Optimizing CatBoost Model: AI-Based Analysis on Rail Transit Figma Platform Practice

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***Abstract*—The research introduces a novel approach that utili zes the Frilled Lizard Optimization (FLO) algorithm to enhance t he hyperparameters of the CatBoost model. First, the Figma platf orm is analyzed in terms of its innovative design applications in r ail transit. Then, the FLO algorithm is applied to optimize the Ca tBoost model, improving its accuracy in detecting foreign objects on rail tracks. Experiments were conducted using a dataset of 6,0 00 images from rail transit scenarios, divided into seven categorie s such as left-turning track, straight track, train, pedestrians, and others. The result showed that the FLO-CatBoost model demons trated superior performance in accuracy, achieving a Root Mean Square Error (RMSE) of 0.274, significantly outperforming other algorithms like TSA, MPA, and RSA. Furthermore, FLO-CatBo ost reduced the Mean Absolute Percentage Error (MAPE) and sh owed better efficiency in evaluation time. Finally, the FLO-CatBo ost model significantly enhances the design and evaluation proces ses for intelligent rail transit systems on the Figma platform, prov iding higher accuracy and efficiency in detecting foreign objects a nd improving system design performance.**

Keywords*—Rail transport; Figma platform innovation design; intelligent analysis and evaluation algorithm; umbrella lizard optimisation algorithm; CatBoost

I. INTRODUCTION

Rapidly developing artificial intelligence technology as well as Internet technology has driven the development of software innovation, which has received attention from scholars and experts at home and abroad [1]. Figma software, as an online collaborative and instantaneous design software, can assist designers in creating, collaborating and iterating design projects [2]. Due to the advantages of real-time, collaboration, compatibility, synchronisation, and cloud storage, Figma design platform has an increasingly wide range of application areas, and receives more and more attention and research from experts in the field. In the field of rail transit, with the rapid development of rail transit, the train speed is getting faster and faster, and the way of judging the foreign objects in front of the car by human beings is no longer adapted to the development of the current era [3]. The study of accurate autonomous detection methods of foreign objects in rail transit not only reduces the rate of rail transit accidents, but also strengthens the detection and processing of emergency events in rail transit [4]. In order to generalise the application of autonomous detection system for foreign objects in rail transit and improve the design efficiency of autonomous detection system for foreign objects in rail transit, the combination of Figma design platform has become the development trend and method of intelligent system design. The research on innovative design of rail transit system combined with Figma design platform includes the research on design principle analysis, design method testing and evaluation, etc., in which the design method testing and evaluation includes the research on design effect evaluation index extraction, evaluation system construction, design effect evaluation model construction combined with Figma design platform. Ye et al. [5] analysed the Figma design method for rail transit, and verified the testing accuracy and efficiency of the proposed method through the image dataset. Zhao [6] proposed an innovative design scheme and idea by combining with the Figma design platform. Maricar et al. [7] took the financial service as the background, and used the Figma to innovatively design its management system and made a quantitative analysis of the system. Cheng and Cai [8] proposed a deep learning algorithm based design platform evaluation and analysis method, and used a public dataset to verify the method to improve the design effect. Liu et al. [9] analysed the efficiency of Figma development and design, and gave a qualitative comparative analysis. With the complexity of intelligent systems, the simple Figma design platform effect analysis and evaluation method can no longer meet the assessment of the predictive accuracy effect, and reduces the efficiency of feedback optimisation. The proposal and development of integrated learning technology and intelligent optimisation algorithms accelerate the efficiency and analysis accuracy of Figma design platform application [10].

In order to improve the analysis and evaluation accuracy of the design effect of Figma platform and enhance the design efficiency, this paper proposes an intelligent analysis and evaluation method of Figma platform based on intelligent optimisation algorithm-CatBoost. By analysing the innovative design problems of Figma platform in rail transit, it introduces the related key on seems, and around the Figma platform intelligent analysis and evaluation problems, it combines the umbrella lizard optimization algorithm with CatBoost to construct Figma platform intelligent analysis and evaluation model. The data images of foreign objects in rail transit are brought into the model system for analysis and evaluation, and the results are compared and analysed with those of multiple algorithms to verify the effectiveness of the model in improving the precision and efficiency, as well as the accuracy of the evaluation.

II. FIGMA PLATFORM FOR RAIL TRANSPORT

A. Figma Platform

Figma is a popular online collaborative design tool [11], which supports real-time collaboration and browser-based design, and is widely used for UI/UX design. Figma provides a comprehensive design platform that includes design, prototyping, collaboration, and version control features, as

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shown in Fig. 1. It aims to make design work more powerful, convenient, and approachable for individual designers, teams, and enterprises.

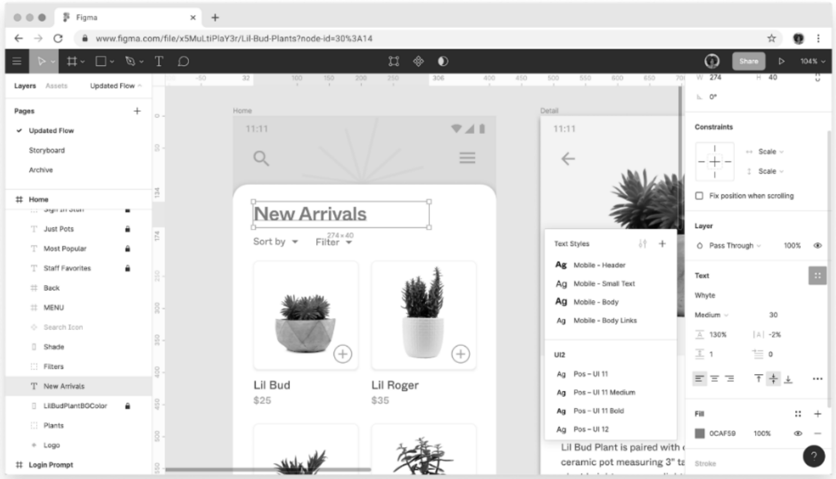

Fig. 1. Figma platform.

