

IAC-26,A6,4,6,x108489

DISCOS vs SATCAT: From Catalogue Discrepancies to Object Type AI Inference

Marta Guimarães ^{a,b,c,*}, Robert Arthur ^{a,1}, Cláudia Soares ^b, Chiara Manfletti ^{a,c}

^a *Neuraspace, Portugal*

^b *NOVA School of Science and Technology, Portugal*

^c *Technical University of Munich, Germany*

*Corresponding Author, marta.guimaraes@neuraspace.com

Abstract

Accurate classification of resident space objects in low-Earth orbit (LEO) is essential for space situational awareness, debris mitigation, and operational decision-making. Two of the most widely used catalogues, SATCAT and DISCOS, provide complementary but structurally different object type classifications, ranging from simplified categories (e.g., payload, debris, rocket body, unknown) to more granular taxonomies describing mission- and fragmentation-related objects. While both sources are reliable, discrepancies between their classifications persist and introduce uncertainty in downstream analyses. This work presents a systematic comparison of object type attribution in LEO between SATCAT and DISCOS using a consistent snapshot of both catalogues. After harmonising classification schemes, mismatches between the two sources are identified and examined in detail. A targeted manual labelling process is then applied to discrepant cases, leveraging retrospective catalogue updates and auxiliary information to establish a best-knowledge reference where possible. The analysis highlights recurring patterns in classification disagreement, particularly in the treatment of unknown objects and debris-related categories, and reveals systematic tendencies in how each catalogue resolves uncertainty over time. Building on the manually curated labels derived from this process, a supervised machine learning model is implemented to infer object type for cases exhibiting missing, ambiguous, or conflicting catalogue information. The model is trained on the reconciled dataset to emulate expert-driven classification decisions and to provide probabilistic object type estimates. This approach demonstrates the potential of data-driven methods to augment existing catalogues in operational contexts, offering timely classification support when reliable updates are unavailable, delayed, or inconsistent.

Keywords: Satellite Catalogue, Object Type, LEO, Supervised Learning

Acronyms/Abbreviations

DISCOS	Database and Information System Characterising Objects in Space.
LEO	low-Earth orbit.
RSO	resident space object.
SATCAT	Satellite Catalog.
SSA	space situational awareness.
TLE	two-line element.

1. Introduction

The rapid growth of the population of resident space objects (RSOs) in low-Earth orbit (LEO) has significantly increased the complexity of space situational awareness (SSA) activities. Reliable information describing the physical and operational characteristics of catalogued objects is essential to support conjunction assessment, collision avoidance, orbit determination, debris environment modelling, and long-term sustainability analyses.

Among the available metadata associated with an object, its type (e.g., payload, rocket body, debris, or

unknown) constitutes one of the most informative descriptors, providing insight into its origin, expected behaviour, and operational status. Object type is also an important proxy for estimating characteristics that are frequently unavailable or uncertain in public catalogues. In particular, knowledge of the object type enables the assignment of representative physical properties, such as mass and characteristic dimensions, which are commonly required by orbit determination, orbit propagation, atmospheric drag modelling, and collision probability estimation. Furthermore, object type provides an indication of whether an object is likely manoeuvrable, allowing operational satellites to be distinguished from inactive spacecraft, rocket bodies, or debris. Consequently, accurate and consistent object type attribution directly benefits both operational SSA applications and long-term analyses of the space environment.

Several publicly accessible catalogues provide object type information, among which the Satellite Catalog (SATCAT) and the Database and Information System Characterising Objects in Space (DISCOS) [1] are two of the most widely adopted by the international SSA community. Although both catalogues are recognised as authoritative sources, they have been developed with different objectives and employ distinct classification schemes, levels of granularity, and update strategies. As a result, discrepancies in object type attribution can arise

¹ While working as a Senior Flight Dynamics Engineer at Neuraspace.

between the two sources, introducing uncertainty into downstream applications that rely on these data.

This paper presents a systematic comparison of object type classifications in SATCAT and DISCOS for the LEO population. After harmonising the classification schemes adopted by both catalogues, discrepancies are analysed to identify recurring disagreement patterns and their underlying causes. A targeted manual reconciliation process is then performed to establish a best-knowledge reference dataset for objects exhibiting conflicting or ambiguous classifications. The resulting dataset is subsequently used to investigate whether object type can be inferred independently from physical characteristics and historical orbital behaviour using supervised machine learning.

