***EE/CprE/SE 492 SEMESTER 2 WEEKLY REPORT***

***3/15/2025 – 4/3/2025***

***Group number: 11***

***Project title: Slowpitch Softball Pitch Detector***

***Client &/Advisor: Nick Fila***

***Team Members/Role:***

***Andrew Vick - Machine Learning Integration***

***Casey Gehling - Client Interaction***

***Sullivan Fair - Individual Component Development***

***Ethan Gruening - Team Organization***

***Josh Hyde - Research***

***Cameron Mesman - Testing***

o **Weekly Summaries**

* **3/15 - 3/23**
  + This week after a successful prototype of the Ultralytics plugin, we worked on integrating the YOLO screen into our tracking application. The calculated height, ball, and field coordinates are included on the new screen as well as the navigational buttons. Additionally, we are working on annotating a new Roboflow dataset to train a model on videos taken from a side-field point of view. Pitching videos were collected at Iowa State’s recreation softball fields, split into frames, inserted into Roboflow, and annotated with bounding boxes to train the new YOLO model on.
* **3/23 - 3/30**
  + This week we prioritized the annotation of images in the Roboflow model to improve accuracy from training on a dataset of images with a field view. Additionally, we continued working on accommodating Android users running the Ultralytics plugin. There are orientation and zooming issues with the Ultralytics plugin and model compatibility issues when running PyTorch. Reformatting the Ultralytics plugin in Flutter and training a new TensorFlow Lite model will allow cross-platform compatibility.
* **3/31 - 4/3**
  + This week, we finished training a new model with videos of an ideal camera angle. We also now have the information from the YOLO model being sent to the Flutter side. Finally, we implemented a separate model that can run on android.