1) Figma characteristics: According to the analysis of Figma application, Fig. 2 presents that Figma has the following features and functions [12]:

- Figma allows multiple users to work on the same design file at the same time, while viewing and editing each other's content in real time;
- Many files are stored in Figma Cloud, users can access and edit files on any device at any time, without worrying about file synchronisation;
- Figma has a built-in prototype tool that allows users to create interactive prototypes directly in the design for easy testing and demonstration;
- Figma can record the history function, users can view and restore the past design state;
- In Figma, designers can create reusable components and styles for easy consistency throughout the design;
- Figma supports third-party plug-in development to expand functionality;
- Figma can be used on multiple operating systems and browsers.

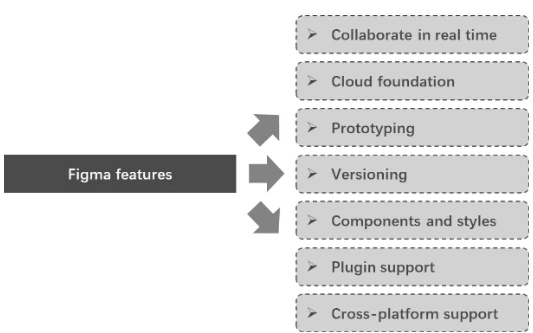

Fig. 2. Figma characteristics.

2) Figma application: Figma has become one of the standard tools in the design world, surpassing competitors such as Sketch, Adobe XD, etc., and has more than 4 million active users in more than 100 countries around the world. Figma's user base includes companies in a wide range of industries such as IT, financial services, advertising, retail, professional training, etc. (Fig. 3), such as Microsoft, Twitter, Dropbox, etc. [13].

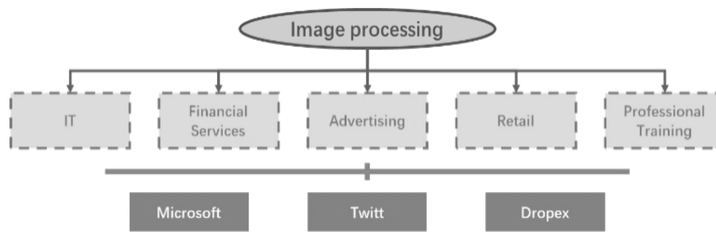

Fig. 3. Current status of Figma applications.

3) Figma design: Figma's design interfaces typically include the following four core components (Fig. 4):

- Canvas (Canvas). This area can hold various design elements such as shapes, text, images, etc.
- Sidebar. This section contains toolbars, layer lists and property panels. Designers can select and modify the properties of design elements through the sidebar.
- Top Menu Bar (Top Menu Bar). This section provides shortcuts to functions such as file management, editing, and view control.
- Component Library (Component Library). This section allows designers to create reusable design elements such as buttons, icons, etc. to be shared and maintained throughout the project [14].

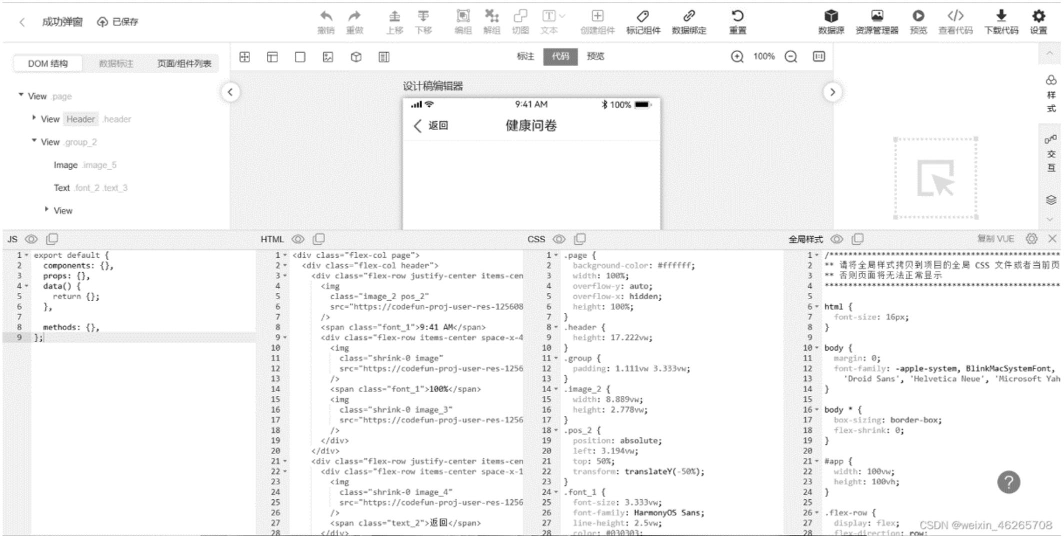

Fig. 4. Figma design interface.

B. Innovative Design Solutions

In order to improve the efficiency of intelligent rail transit autonomous detection system design, this paper proposes an intelligent rail transit autonomous detection system design scheme based on Figma platform, and at the same time, for the effectiveness of the scheme, an efficient machine learning algorithm is used to analyse and evaluate the performance of the intelligent rail transit autonomous detection system design method based on Figma platform.

1) Figma-based platform autonomous detection system: Intelligent rail transit autonomous detection system includes three parts: image acquisition layer, intelligent processing layer, and decision control layer. The system collects images through the starlight camera and inputs them to the image information processing system; the image information processing system analyses the collected data images in real time and identifies the track foreign objects and retrograde with high precision, and then gives correct decision-making information [15], the specific composition diagram is shown in Fig. 5.

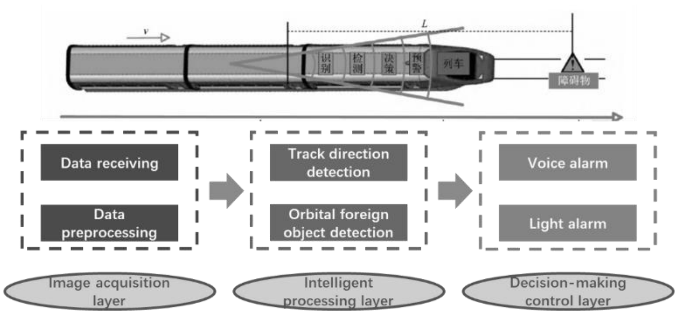

Fig. 5. Autonomous detection system for intelligent rail transit.

