Development Plan
Software Engineering

Team #1, Sanskrit Ciphers
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Table 1: Revision History

Date	**Developer(s)**	**Change**
September 16th 2025	Dylan Garner	Added initial POC plan
September 18th 2025	Umar Khan	Added Workflow Plan and Project Decomposition and Scheduling
September 21st 2025	Umar Khan	Added Expected Technology and Coding Standard
September 21st 2025	Dylan Garner	Updated POC plan with more implementation details
September 22nd 2025	Aswin Kuganesan	Added Team Charter in Appendix
Date2	Name(s)	Description of changes
...	...	...

[Put your introductory blurb here. Often the blurb is a brief roadmap of what is contained in the report. —SS]

[Additional information on the development plan can be found in the lecture slides. —SS]

1 Confidential Information?

[State whether your project has confidential information from industry, or not. If there is confidential information, point to the agreement you have in place. —SS]

[For most teams this section will just state that there is no confidential information to protect. —SS]

2 IP to Protect

[State whether there is IP to protect. If there is, point to the agreement. All students who are working on a project that requires an IP agreement are also required to sign the "Intellectual Property Guide Acknowledgement." —SS]

3 Copyright License

[What copyright license is your team adopting. Point to the license in your repo. —SS]

4 Team Meeting Plan

[How often will you meet? where? —SS]

[If the meeting is a physical location (not virtual), out of an abundance of caution for safety reasons you shouldn't put the location online —SS]

[How often will you meet with your industry advisor? when? where? —SS]

[Will meetings be virtual? At least some meetings should likely be in-person. —SS]

[How will the meetings be structured? There should be a chair for all meetings. There should be an agenda for all meetings. —SS]

5 Team Communication Plan

[Issues on GitHub should be part of your communication plan. —SS]

6 Team Member Roles

[You should identify the types of roles you anticipate, like notetaker, leader, meeting chair, reviewer. Assigning specific people to those roles is not necessary at this stage. In a student team the role of the individuals will likely change throughout the year. —SS]

7 Workflow Plan

- How will you be using git, including branches, pull request, etc.?
- How will you be managing issues, including template issues, issue classification, etc.?
- Use of CI/CD

8 Project Decomposition and Scheduling

- How will you be using GitHub projects?
- Include a link to your GitHub project

[How will the project be scheduled? This is the big picture schedule, not details. You will need to reproduce information that is in the course outline for deadlines. —SS]

9 Proof of Concept Demonstration Plan

9.1 Main Risks for Project Success

The most significant risks for our Buddhist manuscript fragment reconstruction platform are:

- **Inconsistent OCR Performance**: OCR accuracy varies dramatically across different manuscript conditions, script styles, and image quality. Ancient Buddhist texts often contain deteriorated characters, non-standard orthography, and multiple script variations that challenge standard OCR engines.
- **Lack of Positive Training Examples**: The absence of confirmed fragment matches creates a training data challenge. Without verified examples of fragments that belong together, we will need to explore unsupervised learning approaches and develop alternative validation strategies for our matching algorithms.

These are risks because they directly impact the core functionality of our system - the ability to accurately identify which fragments belong together.

9.2 Implementation Challenges

The most challenging aspects of implementation will be:

- **OCR Integration and Consistency**: Implementing OCR engines that can handle Sanskrit manuscript variations while maintaining consistent output across different image conditions and script styles.
- **AI Model Training Without Ground Truth**: Creating and training machine learning models for fragment similarity matching without access to verified positive examples of matched fragments. The final model will need to combine multiple features (OCR text, edge patterns, damage signatures) into confidence scores, which presents challenges for training validation. We plan to explore unsupervised learning approaches to address this challenge.
- **Interactive Canvas**: Building a responsive, intuitive drag-and-drop interface that can handle potentially hundreds of fragment images while maintaining performance.
- **Multi-scale Matching**: Implementing algorithms that can suggest matches at different confidence levels.

9.3 Testing Difficulties

Testing will present unique challenges because:

- **Ground Truth**: We need access to known fragment matches from Buddhist Studies scholars to validate our algorithms, which may be limited initially.
- **Subjective Validation**: Fragment matching often involves scholarly interpretation, making automated testing metrics challenging to define.
- **Performance Testing**: Testing the system with large batches of high-resolution fragment images will require substantial computational resources.
- **User Experience Testing**: The interface must be intuitive for scholars with varying technical backgrounds, requiring extensive usability testing.

9.4 Library and Technology Risks

9.5 Hardware and Infrastructure Concerns

- **Processing Power**: Computer vision and AI algorithms may require substantial CPU/GPU resources for model training.

