**Final Project**

ASM 5560: UAS and Remote Sensing in Agriculture

**Overview**

**Problem definition:**

*Identification of Objectives:* You should document the significance of the problem (s) that inspired you to work on this project as well as describe how the project will address the problem (s) and produce useful results. Feel free to ask the instructor if you have any questions about the objectives of your investigation. The expectation is that the project should be focused on solving a remote sensing or spatial analysis problem. Some examples include:

* Vegetation mapping
* Land use land cover mapping or relevant image classification models
* Change detection of any of the above
* Multiple linear regression models based on remote sensing data derived covariates

Please feel free to use additional analyses and/or software (in addition to ArcGIS Pro) to accomplish your project objectives.

*Site choice:* Since the course is focused on preprocessing, processing, and analyses of geospatial datasets, select a geographic area that is of interest to you and compile the geospatial data from the selected region that would be needed to meet the objectives. The decision to select an objective and a site should be based on whether you could easily find the geospatial data to work with. If you don’t find the data to work on the project, you can consult with the instructor for suggestions.

**Approach:**

Once you have defined a meaningful and thoughtful problem to work on, you can begin thinking of steps that need to be taken to address it. The following information about the requirements of the final project should help guide you in determining your approach.

The project should demonstrate most of the concepts covered in the class. Once the appropriate dataset to be used for the project has been identified, students are encouraged to spend at least:

* 15 - 20+ hours for undergraduate students
* 30 + hours for graduate students

*Data types:* You can use your own data or someone else’s data (for example, already classified data or processing of images collected by someone else). You must use data in either raster or vector (point, line, polygon) format to work with. Feel free to work with data in both formats.

The project should demonstrate the use of at least four (for undergraduate students) or five (for graduate students) of the below topics (60% of grade):

* Georectification
* Contrast Enhancement (Discuss the settings/parameters used in enhancement if you are doing this)
* Spatial Enhancement
* Classification/Regression (each method counts as 1; max of 2 (undergraduate student) or 3 (graduate students))
* Advanced Raster analysis
  + Normalized Difference Indexes or Ratios
* Spatial Overlay

The project should also include some quantitative analyses in describing the results, which can include:

* + Classification summary and accuracy (required if classifying imagery)
  + Zonal statistics of land use areas, watersheds, etc. (mean slopes, elevation)

**Final products (300 points):**

*Presentation (100 points):* You will create presentation slides communicating the results of your analysis, which you will present in front of the class at the end of the semester.

*Report (200 points):* Additionally, you will prepare a short written (with a maximum of 6 pages in length excluding the cover page and appendices section; single-spaced lines) final report. Include this report along with the ArcGIS Pro project file, and data sources in the same folder as “Final\_Project\_A\_B” where A is the first name and B is the last name. You can submit the whole package as a zip file to the Onedrive folder dedicated to the final project submission. Link to the OneDrive folder will be provided as we are closer to the submission date.

Detailed instructions for each component of the final project, as well as grading rubrics, can be found below. You should refer to these instructions for guidance as you prepare your presentation and report.

**PowerPoint presentation**

The purpose of this component of the final project is to prepare and present PowerPoint slides that communicate your approach to addressing the concern or problem that is the focus of your final project analysis. At a minimum, your presentation must include all of the components described in the detailed outline below. Your slides will contain much of the same information that will be included in your report but will be presented in a more concise manner.

1. Introduction
   1. What was the purpose of this final project analysis? Be specific in communicating what concern you are addressing is, and why you are interested in addressing it.
   2. Where is the site you are focusing on located? Provide sufficient information so that the reader understands where the site is located and what its characteristics are. It may be helpful to include a map to orient the viewer.
2. Methods
   1. Describe the approach that you took in solving this problem. You should include figures, maps, and/or additional data as appropriate to help the viewer understand the information you are presenting. Provide a brief description of the steps that you took in order to arrive at a solution to your problem, and the tools, processes, calculations, and data sources that were used in addressing your problem.
3. Results and conclusion
   1. What is your “solution” to your problem, or how do you propose that it is addressed? Briefly explain what you learned from the process of addressing your problem or concern through making use of geospatial information.
4. References/acknowledgment
   1. Please include a references/acknowledgment section at the end of your slides (see the report description for more information regarding what needs to be cited)

**Formatting:**

Your slides should be descriptive enough so that it can be understood by someone who did not attend your presentation or have any prior knowledge of your final project topic, but you should be careful to avoid using excessive amounts of text or graphics. Your oral presentation will be 12-18 minutes long (10-15 minutes for presentation, 2-3 minutes for questions).