To the best of our knowledge, a systematic comparison and reconciliation of object type information between SATCAT and DISCOS has not previously been reported. The application of machine learning to space object classification and characterisation is not, in itself, new; data-driven methods have previously been explored to infer object properties and extract information from orbital and observational data [2]. The proposed framework combines cross-catalogue reconciliation with catalogue-independent object type prediction. The main contributions are:

- Comparison and harmonisation of object type classifications from SATCAT and DISCOS;
- Analysis of classification disagreements, missing information, and temporal changes in catalogue completeness;
- Reconciliation and validation of conflicting and ambiguous object type classifications;
- Object type prediction from physical properties and historical orbital behaviour, independently of catalogue object type information.

2. Comparing DISCOS and SATCAT

2.1. Catalogue Overview and Dataset Construction

This paper compares the object type classifications provided by CelesTrak's SATCAT² catalogue and ESA's DISCOS³ database using snapshots acquired at the beginning of August 2026.

The dataset construction process starts from the SATCAT catalogue, which initially contains 70,177 catalogued objects. Objects with an associated decay date are first removed to retain only RSOs that remained in orbit at the reference epoch, ensuring that the analysis represents the active orbital population. Subsequently, only objects in LEO are selected, resulting in a working dataset of 28,265 RSOs.

The COSPAR international designator is used as the primary key to retrieve the corresponding entries

from DISCOS. Of the 28,265 selected SATCAT objects, 28,250 (99.95%) are successfully associated with a corresponding DISCOS record, while no DISCOS information is available for the remaining 15 objects. These unmatched objects are removed from the subsequent analysis.

Additional consistency checks among the matched records identify 26 cases in which SATCAT and DISCOS associate the same COSPAR identifier with different NORAD catalogue numbers. Inspection of these cases shows that several occur within groups of related objects, such as fragmentation debris originating from the same breakup event or satellites belonging to the same launch or constellation. Within these groups, NORAD identifiers appear to be shifted or permuted between the two catalogues, although isolated inconsistencies and simple pairwise swaps are also observed. To avoid introducing potentially ambiguous object associations into the analysis, these objects are excluded from the comparison dataset.

2.2. Harmonisation of Classification Schemes

SATCAT adopts a compact object type taxonomy consisting of four mutually exclusive classes: Payload (PAY), Rocket Body (R/B), Debris (DEB), and Unknown (UNK). For the analysed LEO population, the catalogue contains 17,393 payloads, 9,799 debris objects, 984 rocket bodies, and 48 objects classified as unknown.

In contrast, DISCOS employs a more detailed taxonomy that distinguishes not only between payloads, rocket bodies, and unknown objects, but also between several categories of fragmentation debris, mission-related objects, and other debris subclasses. Such classes are: Payload (16,694); Payload Fragmentation Debris (5,278); Rocket Fragmentation Debris (3,609); Rocket Body (992); Rocket Mission Related Object (511); Unknown (498); Payload Mission Related Object (212); Payload Debris (124); and Rocket Debris (36). This finer granularity enables DISCOS to capture additional information regarding the origin and nature of non-operational objects, particularly by distinguishing fragmentation debris from mission-related objects. While these distinctions provide valuable information for many applications, they complicate direct comparisons with SATCAT because several DISCOS classes correspond to a single SATCAT category.

To enable a one-to-one comparison between the two catalogues, the DISCOS taxonomy is harmonised with the simpler SATCAT classification scheme. Payload, Rocket Body, and Unknown retain their direct correspondence, whereas all debris- and mission-related object categories are mapped to the SATCAT Debris class. The complete and official DISCOS object type definitions are provided in Appendix A.

