510444907 - First Individual Report

Statement of Work Accomplished (10%)

As part of this project, I contributed across all roles defined in the Extreme Programming (XP) methodology, taking responsibility for both technical development and non-technical project tasks.

XP Roles and Responsibilities

- **Customer/Client Proxy:** Maintained client relations, gathering feedback and ensuring requirements were clarified and prioritized. I presented an improved demo each week to stakeholders, demonstrating progress and incorporating feedback into subsequent iterations.

- **Programmer:** Designed and implemented the application's skeleton and pipeline, ensuring modularity and flexibility. Integrated publicly available pose estimation models into the workflow, adapting them to livestock-specific use cases.

- **Tester:** Verified the functionality of the pipeline through regular testing of model integration, data preprocessing, and interface components. Refined performance evaluation to ensure accuracy in behavior classification.

- **Manager:** Oversaw task distribution and time management, ensuring the group met sprint goals and adhered to XP practices. Helped the team focus on incremental improvements and continuous delivery.

- **Presenter/Communicator:** Delivered weekly updates, communicated technical progress in accessible terms, and ensured alignment between the technical direction and project goals.

Technical Contributions

- Identified and evaluated publicly available pose estimation models suitable for livestock behavior classification.

- Built the foundational skeleton/pipeline for the application, supporting data flow from preprocessing to inference and visualization.

- Developed the base application framework, enabling model integration, evaluation, and later extension to a demo interface.

- Contributed to refining model performance and behavior mapping strategies for livestock monitoring.

Non-Technical Contributions

- Acted as the main client liaison, ensuring smooth communication, expectation management, and continuous alignment with project goals.

- Coordinated and delivered weekly demos, ensuring tangible progress was visible and feedback loops were maintained.

- Supported group cohesion and XP methodology adherence by embodying multiple XP roles simultaneously.

Weekly Plan: Intended vs. Actual Work

Week 2
- **Planned:**
  - Conduct literature review on livestock pose estimation.
  - Search for publicly available datasets and pretrained models relevant to livestock behavior classification.
  - Understand client requirements and confirm them with the client.
- **Achieved:**
  - Completed literature review and compiled references.
  - Identified and evaluated suitable datasets and open-source models.
  - Held discussions with the client to confirm requirements and expectations.

Week 3
- **Planned:**
  - Develop a first-stage demo focused on animal identification.
  - Present the demo to the client for feedback.
- **Achieved:**
  - Built and tested an initial demo that successfully identified animals in input images/videos.
  - Presented the demo to the client and gathered feedback, which was positive and informed the next iteration.

Week 4
- **Planned:**
  - Enhance the demo into a Minimum Viable Product (MVP) that could detect both the animal and its pose.
  - Improve usability by simplifying the command-line interface (reducing required flags).
  - Present the MVP to the client for validation.
- **Achieved:**
  - Developed a working MVP that identified animals and classified their poses.
  - Streamlined the CLI for ease of use, making it more accessible for non-technical users.
  - Successfully demonstrated the MVP to the client.

