design project and I chose a software-based project. That means just with internet access the resources and research space can be obtained.
Limited and restricted travel	I will plan it ahead so that even if I must travel, I can travel being properly equipped. Additionally, most events have been shifted their activities virtually
Inability to hold in-person meetings	The most important meeting will be with my thesis supervisor, senior design instructor and LAUNCH thesis reviewer. I plan to communicate regularly, more specifically weekly at least once with my supervisor; and attend class and LAUNCH activities regularly

Science, Technology, Engineering, Mathematics, and Social Sciences Thesis Application

Partial or incomplete project	I will approach the research statement step by step according to my timetable. In case of uncalled emergencies, I have made the plan versatile for the deliverable outcome.
Virtual project completion	As this is a software-based project, the showcase and deliverables can be completed virtually

Science, Technology, Engineering, Mathematics, and Social Sciences Thesis Application

Section 5: Timeline

Section 5: Timeline – Instructions

The Timeline section is meant to help you plan to effectively carry out your research goals over the course of the academic year. In the Timeline section of the application, describe your weekly goals, benchmarks, and deliverables, as if this were a class syllabus. What are your objectives and outcomes? What do you need to do to achieve your objectives and outcomes and when do you need to it? What do you need to do each week to keep yourself on track? Keep in mind the program requirements above as well as the prompts on the following pages that precede each monthly portion of the Timeline.

Section 5: Timeline – Semesters at a Glance

Fall

1. Attend the program orientation (October 12)
2. Attend 1 initial meeting with your assigned thesis reviewer
3. Attend 1 end-of-semester meeting with your assigned thesis reviewer
4. Attend 1 of 4 drop-in resource sessions
5. Complete 1 fall progress report

Spring

1. Attend 1 of 4 thesis formatting workshops (January 11, 14, 20, 21)
2. Complete 2 installment submissions
3. Complete 2 spring progress reports
4. Make 1 public presentation and submit 1 presentation report *
5. Complete the final thesis submission and receive faculty advisor approval

** Public presentations can take place in either fall or spring between October 12 and April 12 to meet the April 12 deadline to submit the Public Presentation Report. **Note:** Students on the Galveston campus are expected to present at the TAMUG Student Research Symposium in late-April and have until April 23 to submit Public Presentation Reports.*

Science, Technology, Engineering, Mathematics, and Social Sciences Thesis Application

Section 5: Timeline – Fall 2020 Semester

Section 5: Timeline – Fall 2020 Semester – September and October

September and October Goals

Program Requirements

- Finalize any revisions requested by your faculty advisor and/or LAUNCH staff on your program application.
- Attend the program orientation on Oct 12
- Attend the initial meeting with assigned thesis reviewer
- Attend or make plans to attend at least one resource session
- If you are in the LAUNCH University Honors Program and using URS to fulfill your capstone requirement, have you registered for the RESEARCH CAPSTONE section of UGST 497?

Individual Goals

Design your goals as if it were a class syllabus. Think about what you need to accomplish each WEEK and provide as much detail as possible. List assignments and other milestones for yourself, keeping your faculty advisor's schedule in mind. State days and times, you will be meeting with your faculty advisor.

Things to keep in mind as you design your weekly timeline might include:

- If you require research compliance approval and/or other required training: Have you contacted the office of Research Compliance & Biosafety? Do you need to attend a Research Compliance Informational? Are there any trainings you need to complete or schedule?
- Provide a list of dates for when you are contacting and obtaining access to resources you need for your project. Think about scheduling use of laboratory equipment, library or other physical spaces, requesting documents, books, or databases you need to reference, and people you will interact with during your research. Do you need to order anything ahead of time? Do you need to request permission to use any materials or resources for your project (e.g., data, figures, images, etc.).
- Do you have a project notebook?
- What are potential literary sources and appropriate databases you will use throughout the year?
- How is your project different or how does it build on previous research? What previous research in your field will you be including?
- Begin an outline of your thesis (think about your research question and approach, refine your thesis statement).
- Weekly project meetings with faculty advisor: discuss research progress and written thesis content.
- Discuss when and where you will present your work publicly.
- Identify what training you need and when you will complete it.
- Meet with your faculty advisor to determine the frequency of meeting times throughout the semester and what you will accomplish at each meeting.