²<https://celestrak.org/satcat/search.php>

³<https://discosweb.esoc.esa.int/>

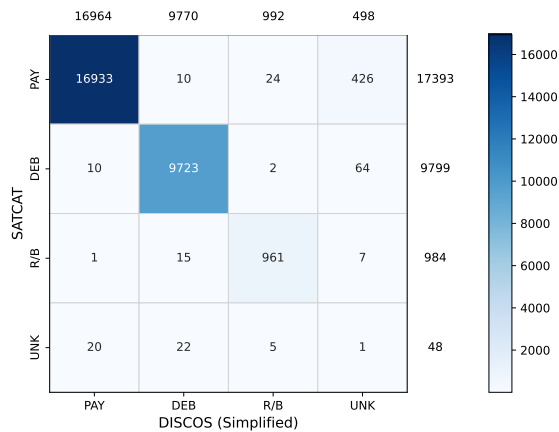


Fig. 1. Comparison of object type classifications provided by SATCAT and the simplified DISCOS taxonomy for the LEO population. Values outside the matrix indicate the total number of objects assigned to each class by the corresponding catalogue.

2.3. Catalogue Comparison

Following the harmonisation procedure, object type classifications from both catalogues are compared on an object-by-object basis using the matched dataset of 28,250 RSOs. Figure 1 presents the resulting confusion matrix after mapping the DISCOS taxonomy onto the four-category SATCAT classification scheme.

The two catalogues exhibit a high degree of agreement when a known object type is provided. Of the 28,250 matched objects, 27,644 receive identical classifications, corresponding to an agreement rate of 97.85%. The remaining 606 objects (2.15%) present discrepant object type assignments between the two sources.

Agreement between the two catalogues is particularly high for known object types, with 16,933 payloads, 9,723 debris objects, and 961 rocket bodies receiving identical classifications in both sources. These results indicate that, despite their different classification philosophies and levels of granularity, both catalogues provide largely consistent object type information for the vast majority of RSOs.

Most discrepancies arise when one of the two catalogues assigns an object to the Unknown category, with only a single object classified as Unknown by both sources. Conversely, 426 objects classified as Unknown in DISCOS are identified as Payloads in SATCAT, while 47 objects classified as Unknown in SATCAT are distributed across the Payload, Debris, and Rocket Body categories in DISCOS. Outside the Unknown category, disagreements are comparatively infrequent and mainly involve objects classified as Debris or Rocket Body.

The relatively small number of discrepant classifications indicates that the two catalogues are largely consistent. Nevertheless, these disagreement cases are of particular interest, as they typically correspond to re-

cently launched objects, mission-related hardware, or objects whose identity or operational status has evolved over time. These cases form the basis of the manual reconciliation procedure described in the following section.

3. Manual Reconciliation of Classification Discrepancies

The 606 objects exhibiting discrepant classifications between SATCAT and DISCOS were manually reviewed to establish a best-knowledge reference label. The reconciliation process aimed to determine the most appropriate object type based on the available evidence, including the information provided by both catalogues, object names, launch context, publicly available mission documentation, and other authoritative sources when necessary.

Some disagreement patterns could be resolved directly without requiring individual inspection. In particular, whenever one catalogue classified an object as Unknown while the other assigned a specific object type, the latter classification was adopted. This affected 47 objects classified as Unknown in SATCAT and 494 objects classified as Unknown in DISCOS, leaving the remaining 62 objects to be individually analysed according to the mismatch patterns discussed below.

SATCAT “PAY” vs DISCOS “DEB”. This mismatch pattern comprises only 10 objects. Inspection of the original DISCOS classifications shows that none of these objects is categorised as fragmentation debris; instead, they are classified as mission-related objects or operational debris associated with launch activities (e.g., adapters or deployment hardware), which are mapped to the simplified DEB category during the harmonisation process. In most cases, the available evidence supports the DISCOS interpretation, as the objects do not constitute operational spacecraft. Two exceptions correspond to deployable sub-satellites classified by DISCOS as *Payload Mission Related Objects*. Since these objects are independent spacecraft with their own mission objectives, they are manually labelled as payloads.

SATCAT “PAY” vs DISCOS “R/B”. This mismatch pattern comprises 24 objects. Inspection of these cases shows that they correspond either to upper stages that remain in orbit following payload deployment or to payloads that remain physically attached to the final stage of the launch vehicle, continuing to orbit as part of a single inert structure. In many cases, the SATCAT designation remains a generic “OBJECT X”, whereas DISCOS provides a specific identification of the launch vehicle stage. The additional contextual information available in DISCOS, together with launch documentation, supports the interpretation of these objects as rocket bodies rather than independent payloads.

