The Path to Rural Revitalization Through E-commerce Image Recognition Technology Empowering Agricultural Product Branding in the New Dual-High Context

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Abstract The brand construction of agricultural products is an important part of the rural revitalization strategy, which plays a key role in promoting agricultural development, raising farmers' income and promoting rural economic revitalization. Based on the application of image recognition technology in the branding of agricultural products, this paper analyzes the existing problems in the design of agricultural products in rural e-commerce. Based on image recognition technology, a model of brand design style generation for rural revitalizing agricultural products was constructed. By studying the typical cases of existing brand construction, the key applications of image recognition technology in the process of brand construction of agricultural products are put forward, including the specific measures to strengthen brand awareness, improve product quality and expand marketing channels, aiming to provide theoretical support and practical guidance for promoting the deep integration of agricultural product branding and image recognition technology.

Index Terms Agricultural products, Branding construction, Image recognition technology, Product Quality

I. Introduction

The "double-high" construction program is a major strategy in the reform and development of China's vocational education, which aims to promote the quality and upgrading of China's vocational education [1]. With the rapid development of China's digital economy, e-commerce and the real economy are rapidly integrating and penetrating, and nowadays almost all enterprises are inseparable from the Internet, and the demand for e-commerce talents from enterprises is also growing [2]-[4]. In this context, the cultivation goal of vocational education is to enable students to acquire the skills and knowledge required for a particular occupation or occupational group, and to provide a pathway to a particular occupation [5]. Focusing on this cultivation goal, higher vocational e-commerce majors should pay more attention to practical education, introduce practical teaching in the professional teaching program, improve students' learning enthusiasm through hands-on training, enhance students' practical innovation ability, so that they can better integrate into the actual workplace [6]-[9].

In the context of the rural revitalization strategy, the development of agricultural e-commerce platforms has risen rapidly as an emerging sales model, injecting new vitality into the development of the agricultural economy [10]. The development of agricultural products e-commerce platform has become an important bridge connecting agricultural producers and consumers. This new marketing model breaks through the time and space limitations, enhances consumers' understanding and trust of agricultural products through vivid and intuitive display, effectively promotes the sale of agricultural products, and injects a new impetus for rural revitalization [11]-[14]. Not only that, the development of agricultural e-commerce also provides more channels and opportunities for the construction of agricultural product brands, such as brand promotion through e-commerce platforms, online marketing activities, etc., which helps to enhance the product brand value of agricultural products [15]-[18]. The establishment of the e-commerce platform effectively enhances the competitiveness of agricultural products, broadens sales channels, promotes farmers' income, and ultimately promotes the sustainable development of the rural economy, and helps the in-depth implementation of the rural revitalization strategy [19]-[21]. In the future, the field of agricultural e-commerce will show a more diversified and intelligent development trend. Therefore, the integration of innovative technology in the comprehensive practical teaching of higher vocational e-commerce majors will help to cultivate more practical skill talents on the one hand, and on the other hand, it will inject new vitality into the construction of agricultural product brands and promote the whole industry to a higher level [22]-[25].

In the wave of digital economy, agricultural products e-commerce live is ushering in unprecedented opportunities and challenges, and a large number of scholars have studied the application of innovative technologies in

agricultural products e-commerce marketing, which makes an important contribution to realizing the win-win situation of the high-quality development of agriculture and the farmers' income and wealth. This paper proposes a fuzzy cognitive map based on consumer perception model and emotion analysis of online comments. By analyzing the relationship between consumer emotional tendency and brand authenticity, it provides a valuable reference for the modern fine-grained management of agricultural products e-commerce platform [26].Through deep learning and data mining technologies, e-commerce user value assessment models are built to effectively extract the value features of agricultural products on e-commerce platforms, thereby helping users to analyze their consumption behaviors and promoting marketing optimization and transformation [27]. Some scholars use word frequency analysis method to count keywords related to e-commerce agricultural products in user reviews, so as to build a brand personality dimension system for localization of agricultural products, and guide the sustainable development of e-commerce agricultural products on the basis of analysis of consumer characteristics [28]. Some scholars have evaluated the applicability of the model of agricultural e-commerce platform based on CNN. It is applicable to the agricultural e-commerce platform, which can accurately predict the return rate of customers and evaluate the service quality of the platform, so as to evaluate the competitiveness of the platform more scientifically, and has great application potential in agricultural e-commerce marketing [29]. The data sources of the above analysis models are mostly review texts, while images, as the most important source of information data for human beings, have become an important hub for information exchange in modern society due to their intuitive image and convenience, especially in the field of e-commerce, where vision is a key basis for determining people's shopping choices, which is worthy of in-depth research.

With the increasing demand of online shopping users, accurate and fast retrieval of target products can provide users with better and more precise services, how to retrieve target information accurately and efficiently from massive image data is one of the both urgent and popular problems in the field of image processing.

The application of image recognition technology in e-commerce is as follows:

(1) Some studies have pointed out that commodity classification technology is crucial to e-commerce platforms, and the integration of product image classification methods can significantly improve the rationality of functional design of e-commerce platforms and help improve the efficiency of e-commerce businesses [30].

(2) Some studies have introduced image processing technology into e-commerce platform and built a product image retrieval method based on clustering attention neural network, which effectively improves the ability of e-commerce platform to extract and detect product image features and promotes the high-quality development of e-commerce platform [31].

(3) A convolutional neural network algorithm based image recognition and product recommendation method has been studied, which is based on deep learning, improves the efficiency of product recognition and recommendation, and effectively improves users' consumption experience and satisfaction [32].

(4) Aiming at the problem that traditional convolutional neural networks cannot simultaneously classify two attributes in e-commerce image recognition, a dual-task learning method combined with transfer learning is proposed, which greatly improves the classification effect and recognition efficiency of e-commerce images [33].