Science, Technology, Engineering, Mathematics, and Social Sciences Thesis Application

TEXAS A&M UNIVERSITY

- Weekly meeting with thesis supervisor on the weekly accomplishments, future course of the project

- **The first deliverable:** The main deliverable of this month will be an overview of the multimodality, either by a graphical interface or code

DATE	Objective, Deliverables, Assignment
Fall **September** 31 Aug - 4 Sep	* Reading previous research papers * Preparing the LAUNCH proposal
7 Sep - 11 Sep	* Reading previous research papers * Submit the LAUNCH proposal * Concept of operation report of ECEN 403
14 Sep - 18 Sep	* Required trainings (ML tools, Python, how to access the server) * Revise the LAUNCH proposal * Work on existing models on PPI (pydca, filterDCA)
21 Sep - 25 Sep	* Work on filterDCA graphics interface to show the effect of multimodality * FSR, ICD, Milestone, and validation plan report of ECEN 403 * First draft of NSF GRFP research proposal
28 Sep - 2 Oct	* The proposal approval * **Midterm presentation of ECEN 403: an overview of the multimodality**
October 5 Oct - 9 Oct	* Understanding the existing state of art for further improvement * Second draft of NSF GRFP research proposal
12 Oct -16 Oct	* Implement the improvement plans and troubleshooting * Meeting with the thesis reviewer on the start of semester
19 Oct - 23 Oct	* Implement the improvement plans and troubleshooting * Meeting with the thesis reviewer * Submit NSF GRFP full application
26 Oct - 30 Oct	* Data sorting to find any special implementation of the model

Science, Technology, Engineering, Mathematics, and Social Sciences Thesis Application

Section 5: Timeline – Fall 2020 Semester – November

November Goals

Program Requirements

- Make sure you have attended at least one resource session by the November 25 deadline
- Attend the end-of-semester meeting with assigned thesis reviewer
- Submit your fall progress report by the November 30 deadline
- If you plan to enroll in the UGST 405 Thesis Writing Class, have you registered?
- If you are in the LAUNCH University Honors Program and using URS to fulfill your capstone requirement, have you registered for the RESEARCH CAPSTONE section of UGST 497?

Individual Goals

Continue to design your goals as if it were a class syllabus. Think about what you need to accomplish each WEEK and provide as much detail as possible. List assignments and other milestones for yourself, keeping your faculty advisor's schedule in mind. State days and times you will be meeting with your faculty advisor.

Things to keep in mind:

- Has the direction of your project changed in any way that might require research compliance approval and/or training? Are you having regular conversations with your faculty advisor to ensure you are conducting legal and ethical research?
- Plan on a week-by-week basis how you are defining future directions for your research (you may be conducting an extensive literature review, conducting experiments, building prototypes, analyzing data, etc.) How is what you are reading, analyzing, or comparing helping you refine your research question?
- Solidify your thesis statement and/or research problem/question.
- Update your methodology based on your literature review, analyses, or comparisons, and discussions with your faculty advisor.
- What potential issues will you have in your research process? How will you address these challenges?
- Update your outline for your thesis. Do you need to make any changes to it based on your reading, procedures, experiments, analyses, etc.? Do you need to adjust your project timeline in any way to address the changes?
- State days and times you will be meeting with your faculty advisor. Address if you will be discussing research progress, written thesis content, or both.
- Identify a venue for your public presentation. If you need to register or secure funding ahead of time, have you done that? If not, when will you?
- What will you focus on this week? What do you still need to read, analyze, compare, build, or collect? What do you need to be thinking about over Winter Break?
- If you have already started writing, have you identified and reviewed the citation style you will be using? Have you discussed with your thesis reviewer any formatting questions you have? Have you reviewed the thesis manual and spring program requirements? If not, when do you plan to do these things?
- What will you begin writing first? Explain the organization of your thesis and when you plan to write your chapters/sections.