SATCAT “DEB” vs DISCOS “PAY”. This mismatch pattern comprises 10 objects. Two correspond to deployable sub-satellites intentionally released to perform independent mission objectives and are classified in DISCOS as payloads. Publicly available information further suggests that one of these objects was used for space environment observation, with speculation about its role in rendezvous and proximity operations. These observations support the interpretation of both objects as operational spacecraft rather than debris, and the DISCOS classification is therefore adopted.

The remaining objects are associated with classified U.S. military missions, for which publicly available information is scarce or intentionally limited. Inspection of the corresponding launches reveals other objects from the same missions that are consistently classified as payloads in SATCAT, suggesting that the debris designation may reflect additional information unavailable from public sources. In the absence of sufficient evidence to justify overriding this assessment, the SATCAT classification is retained for these cases. Consequently, these labels should be regarded as tentative and may be revised as additional information becomes publicly available.

SATCAT “DEB” vs DISCOS “R/B”. This mismatch pattern comprises only two objects. Inspection of the available information indicates that both correspond to spent rocket stages or auxiliary propulsion units remaining in orbit after mission completion. While SATCAT classifies these objects as debris, DISCOS identifies them as rocket bodies. No publicly available evidence was found to support the debris interpretation. Since both objects remain structurally identifiable as launch vehicle components, the DISCOS classification is adopted in the manual reconciliation.

SATCAT “R/B” vs DISCOS “PAY”. This mismatch pattern comprises a single object. Unlike the previous cases, publicly available sources do not provide a clear identification supporting the DISCOS payload classification. Furthermore, inspection of the orbital evolution reveals a continuous orbital decay with no evidence of manoeuvring or operational activity, consistent with the expected behaviour of a passive object. Although this evidence is not conclusive, it favours the interpretation of the object as a rocket body, and the SATCAT classification is therefore retained.

SATCAT “R/B” vs DISCOS “DEB”. This mismatch pattern comprises 15 objects. Inspection of the original DISCOS classifications shows that, with the exception of a single fragmentation debris object, all are classified as Payload Mission Related Objects or Rocket Mission Related Objects. Most correspond to identifiable propulsion hardware, such as boost motors, apogee kick

motors, or ullage motors, which are manually classified as Rocket Bodies because they remain structurally recognisable propulsion units despite no longer being operational. Conversely, auxiliary launch hardware, including adapters, fairings, and protective covers, are classified as Debris, as these objects do not constitute complete rocket bodies. The single fragmentation debris object is likewise labelled as Debris.

4. Data Drift and Operational Considerations

The comparison between the manually reconciled labels and the original catalogue classifications also revealed an important temporal effect in the availability of object type information. In particular, the most recent objects contained a substantially larger proportion of Unknown classifications in DISCOS than the overall population. This represents a form of data drift: although the classification taxonomy itself remains unchanged, the distribution and completeness of the information available evolve over time.

This observation has two important implications. First, it further illustrates the limitations of relying on a single catalogue as a permanent source of ground truth. A classification strategy that depends exclusively on one source may become less reliable as its coverage changes, even when the underlying classification scheme remains stable.

Second, it affects how a machine learning classifier should be used in practice. When SATCAT and DISCOS provide the same object type, there is little operational benefit in invoking an additional classifier. Similarly, when one catalogue reports an Unknown type while the other provides a known classification, adopting the available classification constitutes a simple and effective fallback strategy.

This effect was particularly evident when a chronological train-test partition was considered. The most recent portion of the dataset contained a comparatively large number of objects for which one of the catalogue classifications was Unknown. After removing these cases, the remaining evaluation sample was considerably smaller. Consequently, this subset did not provide sufficient challenging cases to meaningfully assess whether a machine learning model could improve upon the catalogue-based baselines.

These observations suggest that the most relevant role for a predictive model is not to systematically replace existing catalogue classifications. Instead, it can provide an independent source of evidence when catalogue information is unavailable, contradictory, or otherwise uncertain. This consideration motivates the object type prediction approach presented in the following section, in which the catalogue-provided object type fields are excluded from the predictive features.