(5) Some studies have improved the traditional MWI-DenseNet network in the field of e-commerce product image recognition, and proposed a commodity classification model based on GTNet network, which significantly reduces the calculation amount under different flow rates, significantly improves the commodity classification accuracy, and solves the problem of narrow channels in the application of the model [34].

(6) Some studies have introduced the application of Siamese deep architecture in e-commerce platform image processing, which learns fine-grained image embedding to achieve visual similarity and affinity of e-commerce product images [35].

However, due to the limitations of image recognition technology in terms of light and color, image recognition technology was initially not widely used in the agricultural industry. In recent years, with artificial intelligence technology, machine vision technology, mechanical automation technology, image recognition technology in the field of agricultural product quality inspection, disease diagnosis and fruit and vegetable picking and sorting and other areas of rapid development, which helps to promote the e-commerce agricultural products brand value construction.

This paper presents a model of brand image style generation of agricultural products based on image recognition technology, which can generate various types of brand image of agricultural products. The development status and characteristics of agricultural product branding driven by e-commerce and image recognition technology were analyzed. First, the development status of agricultural products e-commerce and agricultural products brand is analyzed respectively, so as to preliminarily understand the development status of the two, and lay the foundation for the analysis of the relationship between the two. The second is to analyze the application of image recognition technology in the brand construction of agricultural products from four aspects: consolidating the digital foundation

of brand development of agricultural products, improving the quality of agricultural products, enhancing brand awareness and enhancing brand premium.

II.   Basic concepts and theories

II. A. Basic concepts

II. A. 1)   Image recognition technology

Image recognition technology refers to the processing and recognition of pattern information such as text, image, picture and scene by machine to solve the important problem of direct communication between computer and external environment. Its purpose is to develop a certain instrument or equipment to automatically process some information, replace people to complete the task of classification and identification, and can quickly and accurately recognize graphics. Generally speaking, an image recognition is composed of three main parts: image preprocessing, image feature extraction and image pattern classification. Pre-processing generally refers to smoothing, enhancing, restoring, edge detection and segmentation of the image, and its purpose is to simplify the input image into a segmented mode. Feature extraction refers to the extraction of the main features of the image under the condition of meeting the requirement of classification and recognition accuracy, and select the features that play a large role in correct classification and recognition according to some criteria as far as possible, so that the classification and recognition task can be completed with fewer features. Image classification is the most important part, it is based on the extracted features, the former part of the feature vector space mapping to type space, the corresponding image belongs to a known class of patterns.

II. A. 2)   Branding of agricultural products

Branding refers to the behavior and path choice of creatively integrating various factors into the production process of the product to create a well-known public image and make the product stand out in the market competition. With the continuous progress of market economy, brand construction plays a key role in enhancing the competitiveness of products in the market. Therefore, brand strategy has gradually become a key means for enterprises to enhance their core strength in the market competition. This method provides consumers with a convenient way to screen, identify and purchase products, but also to better protect the rights of consumers, improve the quality of products, and ensure the healthy and stable operation of the commercial circulation system.

Branding of agricultural products refers to a series of activities in which agricultural product operators design products with personality and obtain trademarks according to market demand and local resource characteristics, so as to achieve the brand acceptance by consumers, expand market share and achieve operational purposes. The brand of agricultural products is determined by the characteristics of the product itself, and is the embodiment of the long-term accumulation of culture, technology and other comprehensive strength of the enterprise. When discussing the deep meaning of the brand of agricultural products, it can be summarized from the definition of agricultural products brand. There are many ways to define the brand of agricultural products, but they are basically defined from the two perspectives of "production" and "sales".

Therefore, the branding of agricultural products covers the following aspects:

The first is to create and communicate information about the attributes and quality of the product itself, including high-quality products and unique characteristics.

The second is to create and convey the ability of commodity operators, reputation, cultural background and other relevant information.

The third is to create and communicate relevant information about regional resources, environment and human history that are closely related to the product.

The branding of agricultural products is the only way to the development of agricultural modernization, and it is also an inevitable move for the development of rural characteristic industries. The implementation of agricultural product brand strategy is not only the actual demand to improve the quality of agricultural products and the market competitiveness of our country in an all-round way, but also the key strategy to promote the development of rural characteristic industries, optimize China's agricultural layout, promote the development of efficient agriculture and increase farmers' income.

II. B. Basic theory

II. B. 1)   E-commerce professional product design

According to the composition and evaluation indexes of comprehensive vocational competence derived from the research of the Institute of Vocational and Adult Education, the vocational competence level performance of e-commerce product brand design professionals is shown in Fig. 1, which is mainly divided into three levels: functional competence, process competence, and design competence. Among them, the lowest level is functional ability, and the evaluation indexes are functionality and interpretation display. The second level is process ability, and the

evaluation indexes are economy, use value-oriented and work process and production (business) process-oriented. The highest level is the design capability, and the evaluation indicators are environmental protection, innovation and social responsibility.
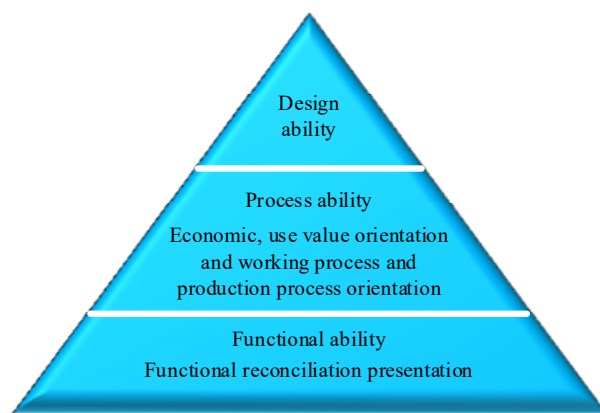

Figure 1: The professional ability of e-commerce

(1) Functional ability is the post ability, that is, the minimum requirements for working in e-commerce. By analyzing the current recruitment demand for e-commerce positions, the functional ability of e-commerce talents has the following four aspects. First, proficient in PS, AI, DW and other related design software, secondly, familiar with Taobao, Jingdong and other platforms of the background operation, thirdly, excellent web interface design, color matching ability, and fourthly, strong communication ability, comprehension ability, implementation ability, and teamwork spirit.