Science, Technology, Engineering, Mathematics, and Social Sciences Thesis Application

- Weekly meeting with thesis supervisor on the weekly accomplishments, future course of the project

- **The intermediate deliverable**: The main deliverable will be a improvement of the existing state of art (for example: filterDCA or pyDCA)

November 2 Nov - 6 Nov	* Developing the model; trained on existing data * Register for spring 2021
9 Nov - 13 Nov	* Attending at least one resource session * Hyperparameter tuning of the shortlisted models * Look out for venues for final presentation
16 Nov - 20 Nov	* Register for venues for final presentation * Documentation of the code, method and overall course of research * **Final presentation of ECEN 403: An improvement of existing state of art**
23 Nov - 27 Nov	* End of semester meeting with thesis reviewer * Fall progress report * Project subsystem demonstration of ECEN 403 * Final report of ECEN 403
December 30 Nov - 4 Dec	* Fall progress report * Final examination
7 Dec - 11 Dec	* Fund management for public presentation * Feature addition of the model

Science, Technology, Engineering, Mathematics, and Social Sciences Thesis Application

Section 5: Timeline – Fall 2020 Semester – Winter Break

Winter Break Instructions:

Winter Break Goals

Program Requirements

- Sign up to attend one thesis formatting workshop
  (Available Dates: January 11, 14, 20, and 21)
- If you plan to present at the URS Symposium, register by January 27

Individual Goals

Continue to design your goals as if it were a class syllabus. Think about what you need to accomplish each WEEK and provide as much detail as possible. List assignments and other milestones for yourself.

Things to keep in mind:

- What do you need to gather to be able to continue reading, analyzing, or comparing your research over Winter Break?
- What are your writing goals for Winter Break?
- What are the presentation and publication venues you are considering? Do you need to identify additional venues or funding? When will you discuss these presentation and publication options with your faculty advisor when classes resume?
- Has the direction of your project changed in any way that might require research compliance approval and/or training? When classes resume, when will you discuss these changes with your faculty advisor to ensure you are conducting legal and ethical research?

Winter Break Individual Goals:

● Weekly meeting with thesis supervisor on the weekly accomplishments, future course of the project	
Winter 14 Dec - 18 Dec	* Development of the model through additional features * Analysis the direction of the thesis
21 Dec - 25 Dec	* Start preparing the thesis writing tools
January 4 Jan - 8 Jan	* Addition of features from the other protein modalities (like image) * Training the model with as much data as possible
11 Jan - 15 Jan	* Addition of features from other protein form (like image)

Science, Technology, Engineering, Mathematics, and Social Sciences Thesis Application

Section 5: Timeline – Spring 2021 Semester

Section 5: Timeline – Spring 2021 Semester – January and February

January and February Goals

Program Requirements

- If you are in the LAUNCH University Honors Program and using URS to fulfill your capstone requirement, have you registered for the RESEARCH CAPSTONE section of UGST 497?
- Sign up to attend one thesis formatting workshop (Available Dates: January 11, 14, 20, and 21)
- If you plan to present at the URS Symposium, register by January 27
- Submit spring progress report 1
- Submit installment 1 and make revisions as requested by your assigned thesis reviewer

Individual Goals

Continue to design your goals as if it were a class syllabus. Think about what you need to accomplish each WEEK and provide as much detail as possible. List assignments and other milestones for yourself.

Things to keep in mind:

