About this template document:

1. This document contains a template for your team to fill in for your required AI Studio “Monthly Progress Summary” for October *(due November 1st, 2023 in your AI Studio course in Canvas; and detailing work completed by your team in October 2023 during the “Modeling & Evaluation” phase of your project).*
2. This document should be stored in your team’s Project Folder in Google Drive, for easy access by team members; your AI Studio TA/Tutor/Course Support; and the Break Through Tech AI Program Team. Submission details are available in Canvas.
3. You can review an example Monthly Progress Summary in the Bridge to Studio module of your AI Studio course in Canvas, on the page titled, “Team Breakout: Team Resources”. However, please note that this example corresponds to Data Understanding/Prep, not Modeling & Evaluation.

[View the template below](#_qhyqphsckgi)

# Monthly Progress Summary *(October)*

**I. Modeling Summary**

Question:   
Please provide a summary of your team's Modeling-related accomplishments during the month of October (focusing on the types of tasks detailed in this month’s Progress Evaluation Rubric, in the categories for Algorithm Selection and Model Training and Testing). Remember to include any relevant links to your work (e.g., a Python/Colab notebook showcasing your team’s work).

Student Team Response:Our model architecture is based on using transfer learning in addition to a pretrained Faster RCNN object detection model to detect and classify pedestrians and cyclists. In particular, we have accomplished the task of selecting the pretrained architecture, accessing the NuImage dataset, running the model on selected images from NuImages, annotation conversion to XML, and doing research on how to transfer learn when working with image datasets. For Algorithm selection, we used Faster RCNN which is based on Selective Search algorithm, which works by computing hierarchical groupings of similar regions based on features like color, texture, size, and shape to be very fast with high recall, matching the criteria we had in mind and outlined in our evaluation section. Furthermore, we wanted to pick an architecture based on an algorithm that specifically had object detection as its main use case.

Links to work:

[Object Detection with nuImages dataset - Colaboratory (google.com)](https://colab.research.google.com/drive/1rSa6HEXwQi6ANKJFFMt1KG74C6hWod9s)

[Object Detection Notebook](https://colab.research.google.com/drive/1xY0u4fI09qzthEcKvKarNZAD9ud_AQXl#scrollTo=4cxkGrKJ4PE0)

[EfficientDet D1 640 x 640 - Colaboratory (google.com)](https://colab.research.google.com/drive/1jw-F1mAFZ1oLLSJKoc4xQjEWEHgrMJFn)

**II. Evaluation Summary**

Question:   
Please provide a summary of your team's Evaluation-related accomplishments during the month of October (focusing on the types of tasks detailed in this month’s Progress Evaluation Rubric, in the categories for Model Evaluation and Model Improvement). Remember to include any relevant links to your work (e.g., a Python/Colab notebook showcasing your team’s work).

Student Team Response:  
During the month, we explored different architectures that we could use for object detection. Through comparing different metrics like speed vs. precision and accuracy, form of the bounding boxes,, we observed that Faster RCNN is the most accurate in detecting different objects. After narrowing down the most desirable ones, we tested the object detection against multiple images below. Through this process we further confirmed that Faster RCNN is most accurate.

Links to work:[*Exploring faster RCNN*](https://colab.research.google.com/drive/1xY0u4fI09qzthEcKvKarNZAD9ud_AQXl)

[*https://colab.research.google.com/drive/1jw-F1mAFZ1oLLSJKoc4xQjEWEHgrMJFn*](https://colab.research.google.com/drive/1jw-F1mAFZ1oLLSJKoc4xQjEWEHgrMJFn)

**III. Lessons Learned and Challenges**

Question:   
Reflecting on the Modeling and Evaluation phases, what were the key insights or challenges your team encountered? How did you address them? Share any important lessons learned that can help guide future steps in the project.  
  
Student Team Response:

One of the main challenges that we encountered during the past month was picking the optimal object detection model for our dataset as well as modifying some of the code to process the nuImages dataset to work on different object detection models. We learned different aspects of Tensorflow detection and how to access the datasets in our Google drive, which took a while to figure out.

As a team, we faced challenges in terms of scheduling meetings and ensuring that all the information is communicated to each team member. We dealt with this problem by now recording our zoom meetings when members are absent, and debriefing in our chats as well.

Overall, we learned multiple things in the past month. In a technical sense, we learned the ins and outs of Transfer Learning. It is often preferred in industry as making a model from scratch uses a lot more energy and effort. However, transfer learning also requires a deep understanding of the existing algorithms/architectures to modify it to the intended purpose. We also learned different ways of using TensorFlow in relation to this project.

**IV. Next Steps (Modeling and Evaluation)**

Question:   
Given your current progress, what additional tasks does your team need to complete in connection with the Modeling and Evaluation phases of your project? What is your plan to complete these tasks?

Student Team Response:

* *Create our own custom object detector using transfer learning on our chosen Object Detector from* [*Tensorflow 2 Detection Model Zo*](https://github.com/tensorflow/models/blob/master/research/object_detection/g3doc/tf2_detection_zoo.md)*o.*
  + Modify these configurations to suit our team’s needs.
    - *num\_classes: Number of class labels detected using the detector. Change this to the number of class labels required in your detector.*
    - *batch\_size: Batch size used for training. Change this value according to your memory availability. A higher batch size requires higher memory.*
    - *fine\_tune\_checkpoint: Path to the checkpoint of the pretrained model.*
    - *fine\_tune\_checkpoint\_type : Set this to “detection”.*
    - *label\_map\_path : Path to the label\_map.pbtxt file we created earlier.*
    - *input\_path: Path to the tfrecord files we created earlier.*
  + Our plan is to continue researching how to accomplish this and reach out to our CA and TA for support on converting our image data to XML
* Fine-Tune Training
  + Use Tensorboard (a feature of Tensorflow that allows us to monitor our model’s performance) on our customized object detector. This can be used to analyze is the model is overfitting or under-fitting or if it is learning anything at all.
  + We will be following this article to help us accomplish the final pieces of Transfer learning [Creating a Custom Object Detector Using Transfer Learning | by Joyce Varghese | The Startup | Medium](https://medium.com/swlh/creating-your-own-custom-object-detector-using-transfer-learning-f26918697889)
* SensorFusion - take a look at LIDAR data
  + *An estimation of the depth, how far an object is which is also not good at detection*
  + Our team can also introduce the safety piece of our image classification using LIDAR data, on our dataset that is customized for pedestrian and cyclist detection, to identify how \*far\* object is from vehicle
  + Our team will reflect on how we were able to classify image data and introduce it to our Custom Object detector, and we will work with our CA to accomplish this
    - *We think that that LIDAR data can be combined into the annotations of our image data as information we can use for classification of safe or unsafe objects*

**V. Request for AI Studio TA Support**

Question(s):   
What additional support do you need from your AI Studio TA/Tutor/Course Support? Please structure your response as specific questions, related to the Modeling and Evaluation phases of your project. Consider areas where you may require specific guidance, clarifications, suggested approaches, or suggested resources. Your AI Studio TA will review these questions and work through them with you in an upcoming meeting or chat.   
  
Student Team Response:

* Currently we are working on converting the annotations from the nuImages dataset to XML files - if you have suggestions for how to do that more effectively, that would be helpful!
* In the future, we would appreciate any support with…
  + using the HPC cluster
  + transfer learning
  + working with LIDAR data
  + evaluating our model after we finish building it
  + pacing our progress so that we are able to finish the project in time

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