Week 5
- **Planned:**
  - Improve the accuracy of the MVP, aiming closer to the expected 90% benchmark.
  - Implement client-requested functionality (flag to include or remove skeleton overlays).
- **Achieved:**
  - Increased MVP accuracy to ~82% (slightly below the target but a substantial improvement).
  - Added skeleton toggle functionality as per client's request.
  - Presented the improved system, demonstrating higher accuracy and more flexible visualization options.
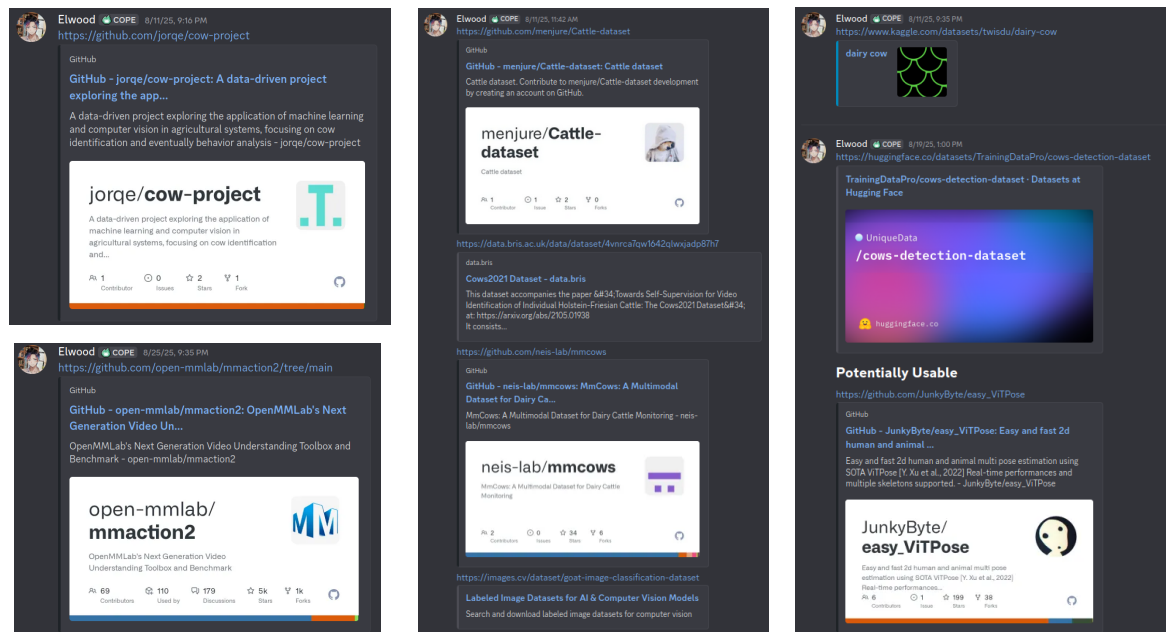
Extent of Work Accomplished (40%)

The repository link is here: https://github.com/Xv-yn/COMP3888_Capstone_Project

The google docs link is here: https://docs.google.com/document/d/1GjvbUHX40hba9Chx2To-PQeshmvGLAEBEpnRY0Aoazc/edit?usp=sharing
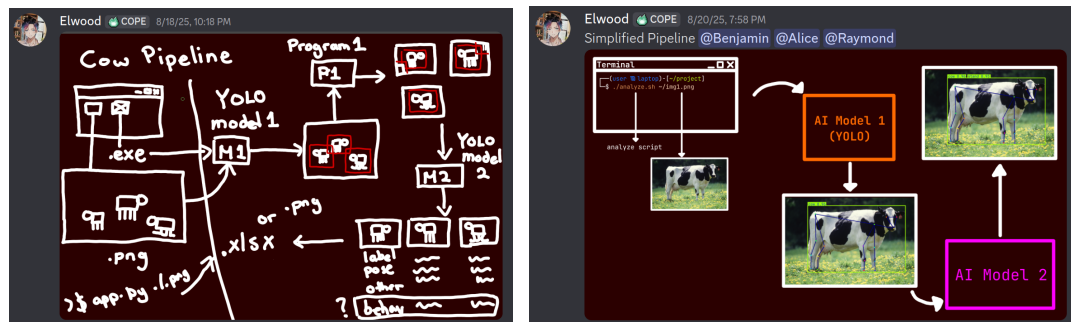
Week 2
- **Technical Contributions:**
  - Identified and evaluated suitable datasets and open-source models.
    - **Evidence:**

  - Drafted/Confirmed application pipeline
    - **Evidence:**

- **Non Technical Contributions:**
  - Held discussions with the client to confirm requirements and expectations.
    - **Evidence:**
      Meeting minutes & client acknowledgement
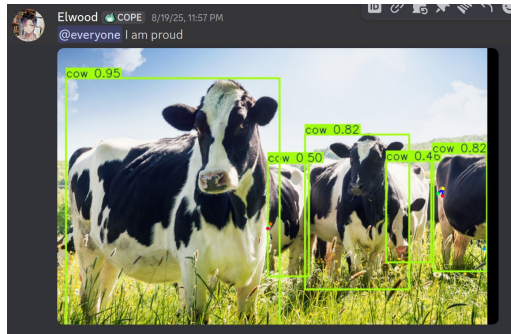- **XP-role Contributions:**
  - Acted as Customer Liaison, translating client feedback into clear technical requirements for the team