o **Week accomplishments**

* **Andrew Vick:**
  + **3/15 - 3/23**
    - I went to the field with Sully to record some videos of us pitching a softball. We setup the camera roughly where it would be located during a game so we could retrain our custom yolo model with a dataset that better captures what the ball would actually look like.
    - Uploaded these videos to Roboflow and shared the project with the rest of the team so we can all begin annotating them.
  + **3/23 - 3/30**
    - Continued work on annotating images in Roboflow.
    - Working with Ethan, we began trying to convert our current .pt model to a .tflite model. Since PyTorch models are not able to run on Android devices, we must find a way to train a model using TensorFlow Lite to accommodate for Android users.
  + **3/31 - 4/3**
    - Trained our new model on the dataset Sully and I created with Roboflow. Got it deployed to our app and started testing it again. Also worked on fixing orientation issues our app is having.
* **Sullivan Fair:**
  + **3/15 - 3/23**
    - I went to a field with Andrew to record new videos with our desired angle, as our current model cannot track a ball at an adequate distance.
    - I have begun annotating the photos so we can train a new model. I am currently done with 230 images, with around 500 left.
  + **3/23 - 3/30**
    - I do not have any technical updates this week. I prioritized labeling images for our new model. We are nearly done with the image annotating and should be able to start training our new model.
  + **3/31 - 4/3**
    - This week, the model was finished training and went to the fields where we recorded the training videos to test. Our new model can detect the ball from farther away, but it is still inconsistent with finding the ball in general.
* **Casey Gehling**
  + **3/15 - 3/23**
    - Out for spring break.
  + **3/23 - 3/30**
    - Spent time catching up on project updates from my time away.
    - Continued work on app UI – noted refactorization areas within the code to be implemented when I have access to the project on my PC
    - Continued work on user testing flow – useful to work on in tandem with UI updates to ensure UX is being properly tested.
  + **3/31 - 4/3**
* **Ethan Gruening**
  + **3/15 - 3/23**
    - Working from Sully and Andrew’s new Roboflow project, I annotated 260 images, which will be used to build a new YOLO model for a sideline-view softball detector.
    - Integrated the camera screen functionality of the YOLO widget from the Ultralytics Flutter prototype screen. Expandable buttons navigate to the home and past pitches screen and a new “Data” button displays a widget to show the calculated height and field coordinates.
    - I looked into more research on how to keep the past pitches functionality while the Ultralytics plugin uses the camera controller. Currently working on recording the screen as a workaround.
  + **3/23 - 3/30**
    - Working from Sully and Andrew’s new Roboflow project, I annotated ~350 images, which will be used to build a new YOLO model for a sideline-view softball detector.
    - Working alongside Andrew, I start on converting our .pt (PyTorch) model to a .tflite (TensorFlowLite) model for Android use for the Ultrlytics Plugin. Unfortunately, I could not successfully convert it as there is no direct conversion to .pt → .tflite files without first converting to an ONYX model, loosing critical weight data. Looking into training the model on Google CoLab and outputting as a TensorFlow object rather than a PyTorch object for cross-platform functionality.
  + **3/31 - 4/3**
    - This week, I built TensorFlow’s Docker container to use the TensorFlow library in Python to export a trained YOLO model in TensorFlow Lite format for using the Ultralytics plugin on Android devices
    - Additionally, I linked the YOLO model running in the Ultralytics plugin to update the ball’s coordinates when a new object is detected to display the calculated height to the screen.
* **Josh Hyde**
  + **3/15 - 3/23**
    - I worked mainly on fixing the new grid system implementation with the solution that we fixed during break that more or less seems likes the whole android orientation issues were fixed along with the screen dimensions being bigger and fitting the whole screen as opposed to what it was before. Additionally, I worked on fixing the new grid system for this implementation and did so.
    - I also worked in trying to fix the past pitches screen with the same implementation that we did for the normal camera screen in the fixed orientation, the correct bigger size dimensions and the grid system fitting the whole screen with the new dimensions. With the new fixes it messed up the grid system a little bit and we had to fix that.
  + **3/23 - 3/30**
    - Worked on making a video that will go through most of the functionality of the app, to get a better idea and understanding of the user experience that may be implemented into the app to better show how to use the app for potential new users. Additionally, this video is used to show our advisors our current progress on the app as a whole as well.
    - Put some research and beginning implementation of tflite into our flutter project, which will then be used to allow the ultralytics yolo model to work on android properly.
    - Put a little bit of research and work also into fixing an issue on android where the ultralytics screen is very zoomed in, but not too much as it might be caused by the issue above of not having the tflite properly installed and available to use yet.
  + **3/31 - 4/3**
    - Helped to test and fix some of the bug issues we got on specifically the android side of our flutter project with the running ultralytics model.
* **Cameron Mesman**
  + **3/15 - 3/23**
    - Worked with Josh on the Android orientation bug. We found a solution that fixes the orientation on Android, but it still needs to be added to the past pitches screen to be tested fully. We also need to test it further on ios to make sure our new code doesn’t mess up anything there. If it does, we just need to add a check to see what device is being used and only run our new code for Android.
    - Also started working on fixing the grid system that we broke with our orientation code
  + **3/23 - 3/30**
    - Annotated > 4,000 images in Roboflow.
    - I focused this week on annotating images for our ML model. We’re about done with all of the images so we can move on to training and then testing the model
  + **3/31 - 4/3**
    - Helped build and test new model
* **Weekly pending issues** 
  + **3/15 - 3/23**
    - The Roboflow annotations still need to be completed. This takes time, and a new model can be built once finished.
    - The Ultralytics plugin requires portrait orientation, while our application requires landscape mode. This causes an error in the sizing and orientation of the camera preview.
    - The Ultralytics plugin currently does not update the ball coordinates variable.
  + **3/23 - 3/30**
    - The Roboflow annotations must still be completed with only a few hundred images left.
    - The Ultralytics plugin requires portrait orientation, while our application requires landscape mode. This causes an error in the sizing and orientation of the camera preview.
    - The Ultralytics plugin requires a TensorFlow Lite model for Android.
    - The Ultralytics plugin currently does not update the ball coordinates variable.
  + **3/31 - 4/3**
    - The model still has difficulty picking the ball up when the scene behind it is complicated (i.e. lots of trees, cars, hands).