- Mark your calendars to attend URS program drop-in sessions and workshops.
    - Plan to attend thesis help drop-in session on January 22 to get help on installment 1
    - Plan to attend the Writing Abstracts workshop on January 22 to get help on your abstract submission before the URS Symposium registration deadline on January 27
    - Plan to attend the Presentation Skills workshop on February 16 to get help on your presentation before the URS Symposium on February 24
    - Plan to attend the Presentation Practice Session on February 23 to get help on your presentation before the URS Symposium on February 24
    - Plan to attend thesis help drop-in session on February 26 to get help on installment 2
- Plan for the Public Presentation requirement by registering for the URS Symposium (held on February 24). Registration will close on January 27.
- Has the direction of your project changed in any way that might require research compliance approval and/or training? Are you having regular conversations with your faculty advisor to ensure you are conducting legal and ethical research?
- How has your writing progressed?
    - How are you setting up your argument in relation to the existing dialogue or publications in your field?
    - Have you decided which of your sources are pertinent? Do you need to gather and review additional source material? How are you managing your data, sources, citations? Are you using citation software?
    - What kind of outline have you prepared to begin writing your thesis? Is it a simple sketch or detailed list? Do you have topic sentences for your main paragraphs? Have you planned or outlined the headings and subheadings for your chapters/sections?
    - How have you planned to maintain the thread of your main argument throughout your full thesis document? Are you telling your research story in a way that your reader can easily follow?
    - What have you started writing? Have you refined your thesis statement? Have you started thinking about transitions between your main paragraphs?
    - State days and times you will be meeting with your faculty advisor. Address if you will be discussing research progress, written thesis content, or both.
    - Have you visited the University Writing Center to take advantage of the Dissertation, Article, and Thesis Assistance (DATA) program that is exclusive to URS students?

Science, Technology, Engineering, Mathematics, and Social Sciences Thesis Application

- Weekly meeting with thesis supervisor on the weekly accomplishments, future course of the project

- **Final deliverable:** Additional feature or modality integration within the model

Spring 18 Jan - 22 Jan	* Attend at least one virtual formatting workshop * Choose a thesis outline * Preparation for installment 1 & Spring progress report 1 *Any troubleshooting within the feature addition
25 Jan - 29 Jan	* Submit the installment 1 & Spring progress report 1 * URS Symposium registration * Trying on the validation data set to check overfitting and underfitting
February 1 Feb - 5 Feb	* Start writing the thesis * Troubleshooting of the model
8 Feb - 12 Feb	* Continue writing the thesis * Start preparing for the URS symposium
15 Feb - 19 Feb	* Ask the writing center to show the thesis * Prepare for the URS symposium * Deploy the model; improve the model as needed
22 Feb - 26 Feb	*** URS symposium: Feature addition to the state of art** * Any other public presentation * Preparation for installment 2 & Spring progress report 2

Science, Technology, Engineering, Mathematics, and Social Sciences Thesis Application

Section 5: Timeline – Spring 2021 Semester – March

March Instructions:

March Goals

Program Requirements

- Submit spring progress report 2 by March 1
- Submit installment 2 by March 1 and make revisions as requested by your assigned thesis reviewer
- Make a public presentation, if you have not already, no later than April 12*
- Draft and submit the public presentation report no later than April 12*

** Public presentations can take place in either fall or spring between October 12 and April 12 to meet the April 12 deadline to submit the Public Presentation Report. **Note:** Students on the Galveston campus are expected to present at the TAMUG Student Research Symposium in late-April and have until April 23 to submit Public Presentation Reports.*

Individual Goals

Continue to design your goals as if it were a class syllabus. Think about what you need to accomplish each WEEK and provide as much detail as possible. List assignments and other milestones for yourself.

Things to keep in mind:

- Mark your calendars to attend URS program drop-in sessions on April 8 and April 9 to get help on your final thesis.
- **You no longer have time to receive research compliance approval.** Are there any challenges or concerns that you need to discuss with your faculty advisor or LAUNCH staff? Are you having regular conversations with your faculty advisor to ensure you are conducting legal and ethical research?
- State days and times you will be sending your final thesis to your faculty advisor before turning it into LAUNCH on April 12. **Remember:** Revisions usually take longer than you think. You may need multiple rounds of revisions before your faculty advisor is satisfied—PLAN AHEAD.
- How are you wrapping up the writing process?
    - What remaining sections do you need to draft and revise?
    - Have you finalized the Introduction and Conclusion sections and made sure they connect to the arguments, analyses, and/or comparisons you presented in your chapter(s)/section(s)?
    - Are your subheadings telling your research story? Do your subheadings reflect the content of your thesis? **Remember:** Readers use subheadings to navigate your argument. Can your reader easily follow your research story?
    - Have you addressed any holes in your argument with your faculty advisor? How will you incorporate additional information in your thesis?
    - What are the future directions for this research? How will you incorporate these future directions into your thesis?
- Things to keep in mind for revising and formatting:
    - Have you asked your faculty advisor the correct way to list and spell his/her/their name and credentials on the Title and Abstract pages, and in the STSS? **Remember:** Not everyone has the title of Dr. or Ph.D. Be sure to check.
    - **If you are on a URS team:** Have all team members coordinated the correct way to list and spell names on the title and abstract pages? Teams should have a single, shared document.
    - Are there any others you need to list on the Acknowledgements page?
      Remember: You must recognize funding sources and other contributors (such as graduate students).
    - Have you finalized all figures, tables, images, equations, etc.? Have you included any necessary permission statement(s) in the Appendix section? Are your captions and/or titles detailed enough for clear understanding?
    - Have you checked your in-text citations for proper format? Have you checked that all in-text citations appear in your References section(s)? Have you checked that your References section(s) is properly formatted?