Week 3
- **Technical Contributions:**
  - Built and tested an initial demo that successfully identified animals in input images.
    - **Evidence:**

- **Non-Technical Contributions:**
  - Presented the demo to the client and gathered feedback, which was positive and informed the next iteration.
    - **Evidence:**
      Meeting minutes & client acknowledgement
- **XP-role Contributions:**
  - As Manager, coordinated weekly updates, delegated tasks, and ensured progress aligned with milestones.

Week 4
- **Technical Contributions:**
  - Developed a working MVP that identified animals and classified their poses.
    - **Evidence:**
      https://github.com/Xv-yn/COMP3888_Capstone_Project/commit/f96a9a0962fcaf71ec976360d2186ccca119d2dd
      https://github.com/Xv-yn/COMP3888_Capstone_Project/commit/4b286e554261b6160ac0bddac3675af1c677ccb7
      https://github.com/Xv-yn/COMP3888_Capstone_Project/commit/ba61228402b79bb968b3a8c5243eefc4af2090da
      https://github.com/Xv-yn/COMP3888_Capstone_Project/commit/a73e415b326c0645f4279d1ee0516906f653dc9f
      https://github.com/Xv-yn/COMP3888_Capstone_Project/commit/c96f6d9cfe32ea8e8ac751cb43d8e3098e85d11e
      https://github.com/Xv-yn/COMP3888_Capstone_Project/commit/a40bfa282c98d62110a03a9be9bbbee6345ec880
      https://github.com/Xv-yn/COMP3888_Capstone_Project/commit/4445489a2753c2d8c5390d9a7976e661861e5bf5
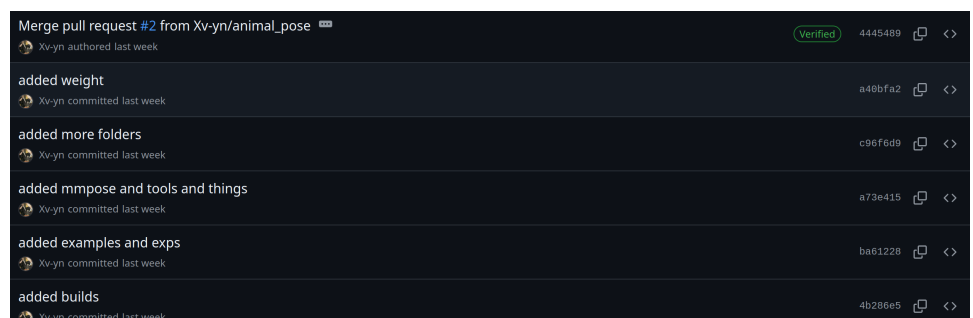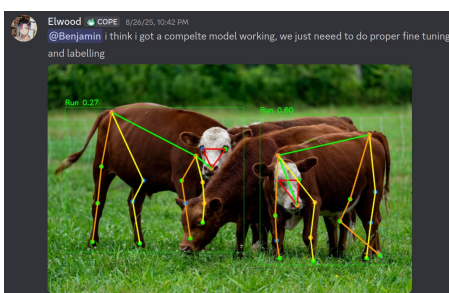
- Streamlined the CLI for ease of use, making it more accessible for non-technical users.
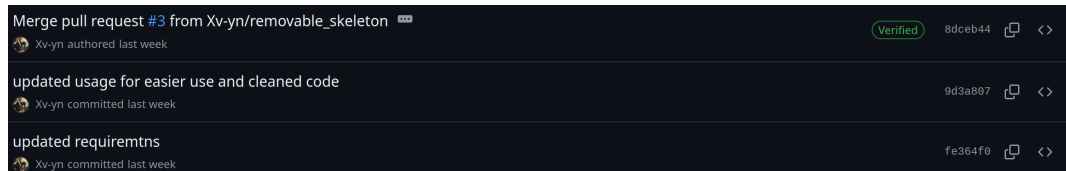 - **Evidence:**
    https://github.com/Xv-yn/COMP3888_Capstone_Project/commit/fe364f062e9bb26de4d0dbab76013f56415fa733
    https://github.com/Xv-yn/COMP3888_Capstone_Project/commit/8dceb444ffe86e9fd2344c6087b1141ffe8679a6
    https://github.com/Xv-yn/COMP3888_Capstone_Project/commit/9d3a80765b39c082bb7884e3785ad01dde6d93b1