(2) Process competence is the ability to make money, that is, to complete work tasks within a specified time according to the requirements of the enterprise and to achieve work performance goals.

(3) Design competence is the ability to design work methods, i.e., students are required to be able to recognize work tasks in the context of the whole work system, not only to meet the complexity of the tasks, but also to take into account the different requirements of the complex business and social environments on the work process and results.

II. B. 2)   E-commerce agricultural product brand design

From the perceptual feeling, the traditional business model of agricultural products brand that is mainly offline sales of brands, consumers shopping can directly see the touch to the product, in the visual, tactile, taste, smell can have an intuitive experience, so it has intuitive, immediate. While the brand under the e-commerce model is mainly to order online, logistics and transportation, consumers can only browse through the web page in the picture, video based on visual association, only visual dependence, the other feelings of the commodity can only be through the visual association. Therefore, the brand image design of agricultural products in the mode of e-commerce should give consumers a visual impact, so that they are interested in understanding the quality of the product in depth. The e-commerce agricultural products brand image design features are shown in Figure 2, which mainly contain brand positioning, brand logo design, page design, packaging design, promotional material design, content marketing strategy, social media interaction and after-sales service.

(1) Promote brand co-branding and shape cross-border culture.

Co-branding is an effective way to build brand culture, especially in the field of agricultural products, designers can combine regional characteristics with brand stories, and seek co-branding cooperation with well-known brands or other brands in related fields. Through cross-border cooperation, it attracts more young consumers and expands its market influence.

(2) Multi-sensory experience design.

In the design of visual elements of agricultural products, it is necessary to present elegant, fresh, smart and natural visual effects, highlighting regional characteristics. The color of the brand needs to use the yellow-green gradient color symbolizing the sunrise and sunrise, which contains the meaning of vigorous growth and vigorous development of life, and conveys the concept of harmonious coexistence between man and nature. In addition to the traditional logo, color system and font design, the comprehensive application scenario design scheme ensures the consistency of the brand image in various marketing channels.
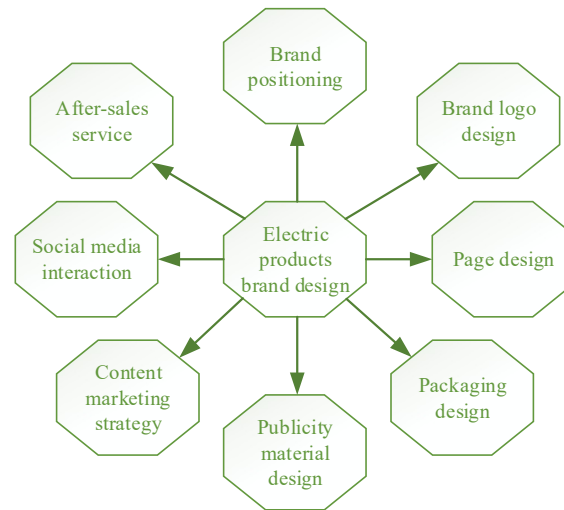
Figure 2: Electric products brand design

(3) Differentiated design is the key to highlight regional characteristics.

The design should focus on the "origin + product information" model to ensure that the brand of agricultural products has a distinct visual recognition. Using a design with local cultural symbols and colors can make consumers feel the uniqueness and origin of agricultural products, thus enhancing the market recognition and appeal of the brand.

III. Multi-scenario application of image recognition in the brand construction of agricultural products

III. A. Generation of brand image of agricultural products

In order to better assist the students in e-commerce majors in the ability to grasp the brand image style of agricultural products, this paper introduces the residual module in the generator and discriminator of CGAN, and combines the self-attention mechanism to obtain the brand image style image of agricultural products, in order to generate the image that meets the needs of e-commerce agricultural products brand. Figure 3 shows the network structure of the agricultural brand image generation model CRGAN-SAM, whose whole consists of generator and discriminator. The generator inputs are category label and random noise, and the discriminator inputs are generated samples and real label samples. The self-attention mechanism and the depth residual module are added to the generator and discriminator respectively, and the jump structure of the residual module can effectively solve the problem of gradient disappearance during training, so as to improve the network model training stability. The self-attention mechanism functions to make up for the defects of the residual module itself, improve the quality of the generated feature maps, and thus improve the effect of generating the brand image style of agricultural products.
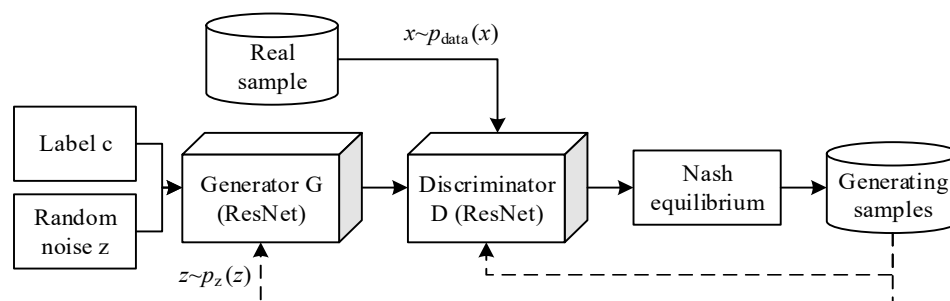

Figure 3: The network structure of the CRGAN-SAM

The main body of the CRGAN-SAM generator consists of a fully connected layer, an upsampling residual module and a self-attention module. Input label information and random Gaussian noise, the upsampling residual module

implements batch normalization processing, introduces the ReLU function, and the convolutional layer uses constant mapping to achieve upsampling. Adding batch normalization processing can ensure the validity of initialization, improve the speed of model training and achieve regularization. The global information can be obtained through the self-attention mechanism, and then processed by the up-sampling residual module. The output layer convolution is set up with a 3×3 convolution kernel with a step padding of 1, using the Tanh function.

