We propose to investigate spatial data science approaches for Identifying Aberration Patterns in Multi-attribute Trajectory Data with Gaps (IAP-MTD). Example multi-attribute trajectory data (MTD) includes maritime MTD recording ship attributes (e.g., draught, rate of turn) and vehicle MTD recording on-board diagnostic attributes (e.g., emission). An aberration pattern represents a significant deviation from expected values. Identifying such aberration patterns can help improve maritime security and prevent illicit activities (e.g., illegal fishing, illegal oil transfer to violate United Nations sanctions) where the involved objects may hide their movement by deliberately not reporting their locations. The challenges of this problem arise from the complexity of modeling gaps and a large amount of data. Existing works on trajectory mining focus on bare-bone trajectory data and consider only location-time information. In addition, they interpolate the gaps and ignore the many possibilities between consecutive reported locations. To overcome the limitations in the literature, we propose a three-phase approach. First, we propose a novel frustum-chain model that represents multi-attribute trajectory data with gaps as well as the position measurement error of reported locations. Second, we propose query methods to efficiently discover aberration patterns with known spatiotemporal signatures. Third, we propose data mining approaches to discover aberration patterns without known spatiotemporal signatures. Both theoretical and experimental methodologies including proofs, complexity analysis, and experiments with synthetic as well as real datasets (e.g., MarineCadastre) will be used to evaluate the computational efficiency of the proposed methods. Furthermore, case studies will be used to evaluate the effectiveness of proposed methods.