5. Object Type Prediction

5.1. Feature Engineering

The manually reconciled labels described in the previous section constitute the reference dataset used to train a supervised machine learning model for object type prediction. Following the considerations discussed above, objects for which either SATCAT or DISCOS reported an Unknown classification were excluded from the modelling dataset. Objects for which both catalogues provided a known and concordant classification were retained as labelled examples for training the classifier. After this filtering, and with the remaining Unknown manual label excluded, the prediction task was formulated as a three-class classification problem comprising Payload, Rocket Body, and Debris.

Rather than relying on the object type information already provided by SATCAT or DISCOS, the proposed model aims to infer the reconciled object type from independent physical and orbital characteristics. In particular, the historical orbital evolution of an object can provide information regarding its dynamical behaviour that complements static physical properties such as its mass and dimensions.

To incorporate this information while preserving a tabular learning framework, historical two-line element (TLE) sets⁴ were used to derive descriptive features for each object. Only TLE data from 2026 were considered. This provides a recent representation of the orbital behaviour of the objects while limiting the computational and storage requirements associated with processing large historical TLE archives. Restricting the analysis to this period also provides a simple and reproducible initial configuration. The influence of the observation period constitutes a natural direction for future work, where longer or shorter temporal windows could be evaluated to determine the amount of orbital history required for reliable classification.

For each object, the historical evolution of the semi-major axis (a), inclination (i), eccentricity (e), BSTAR drag term, and mean motion (n) was considered. Four statistical descriptors were computed for each parameter: the maximum absolute variation (`max_delta`), the standard deviation (`std`), the median absolute deviation (`mad`), and the mean rolling standard deviation (`rolling_std_mean`). These descriptors provide a compact representation of orbital variability while preserving the tabular structure required by the machine learning model considered.

The TLE-derived descriptors were complemented with additional features characterising the orbital evolution, including the observation time span, drag index, and eccentricity variation rate. Physical information obtained from DISCOS, namely the estimated mass and characteristic span of each object, was also included. The object type classifications supplied by SATCAT and DISCOS were deliberately excluded from the predictive

features, so that the model could provide an independent source of classification evidence rather than reproduce the information already available from the catalogues.

5.2. Classification Methodology

Object type prediction was formulated as a supervised multi-class classification problem using the XGBoost algorithm [3]. XGBoost was selected due to its strong performance on heterogeneous tabular datasets, its ability to model complex non-linear relationships, and its suitability for combining physical and orbital features with substantially different distributions and scales.

To provide an evaluation representative of the intended application to newly catalogued objects, the dataset was divided chronologically into training (80%) and testing (20%) subsets.

Hyperparameter optimisation was performed on the training set using five-fold stratified cross-validation. A grid search explored combinations of the maximum tree depth, learning rate, and number of boosting iterations. The macro-averaged F_1 -score was adopted as the optimisation metric to account for the substantial imbalance between the three object classes.

To assess the robustness of the proposed methodology, the optimisation and training procedure was repeated using five different random seeds. For each repetition, the optimal hyperparameter combination identified during cross-validation was used to train a final model, which was subsequently evaluated on the chronologically held-out test set. The reported performance metrics correspond to the mean and standard deviation obtained across the five runs.

5.3. Results

Table 1. Classification performance of the object type prediction model across five runs. Results are reported as mean $\pm$ standard deviation.

Class	Precision	Recall	F_1 -score
Macro	0.950 $\pm$ 0.006	0.855 $\pm$ 0.009	0.890 $\pm$ 0.008
PAY	0.995 $\pm$ 0.000	0.999 $\pm$ 0.000	0.997 $\pm$ 0.000
DEB	0.966 $\pm$ 0.005	1.000 $\pm$ 0.000	0.982 $\pm$ 0.003
R/B	0.889 $\pm$ 0.015	0.566 $\pm$ 0.027	0.692 $\pm$ 0.023

Table 1 summarises the classification performance obtained across the five runs. The model achieved a macro-averaged F_1 -score of 0.890 $\pm$ 0.008, with limited variability between runs. This indicates that the classifier is able to recover the manually reconciled object types with consistent performance using only physical characteristics and features describing the historical orbital evolution, without relying on the object type classifications provided by either catalogue.

