**1. Name:** Matt Scardino, [scard659@regis.edu](mailto:scard659@regis.edu)

**2. Project Proposal:** Wildlife Image Processing & Semantic Search System

**3. High level description of the project:**

This project aims to build a modular, AI-enhanced system for processing, classifying, and searching wildlife images and videos. Leveraging OpenCV for traditional image processing and OpenAI models for semantic understanding, the platform will provide manual and AI-assisted annotation tools, store metadata and embeddings, and enable natural language queries to retrieve relevant visual content.

Phase 1 Outcomes:

* Working ingestion-to-query system
* Solid foundation for advanced vision work

**4.** **What type of data science task is it?**

A full-stack, multimodal AI system combining computer vision, NLP, data engineering, and exploratory analysis — purpose-built for wildlife media understanding and retrieval.

**5. Data**

I will be using a diverse set of sample data, including my wildlife images and video. I will perform initial processing to identify the subjects and retrieve metadata.

**6. How will you analyze the data?**

The priority for the first 8 weeks is infrastructure: build the ingestion, storage, embedding, and search stack; the goal is to validate that the system is working end-to-end. In the initial analysis phase, I will conduct basic frequency analysis by species, location, and time; evaluate search success to assess how effectively embeddings retrieve semantically similar images; visualize embeddings using techniques like t-SNE or UMAP to inspect clustering of species and contexts; and assess tag coverage to determine the completeness and consistency of annotations.

**7. Describe any anticipated difficulties and problems.**

Anticipated challenges include the ambitious scope for an 8-week timeline, particularly in integrating multiple components like OpenCV, embedding generation, and database-backed semantic search. Depending on early progress and data quality, the project may need to pivot or narrow its focus to ensure a stable, functional foundation before expanding into more advanced analysis and automation. Another potential limitation is the usage constraints of the OpenAI embedding API, including rate limits, token quotas, or associated costs. These may impact the volume of data processed within the timeline, potentially requiring batch processing, prioritization of key images, or temporary use of mock data for testing.

**8. Suggest a timeline for the project.**

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| **Week** | **Focus** | **Deliverables** |
| Week 1 | Project Setup & Planning | Define scope, install dependencies, set up Git, outline architecture |
| Week 2 | Image/Video Ingestion Pipeline | OpenCV for frame extraction and EXIF metadata extraction |
| Week 3 | Streamlit UI for Upload & Metadata | Upload interface, species, location, time input, preview images |
| Week 4 | Embedding Generation & Storage | OpenAI API integration, store embeddings in PostgreSQL + pgvector |
| Week 5 | Natural Language Search | Query interface, semantic search results from pgvector |
| Week 6 | Annotation Tools & Data QA | Metadata editing, tag validation, basic analytics |
| Week 7 | Evaluation & Visualization | t-SNE or UMAP embedding visualization, tag coverage stats |
| Week 8 | Final Presentation & Demo | Prepare slides, system walkthrough, highlight key learnings and outcomes |

**9. Create GitHub repository for your Practicum project.**

https://github.com/readcommitted/wildlife-vision-pipeline/blob/5afba2c2b68a649883bf97c45a878bfbcbbdbc57/ProjectProposal.docx