Combined with Figma platform, the design scheme of intelligent rail transit autonomous detection system based on Figma platform is proposed, as shown in Fig. 6. The design process of this design scheme is as follows: 1) In-depth study of the characteristics of the rail transit industry, user groups, existing workflows, and challenges, to determine the design objectives and core functional requirements; 2) Based on the results of the requirements analysis, conceptual design and preliminary sketches; 3) Interaction design using Figma, to create low-fidelity and high-fidelity prototypes of autonomous detection for rail transit; 4) Design After the prototype is completed, conduct user testing and collect user feedback; 5) conduct visual design on the basis of interaction design to ensure that the design style is in line with the professional image of the rail transport industry; 6) transform the design into an actual application, while ensuring the feasibility of the design and performance optimization; 7) conduct comprehensive testing after the completion of the development, and then carry out on-line deployment; 8) after the launch of the platform, continuously monitor the platform After going live, continuously monitor the platform's operation status and carry out the necessary maintenance and functional iteration and upgrade according to the feedback.

2) Analysis and evaluation programme: According to the design scheme combining Figma platform, this paper analyses and evaluates the Figma design effect of the rail transit detection system from six aspects [16] (Fig. 7), including the target and core function design A, sketching B, prototyping C, Figma platform interactivity D, operation of the rail transit detection system E, and analysis of the detection results F. By extracting the Figma design effect analysis assessment indicators, construct the assessment indicator set, use data preprocessing methods based on missing value deletion, noise data deletion, normalization, feature selection and other data preprocessing methods to process the assessment indicator dataset, annotate and divide the dataset, and combine with optimized CatBoost technology to construct the mapping relationship between the Figma design effect indicator values and the analysis and evaluation scores, and analyse and compare their performance, the specific overall idea is shown in Fig. 8.

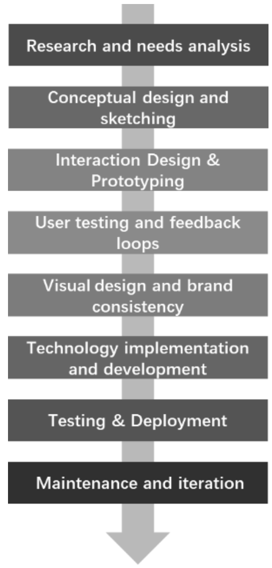

Fig. 6. Autonomous detection system for intelligent rail transit based on Figma platform.

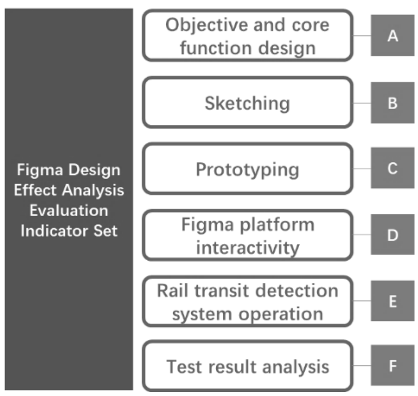

Fig. 7. The evaluation aspects of Figma's design effects analysis.

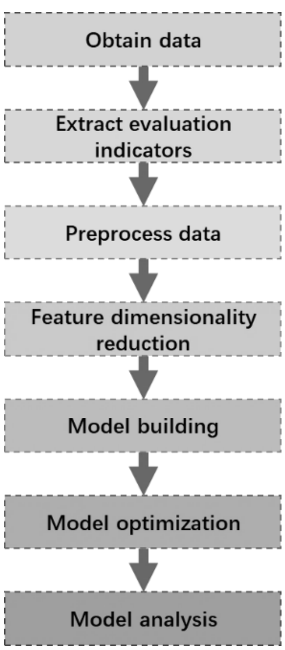

Fig. 8. Ideas for evaluating Figma's design effect analysis.

According to the design idea in Fig. 8, the analysis and evaluation scheme of rail transit detection system combined with Figma design platform includes key technologies such as autonomous detection design of rail transit on Figma platform, data acquisition, extraction of indicator set for analysis and evaluation of Figma design effect, data preprocessing, data annotation and division, and construction and optimisation of model for analysis and evaluation of Figma design effect, etc., and the specific key technologies are shown in Fig. 9. The specific key technologies are shown in Fig. 9.

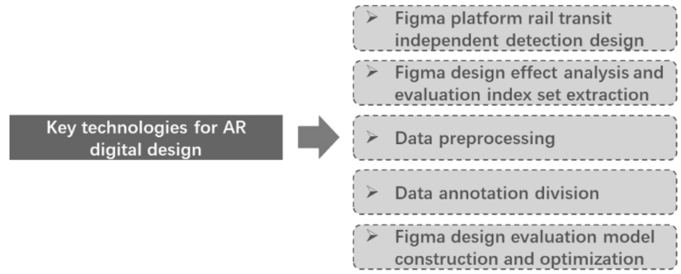

Fig. 9. Figma design effectiveness analysis and evaluation key technology.

III. Analysis and Evaluation Algorithms

A. Analysis of Intelligent Analytics Assessment Issues

According to the analysis of the key technology of Figma design effect analysis and assessment, Figma design intelligent analysis and assessment research as the key technology of the rail transit detection system analysis and assessment system combined with Figma design platform, by using the improved and efficient intelligent machine learning algorithm to fit the mapping relationship between the effect analysis assessment indicator values and assessment scores, as shown in Fig. 10. In this paper, CatBoost is used to construct the mapping relationship between assessment index values and assessment scores, and the umbrella lizard optimisation algorithm is used to optimise the hyper-parameters of CatBoost technology to improve the accuracy of analysis and assessment of the Figma design effect and enhance the effect of Figma design.

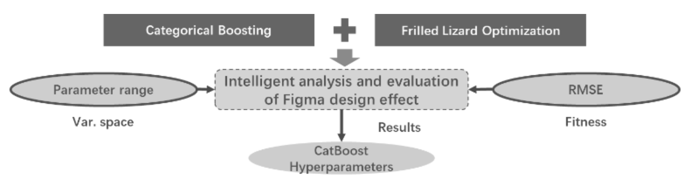

Fig. 10. Figma design analysis and evaluation method based on improved and efficient machine learning algorithm.