Merge pull request #3 from Xv-yn/removable_skeleton — Verified 8dceb44
Xv-yn authored last week

updated usage for easier use and cleaned code 9d3a807
Xv-yn committed last week

updated requiremtns fe364f0
Xv-yn committed last week

- **Non-Technical Contributions:**
  - Successfully demonstrated the MVP to the client.
    - **Evidence:**
      Meeting minutes & client acknowledgement.
- **XP-role Contributions:**
  - As Programmer, focused on core technical implementation (MVP development, CLI refactor).

Week 5
- **Technical Contributions:**
  - Increased MVP accuracy to ~82% (slightly below the target but a substantial improvement).
    - **Evidence:**
      https://github.com/Xv-yn/COMP3888_Capstone_Project/commit/c2d1f9b4852931c40dde563e15f1e0845633326c
      https://github.com/Xv-yn/COMP3888_Capstone_Project/commit/90a9fdd8fe9819865fb4727af917bb3c2e15d1f3

Merge pull request #5 from Xv-yn/training_and_detection — Verified 90a9fdd
Xv-yn authored last week

added easier usage and training c2d1f9b
Xv-yn committed last week

  - Added skeleton toggle functionality as per client's request.
    - **Evidence:**
      https://github.com/Xv-yn/COMP3888_Capstone_Project/commit/9d3a80765b39c082bb7884e3785ad01dde6d93b1

Merge pull request #3 from Xv-yn/removable_skeleton — Verified 8dceb44
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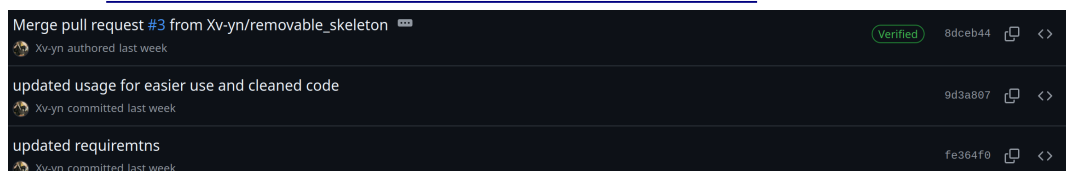
  - Documentation
    - **Evidence:**
      https://github.com/Xv-yn/COMP3888_Capstone_Project/commit/1467770657718bd1eff776d74f030f221085b2da
      https://github.com/Xv-yn/COMP3888_Capstone_Project/commit/52955b539de7c41b5ab3296a9f69d89bbfc4c3d2

- **Non-Technical Contributions:**

  - Presented the improved system, demonstrating higher accuracy and more flexible visualization options.

    - **Evidence:**

      Meeting minutes & client acknowledgement

  - Completed **66% of System Specifications & Design and System Architecture & Design report sections:**

    - Wrote **system requirements** (functional & non-functional).

    - Drafted **architecture diagram** (modules for detection, pose estimation, CLI).

    - Designed **data flow diagram** (input images → detection → pose classification → output).

    - **Evidence:** Draft report section on Google Docs

- **XP-role Contributions:**

  - As Programmer, carried out advanced technical enhancements, while also assisting with report drafting to support the team's documentation workload.