Rubrics detailing the final project presentation grading are included at the end of this document. Please consult these rubrics as you create and prepare your presentation so that you can ensure that you are including all the required elements. Points for this component of the final project will be assigned as follows: 40 points for slide preparation, 40 points for presentation, and 20 points for completing in-class participation activities on presentation days (100 points total).

**Report**

The purpose of this component of the final project is to prepare a written report that communicates your approach to addressing the concern or problem that is the focus of your final project analysis. Justification for all decisions that you have made, and explanations of your approach, are required throughout the report. At a minimum, your report must include all of the components described in the detailed outline below. You should also consult the Final Project Outline to ensure that you are including all required elements (e.g., required a number of tools and processes, data types, and maps).

1. Cover page including your name, the course name, and an appropriate title conveying the purpose of the report
2. Introduction to the site and the purpose of the report:
   1. Why did you choose this project? Communicate, in detail, what concern you are addressing, why is it important, and why you are interested in addressing it.
   2. Where is the site you are focusing on located? Provide sufficient information so that the reader understands where the site is located and what its characteristics are.
      1. Your introduction to the site should reference figures and maps where appropriate
3. Methods
   1. Describe the approach that you took in solving this problem. Reference figures, maps, and/or additional data as appropriate. Address the following questions in your response:
      * Where did you obtain the data used in your analysis? Please make sure to specify, for each type of data used in your analysis, whether it is vector or raster data.
      1. How did you determine the sequence of steps that you needed to take in order to arrive at a solution? (How did you organize your analysis?)
      2. What were each of the tools, processes, and analyses that you used to address your problem, and why were each of them appropriate?
      3. What were the calculations you performed as part of your analyses? Why were they necessary? (Detailed calculation steps should be included in an appendix at the end of the document; see the “Appendices” section below.)
4. Results
   * What did you observe after your analysis? Reference appropriate figures and graphs to support your statement.
5. Limitations
   * Describe at least three limitations of the approach that you took to address your problem.
6. Conclusion
   * A short summary of your results and what this means for future research and/or societal implications
   * The report should not be just a line-by-line description of what you did
   * The report should contain a short section or bullet points detailing which concept learned in the class is utilized for your analysis
   * Explain what you learned from the process of addressing your problem or concern through making use of geospatial information.
   * Were you able to address your problem fully? Was there additional information that you would have liked to have in order to inform you of your decision? Offer suggestions for how you could have improved your solution to this problem if you had these additional resources.
7. Works cited
   1. Please include a references page, with all references cited in MLA or another standard format (e.g., APA). References must also be cited in the text. See the “Formatting” section below for more information on reference formatting.
   2. There is no minimum number of references required. However, you cannot receive full credit if references are not provided in appropriate places to support your claims. It is important that you share your information sources with the reader, and that you are referencing credible sources in making recommendations and decisions.
8. Appendices
   1. You should provide the following items as separate appendices at the end of your report:
      1. Any calculations performed during your analysis. Each calculation should be accompanied by a brief explanation of what it is and why it was performed.
      2. Any additional materials used in the preparation of the report.

**Formatting:**

Your report must address all of the questions above succinctly in six pages. Each section should be a paragraph in length at minimum, and (particularly for the “Methods” section) will likely need to be multiple paragraphs long in order to address all required components.

Your report must be typed in a standard 11- or 12-point font (e.g., Times New Roman, Calibri) and must have 1-inch margins on all sides. Be sure to proofread your assignment to remove any grammatical or spelling errors.

Finally, you must cite all of the data sources you used in your final project, both at the end of this report and as in-text citations. You should also include appropriate references to support any claims that you make in your report (please ask the instructor if you need guidance on determining whether references are necessary). Your citations should follow the formatting conventions demonstrated in the examples below:

*End of report citation example:*

* Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture (n.d.). Soil Survey Geographic (SSURGO) Database. Available online at <https://sdmdataaccess.sc.egov.usda.gov/?referrer=Citation.htm-SSURGOLink>

*In-text citation example:*

* Information about soils in this watershed was obtained from the Soil Survey Geographic Database (Soil Survey Staff, n.d.).

A rubric detailing the final project report grading is included below. Please consult this rubric as you write your final report so that you can ensure that you are including all the required elements. As you write, compare the quality of your work to the rubric criteria required to obtain each score to understand whether your report meets the required criteria.

Your presentation and report should include

* + - A flowchart or similar overview (e.g., bullet points) of the general methodology .
    - A table of data inputs, where to obtain them, dates (if imagery), coordinate system of the data, and common coordinate system used.
    - Images of your project area and tables of results at minimum.
    - All maps should include scales and titles and a legend if needed.