B. CatBoost Technology

CatBoost (Categorical Boosting) [17] is a gradient boosting algorithm that consists of two techniques, Categorical and Boosting, which can be used to handle classification and regression problems. It is one of the algorithms belonging to the Gradient Boosting Decision Trees (GBDT) family of algorithms and is well known for its ability to handle categorical features. CatBoost is able to automatically convert categorical features to numerical features, reducing the need for manual feature engineering, and is able to handle high cardinality categorical features without inducing dimensionality disaster, the structure of which is shown in Fig. 11. In addition, CatBoost effectively reduces the bias of gradient estimation and improves the accuracy and generalisation ability of the model by using symmetric tree and sort boosting methods.

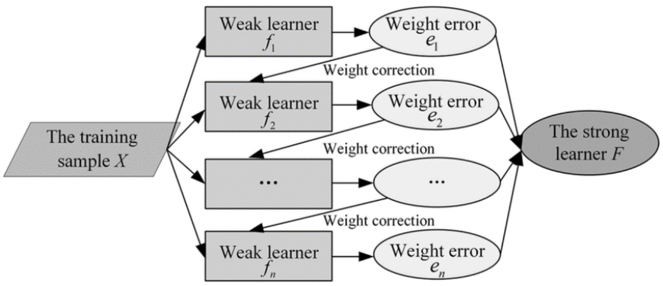

Fig. 11. CatBoost structure.

In CatBoost decision tree, CatBoost uses the Greedy TS method to process the category features [18], and equation changes are made to avoid conditional bias as follows:

$$x_k^i = \frac{\sum_{x_j \in D_k} \left\{ x_k^i = x_j^i \right\} \times y_i + aP}{\sum_{x_j \in D_k} \left\{ x_k^i = x_j^i \right\} + a} \tag{1}$$

Among them, P is the a priori value, which is mainly used to smooth the noise, a is the weight coefficient, and $\left\{ x_k^i = x_j^i \right\}$ is mainly used to judge whether the current sample k and sample j are in the same category, and the same is 1, and vice versa is 0.

Compared with other algorithms in the Boosting cluster class, the CatBoost algorithm is able to handle discrete feature data well and is suitable for problems with multiple input features. The CatBoost algorithm has the following features [19]: 1) automatic processing of category-based features; 2) reduction of gradient bias; 3) handling of missing values; 4) good robustness; 5) ease of use; 6) support for GPU acceleration; 7) Built-in cross-validation, as shown in Fig. 12.

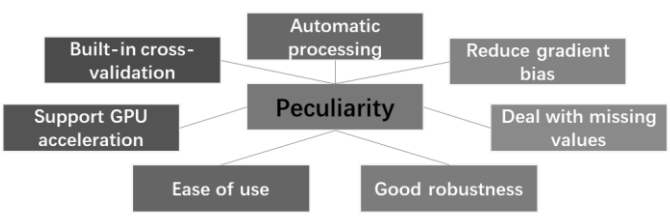

Fig. 12. CatBoost characteristics.

CatBoost is widely used for a variety of machine learning tasks due to its high performance and ease of use, including but not limited to financial risk assessment, recommender systems, bioinformatics, and natural language processing. Its ability to handle large-scale datasets and to deal with complex nonlinear relationships has made it the algorithm of choice in many real-world application scenarios [20-21].

C. Improved CatBoost Evaluation Model Based on Umbrella Lizard Optimisation Algorithm

With the increase of input data dimension, CatBoost algorithm training optimisation will fall into local optimum [21]. In order to improve the regression accuracy of CatBoost algorithm, this paper chooses the umbrella lizard optimisation algorithm to optimise the hyperparameters of CatBoost algorithm, so as to make the Figma platform innovation design analysis and evaluation model error to reach the minimum.

1) Umbrella lizard optimisation algorithm: Frilled Lizard Optimization (FLO) [22], as a biological meta-heuristic based algorithm, simulates the unique hunting behaviour of umbrella lizards in their natural habitat. The algorithm has a unique algorithmic structure and a novel iterative approach with strong adaptive optimisation capabilities.

The main diet of the wrinkled lizard is insects and other invertebrates, although it rarely eats vertebrates as well. Primary prey include centipedes, ants, termites, and moth larvae. The frilled lizard is a sit-and-wait predator, looking for potential prey. Upon seeing prey, the frilled lizard runs quickly on two legs and attacks the prey, catching it and eating it. After feeding, the frilled lizard retreats to a tree.

a) Initialisation: Like other optimisation algorithms, the FLO algorithm uses random initialisation for the population of wrinkled lizards:

$$X = \begin{bmatrix} X_1 \\ \vdots \\ X_i \\ \vdots \\ X_N \end{bmatrix}_{N \times m} = \begin{bmatrix} x_{1,1} & \cdots & x_{1,d} & \cdots & x_{1,m} \\ \vdots & \ddots & \vdots & \iddots & \vdots \\ x_{i,1} & \cdots & x_{i,d} & \cdots & x_{i,m} \\ \vdots & \iddots & \vdots & \ddots & \vdots \\ x_{N,1} & \cdots & x_{N,d} & \cdots & x_{N,m} \end{bmatrix}_{N \times m} \tag{2}$$

$$x_{i,d} = lb_d + r \cdot \left(ub_d - lb_d \right) \tag{3}$$

where X denotes the population of frilled lizards, X_i denotes the ith frilled lizard, $x_{i,d}$ is the d-dimensional position of the ith frilled lizard, and lb_d and ub_d denote the lower and upper boundaries of the d-dimension, respectively.

b) Hunting strategy (exploratory phase): One of the most typical natural behaviours of frilled lizards is hunting strategy animals. The frilled lizard is a sit-and-wait predator that attacks its prey when it sees it. The first stage of the FLO algorithm uses a hunting strategy, which is modelled as follows:

$$x_{i,d}^{P_1} = x_{i,d} + r \cdot \left(SP_{i,d} - I \cdot x_{i,d} \right) \tag{4}$$

$$X_i = \begin{cases} X_i^{P_1} & F_i^{P_1} < F_i \\ X_i & else \end{cases} \tag{5}$$