The main body of the CRGAN-SAM discriminator consists of a convolutional layer, a residual module, a self-attention module, and adaptive mean pooling. The inputs are produce images of generated samples and real samples, and the convolutional layer uses the Leaky ReLU function. The residual module contains convolutional layer, BN layer and uses Leaky ReLU function. The overall network structure is two parts, one of which contains operations such as BN, Leaky ReLU function and convolution layer, and the other part contains 2D convolution and BN layer, which mainly realizes constant transformation to form a complete residual module. Applying the self-attention mechanism to the residual module can obtain the global information of the feature map. The application of adaptive average pooling layer can simplify the parameters of the fully connected layer and realize the classification of generated samples and real samples.

III. B. The integration of image recognition technology and e-commerce drives the brand construction of agricultural products

III. B. 1) E-commerce should increase publicity and enhance brand awareness of agricultural products

E-commerce to increase publicity, enhance brand awareness of agricultural products E-commerce to shorten the interval time of agricultural product brand cultivation, so that many agricultural products brand awareness in a short period of time to improve rapidly. Image recognition and acquisition technology, as a tool of information inclusion in the new era, enables more and more farmers to use it to carry out e-commerce, marketing and promoting local agricultural and sideline products, cultural and tourism products, original ecological scenery and other products, and a number of new farmers have emerged to share the dividend of digital technology and embark on the road of increasing income and getting rich.

For example, the Douyin account "ShuzhongTaosister" attracted 20 million fans by making a short food video with a very local flavor, and started the popularity of local agricultural products such as dried spicy radish, spicy rabbit head and Bobo chicken, achieving monthly sales of more than one million yuan and sales of hundreds of millions of yuan, contributing to the rapid landing of agricultural products branding. Taobao's "Poverty Alleviation Live Channel" and Kuaishou's "Fumiao Program" have helped more than 40 poor areas sell mountain products. Dangshan Pear, Menghai Pu 'er Tea, Pingjiang latiao and other online red agricultural products have upgraded their value chains by optimizing industrial supply chains with the help of e-commerce, and online retail sales have continued to increase.

III. B. 2) Image technology and e-commerce help to enhance brand value and brand premium of agricultural products

With the help of image technology and e-commerce, agricultural products brands continue to expand market increment, brand value and premium ability have been significantly enhanced, and some brand agricultural products have achieved the goal of high quality and high price. According to the "China Agricultural Brand Development Report" data, the 300 regional public brands of agricultural products on Ali's e-commerce platform achieved sales of 4.5 billion yuan, and the number of re-purchases of consumer brand agricultural products reached 15 million, with a year-on-year increase of 2.26%, and consumers' loyalty to agricultural products brands was significantly enhanced. Based on 300 regional agricultural product brands, the brand premium of food and aquatic agricultural products is more than 60%, and the brand premium of tea is more than 50%. Among them, Wuchang rice and other products selected through image recognition technology have a brand value premium of more than 100%.

III. B. 3) Image technology and e-commerce drive the digital transformation of agriculture

E-commerce has penetrated into the layout of the production end of the agricultural product chain, strengthened the cornerstone of digitalization and modernization of agriculture, and laid the foundation for the realization of brand development of agricultural products. According to the "China E-commerce Report" shows that Alibaba digital agriculture system directly connects 10,000 agricultural products direct mining bases, and has built production warehouses in five places such as Chengdu, Nanning and Xi 'an, covering 300 counties across the country. 1,000 digital agricultural bases and 120 Hema villages are under construction, equipped with integrated water and fertilizer, drones, and image recognition technology for weeding and pest control, helping farmers grow intelligentized fields and produce high-quality agricultural products.

At the same time, Jingdong is building 100,000 live agricultural products base, and the Ministry of Agriculture and Ecology of digital Intelligence is committed to building a large center platform for agricultural products circulation, digital farms, agricultural modernization industrial parks, and intelligent warehouse distribution network to

comprehensively enhance the production and circulation of agricultural products. Large e-commerce platform enterprises are using platform data and image recognition technology to penetrate into all links of the agricultural product chain, strengthen the construction of agricultural production infrastructure at the production end, and help the digitalization and branding transformation of traditional agriculture.

III. C. Image recognition technology drives the quality improvement of agricultural products

(1) Detection of plant diseases and pests

At present, plant diseases and pests are still the main killers affecting crop yield and brand of agricultural products, and bring serious harm to agricultural production. In the current pursuit of green, organic, zero-residue background, the use of pesticides can achieve good results in a short period of time, but the heavy use of pesticides to suppress the development of pests and diseases, not only caused damage to the ecological environment, but also increased the resistance of diseases and pests. At the same time, the amount of pesticide residues in agricultural products continues to increase, which seriously affects the progress of the brand of agricultural products. The use of image recognition technology can identify and classify the texture, shape, size and other characteristics of pests, and capture the identified characteristics before the scale of pests and diseases forms a disaster and causes serious impact, which can minimize the possibility of disaster. Indirectly reduce the amount of pesticides, improve the quality of agricultural products, can create a green, organic, zero-residue business card for agricultural products.

(2) Crop weed control

Field weeds compete for crop resources and tend to have shorter growth cycles than crops. Therefore, if weeds are not cut or treated in time, they will flourish and form a "weed outbreak". In addition, weeds can attract pests and diseases and spread viral diseases, further endangering the health and yield of crops. However, long-term chemical weeding can cause weeds to become resistant to herbicides, which in turn leads to increased use of herbicides, aggravating environmental pollution and ecological risks. With the improvement of people's awareness of health and environmental protection, the use of intelligent mechanical weeding equipment to replace chemical herbicides has become an important direction.