Science, Technology, Engineering, Mathematics, and Social Sciences Thesis Application

- o Have you checked that your page numbers are correct in the Table of Contents and that subheadings correspond to the correct sections in your document?
  - o Have you checked for any typos or spacing errors and inconsistencies?
- ▪ Things to keep in mind while you polish your writing in the final version of your thesis:
  - o Is your writing concise?
  - o Do you vary your sentence structure?
  - o Do you vary your word choice? Have you avoided repetition?
  - o Do you have transitions between paragraphs? Do you have internal transitions within your paragraphs so that your ideas flow?
  - o Do you have manageable paragraph sizes?
  - o Do you have proper punctuation?
  - o Does your Conclusion summarize your main ideas? Does your Conclusion connect back to your Introduction? Have you presented a cohesive argument?
  - o Have you visited the University Writing Center to take advantage of the Dissertation, Article, and Thesis Assistance (DATA) program that is exclusive to URS students?

March Individual Goals:

● Weekly meeting with thesis supervisor on the weekly accomplishments, future course of the project	
March 1 Mar - 5 Mar	* Submit the installment 2 & Spring progress report 2 * Completion of the thesis writing
8 Mar - 12 Mar	* Revision of the thesis and the technical details
15 Mar - 19 Mar	Spring break
22 Mar - 26 Mar	* Revision of the thesis * Proper documentation of the work done
29 Mar - 2 April	* Revise the thesis * Prepare for public presentation report

Science, Technology, Engineering, Mathematics, and Social Sciences Thesis Application

Section 5: Timeline – Spring 2021 Semester – April and May

April and May Instructions

April and May Goals

Program Requirements

- If you have not already, submit your Public Presentation Report by April 12*
- Review the final thesis submission instructions
- Submit your Final Thesis by April 12 and submit revisions as requested by your faculty advisor and LAUNCH staff
- Determine your embargo selection (thesis hold) with your faculty advisor and team members (if applicable).

* Public presentations can take place in either fall or spring between October 12 and April 12 to meet the April 12 deadline to submit the Public Presentation Report. **Note:** *Students on the Galveston campus are expected to present at the TAMUG Student Research Symposium in late-April and have until April 23 to submit Public Presentation Reports.*

Individual Goals

Things to keep in mind:

- If your faculty advisor requires revisions, make them immediately.
- If the LAUNCH office requires revisions, make them by the deadline(s) specified by your assigned thesis reviewer.
- **Remember: No changes can be made to your thesis once you have completed the program.**
- Have you determined your embargo selection (thesis hold) with your faculty advisor and team members (if applicable)? The standard embargo (thesis hold) is two years. LAUNCH will contact your faculty advisor once the hold has expired to determine if an extension if needed. Please be aware that if no response is received from your faculty advisor, your thesis will be published to the OAKTrust Repository and will be available to the public. Make sure you have had this conversation with your faculty advisor and team members (if applicable).

April and May Individual Goals:

● Weekly meeting with thesis supervisor on the weekly accomplishments, future course of the project	
April 5 April - 9 April	* Revise the thesis * Prepare for public presentation report
12 April - 16 April	* Final thesis, public presentation report submission
19 April - 23 April	* Any necessary technical detail completion
26 April - 30 April	* Any necessary technical detail completion

Science, Technology, Engineering, Mathematics, and Social Sciences Thesis Application