Where, $x_{i,d}^{P_1}$ denotes the location information of the ith frilled lizard in the dth dimension in the first stage of the FLO algorithm, r is a random number between 0 and 1, $SP_{i,d}$ denotes the location information of the ith frilled lizard in the dth dimension for selecting the prey, I is a randomly selected number of the 1 and 2 number set, $F_i^{P_1}$ denotes the fitness value of $X_i^{P_1}$, and F_i denotes the fitness value of X_i.

c) Tree-climbing strategy (development phase): After feeding, the frilled lizard retreats to the top of a tree near its location. By modelling the movement of the frilled lizard to the top of the tree, the decision space position of the population individuals is made to change slightly, thus improving the algorithm's ability to exploit local search. In the second stage of FLO, the positions of population individuals in the solution space are updated according to the post-feeding tree-climbing strategy. The specific model is as follows:

$$x_{i,d}^{P_2} = x_{i,d} + (1-2r)\cdot\left(\frac{ub_d - lb_d}{t}\right) \tag{6}$$

$$X_i = \begin{cases} X_i^{P_2} & F_i^{P_2} < F_i \\ X_i & else \end{cases} \tag{7}$$

where, $X_i^{P_2}$ denotes the location information of the ith frilled lizard in the second stage of the FLO algorithm, $x_{i,d}^{P_2}$ denotes the information of the ith frilled lizard in the dth dimension in the second stage, t is the current number of iterations, and $F_i^{P_2}$ denotes the fitness value of $X_i^{P_2}$.

Combining the hunting strategy and tree-climbing strategy of the FLO algorithm, the step-by-step flow of the FLO algorithm (Fig. 13) is as follows:(a)

2) FLO-CatBoost: In order to enhance the design effect of Figma rail transit autonomous detection and improve the accuracy of analysis and evaluation performance, this paper takes CatBoost hyperparameters (number of decision trees, learning rate, maximum depth of the tree and L2 regularisation term) as the optimisation variables, FLO algorithm hunting strategy and tree-climbing strategy as the optimisation method, and RMSE error value as the fitness value function to optimise the CatBoost model. The specific process steps are shown in Fig. 14.

3) Application of FLO-CatBoost in analysing and evaluating the design effect of autonomous detection in Figma platform rail transit: In order to construct the Figma platform rail transit autonomous detection design effect analysis and evaluation model, this paper applies FLO-CatBoost to the Figma platform innovation design intelligent analysis and evaluation problem, and its specific application process is shown in Fig. 15.The application of FLO-CatBoost in Figma platform rail transit autonomous detection design effect analysis and evaluation mainly includes three parts The application of FLO-CatBoost in Figma platform rail transit autonomous testing and design effect analysis and evaluation mainly includes three parts, i.e. Figma platform rail transit autonomous testing and design effect analysis and evaluation index construction part, data pre-processing part, and Figma platform rail transit autonomous testing and design effect analysis and evaluation model construction and optimisation part. In the first part, the assessment indicators are extracted and the assessment indicator system is constructed by analysing the Figma platform innovative design intelligent analysis assessment problem; in the second part, the indicators are feature extracted by abnormal data preprocessing and normalizing the data set; in the third part, the mapping relationship between the values of the effect analysis assessment indicators and the assessment scores is constructed by using the CatBoost technology and the FLO algorithm is used to Optimisation of CatBoost model hyperparameters.

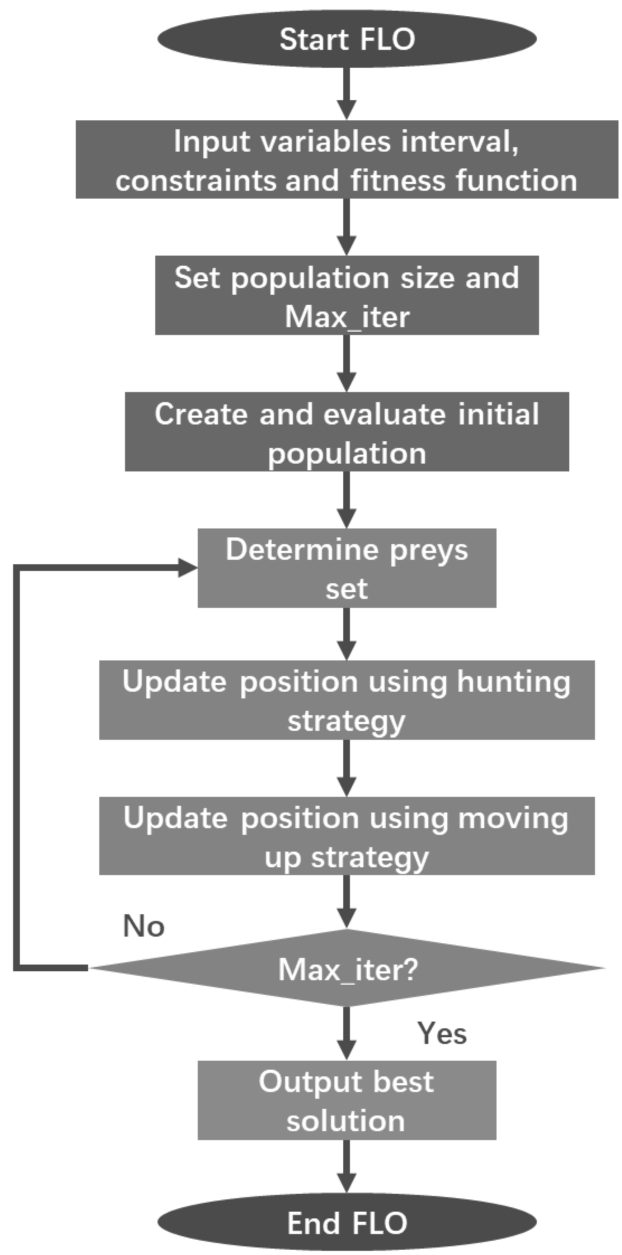

Fig. 13. Flowchart of FLO algorithm.