Performance was particularly strong for Payload and Debris objects. Payloads achieved an F_1 -score of

⁴<https://www.space-track.org/#gp>

0.997 ± 0.000 , with both precision and recall approaching unity. Debris objects were also reliably identified, with an F_1 -score of 0.982 ± 0.003 and a recall of 1.000 ± 0.000 . The consistency of these metrics across the five runs suggests that the characteristics separating these two classes are robustly captured by the selected features.

Rocket Bodies represented the most challenging class. Although the model achieved a relatively high precision of 0.889 ± 0.015 , recall decreased to 0.566 ± 0.027 , resulting in an F_1 -score of 0.692 ± 0.023 . The confusion matrix in Fig. 2 provides further insight into this behaviour. On average, 40.2 ± 1.7 Rocket Bodies were correctly classified, while 28.8 ± 1.7 were classified as Payloads. Only 2.0 ± 0.0 were incorrectly assigned to the Debris class. Conversely, misclassification of Payloads and Debris remained very limited. This indicates that the principal ambiguity encountered by the classifier lies in distinguishing Rocket Bodies from Payloads rather than in separating intact objects from debris.

The feature attribution analysis shown in Fig. 3 provides additional insight into the information used by the classifier. Mass and span exhibit the largest mean absolute SHAP values [4], indicating that the physical characteristics of an object provide the strongest contribution to the predicted object type. Their contribution is particularly pronounced for the Payload class, suggesting that these static physical properties provide substantial discriminatory information for identifying payload objects.

Nevertheless, the relative importance of the features differs across object types. While mass and span dominate the contributions associated with Payload classification, features describing the historical orbital evolution become comparatively more relevant for Rocket Bodies and Debris. In particular, the maximum variation in semi-major axis ($a_{\max_delta}$) shows a substantial contribution to both classes, while several descriptors associated with the BSTAR drag term, including its maximum variation and rolling variability, are especially prominent for Debris. Variations in eccentricity and the derived drag index provide additional, although smaller, contributions.

This class-dependent pattern is particularly relevant because it indicates that the model combines different sources of information depending on the object being classified. Static physical characteristics provide strong discriminatory information, especially for Payloads, whereas features capturing orbital variability and drag-related behaviour contribute more prominently to the distinction of Rocket Bodies and Debris. The historical TLE information therefore provides complementary information beyond the physical characteristics of the objects and contributes to the ability of the model to discriminate between the three classes.

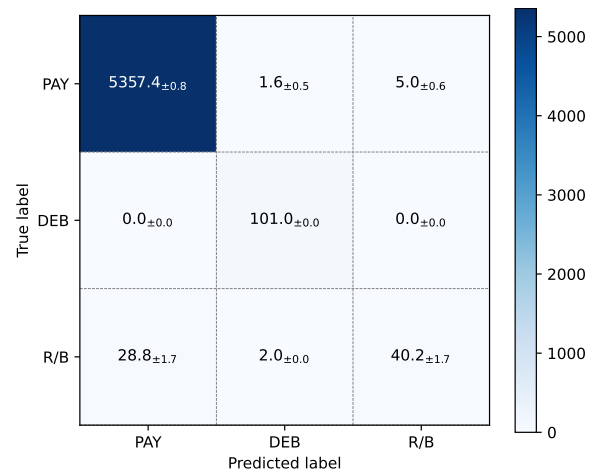


Fig. 2. Confusion matrix for the object type prediction model on the chronologically held-out test set. Values represent the mean number of predictions across five runs, with the standard deviation reported as a subscript.

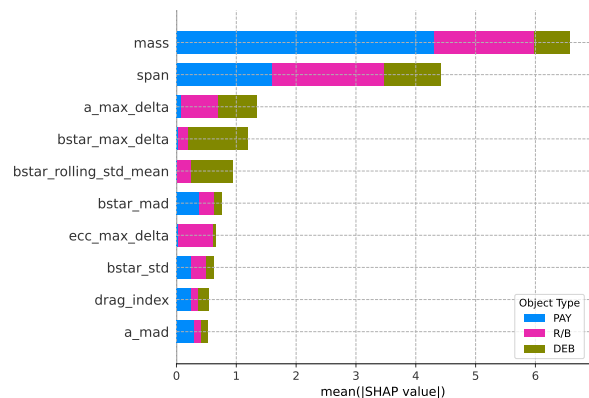


Fig. 3. Top ten features contributing to the object type predictions, ranked by mean absolute SHAP value. Colours indicate the contribution associated with each object type.

