

## Analysis Focused on Software Updates:

Given the dataset description and the observed patterns in the graphs, it is possible to infer when software updates might have occurred and their effects on the radar data.

## Likelihood of Software Updates:

1. **Multiple Anomalies Across Features:**
  - Several features show significant spikes and anomalies, particularly on day 1, 2 and day 3. This pattern suggests that the radar software might have been updated on these days.
  - The PCA plots show distinct clusters by file, further indicating changes between the days that could be attributed to software updates.
2. **Distinct Changes on Specific Days:**
  - **Day 1 (file1.mat):** Almost all features have significant spikes on this day, which could indicate a major software update, issues or initialization of the radar sensor.
  - **Day 2 (file2.mat):** The flat line observed in Feature 7 on this day followed by spikes suggests a potential update or restart of the sensor software, leading to initial, partial data loss or constant values.
  - **Day 3 (file3.mat):** Similar anomalies are seen on day 3, suggesting another possible software update or calibration event.
3. **Consistency in Later Days:**
  - **Day 4 (file4.mat) and Day 5 (file5.mat):** These days show fewer anomalies and more consistent data, suggesting that after initial updates on earlier days, the software became more stable.

## Effects of Software Updates:

1. **Spikes and Outliers:**
  - Software updates could introduce calibration processes or error states that result in large spikes in the recorded data. These are particularly noticeable in Features 1-4, 6 and 8.
  - The presence of these spikes across multiple features on specific days indicates the potential impact of software changes or reinitialization.
2. **Specific Updates and Their Effects:**
  - **Update Between Day 2 and Day 3:** The anomalies observed in Features 1, 2, and 8 on days 1 and 2 are notably reduced by day 3. This indicates that a software update likely occurred between day 2 and day 3, addressing the issues causing these anomalies.
  - **Update Between Day 3 and Day 4:** The anomalies present in Features 3, 4, and 5 on days 1, 2, and 3 are significantly reduced or absent by day 4. This suggests another software update between day 3 and day 4 that fixed the issues causing anomalies in these features.
3. **Cluster Separation in PCA:**
  - The PCA plots reveal distinct clusters by file, indicating that the radar data characteristics changed between different days. This separation suggests that the software updates had a significant impact on how the radar data was processed and recorded.