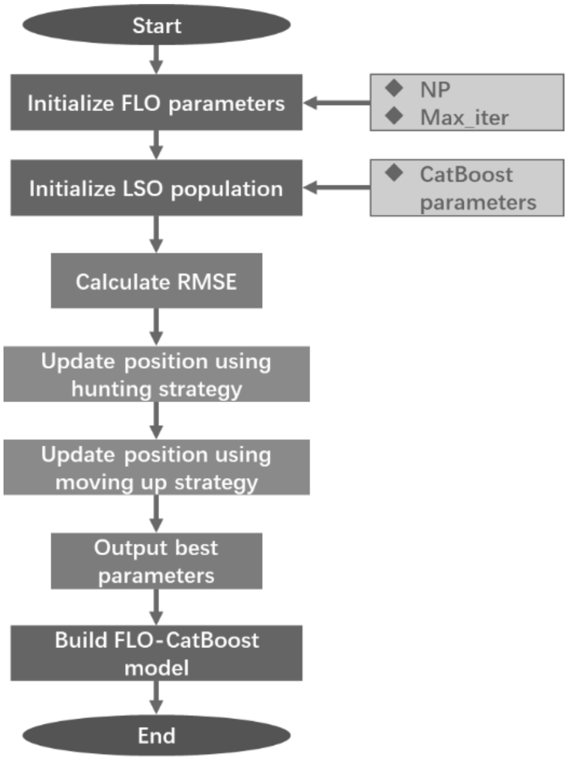

Fig. 14. Flowchart of FLO-CatBoost algorithm.

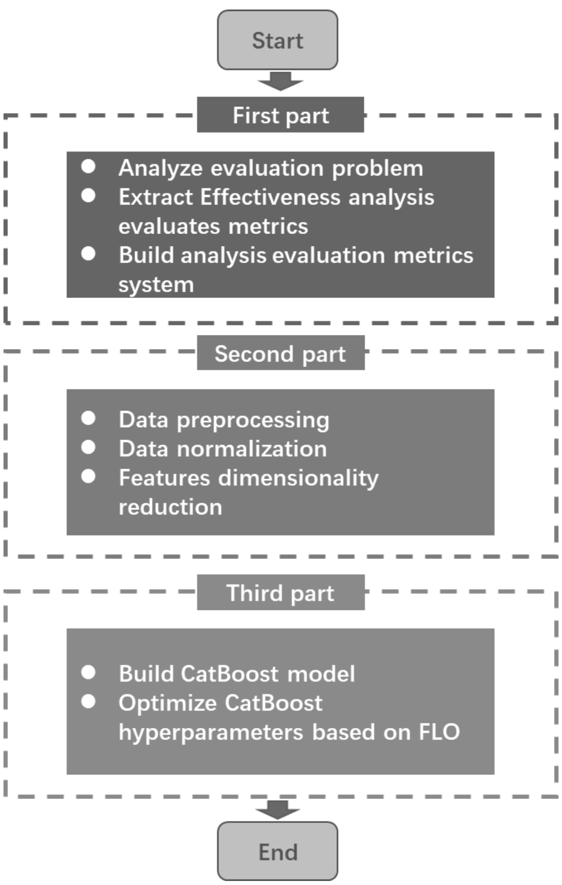

Fig. 15. Application of intelligent analysis and evaluation model for Figma platform combined with FLO-CatBoost.

IV. Simulation Results

A. Experimental Set-up

In this paper, FLO-CatBoost algorithm is simulated and tested in Python 3.7 environment and compared with TSA, MPA, RSA, WSO algorithms. The common parameters of TSA, MPA, RSA, WSO, FLO algorithms include the number of populations, the maximum number of iterations, and their values are set to 100, 1000, respectively. The values of TSA, MPA, RSA , WSO, FLO algorithms other algorithm settings are shown in Table I.

TABLE I. Contrast Algorithm Parameter Settings

No.	Algorithms	Parameter settings
1	CatBoost	Iterations=16, Learning_rate=0.1,depth=5,L2_leaf_reg=1
2	TSA-CatBoost	P_{min}=1, P_{max}=4, c1\c2\c3=rand
3	MPA-CatBoost	P=0.5, R=rand, FADs=0.2, U=0 or 1
4	RSA-CatBoost	Alpha=0.1, Beta=0.01, ES=[-2.2]
5	WSO-CatBoost	F_{min}=0.07, F_{max}=0.75,
6	FLO-CatBoost	No Parameter

In order to analyse the effect of the autonomous detection system of foreign objects in rail transit, this paper collects 6000 images, which are divided into seven categories of foreign object targets, such as left-turning track, right-turning track, straight track, train, pedestrians, wrench and safety, etc., and the sample images are shown in Fig. 16 and the distribution of the number of samples of foreign object targets is shown in Fig. 17.

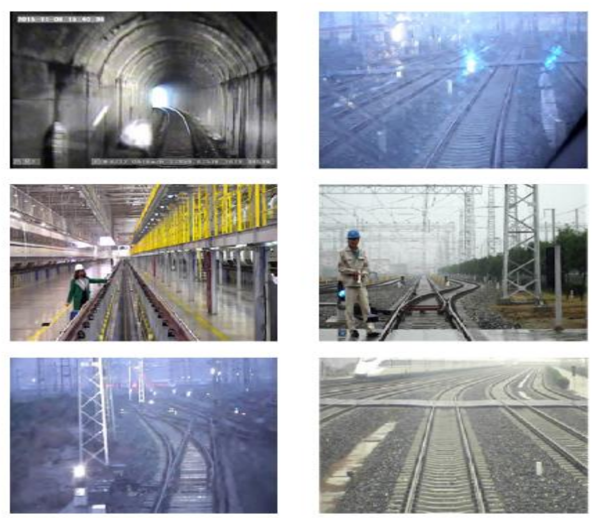

Fig. 16. Sample images.

Testing Figma Platform Intelligent Analytics Evaluation Model Performance Using Figma Platform evaluation metrics data, 1,890 sample data were collected, 1,250 for the training set, 430 for the testing set, and 210 for the validation set.

