# Take Home Exercise (MOT)

**Intern Take-Home Assignment: Exploring and Modifying a Multi-Object Tracking System**

**Objective:** The goal of this assignment is to assess your ability to understand existing machine learning concepts, work with and debug unfamiliar codebases, and integrate new components into a system. We're more interested in your process, problem-solving skills, and the clarity of your documentation than in achieving state-of-the-art performance.

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## Task 1: Research and Conceptual Understanding

Your first task is to build a foundational understanding of the core concepts.

1. **Research Multi-Object Tracking (MOT):** Briefly learn about the goals and common challenges of MOT.
2. **Explain ByteTrack:** Read about the **ByteTrack** paper and understand it's algorithm. You are encouraged to use LLMs (like ChatGPT, Gemini, etc.) to help you quickly grasp the main ideas.
3. **Summarize Your Findings:** In a short summary, explain the core idea behind ByteTrack. Focus on breaking down its main components and explaining on how it works. The goal is to explain it simply, as if you were teaching it to a teammate.

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## Task 2: Reproduce Baseline Results

This task will test your ability to set up a development environment and work with an existing codebase, which may have issues.

1. **Project Setup:** Fork the repository: `https://github.com/kamkyu94/TrackTrack` .
2. **Reproduce HOTA Score:** Download the **MOT17** dataset. Using the **MOT17-val** dataset, your goal is to reproduce the `69.1 HOTA` score reported in the paper. For validation dataset, you should use the `mot17_half.pth.tar` pre-trained weights and `mot17_half_sbs_S50.pth`
3. **Fix issue if any:** You may encounter bugs or configuration issues, fix it and commit your fixes

## Task 3: Integrate a New Detector

Now, you will modify the tracking pipeline by swapping a core component.

1. **Replace the Detector:** Replace the existing YOLOX detector in the `TrackTrack` codebase with a **DETR-based detector** from the following repository: `https://github.com/roboflow/rf-detr`.

2. **Integration:** You will need to adapt the output of the new detector to be compatible with the input format expected by the `TrackTrack` tracker.

3. **Run and Record:** Run the modified tracker on the **MOT17-val** dataset and record the new **HOTA** score. Performance is not the primary concern; a successful integration is the main goal. Briefly note any challenges you faced during this integration.

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## Task 4: Integrate a New Re-ID Model (optional)

Finally, you will replace the appearance feature extractor (Re-ID model). This is an optional, but highly encouraged, bonus task.

1. **Replace the Re-ID Model:** This repo uses models from FastReID. Replace this with `osnet_ain_x0_25` from the **deep-person-reid** library: `https://github.com/KaiyangZhou/deep-person-reid`.

2. **Run and Record:** Run your latest modified tracker (with the new detector from Task 3 and the new Re-ID model from this task) on the **MOT17-val** dataset and record the final **HOTA** score.

## Submission Guidelines

1. A **PDF** of :
   a. your concise explanation of ByteTrack (Task 1).
   b. A summary of your results for Tasks 2, 3, and 4, including the **HOTA** scores you achieved at each stage.
   c. A brief discussion of the challenges you encountered and how you overcame them, especially for Task 2.
   d. A link to your forked repository.

2. **Source Code:** A fork repository of `TrackTrack` with your modifications for Tasks 3 and 4 with well committed issue or PR.