By taking real-time field images and analyzing the images by computer, soil background removal and seedling and grass separation can be carried out, and then the target area can be located. After the positioning is determined, the cutting part will carry out precise force control and speed adjustment to achieve efficient weed removal. At present, most of the models used for weed identification are optimized based on the existing models to better adapt to the needs of the real production environment.

(3) Sorting and quality inspection of agricultural products

The freshness time of fruit and vegetable agricultural products is short, easy to damage, and the pure manual sorting speed is slow and time-consuming, which affects the circulation efficiency. Replacing manual sorting with fruit and vegetable sorting equipment has become the trend of modern agricultural development. Image processing, computer vision and other technical means are used to carry out rapid, accurate and non-destructive testing of the appearance characteristics of agricultural products, so as to realize the quality assessment, classification and classification of agricultural products. This allows agricultural products to be divided into batches of similar quality and then combined into neat and uniform goods that are easy to sell and transport, reducing the blending rate of undesirable agricultural products.

IV. Examples of e-commerce and image technology driving agricultural product brand building

With the rapid development of Internet technology, "Internet +" has become an important model of modern industrial economic development, and rural e-commerce is an important form of integrated development of Internet + modern agriculture. In the context of rural revitalization and the actual environment of agriculture, rural e-commerce development model continues to mature, and the development of rural e-commerce is increasingly diversified. How to effectively use the dual use of image recognition technology and education to empower the brand building of agricultural products has become an opportunity to promote rural revitalization. In this paper, the digital image of agricultural products brand is established based on the model of brand image generation of agricultural products, which provides a new development direction for the professional brand image design of agricultural products in e-commerce.

IV. A. Brand Image Style Generation

IV. A. 1)   Quantitative comparison of models

When using image processing technology to carry out agricultural brand building in rural revitalization, the CRGAN-SAM model established in this paper is used to generate the brand image style of agricultural products related to e-commerce professions, so as to promote the construction of the brand image of agricultural products in e-commerce

professions. In order to verify the model's agricultural product brand image style generation effect, the article collects multiple types of agricultural product brand images from major e-commerce platforms on the Internet, obtains a total of 3,249 web pages, and divides them into a training set and a test set according to 8:2. In this paper, the SSIM, PSNR and CD indexes of image generation are used to quantitatively analyze the model's agricultural brand image style generation effect, PSNR measures the degree of similarity between the corresponding pixels, SSIM measures the degree of structural similarity between the images in the test set and the generated images, and CD measures the color difference between the generated images and the true-value images. And multiple types of image style generation models are selected as comparisons, and the quantitative comparison results of different models are obtained as shown in Table 1, where the optimal results are marked with bold.

Based on the results in the table, it can be seen that the CRGAN-SAM model constructed in this paper has the optimal average results in all three evaluation indexes compared with other comparison models. Among them, compared with the URetinex-Net model, which ranks second in the overall ranking of evaluation indexes, the algorithm in the paper improves 30.25% and reduces 43.25% in the PSNR and CD indexes, respectively, whereas SSIM is closer to it, with its overall improvement of 3.26%. Compared with the JED algorithm, which has the lowest overall ranking in terms of evaluation metrics, the SSIM and PSNR metrics of the algorithm in the paper have been improved by 34.17% and 50.50%, while the CD metrics have been decreased by 63.59% as a whole. In terms of SSIM metrics, the CRGAN-SAM model in this paper improves 1.66% compared to the second best-ranked KinD-New algorithm, and 34.17% compared to the lowest-ranked JED algorithm.PSNR characterizes the model's ability to retain the effective signals of the image to a certain extent, and the model in this paper improves 9.10% compared to the second best-ranked SNR algorithm, and 118.17% compared to the lowest-ranked GAN by 118.21%. In terms of chromatic aberration correction ability, i.e., CD metric, the SNR algorithm ranked second, and the CD of this paper's model was reduced by 12.47% compared to it, and the GAN network ranked the lowest, and the model in the paper was reduced by 65.21% compared to it. All of the above data show that the CRGAN-SAM model constructed in this paper has a relatively excellent performance in terms of noise suppression, chromatic aberration elimination, and effective information retention in the process of generating brand image styles of e-commerce agricultural products, which can provide students with diversified agricultural product brand image styles resource images during the teaching process of e-commerce majors, and further enhance the students' agricultural product brand design effect.

Table 1: Quantitative comparison of different models

Model	SSIM	PSNR	CD
GAN	0.712	13.507	1218.381
JED	0.638	19.584	1163.979
KinD-New	0.842	21.932	656.667
Retinex-Net	0.635	18.065	851.248
SNR	0.837	27.014	484.274
URetinex-Net	0.829	22.628	746.852
CRGAN-SAM	**0.856**	**29.473**	**423.865**

The article adds the residual network module on the basis of CGAN network as a way to enhance the ability of generating brand image styles of agricultural products, in order to analyze the effectiveness of the residual network, this subsection compares and analyzes the CGAN with different backbone networks. This section tries to change the backbone network of CGAN by replacing it with UNet, VGG, Pix2Pix and ResNet to evaluate the quality of generating brand image style of agricultural products with different backbone networks. The collected images of e-commerce agricultural brand images were divided into six different style categories, and the peak signal-to-noise ratio (PSNR) and FID were used to measure the generation quality of the agricultural brand images of the six styles, in which the lower the FID score indicated that the closer the content of the two images was, the better the generation quality. Table 2 shows the generated image quality of the six agricultural brand image styles output from different backbone networks.