In order to avoid unexpected results of the experiment, the test optimisation process was repeated independently 10 times and the RMSE, MAPE, and evaluation time means and standard deviations were counted.

B. Algorithm Performance Analysis

1) Analysis of the effectiveness of autonomous detection of foreign objects in railway transportation combined with figma platform: Fig.18 presents the confusion matrix for autonomous detection of foreign objects in rail transport combined with Figma platform. From Fig. 18, it can be seen that the correctness of the detection of seven types of foreign object targets such as left-turn track, right-turn track, straight track, train, pedestrian, spanner and safety is more than 90%, which indicates that the detection results are good.

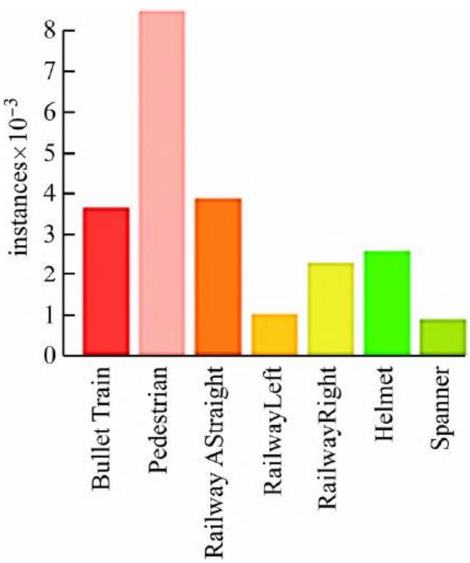

Fig. 17. Distribution of sample data.

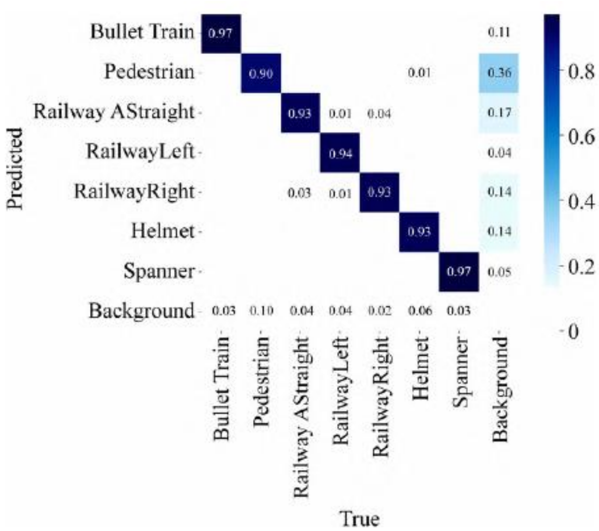

Fig. 18. Confusion matrix for autonomous detection of foreign objects in rail transport combined with Figma platform.

The Precision-Recall curves for autonomous detection of foreign objects in rail transport combined with Figma platform are given in Fig. 19 As shown in Fig. 19 the accuracy-recall curves for the seven categories of foreign object targets, such as left-turn track, right-turn track, straight track, train, pedestrian, spanner and safety, all indicate good detection results.

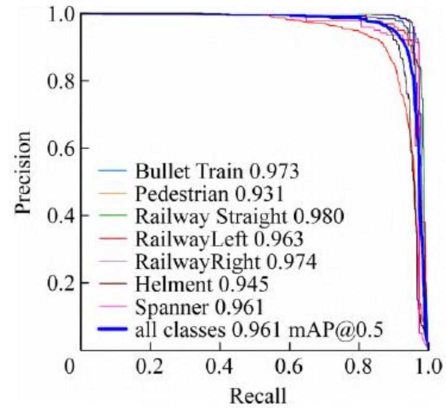

Fig. 19. Precision-Recall curve for autonomous detection of foreign objects in railway combined with Figma platform.

2) Analysis of the results of the assessment: Table II counts the RMSE, MAPE, evaluation time mean and standard deviation of different algorithms for 10 experiments. From Table II it can be seen that in terms of RMSE and MAPE, the analysis and evaluation accuracy of Figma rail transit design platform based on FLO-CatBoost model is better than other algorithms, and the evaluation time is more than that of CatBoost, and is better than that of TSA-CatBoost, MPA-CatBoost, RSA-CatBoost, WSO- CatBoost.This is to show that the optimisation of CatBoost hyperparameters by FLO algorithm makes Figma rail transit design platform analysis and evaluation more efficient.

TABLE II. MEAN AND STANDARD DEVIATION OF RMSE, MAPE, AND EVALUATION TIME FOR DIFFERENT ALGORITHMS

No.	**Algorithms**	**RMSE**		**MAPE**		**Evaluation time/s**	
		Mean	Std	Mean	Std	Mean	Std
1	CatBoost	1.4523	0.6554	0.5988	0.2673	0.0655	0.0098
2	TSA-CatBoost	0.7667	0.3890	0.4722	0.2178	0.1367	0.0178
3	MPA-CatBoost	0.8904	0.4163	0.5147	0.2893	0.1190	0.0122
4	RSA-CatBoost	0.8389	0.4376	0.5098	0.2865	0.1904	0.0245
5	WSO-CatBoost	0.4731	0.2109	0.2587	0.0988	0.0983	0.0100
6	FLO-CatBoost	0.2744	0.0971	0.1218	0.0674	0.0910	0.0066

Table III gives the results of different optimisation algorithms for optimising CatBoost hyperparameters. As can be seen in Table III the FLO algorithm optimises the CatBoost hyperparameters with the following final results: the number of decision trees is 15, the learning rate is 0.015, the maximum depth of the tree is 6, and the L2 regularisation is 1.