**Undergraduate Students:**

* 10-minute oral presentation (33% of project grade)
  + Follow the report outline

**Graduate Students**:

* 15-minute oral presentation (33% of project grade)
  + Follow the report outline

**Due Dates**

* Topic Submission Deadline: March 06
* Oral Presentations: Friday, April 18, class time
* Final Report: Thursday, April 24, 11:59 PM

**Rubric for the final project- PowerPoint presentation preparation (40 points)**

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| --- | --- | --- | --- | --- | --- |
| **Item** | **10 (outstanding)** | **8 (meets expectations)** | **6 (below expectations)** | **4 (basic)** | **0 (missing)** |
| **A complete yet concise description of the problem being addressed, its relevance, and its importance is presented (25% of grade)** | The problem of focus is described in such a way that the reader clearly understands the problem, why it was chosen, and its importance. The description demonstrates a nuanced understanding of the problem. | The problem of focus is described in such a way that the reader clearly understands the problem, why it was chosen, and its importance | The problem of focus is described, but some additional detail would enhance understanding of the problem and why it was chosen | The problem of focus is described in such a way that considerable additional detail is required to understand the problem and why it was chosen | The problem of focus is not described |
| **Methods and approach are concisely described (40% of grade)** | **16 (outstanding)** | **12.8 (meets expectations)** | **9.6 (below expectations)** | **6.4 (basic)** | **0 (missing)** |
| The slides address all the required elements of the Methods section as stated above, and descriptions are supported by figures wherever appropriate | 12.8 Meets  The slides address all the required elements of the Methods section as stated above | The slides address most of the required elements of the Methods section as stated above | The slides address some of the required elements of the Methods section as stated above | The slides do not address the required elements of the Methods section as stated above |
| **Results and conclusion section address the solution to the problem and what was learned (25% of grade)** | **10 (outstanding)** | **8 (meets expectations)** | **6 (below expectations)** | **4 (basic)** | **0 (missing)** |
| The slides address all required elements of the Results and conclusion section as stated above, and all components are thoughtfully yet concisely explained | The slides address all required elements of the Results and conclusion as stated above | The slides address most of the required elements of the Results and conclusion as stated above | The slides address some of the required elements of the Results and conclusion as stated above | The slides do not include a Results and conclusion section |
| **Slides are properly formatted and have been proofread (10% of grade)** | **4 (outstanding)** | **3.2 (meets expectations)** | **2.4 (below expectations)** | **1.6 (basic)** | **0 (missing)** |
| The slides are formatted according to the requirements stated above, and no grammatical or spelling errors are present | The slides are formatted according to the requirements stated above, and few grammatical or spelling errors are present | The slides are formatted according to the requirements stated above with minor deviations, and few grammatical or spelling errors are present, or slides are formatted according to the requirements stated above, and numerous grammatical or spelling errors are present | The slides are not formatted according to the requirements stated above; grammatical or spelling errors interfere with the reader’s ability to understand the slides | — |

**Rubric for the final project—presentation (40 points)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Item** | **12 (outstanding)** | **9.6 (meets expectations)** | **7.2 (below expectations)** | **4.8 (basic)** | **0 (missing)** |
| **Presenter addresses all of the components (as listed in description) in their oral presentation (30% of grade)** | Oral presentation reviews all required components | — | Oral presentation reviews most of the required components | Oral presentation reviews some of the required components | — |
| **Additional information is introduced during oral presentation (40% of grade)** | **16 (outstanding)** | **12.8 (meets expectations)** | **9.6 (below expectations)** | **6.4 (basic)** | **0 (missing)** |
| Oral presentation provides sufficient information, in addition to what is required, to clearly and concisely communicate the presenter’s final project approach to the audience | Oral presentation provides sufficient information, in addition to what is required, to communicate the presenter’s final project approach to the audience | Oral presentation provides insufficient information, in addition to what is required, to communicate the presenter’s final project approach to the audience | Oral presentation provides little additional information to communicate the presenter’s final project approach to the audience | — |
| **Presentation is engaging and high-quality (20% of grade)** | **8 (outstanding)** | **6.4 (meets expectations)** | **4.8 (below expectations)** | **3.2 (basic)** | **0 (missing)** |
| Presenter speaks clearly and confidently and captures the audience’s interest, and does not rely on reading the slides | — | Presenter is difficult to understand at times or may resort to reading directly from the slides | — | — |
| **Presentation adheres to time limits (10% of grade)** | **4 (outstanding)** | **3.2 (meets expectations)** | **2.4 (below expectations)** | **1.6 (basic)** | **0 (missing)** |
| Presentation is 10 – 12 minutes in length | — | — | Presentation is less than 10 or longer than 12 minutes | — |

