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EE 421 Notebook

1/12/2023 – Spoke with some of the members who were here – Rose Ellen and Will. Will is planning on moving to another project and is going to put his work into the Discord, which will take a lot of adjustment. We are now in COAS 205.

1/17/2023 – Talked to Dr. Akbas about our new group ideas for adjusting to Will not being here. Planning on drifting away from AI a bit to focus on making the payload hot-swappable (possibly some CAD design involved in this). Could also possibly do something with the whale image database. Dr. Akbas said we have to have someone understanding how to run the software on the Jetson as Alejandro is not going to be present at all the flights. Rose volunteered and Parker said he would talk to Dr. Dan about the payload engineering (as the project moves to larger aircraft, a swappable payload is important).

1/19/2023 – Everyone here. New goal is to get Inventor running and we want the vision statement and familiarization with Autodesk Inventor done by Tuesday. We will work on that over the weekend as well, so Rose made a when2meet to find a time we can have an online meeting. Going to spend some time before talking to Dr. Akbas on getting the GitHub working. We fought with ZenHub for a long while but were unable to get it working. We decided to use Teams Tasks as Scrum instead. I am now working on the vision statement. Dr. Akbas doesn't seem happy with our project decision. He seems to want us to do some AI related thing.

1/22/2023 – Sunday meeting. I had worked on the vision statement and drafted up some potential tasks to add to the backlog on Teams. Everybody reviewed the vision statement, Rose put it onto the Teams, people thought it was generally alright and Parker had some rewording suggestions for clarity (I will implement those). Parker and Chris have been doing some slight work on getting Autodesk Inventor into their machines. I will add those tasks to the backlog after some revisions.

1/25/2023 – Tuesday. Rose and I were both over Discord rather than in-person for this class. Added my revised tasks to the backlog (it should be ready to submit tonight). Parker spoke with Dr. Dan and we may do some work on a charging system for the Jetson payload in addition to our other workload. Dr. Akbas said that was alright but cautioned us not to get overburdened. Via Parker I asked Dr. Akbas if submitting the Teams link to our backlog was ok and it seems to be, so tonight someone (probably Rose – I have a late lab) will submit the link to the vision statement on Github and the backlog on Teams. I need to order some part for my computer – if I upgrade the hard drive it may be able to run 3D modeling software. In the meantime I will work on updating documentation.

1/27/2023 – Met with Dr. Akbas, not sure where Parker was today. Parker's report from yesterday was that he spoke to the new hardware lead and someone working on the Whale AI related aspects. Did some background research on the Jetson Xavier power supply, as that may be an aspect of our goals. One of our tasks will be documentation of the startup procedures of the Jetson – we'd like to have a record of how to power it on for the more programming side of this project. Next flight is next Friday, I might try to make it to see the startup procedures of the Jetson system.

1/31/2023 – I brought in an SD card adapter for Rose so that we can connect to the Jetson and work on a list or program of startup procedures. Over the weekend I looked into the hardware limitations of my current computer and I bought some components that I hope will allow me to use the same tools that

my teammates are currently using. I do have some concerns that it'll take me a bit of time to catch up, but at least I should be able to contribute more. We also brainstormed some ideas for the Sprint 1 Demo which will be coming up next week, and spoke with Professor Akbas. Not sure where Parker was today. Rose is working on a list of startup procedures for the Jetson, and Chris is trying to create some model parts on Inventor. I need to update the backlog and possibly start a demo presentation.

2-2-2023 – Parker still not here, let us know on Discord that he was unable to make it. I created a presentation that we will use when we present our Sprint 1 results (may need a recap slide for a little bit of a retrospective) and I updated some of the tasks in the backlog. Have not gotten the hardware components to upgrade my machine yet, still waiting on those but hoping they will be here soon. Rose-Ellen has been working on an explanation of how the software powers on. Chris is still working on Inventor and hopes to get into contact with the hardware lead Gianna Canuli at canulig@erau.edu .

2-7-2023 – Whole group was there; I was a bit late. Got the shipment of hard drive to upgrade my machine in but have not had the opportunity to do so yet. Added more to the PowerPoint over the weekend, and Rose is going to flesh out some more of the slides on Wednesday. We are also planning to meet prior to class on Thursday to review the presentation one more time before we have to present.

2-9-2023 – Met before class to review presentation and work on it. Wrapped up the last bit of the slides with the Inventor models that Parker added. Presented to the class; Dr. Akbas had quite a few criticisms. Need to fix the system architecture diagram. Less concrete aspects to goals; more idealistic. Need 'more' from the project. Will try to upgrade machine hardware over the weekend if possible. If Rose has not submitted the PowerPoint link on GitHub by later tonight, I will get it turned in.

2-14-2023 – I did wind up adding the PowerPoint to the GitHub. I spent most of the weekend trying (and failing) to get my hardware upgraded so I could then load the neural network code onto it. The issue came in transferring my current hard drive over to my new hard drive and now my computer won't boot. The information shouldn't be deleted – it's likely a problem with whatever partition is holding the boot sector. It's going to be difficult getting work done with my laptop messed up like this, will need to do more work using the school computers, although I can't do much on the neural networks on those. Working on getting this fixed as well as all the other stuff I have to do.