TABLE III. RESULTS OF DIFFERENT OPTIMISATION ALGORITHMS FOR OPTIMISING CATBOOST HYPERPARAMETERS

Parameters	**TSA-CatBoost**	**MPA-CatBoost**	**RSA-CatBoost**	**WSO-CatBoost**	**FLO-CatBoost**
Iterations	17	16	16	17	15
Learning_rate	0.5	0.09	0.07	0.43	0.015
Depth	5	5	6	7	6
L2_leaf_reg	1	1	1	1	1

V. CONCLUSION AND OUTLOOK

Combining Figma platform and CatBoost technology, FLO-CatBoost model is applied to the problem of analysing and evaluating the effect of autonomous detection and design in rail transit. Aiming at problems such as low efficiency of effect analysis and assessment methods, this paper proposes an intelligent analysis and assessment method for Figma platform based on FLO-CatBoost model combined with FLO-CatBoost. The method analyses the innovative design scheme of Figma platform in rail transit, focuses on the Figma platform intelligent analysis and assessment problems, combines FLO and CatBoost algorithms, and constructs the intelligent analysis and assessment model of Figma platform based on FLO-CatBoost. The disclosed data image test shows that the constructed intelligent analysis and evaluation model of Figma platform based on FLO-CatBoost has higher evaluation accuracy than CatBoost, TSA-CatBoost, MPA-CatBoost, RSA-CatBoost, and WSO-CatBoost models, and obtains FLO algorithm optimised CatBoost optimal hyperparameters, i.e., the number of decision trees is 15, the learning rate is 0.015, the maximum depth of the tree is 6, and the L2 regularisation is 1.

However, there are limitations to this study. Firstly, the dataset used may not comprehensively represent all real-world rail transit conditions, which could impact the model's generalizability. Secondly, the proposed method focuses on static image data, limiting its application in dynamic and more complex scenarios. Future research could explore (1) the inclusion of more diverse datasets that capture a broader range of real-time rail transit conditions, (2) the extension of the model to handle video data for more dynamic analysis, and (3) integration with other machine learning algorithms to further enhance performance and robustness in real-world applications.

REFERENCES

[1] Kay S., Oyiliagu C., Ali A.388 Prototyping a mobile phone application for Chimeric Antigen Receptor (CAR) T-cell therapy patient monitoring and data collection post-discharge[J].Journal of Clinical and Translational Science, 2024, 8(s1):115-116.

[2] Odedairo B O.Assessing the Influence of Various Work Breakdown Structures on Project Completion Time[J].engineering technology & applied science research, 2024, 14(2):13773-13779.

[3] Safar L .How Product-Led Localisation Helps 10X Product Adoption Internationally[J].Multilingual, 2022.

[4] Perez-Siguas R , Matta-Solis H , Matta-Solis E .Mobile application Design to help People Suffering from Alzheimer's[J]. Engineering Trends and Technology, 2022, 70(5):258-265.

[5] Ye T., Zheng Z. K, Hao T. C., Xu X. Yu, Li D. S. Design of practical teaching platform for innovation training of university students in rail intelligent transport[J]. Laboratory Research and Exploration,2024,43(01):152-158+198.

[6] Zhao N. Design and implementation of a ticketing system based on Spring Boot[J]. Information Systems Engineering, 2023(7):32-35.

[7] Maricar M A., Pramana D., Edwar E.Pengujian Prototype Pemesanan Creative Gift Menggunakan HEART Framework[J].JURNAL MEDIA INFORMATIKA BUDIDARMA,. 2022.

[8] Cheng F., Cai H .Deep learning-based object detection between train and rail transit platform door[J].International Journal of Grid and Utility Computing, 2022, 13(5):526-537.

[9] Liu J., Canca D., Lv H.Spatiotemporal synchronous coupling algorithm for urban rail transit timetables design under dynamic passenger demand[J]. Applied Mathematical Modelling, 2023.

[10] Shuling H., Yunong G., Peijie C .How to use POE to intervene in the design and renovation of rail transit public buildings[J].Academic Journal of Architecture and Geotechnical Engineering, 2023.

[11] Fei Y. U.Design Strategy of Underground Space of Urban Rail Transit Complex Based on Integration Concept[J]. Landscape Research:English Edition, 2023, 15(1):31-35.

[12] Chen Y., Wang S., Liao H. Y. Design scheme of integrated ticketing management platform system for rail transit[J]. Automation and Instrumentation, 2023, 38(5):105-109.

[13] Chang M., Nan N., Qu D., X., Zhang L.Architecture design and re1iabi1ity eva1uation of a nove1 software defined train contro1 system[J].Urban Rail Transit, 2022 :1-11.

[14] Yan S .Optimal Design of a Short Primary Double-Sided Linear Induction Motor for Urban Rail Transit[J].World Electric Vehicle Journal, 2022, 13.

[15] Pu W. S., Ji T. T. ,Xie H. M. Research on tool selection based on mobile UI design[J]. Wireless Internet Technology, 2023, 20(15):104-107.

[16] Zhang L., Chen Y., Yan Z.Predicting the short-term electricity demand based on the weather variables using a hybrid CatBoost-PPSO model[J]. of Building Engineering, 2023.

[17] Martin R , Watanabe R , Hashimoto Y .Evidence-Based Prediction of Cellular Toxicity for Amorphous Silica Nanoparticles[J].ACS nano, 2023, 17(11):9987-9999.

[18] Ana T., Andrija T., Eljka Z.Machine learning to optimise cerebrospinal fluid dilution for analysis of MRZH reaction[J]. laboratory medicine: CCLM, 2024, 62(3):436-441.

[19] Bian J., Wang J., Yece Q .A novel study on power consumption of an HVAC system using CatBoost and AdaBoost algorithms combined with the metaheuristic algorithms[J].Energy, 2024, 302.

[20] Han C , Gong M , Sun J., Zhao Y., Jing L., Dong C., Zhao Z. .Heat Load Prediction for District Heating Systems with Temporal Convolutional Network and CatBoost[J].Thermal engineering, 2023, 70(9):719-726.

[21] Ibraheem A F, Osama A, Saleh A, Gulnara B, Saikat G, Irina L, Om P M, Frank W, Mohammad D. Frilled Lizard Optimization: a Novel Bio-Inspired Optimizer for Solving Engineering Applications, Computers, Materials & Continua 2024, 79(3), 3631-3678.

[22] Liu Y. H.,Song Y. B., Zhu D. P. A rolling bearing fault diagnosis method based on ELDA dimensionality reduction and MPA-SVM[J]. Noise and Vibration Control,2024,44(03):117-124.