**Rubric for the final project—written report (200 total points)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Item** | **40 (outstanding)** | **32 (meets expectations)** | **24 (below expectations)** | **16 (basic)** | **0 (missing)** |
| **Report contains a complete description of the problem being addressed, its relevance, and its importance (20% of grade)** | The problem of focus is described in such a way that the reader clearly understands the problem, why it was chosen, and its importance. The description demonstrates a nuanced understanding of the problem. | The problem of focus is described in such a way that the reader clearly understands the problem, why it was chosen, and its importance | The problem of focus is described, but some additional detail would enhance understanding of the problem and why it was chosen | The problem of focus is described in such a way that considerable additional detail is required to understand the problem and why it was chosen | The problem of focus is not described |
| **Sufficient explanation is provided to describe methods and approach (25% of grade)** | **50 (outstanding)** | **40 (meets expectations)** | **30 (below expectations)** | **20 (basic)** | **0 (missing)** |
| The report addresses all the required elements of the Methods section as stated above, and responses to all questions are thorough and thoughtful | The report addresses all the required elements of the Methods section as stated above | The report addresses most of the required elements of the Methods section as stated above | The report addresses some of the required elements of the Methods section as stated above | The report does not address the required elements of the Methods section as stated above |
| **Sufficient justification is provided for data sources and analyses used (20% of grade)** | **40 (outstanding)** | **32 (meets expectations)** | **24 (below expectations)** | **16 (basic)** | **0 (missing)** |
| The report provides a rationale for why each of the tools/processes and each of the data sources used in the assignment were appropriate for addressing the problem. The response conveys a nuanced understanding of suitability of each tool/process and data source for the purpose for which it was used. | The report provides a rationale for why each of the tools/processes and each of the data sources used in the assignment were appropriate for addressing the problem | The report provides a rationale for why some of the tools/processes and some of the data sources used in the assignment were appropriate for addressing the problem; or response to one of these components is complete and response to the other is missing | The report provides a rationale for why a few of the tools/processes and a few of the data sources used in the assignment were appropriate for addressing the problem; or response to one of these components is mostly complete and response to the other is missing | The report does not provide a rationale for why the tools/processes or data sources used in the assignment were appropriate for addressing the problem |
| **Limitations of the approach are addressed (10% of grade)** | **20 (outstanding)** | **16 (meets expectations)** | **12 (below expectations)** | **8 (basic)** | **0 (missing)** |
| The report describes at least three limitations associated with the approach chosen to address the problem, and descriptions demonstrate a nuanced understanding of the limitations | The report describes at least three limitations associated with the approach chosen to address the problem | The report describes two limitations; or descriptions do not adequately convey a full understanding of the limitations mentioned | The report describes fewer than two limitations; or descriptions do not adequately convey a full understanding of the few limitations mentioned | The report does not describe limitations of the chosen approach |
| **Conclusion addresses what was learned and potential future work (10% of grade)** | **20 (outstanding)** | **16 (meets expectations)** | **12 (below expectations)** | **8 (basic)** | **0 (missing)** |
| The report addresses all required elements of the Conclusion as stated above, and all components are thoughtfully written | The report addresses all required elements of the Conclusion as stated above | The report addresses most of the required elements of the Conclusion as stated above | The report addresses some of the required elements of the Conclusion as stated above | The report does not include a Conclusion section |
| **Appendices contain all information necessary to describe the site and the approach (10% of grade)** | **20 (outstanding)** | **16 (meets expectations)** | **12 (below expectations)** | **8 (basic)** | **0 (missing)** |
| The report contains all required elements of the Appendices section as stated above, and all components are complete and thorough. All calculations are easy to follow, supporting information (if applicable) is neatly presented, and all maps are professionally formatted and include important features (i.e., legends, titles, north arrows, and scale bars). | The report contains all required elements of the Appendices section as stated above, and all components are complete and thorough | The report contains most of the required elements of the Appendices section as stated above. Some components may not be complete and thorough, or may not be formatted properly. | The report contains some of the required elements of the Appendices section as stated above. Some components may not be complete and thorough, or may not be formatted properly. | The report does not include an Appendices section |
| **Report is properly formatted and has been proofread (5% of grade)** | **10 (outstanding)** | **8 (meets expectations)** | **6 (below expectations)** | **4 (basic)** | **0 (missing)** |
| The report is formatted according to the requirements stated above, and no grammatical or spelling errors are present | The report is formatted according to the requirements stated above, and few grammatical or spelling errors are present | The report is formatted according to requirements stated above with minor deviations, and few grammatical or spelling errors are present, or the report is formatted according to requirements stated above, and numerous grammatical or spelling errors are present | The report is not formatted according to the requirements stated above; grammatical or spelling errors interfere with reader’s ability to understand the report | — |