As the metrics show, CGAN-based combined with ResNet residual network performs better. The average performance of CGAN with ResNet residual network is improved by 6.44, 6.83, 5.18, and 2.53 in PNSR metrics compared to CGAN, CGAN+UNet, CGAN+VGG, and CGAN+Pix2Pix, respectively, and the average performance of CGAN with ResNet residual network is reduced by 34.45, 33.85, 25.95, and 8.31 in FID metrics compared to CGAN, CGAN+UNet, CGAN+VGG, CGAN +Pix2Pix are reduced by 34.45, 33.85, 25.95, and 8.31, respectively. PSNR metrics indicate that more noise can be better removed after ResNet residual network to further improve the

quality and effect of generating brand image of agricultural products.FID metrics indicate that the generated image by this paper's method is closer to the original image and the difference is smaller. In the FID metrics, the method with the addition of ResNet residual network gains a great improvement in general, thus indicating that the method is able to retain the content information of the original image. Therefore, this indicates that the introduction of ResNet residual network in CGAN can significantly enhance the generation effect of brand image of agricultural products, and provide accurate generation results for promoting the diversification of brand image construction of agricultural products.

Table 2: Product brand image style produces image quality

Method	PSNR1	PSNR2	PSNR3	PSNR4	PSNR5	PSNR6
CGAN	18.04	13.83	15.79	18.98	15.04	17.57
CGAN+UNet	15.27	15.62	14.56	16.75	16.38	18.32
CGAN+ VGG	16.39	18.74	15.32	18.24	18.15	19.95
CGAN+Pix2Pix	19.73	20.95	18.71	21.36	20.52	21.46
CGAN+ResNet	**23.28**	**24.61**	**21.83**	**23.87**	**21.46**	**22.84**
Method	FID1	FID2	FID3	FID4	FID5	FID6
CGAN	235.71	202.43	275.69	159.81	56.54	84.17
CGAN+UNet	238.57	204.65	299.54	135.67	53.69	78.59
CGAN+ VGG	239.42	196.14	305.46	121.38	38.27	62.65
CGAN+Pix2Pix	213.15	162.37	248.83	112.49	57.35	63.26
CGAN+ResNet	**209.08**	**151.32**	**241.67**	**105.15**	**42.93**	**57.48**

IV. A. 2)   Image recognition technology helps agricultural brand building

Through the above research findings, we can conclude that image recognition technology plays an important role in brand building of agricultural products, which is mainly reflected in the following aspects:

(1) Quality detection and classification

Through image recognition technology, it can automatically detect the appearance, size, color, defects, etc., to ensure the quality standard of agricultural products. At the same time, according to the test results, the system can automatically grade agricultural products to enhance the professionalism and credibility of the brand.

(2) Anti-counterfeiting and traceability

Image recognition technology can be used to verify the anti-counterfeiting labels on the packaging of agricultural products, combat counterfeiting and protect brand reputation. At the same time, consumers can trace the entire information of agricultural products from production to sale, enhancing brand trust.

(3) Brand image enhancement

Image recognition technology can analyze consumer preferences for packaging to help optimize design and enhance brand appeal. Through image recognition and technology to identify consumer behavior, brands can accurately advertise and improve marketing effectiveness.

(4) Intelligent agricultural management

Image recognition technology can help farmers find pests and diseases in time, reduce losses, and ensure stable product quality.

(5) Supply chain optimization

Graphic recognition technology can be used for automatic sorting and packaging of agricultural products, improve efficiency and reduce labor costs, and achieve management optimization of agricultural brand supply chain.

IV. B. Effect of agricultural brand image construction

Based on the brand image design map of agricultural products, students are invited to evaluate the brand image works of agricultural products, mainly from the aspects of packaging elements, packaging design, derivatives, brand communication and creative expression. The works before the experiment were compared and scored, and the collected data were tested by independent sample T-test. The statistical results are shown in Table 3. From the evaluation results of the brand image of agricultural products, the students' evaluation of the brand image of agricultural products after the experiment was above 4 points, and showed a significant difference of 1% compared with before the experiment. In terms of the extraction of packaging elements of agricultural products in e-commerce, students can obtain brand elements of agricultural products based on the generation model of brand image style of agricultural products, and packaging elements of agricultural products can have a positive impact on consumers.

Table 3: Brand image construction

Index	Works	M±SD	T	Sig.
Packaging elements	Before	2.46±0.84	4.587	0.004***
	After	4.07±0.65		
Packaging design	Before	2.81±1.27	6.592	0.003***
	After	4.13±1.06		
Related derivatives	Before	3.06±1.13	3.926	0.000***
	After	4.38±0.92		
Brand communication	Before	2.71±0.84	4.158	0.001***
	After	4.26±0.53		
Creative performance	Before	2.84±1.17	5.279	0.005***
	After	4.19±0.86		

In terms of packaging innovation design, the diversified and unified packaging illustration and harmonious packaging color make the brand image of agricultural products more diversified, and the design practice in this respect can obviously gain the recognition of consumers, and has certain practical value for improving the existing problems of agricultural product brand packaging.

In terms of brand communication and creative expression of agricultural products, the new model enables students to have more divergent innovative thinking when constructing brand image of agricultural products, which can create a more unique brand experience of agricultural products. Through the testing and evaluation of the design practice, the timely feedback of consumers and market demand can be obtained, and the empirical evidence can be provided for the brand building and packaging innovation design of agricultural products in the future e-commerce profession to be more perfect and more suitable for the consumer market.

IV. C. Image recognition technology enables brand value creation, delivery and realization
IV. C. 1) Brand value creation of agricultural products
The creation of brand value is the first stage of the formation and development of brand value, which should focus on product quality as the fundamental element. China's "new three products and one standard" of agricultural production also clearly puts variety cultivation and quality improvement before brand building. Therefore, quality must be the first essence of the development of agricultural products branding. The creation of brand value of agricultural products emphasizes on the quality and image of agricultural products, to meet the needs of consumers for products, including quality output and image upgrading two initial categories.

The brand value creation of agricultural products mainly takes the quality of agricultural products and the creation of brand image as the first element. For the e-commerce platform of agricultural products with rich marketing resources, it does not ignore the quality and image elements of agricultural products, but pays more attention to the creation of quality in the process of promoting the development of agricultural products brand. On the one hand, image recognition technology promotes the standardization of agricultural production. Image recognition technology is used to carry out fine inspection, optimization and classification of products entering the market, and grasp quality control from the source. On the other hand, as the external expression of the quality of agricultural products, the image of the packaging of agricultural products is related to the first impression of consumers on the product. The use of brand image style generation model based on image recognition technology can transform and upgrade the packaging image of agricultural products, empower the packaging design of agricultural products, highlight the characteristics of local products, innovate the product image, and lay the foundation for the building of the brand.