9.6 Demonstration Plan

To address these risks and demonstrate feasibility, our POC will focus on proving that the core technical challenges can be overcome:

- **OCR Functionality Demonstration**: Show OCR engines successfully extracting text from sample manuscript fragments with varying quality levels. We will demonstrate text extraction from both clear and degraded fragments to validate OCR consistency approaches.
- **Image Segmentation and Normalization**: Demonstrate fragment segmentation algorithms that can isolate individual fragments from composite images and normalize them for consistent analysis (rotation correction, standardization).
- **Basic Feature Extraction**: Show extraction of key features from fragments including edges, text content, and damage patterns that could be used for matching.
- **Prototype Similarity Metrics**: Implement basic similarity algorithms that compare normalized fragments and provide confidence scores, acknowledging the limitation that it will be difficult to validate accuracy without ground truth data.
- **Interactive Workspace**: Create a basic interface where users can upload fragments, view OCR results, and see preliminary similarity suggestions.

This demonstration will prove the technical feasibility of the core components. The POC focuses on demonstrating that our technical approach can extract and compare the right types of features for fragment matching. While the absence of ground truth data presents challenges, we will explore unsupervised learning techniques and develop validation approaches that can work with the available data.

10 Expected Technology

[What programming language or languages do you expect to use? What external libraries? What frameworks? What technologies. Are there major components of the implementation that you expect you will implement, despite the existence of libraries that provide the required functionality. For projects with machine learning, will you use pre-trained models, or be training your own model? —SS]

[The implementation decisions can, and likely will, change over the course of the project. The initial documentation should be written in an abstract way; it should be agnostic of the implementation choices, unless the implementation choices are project constraints. However, recording our initial thoughts on implementation helps understand the challenge level and feasibility of a project. It may also help with early identification of areas where project members will need to augment their training. —SS]

Topics to discuss include the following:

- Specific programming language
- Specific libraries
- Pre-trained models
- Specific linter tool (if appropriate)
- Specific unit testing framework
- Investigation of code coverage measuring tools
- Specific plans for Continuous Integration (CI), or an explanation that CI is not being done
- Specific performance measuring tools (like Valgrind), if appropriate
- Tools you will likely be using?

[git, GitHub and GitHub projects should be part of your technology. —SS]

11 Coding Standard

[What coding standard will you adopt? —SS]

Appendix — Reflection

[Not required for CAS 741 —SS]

The purpose of reflection questions is to give you a chance to assess your own learning and that of your group as a whole, and to find ways to improve in the future. Reflection is an important part of the learning process. Reflection is also an essential component of a successful software development process.

Reflections are most interesting and useful when they're honest, even if the stories they tell are imperfect. You will be marked based on your depth of thought and analysis, and not based on the content of the reflections themselves. Thus, for full marks we encourage you to answer openly and honestly and to avoid simply writing "what you think the evaluator wants to hear."

Please answer the following questions. Some questions can be answered on the team level, but where appropriate, each team member should write their own response:

1. Why is it important to create a development plan prior to starting the project?

2. In your opinion, what are the advantages and disadvantages of using CI/CD?

3. What disagreements did your group have in this deliverable, if any, and how did you resolve them?

Appendix — Team Charter

[borrows from University of Portland Team Charter —SS]

External Goals

[What are your team's external goals for this project? These are not the goals related to the functionality or quality fo the project. These are the goals on what the team wishes to achieve with the project. Potential goals are to win a prize at the Capstone EXPO, or to have something to talk about in interviews, or to get an A+, etc. —SS]

Attendance

Expectations

[What are your team's expectations regarding meeting attendance (being on time, leaving early, missing meetings, etc.)? —SS]

Acceptable Excuse

[What constitutes an acceptable excuse for missing a meeting or a deadline? What types of excuses will not be considered acceptable? —SS]

In Case of Emergency

[What process will team members follow if they have an emergency and cannot attend a team meeting or complete their individual work promised for a team deliverable? —SS]

Accountability and Teamwork

Quality

[What are your team's expectations regarding the quality of team members' preparation for team meetings and the quality of the deliverables that members bring to the team? —SS]

Attitude

[What are your team's expectations regarding team members' ideas, interactions with the team, cooperation, attitudes, and anything else regarding team member contributions? Do you want to introduce a code of conduct? Do you want a conflict resolution plan? Can adopt existing codes of conduct. —SS]

Stay on Track

[What methods will be used to keep the team on track? How will your team ensure that members contribute as expected to the team and that the team performs as expected? How will your team reward members who do well and manage members whose performance is below expectations? What are the consequences for someone not contributing their fair share? —SS]

[You may wish to use the project management metrics collected for the TA and instructor for this. —SS]

[You can set target metrics for attendance, commits, etc. What are the consequences if someone doesn't hit their targets? Do they need to bring the coffee to the next team meeting? Does the team need to make an appointment with their TA, or the instructor? Are there incentives for reaching targets early? —SS]

Team Building

[How will you build team cohesion (fun time, group rituals, etc.)? —SS]

Decision Making

[How will you make decisions in your group? Consensus? Vote? How will you handle disagreements? —SS]