Quality of Technical Work Accomplished (to-date) and Other XP Principles (20%)

- **Testing & Validation**
  - Designed an evaluation pipeline to track detection and pose accuracy across validation sets. Instead of relying only on training loss, I measured precision/recall and mAP to catch overfitting early.
    - **Evidence:**

> **https://github.com/Xv-yn/COMP3888_Capstone_Project/commit/
> c2d1f9b4852931c40dde563e15f1e0845633326c**

- Used "quick sanity tests" whenever refactoring CLI (e.g., testing flag parsing, empty inputs, invalid images) to avoid regressions.

- **Code Reviews & Refactoring**
    - Participated in peer reviews before merging major features. For example, when integrating pose estimation, I broke down the changes into smaller commits so teammates could review logic and style in chunks.

    - Refactored shared modules (data pipeline, inference loop) to remove duplication and make functions reusable. This directly improved readability for teammates.

        - **Evidence:**

        > **https://github.com/Xv-yn/COMP3888_Capstone_Project/commit/
        > a73e415b326c0645f4279d1ee0516906f653dc9f**

- **Documentation & Reproducibility**
    - Treated documentation as part of code quality. Every major feature update (e.g., adding `--no-skeleton`) was followed by README updates, ensuring that someone new could run the system without prior knowledge.

        - **Evidence:**

        > **https://github.com/Xv-yn/COMP3888_Capstone_Project/commit/
        > 9d3a80765b39c082bb7884e3785ad01dde6d93b1**

- **Customer Collaboration**
    - Held weekly client demos and explicitly captured feature requests (e.g., skeleton toggle). This ensured client needs shaped development rather than assumptions.
        - **Evidence:**
        **https://github.com/Xv-yn/COMP3888_Capstone_Project/commit/
        9d3a80765b39c082bb7884e3785ad01dde6d93b1**

- **Incremental Development**
    - Followed short weekly iterations:

        - Week 3: initial demo (animal detection only).

        - Week 4: MVP (detection + pose).

        - Week 5: improved accuracy + skeleton toggle.

    - Each iteration ended with a working deliverable, even if incomplete, reflecting XP's *"small releases"* principle.

- **Simplicity & Maintainability**

    - Applied the XP principle *"do the simplest thing that works."* For instance, instead of building a GUI, I simplified the CLI so non-technical users could run commands with fewer flags.

    - **Evidence:**
    **https://github.com/Xv-yn/COMP3888_Capstone_Project/commit/fe364f062e9bb
    26de4d0dbab76013f56415fa733**

Discipline-based Contributions (20%)

My discipline knowledge in software engineering and computer science directly shaped the specialized contributions I made throughout the project. Given the scope of the capstone and the team's distribution of tasks, I took responsibility for the entire technical implementation pipeline, from design and architecture, through algorithm/model integration, to deployment and documentation.

System and Algorithm Design

- Applied knowledge of **software architecture** to design the project pipeline (input → detection → pose estimation → CLI output).

  - Defined clear module boundaries between detection, pose estimation, and interface layers to ensure maintainability.

  - Drew on algorithmic knowledge to integrate **YOLOX** (object detection) with **HRNet** (pose estimation). This required understanding of both convolutional neural networks and multi-stage inference pipelines.

  - **Evidence:**
    https://github.com/Xv-yn/COMP3888_Capstone_Project/commit/4445489a2753c2d8c5390d9a7976e661861e5bf5

Testing, Maintenance, and Optimization

- Implemented testing and evaluation strategies to measure accuracy (precision, recall, mAP), applying knowledge of machine learning evaluation metrics.

  - **Evidence:**
    https://github.com/Xv-yn/COMP3888_Capstone_Project/commit/c2d1f9b4852931c40dde563e15f1e0845633326c

- Refactored code for modularity, improving maintainability by separating core inference logic from CLI and visualization components.

  - **Evidence:**
    https://github.com/Xv-yn/COMP3888_Capstone_Project/commit/a73e415b326c0645f4279d1ee0516906f653dc9f

Monitoring and Documentation

- Maintained project quality by adding logging and error handling to monitor pipeline behavior during runtime.
- Produced detailed documentation (README, deployment guide, usage instructions, report), reflecting best practices in software engineering maintenance.
  - **Evidence:**
    See above github commits and google docs screen shots.