**Reflection on ads-b flight paths capstone**

This project brought together key concepts from **IA 640: Information Visualization** and **IA 651: Applied Machine Learning**, supported by targeted independent research. Together, these courses shaped both the interactive map design and the anomaly-detection algorithm.

**IA 640: Information Visualization**

* **Perceptual Encoding**: Applied pre-attentive principles and high-contrast color ramps to distinguish flight-segment time intervals clearly.
* **Interactive Controls**: Incorporated a date-picker and dynamic filters based on dashboard design discussions, enabling rapid exploration of daily ADS-B logs.
* **Layout & Responsiveness**: Positioned legends and controls to remain visible yet unobtrusive across different viewports, drawing on lessons in responsive dashboard composition.

**IA 651: Applied Machine Learning**

* **Time-Series Segmentation**: Adapted sequential-data techniques to split flight tracks when time gaps exceed a threshold, isolating meaningful segments.
* **Anomaly Scoring:** Combined deviations in velocity and heading-change rate to form an “irregularity” metric inspired by unsupervised learning labs.
* **Manual Validation:** Tested candidate features by hand and determined that a “curviness” measure underperformed, while the irregularity score consistently highlighted true anomalies.

**Independent Research**

* **SSH/SFTP Integration**: Leveraged online Paramiko tutorials to automate remote ADS-B log retrieval.
* **Advanced Mapping**: Consulted library docs and forums to overlay GeoJSON layers and heatmaps in ipyleaflet, adding contextual detail.
* **Performance**: Adopted lazy data-loading and widget-rendering techniques from technical blogs to ensure a responsive interface with large datasets.

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