2-16-2023 – Getting ready for the flight tomorrow, it's really troublesome typing out emails on my phone but Dr. Dan should know I'm planning on attending. I'm not sure if anyone else will be going. Possibly Parker will be there to speak with the hardware team, but Rose is unable to make it. Spoke with Dr. Akbas about what the different members of the team have been doing – Chris on modeling, Parker also working with hardware though he often isn't in class, Rose on documentation of how to start the Jetson, and me with Scrum stuff and assisting with documentation. Dr. Akbas and Rose were pretty unhappy with the rest of the team's small contributions. Not a great feeling, will try to do more but not sure how with current limitations.

2-21-2023 – Attended the flight, it went fairly well, got a better understanding of how the Jetson is mounted into the payload and how everything plugs in/the tests that are done to check the software shortly before takeoff. Alejandro also briefly explained how the USB stores the images the camera collects, and how the software team does a spot-check onsite to make sure that the pictures came through alright. I also spoke with Gabriel a bit about options for AI. I'm thinking to help the team more, I can specialize in incorporating a Whale AI somehow, and he let me know there's some good information

from a competition hosted by a website called Kaggle. I researched it a little over the weekend. Today in-class was the hardware team meet-up date, so we all spoke with Gianna. She had some important information about the payload to go over – one thing that stood out to me is that the print material seems to be PLA. However, she also had a lot of proposed ideas, and some of them seem to me to be beyond our current capabilities, so I hope the hardware side of our project does not lose focus in this.

2-23-2023 – Met with Alejandro along with Rose before class at the MicaPlex. He went over how the Jetson operates, the file system used, how the shell scripts run and the python files they utilize, as well as some stuff about TensorFlow – or rather TensorFlow Lite – and the memory limitations of the Jetson. I think Rose and I both found it to be some valuable information, and some of it we talked about when we had our Scrum meeting once we got to class. In class, I also briefly discussed Whale AI a bit with Prof. Akbas, talking about the different options available from the Kaggle competition. The team agreed that whatever option of the potential programs gets picked, we should stick with, as we don't want to jump around in this when we're already delayed on time.

2-28-2023 – Working on the test plan, want to have it done ahead of time so professor can review it and we can get feedback on our submission to revise. Should have done more on it over the weekend but I was out of town. Have downloaded some WildMe code and am trying to finalgle it into working. It's got a lot of 3rd-party tools it apparently needs – OpenCSV, Keras, Tensorflow, and of course Python. TensorFlow at least is a good sign, as our current model relies on that. But right now anytime I try to run it it's telling me I'm missing Python dependencies and I don't know how to fix it. Relayed this information to team, I am going to focus on my test plan sections for a bit.

3-2-2023 – Spoke briefly with team in class today, Parker was unable to make it but he had some questions for Alejandro which he posted in the Discord. I am planning to work more on the Whale AI stuff. Looked up the Kaggle competition and some of the winning algorithms were things like WildMe and Flukebook. Flukebook is some sort of API-based AI, I looked into it but it wouldn't work for our purposes – no wi-fi out over the ocean. Continually trying with WildMe. It's documentation is a complicated tangle, and some parts of the system seem deprecated. I am also looking into Deepsense.Ai a bit, as their solution seems maybe a tad more streamlined. Will try to get something of their code working.

3-7-2023 – Got some output from the Deepsense.ai framework, but not sure if I'm operating it correctly. Struggled some more with the WildMe, apparently Rose was having trouble with it as well. Spent a lot of time working on the PowerPoint, got majority of the slides filled out. Rose had done around 4 slides before I started work, now there's around 14 filled out (Rose is making some design tweaks though – my bullet points get fairly wordy and it makes the slides not look nice). Asked Parker and Chris to help with the PowerPoint, Parker said his computer's not working with Teams. We are planning to meet up an hour early on Thursday to practice before the presentation – which is Thursday. There's also a lot of work to do on the SRS and SDD which are due Friday.

3-9-2023 – Prepped for the presentation prior to class. All my slides were done and I was ok with the stylistic edits Rose had made. I helped with some slight design changes as we got ready. think it went off alright although I feel like I stumbled over one of my slides. I tend to try and watch the audience rather than the slide when I'm talking during the presentation, so it's easier to get tripped up doing that. The next thing to focus on is the SRS and SDD, which I've been doing a bit of work on, but need to do more. The software focus has shifted, and it's not as simple as just shifting out turtles for whales,

because we're trying to produce a portable model and the SRS and SDD need to reflect that. I also need to work some more on the introductory and summary sections; I feel like people are leaving a lot of stuff the same, but that doesn't really reflect the changes we've made to what we're trying to accomplish.

