Objective

The objective of Week 4 was to validate the overall ADS-B decoding system, analyze decoded data, and visualize message characteristics to better understand system performance and limitations.

Due to time constraint for project timeline and issues with code debugging, this phase focuses on evaluation interpretation and engineering concepts instead of the planned continuation of decoding layers

Decoder Validation and Consistency Checks

To validate correctness, I analyzed decoded frames across entire capture files instead of individual examples. Several consistency checks were used:

- Repeated ICAO addresses indicate persistent aircraft presence
- Callsigns follow known airline and flight number formats
- CRC validation removes malformed frames
- Message counts scale with capture duration

Visualization and Statistical Analysis

To better understand the decoded data, I implemented visualization scripts to analyze message characteristics. This includes histograms of ADS-B message type codes and summaries of decoded frame categories.

Visualizing message distributions provides insight into what types of broadcasts are most common in the captured airspace, such as identification, position, or status messages. These plots also serve as an indirect validation that the payload decoder is classifying frames correctly.

Closing Reflection

Through Weeks 1 to 4, this project evolved from raw RF capture into a functioning ADS-B decoder capable of extracting real aircraft information from the air. The final system reflects not only theoretical understanding, but practical implementation, validation, and critical evaluation of a real wireless communication system