IV. C. 2) Brand value transmission of agricultural products
Brand value transmission is the second stage of brand value formation and development, which should focus on channel construction and brand marketing. The process of value delivery is the process of brand building. The purpose is to tell consumers the quality and characteristics of the brand, and consumers can understand the product or service through the brand. In practice, the e-commerce of agricultural products achieves the purpose of brand building by expanding the construction of marketing channels and updating the marketing matrix. The delivery of brand value of agricultural products depends on channel and marketing, including channel construction, operation innovation, content marketing and activity marketing.

The transmission of brand value of agricultural products mainly revolves around marketing elements, which is related to whether high-quality agricultural products can emerge from the circle and occupy a place in the consumer market. The omni-channel marketing communication channel of e-commerce broadens the coverage of agricultural products brands. E-commerce platforms hold online and offline marketing activities such as the New Year Shopping

Festival, Double 11, Harvest Festival and picking Festival to increase the exposure of high-quality agricultural products. The image recognition technology provides quality assurance for agricultural products, helps the brand of agricultural products to carry out content marketing, and creates the "selling point" of agricultural products by combining the humanistic customs of the origin with the "storytelling" means. With the continuous innovation of the marketing operation mode of the e-commerce platform, the platform relies on multi-dimensional marketing matrix and marketing communication channels to help many featured agricultural products achieve explosive emergence, causing a dramatic response in the vast number of consumer groups, which is conducive to the realization of brand development of agricultural products.

IV. C. 3)   The realization of brand value of agricultural products

The realization of brand value is the third stage of the formation and development of brand value, which should be judged by the satisfaction of consumers and producers. Consumer-oriented branding is the sum of trust, relevance and meaning generated by how consumers feel about a product, representing consumers' feelings about products and services in life, and the process by which consumers' cognition, perception and loyalty to the product, as well as the derived purchasing behavior, bring profits to the enterprise. Therefore, the process of agricultural product branding is the process of creating, transmitting and realizing the brand value of agricultural products, and the result not only makes consumers recognize, accept and buy back the agricultural products. At the same time, it is also necessary to create greater economic benefits for agricultural producers, and only agricultural brands that achieve these two goals are successful and sustainable.

Consumer satisfaction and producer income are two criteria to judge the effect of brand value of agricultural products. Whether it is the creation or value delivery of agricultural products brand value, it is necessary to focus on consumers to meet consumer demand and improve consumer experience as the goal, and finally enable consumers to form reliable loyalty to agricultural products while bringing considerable benefits to producers, thus successfully realizing the brand value of agricultural products. The use of image recognition technology can improve consumers' loyalty to agricultural products brands, and considerable benefits are the increase in sales of agricultural products, the enhancement of premium ability and the development of agricultural industrialization brought by e-commerce.

V.   Conclusion

The article discusses how e-commerce majors can use image recognition technology to promote agricultural product branding in rural revitalization, mainly through deep learning technology to generate e-commerce agricultural product brand image style images, and combining with Super Star Learning Pass to build a blended teaching mode to assist students to improve the innovative design ability of agricultural product brand image. Through the agricultural product brand image style generation model, the generated agricultural product brand image style is more diversified. In this paper, the conditions and applications of image recognition technology driving the development of brand of agricultural products are clarified. It is pointed out that the creation, transmission and realization of brand value of agricultural products are the results of image recognition technology driving the development of brand of agricultural products.

Although the conclusion of this study provides a new way to study the relationship between image recognition technology and agricultural products brand in theory, there are still some limitations. First, although the research results further clarify the deep relationship between image recognition technology and agricultural product branding, the analysis results tend to be more objective. Second, there is a high proportion of secondary data in the text data collected in this study, and the primary analysis data is limited, which may not cover the practical behavior analysis of image recognition technology in the branding of agricultural products.

References

[1]   Wang, J., & Zheng, G. (2020). Research on E-commerce Talents Training in Higher Vocational Education under New Business Background. INTI JOURNAL, 2020(5).

[2]   Feng, Y., & Koompai, S. (2022). Demand Analysis and Training Mode Research of E-Commerce Talents in Guangxi Cross Border E-Commerce Comprehensive Experimental Zone. Science, Technology, and Social Sciences Procedia, 2022(2), CiM23-CiM23.

[3]   Li, X., & Li, Y. (2022, January). Talent skill demand analysis in the e-commerce industry based on online recruitment data. In Proceedings of the 2022 13th International Conference on E-Education, E-Business, E-Management, and E-Learning (pp. 377-383).

[4]   Qiang, J. (2018). Research on the Training Mode of Cross-border E-commerce in Applied Undergraduate Colleges. Search in.

[5]   Gao, Y. (2021). Research on the Teaching Reform of e-Commerce Specialty in Higher Vocational Colleges under the Project Teaching Mode. Advances in Vocational and Technical Education, 3(2), 182-186.

[6]   Xia, S., Rao, X., & Wu, X. (2023). Research on the Training Path of Live E-commerce Talents Oriented by Industry Development. Academic Journal of Management and Social Sciences, 2(3), 149-154.

[7]   Liu, S. (2023). A Brief Analysis of the Teaching Practice of E-commerce. Journal of Theory and Practice of Social Science, 3(4), 11-13.

[8]   Xu, G., Shi, L., Xiao, P., & Zhang, Z. (2021). Exploration of e-commerce talents training mode based on CDIO-OBE concept. European Journal of Education and Pedagogy, 2(4), 20-24.

[9]   Liu, X. (2023). The application of new media technology in the teaching of E-commerce specialty in higher vocational colleges. Probe-Media and Communication Studies, 5(5).