3-14-2023 – I don't think I'm going to do much over Spring Break, possibly do some research into retraining the AI, but I'm tired from everything I had to get done on the SRS and SDD. People said in the discord that 'the software system architecture still applies' so they 'left it for now' but it doesn't! I had to rewrite a lot of those sections, which I wasn't even assigned to, and had to make a new diagram for showing the system changes. After how we got knocked for the system architecture slide the presentation before last, you'd think everyone would recognize that is an important aspect to get right, but no, that section and a lot of others just got left as-is and I had to do a lot of last minute-fixes to get the documents close to ready. Someone left in the old photos of categorizing turtles (of come on) and I wasn't even able to get the style choices fixed before it got to the deadline and I had to submit. Yeah, I might take most of Spring Break off.

3-16-2023 – Spring Break cont., getting work done for other classes.

3-21-2023 – Chris and Parker have been working a big on the 3D modeling side of things, hopefully they will have some quick-print prototypes ready to go soon so we can test our ideas out physically. On my side of things, I am working on getting the 3D printing club printers ready so we can hit the ground running with manufacturing those 3D prototypes. In bad news, Rose and I took a closer look at the Deepsense AI software, and it turns out I was wrong about the software. I thought I had it outputting to a new .csv file with the bounding box data, but that was the default data and it's not updating with new entered images. Basically, it's not working for our purposes. Rose had some good ideas for alternatives, though, and I am now looking into those as well.

3-23-2023 – Attempted to get into the Fusion folder where our team (and the overall hardware team) is storing their versions of the 3D models. I was unable to do so, though, Fusion was doing that not-loading thing like Teams does sometimes. So instead, I inquired about the Fusion Folder .stl files through discord and asked if they could be shared there. Later today, Parker sent some through – just the initial mounting plate and mount segment, not the pin yet as he was having trouble getting Fusion to work as well (apparently it was loading for him, but running very slow? I don't know if that's trouble on our end or the software). Chris was unable to make it today; career fair. I haven't got an object detector working yet in software, also. Update; got .stl file of the mounting pin as well. I've started the plating and slicing to get a quick gcode printable file. This weekend I plan to do some prints to get some working models.

3-28-2023 – Over the weekend, I printed out about 4 sets of the mounting pin, mounting plate, and mounting segment. I tried some different orientations and settings, and I ran them on slow printing as they're small pieces (that made it take longer, but I was trying for more detail). Some of them look alright, most have an issue with gaps in the print, possibly a temperature issue. If the layer is very small, the print may not have enough time to cool down, resulting in the uneven surface. Also, there's the problem of tolerances; it seems that the clearance between the pin and plate may be below the level that the printer can print. Regardless, I showed off the printed versions in-class; Dr. Akbas noted that parts of them fit together, but other pieces do not; I explained I am getting a friend of mine (already asked him) to print versions on a resin printer for a higher level of detail. Without upping the tolerances, though, it still may not work; in the Discord we talked about increasing the distance between parts, and hopefully the guys are working on those files now. For software, I downloaded Anaconda for easier

python use, and am currently working on getting a general image detector working from a sample project. I feel I am close to getting that working, and then hopefully I can build a more specific model.

3-30-2023 – I got the image classifier working! It's a neat little program – as mentioned, general purpose, so after I had it running, I spent a lot of time just plugging in various images to see the metrics it would return. Getting it running required a lot of dependencies, TensorFlow, cv2, and a few others, but it runs natively in anaconda luckily. What it doesn't do is display the bounding box data we're looking for. I showed it off in class, and it did display that it was able to categorize what was in images to the best of it's generalized ability (that is, it commonly confuses shales with sharks and other fish). Rose had some great ideas for the bounding boxes about using the TFOD Course resource that Will used last semester. I worked with Rose on that for a bit, and will continue on trying to use it a little outside of class.

4-4-2023 – Not in class, answering questions for upcoming job (hopefully they get my placement in soon. Only Parker could make it today.) However, I have been working on retraining the image classifier with the whale database. Substituting in new labels and a different model based off of the whale images dataset does not seem to be working – I'm getting straight 100 or 0 for confidence levels, and it misidentified some ocean water. Which got me thinking, our current database is all positives – whale in every image. Our likely data will be made up of mainly negatives – lots of photos of empty ocean. What if we accidentally overfit the model to whale images and it expects one in every pic? We'd get a ton of false positives. So after I hit a roadblock with TensorFlow not working in the TFOD Course, I turned to gathering a bunch of images of various empty ocean water – as well as some aerial shots with other wildlife. In the event we need to fix problems with the dataset, those can be used.

4-6-2023 – After gathering a whole bunch – that is, over 1000 – varied aerial ocean images, I then moved on to a big task of the TFOD course related software. More specifically, data entry. I labeled 500 images of whales with bounding boxes of where the whales were and whether or not they were difficult to see (then when I came into class, I was told I should have labeled them separately by either head or fluke). Regardless, I am very tired of looking at whales, but I've uploaded the newly annotated dataset to an online tool which will let me easily convert it to other label-set formats, which will hopefully make it easier to train using that dataset. I also shared this dataset via link with the Discord group at the request of Alejandro and Dr. Akbas, who also had some questions about image size. Our images are pretty big – often 2000x3000, but the training does shrink the down. This online organization tool has been helpful so far, and I'm hoping to have some sort of model working over the weekend.