6. Conclusion

This work compared and reconciled the object type classifications provided by SATCAT and DISCOS for the LEO population. The two catalogues show high agreement when a known classification is available, while most discrepancies are associated with incomplete information or different stages of object identification. Rather than indicating that one source is preferable, these results highlight their complementary nature and the value of using both sources together.

The analysis also revealed temporal changes in catalogue completeness, with an increased occurrence of Unknown classifications among more recent objects. Such data drift reinforces the limitations of relying on a single source, particularly in operational applications where catalogue coverage may evolve over time.

The manually reconciled object type was predicted

with a macro F_1 -score of $0.890_{\pm 0.008}$ without using the object type classifications from either catalogue. Payload and Debris objects were identified with high reliability, while Rocket Bodies remained the main source of confusion. These results support combining multiple catalogue sources with independent physical and orbital information to improve object characterisation when catalogue information is incomplete or uncertain.

Acknowledgements

This work was carried out under the Project “Artificial Intelligence Fights Space Debris” N° C626449889-0046305 co-funded by the Recovery and Resilience Plan and NextGeneration EU Funds (www.recuperarportugal.gov.pt). This work was partially supported by NOVA LINC UID/04516/2025 (FCT.IP), UID/PRR/04516/2025, UID/PRR2/04516/2025 (NextGenerationEU).

References

- [1] T. Flohrer, S. Lemmens, B. Bastida Virgili, H. Krag, H. Klinkrad, E. Parrilla, N. Sanchez, J. Oliveira, and F. Pina. DISCOS: Current Status and Future Developments. *6th European Conference on Space Debris*, 2013.
- [2] Marta Guimaraes, Claudia Soares, and Chiara Manfletti. Predicting the Properties of Resident Space Objects in LEO using Graph Neural Networks. In *Proceedings of the Small Satellite Conference*, 2024.
- [3] Tianqi Chen and Carlos Guestrin. XGBoost: A Scalable Tree Boosting System. In *Proceedings of the 22nd ACM SIGKDD International Conference on Knowledge Discovery and Data Mining*, KDD ’16, pages 785–794. Association for Computing Machinery, 2016.
- [4] Scott M Lundberg and Su-In Lee. A Unified Approach to Interpreting Model Predictions. In I. Guyon, U. V. Luxburg, S. Bengio, H. Wallach, R. Fergus, S. Vishwanathan, and R. Garnett, editors, *Advances in Neural Information Processing Systems 30*, pages 4765–4774. Curran Associates, Inc., 2017.
- [5] ESA Space Debris Office. ESA’S Annual Space Environment Report. 2026.

A. DISCOS Object Type Definitions

The following definitions are reproduced verbatim from the *ESA’s Annual Space Environment Report* [5].

Payloads Space object designed to perform a specific function in space excluding launch functionality. This includes operational satellites as well as calibration objects.

Payload Mission Related Objects Space objects released as space debris which served a purpose for the functioning of a payload. Common examples include covers for optical instruments or astronaut tools.

Payload Fragmentation Debris Space objects fragmented or unintentionally released from a payload as space debris for which their genesis can be traced back to a unique event. This class includes objects created when a payload explodes or when it collides with another object.

Payload Debris Space objects fragmented or unintentionally released from a payload as space debris for which the genesis is unclear but orbital or physical properties enable a correlation with a source.

Rocket Body Space object designed to perform launch related functionality. This includes the various orbital stages of launch vehicles, but not payloads which release smaller payloads themselves.

Rocket Mission Related Object Space objects intentionally released as space debris which served a purpose for the function of a rocket body. Common examples include shrouds and engines.

Rocket Fragmentation Debris Space objects fragmented or unintentionally released from a rocket body as space debris for which their genesis can be traced back to a unique event. This class includes objects created when a launch vehicle explodes.

Rocket Debris Space objects fragmented or unintentionally released from a rocket body as space debris for which the genesis is unclear but orbital or physical properties enable a correlation with a source.