[10] Chen, M., & Long, Y. A. (2024). Empowering Rural Revitalization: Unleashing the Potential of E-commerce for Sustainable Industrial Integration. Journal of the Knowledge Economy, 1-19.

[11] Liu, S., Gao, Z., & Zhu, X. (2021, August). Development trend of agricultural brand e-commerce mode from the perspective of new media. In Journal of Physics: Conference Series (Vol. 1992, No. 4, p. 042052). IOP Publishing.

[12] Lin, Y., & Wang, X. (2023). Does establishing regional brands of agricultural products improve the reputation of e-commerce? Evidence from China. Electronic Commerce Research, 1-19.

[13] Ma, H., & Zhang, X. (2022). Construction of Smart Marketing Model of Agricultural Products E-Commerce in the Era of Big Data. Mobile Information Systems, 2022(1), 3016554.

[14] Zhang, J., & Liu, Z. (2023). An empirical analysis of the impact of brand story themes on brand attitude in the context of B2C E-commerce platforms for organic agricultural products. Sustainability, 15(24), 16679.

[15] Xu, D. (2018). Research on Brand Construction and Development of Agricultural Products in Guizhou. Engineering Heritage Journal (GWK), 2(2), 19-24.

[16] Zhao, M., Zhang, Q., & Liu, L. (2024). Study on the Development Path of Agricultural Products E-commerce from the Perspective of County. Academic Journal of Humanities & Social Sciences, 7(2), 34-44.

[17] Guan, Q., Liu, F., Chen, Y., Ao, X., & Cheng, W. (2023). Cultivating Your Agriculture-Branding and E-Commerce Participation in Rural Revitalization. Academic Journal of Humanities & Social Sciences, 6(6), 65-70.

[18] Gong, P. (2019). Problems and Countermeasures in the Construction of Regional Agricultural Products E-Commerce Platform in Second- and Third-Tier Cities. Industrial Engineering and Innovation Management, 2(1), 52-58.

[19] Gao, X. (2022). Qualitative analysis of the key influencing factors of farmers participate in agricultural products e-commerce to help rural revitalization. Academic Journal of Business & Management, 4(17), 121-130.

[20] Zhou, G. J. (2022). Analysis and Research on the New Model of E-Commerce Poverty Alleviation: E-Commerce Live Broadcast of Agricultural Products. Journal of Accounting, Finance & Management Strategy, 17(2), 33-59.

[21] Teng, D. (2021). The Problems and Countermeasures in the Development of Agricultural Products e-Commerce Marketing. Journal of Sociology and Ethnology, 3(6), 71-74.

[22] Lin, C. Y., Xi, Z., Gao, C., & Tsai, S. B. (2021). Research on the Training Model of E-Commerce Professionals Based on Big Data Analysis. Wireless Communications and Mobile Computing, 2021(1), 2030991.

[23] Xinjian, Z., Fang, T., Liyan, L., & Yirun, C. (2018). How to Cultivate Application-Oriented Undergraduates--The Growth Path of an Outstanding Graduate on E-Commerce Major. Education Quarterly Reviews, 1(2), 153-167.

[24] Xia, S., Lai, X., & Li, C. (2023). Research on the Market Positioning and Competitive Strategy of Rural E-commerce in Agricultural Products Sales. Frontiers in Economics and Management, 4(7), 86-96.

[25] Liang, S., & Cheng, H. (2024). Research on the Mode of E-Commerce Assisting Agricultural Innovation and Entrepreneurship under the Background of Platform Economy—A Case Study of E-Commerce Assisting Farmers in Wenchuan County. Economics & Management Information, 1-10.

[26] Sun, Y., Liu, X., Chen, H., Zhu, L., & Li, Y. (2023). E-commerce brand authenticity perception model of territorial characteristic agricultural products based on fuzzy cognitive map and emotional analysis. Journal of Intelligent & Fuzzy Systems, 45(3), 3807-3822.

[27] Yang, H., Zheng, Z., & Sun, C. (2022). E-Commerce Marketing Optimization of Agricultural Products Based on Deep Learning and Data Mining. Computational Intelligence and Neuroscience, 2022(1), 6564014.

[28] Zu, X., Dai, F., Yi, J., & Zhang, Z. (2019). Analysis on Localized Personality Recognition of Brands of Fresh Agricultural Products Retail E-commerce. In International Conference on Economics, Management Engineering and Education Technology (pp. 1883-1892).

[29] Fu, G., & Ding, R. (2024). Evaluation Method for Competitiveness of Agricultural Product E-commerce Platforms based on Convolutional Neural Networks. Pakistan Journal of Agricultural Sciences, 61(4), 1259-1270.

[30] Rui, C. (2020). Research on classification of cross-border E-commerce products based on image recognition and deep learning. IEEE Access, 9, 108083-108090.

[31] Wei, Z., & Zhang, X. (2021). Feature Extraction and Retrieval of Ecommerce Product Images Based on Image Processing. Traitement du Signal, 38(1).

[32] Diwu, W., Zhang, R., Feng, L., & Mu, Q. (2024, April). Image Recognition and Product Recommendation Algorithms Based on Deep Learning. In 2024 Third International Conference on Distributed Computing and Electrical Circuits and Electronics (ICDCECE) (pp. 1-5). IEEE.

[33] Cao, Z., Mu, S., & Dong, M. (2020). Two-attribute e-commerce image classification based on a convolutional neural network. The Visual Computer, 36(8), 1619-1634.

[34] Zhao, B., Li, W., Guo, Q., & Song, R. (2022). E-Commerce Picture Text Recognition Information System Based on Deep Learning. Computational Intelligence and Neuroscience, 2022(1), 9474245.

[35] Rajest, S. S., Sharma, D. K., Regin, R., & Singh, B. (2021). Extracting Related Images from E-commerce Utilizing Supervised Learning. Innovations in Information and Communication Technology Series, 1, 34-46.