o **Individual contributions**

| **NAME** | **Individual Contributions**  *(Quick list of contributions. This should be short.)* | **Hours per**  **week** | **HOURS**  **cumulative** |
| --- | --- | --- | --- |
| Andrew Vick | **3/15 - 3/23**   * Recorded videos for training and testing. Roboflow annotations   **3/23 - 3/30**   * Roboflow annotations, TensorFlow model   **3/30 - 4/03**   * Trained new model and got it deployed to app | 6, 3, 7 | 103 |
| Casey Gehling | **3/15 - 3/23**   * Out for break   **3/23 - 3/30**   * User testing documentation, UI planning | 0, 3, | 89 |
| Sullivan Fair | **3/15 - 3/23**   * Recorded videos for training and testing. Roboflow annotations   **3/23 - 3/30**   * Annotated images for our model dataset   **3/31 - 4/03**   * Tested the new model | 4, 5, 3 | 103 |
| Josh Hyde | **3/15 - 3/23**   * Fixed grid system with new implementation, worked on fixing past pitches screen   **3/23 - 3/30**   * App video, tflite research | 4, 5, 3 | 106 |
| Ethan Gruening | **3/15 - 3/23**   * Roboflow annotations, Flutter YOLO screen   **3/23 - 3/30**   * Roboflow annotations, TensorFlow model   **3/30-4/3**   * TensorFlow model, object detection linkage | 6, 4, 5 | 133 |
| Cameron Mesman | **3/15 - 3/23**   * Android orientation, grid system   **3/23 - 3/30**   * Annotated images | 2, 8, 2 | 101 |

**Plans for the next week**

* Andrew Vick
  + **3/15 - 3/23**
    - Train a new Yolo model with videos gathered at the softball fields
  + **3/23 - 3/30**
    - Continue annotations
    - Train a TensorFlow Lite model for cross-platform use.
  + **3/31 - 4/3**
    - Continue training and refining the model
    - Improve how the app handles the model
* Casey Gehling
  + **3/15 - 3/23**
    - Will be abroad.
  + **3/23 - 3/30**
    - Prioritize completing UI updates
    - YOLO model config if necessary
  + **3/31 - 4/3**
* Ethan Gruening
  + **3/15 - 3/23**
    - Work on resizing and orientation issues for the YOLO camera screen.
    - Work on updating the ball coordinates form the YOLO model.
  + **3/23 - 3/30**
    - Train a TensorFlow Lite model in Google CoLab
    - Explore the ObjectDetector class in Flutter to calculate the ball coordinates.
  + **3/31 - 4/3**
    - Begin testing the Flutter/YOLO integration and debug as needed
* Josh hyde
  + **3/15 - 3/23**
    - Make sure the past pitches screen is fully fixed and has the correct dimensions
    - Potentially start testing and or getting more video to use for testing.
  + **3/23 - 3/30**
    - Try and get tflite to work on android
    - Try and fix zoomed in model screen on android
  + **3/31 - 4/3**
    - Look into the weird orientation/zoomed in screen on android
    - Start looking into creating the actual pitch detection for when only a pitch is thrown and not any random ball being in frame.
* Sullivan Fair
  + **3/15 - 3/23**
    - Finish the dataset so we can train a new model
  + **3/23 - 3/30**
    - Finish the last annotations for the dataset and start training the new model
  + **3/31 - 4/3**
    - Continue to test our detection model as it continues training
* Cameron Mesman
  + **3/15 - 3/23**
    - Work with Josh on adding orientation fix to past pitches
    - Fix grid system
  + **3/23 - 3/30**
    - Train and test the new model
  + **3/31 - 4/3**
    - Continue testing new model
    - Orientation issues on android