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Artificial Intelligence in Textile Industry-Review

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Abstract

Artificial Intelligence is an important application in the development of enterprises, having most essential part to play in taking advantages of independent operational efficiency. One of such areas of artificial intelligence is the textile industry that has seen proper growth. AI is a computer generated system to imitate human intelligence processes. Textile industry has a great future in manufacturing by the application of AI With the application of in textile industry it has been possible to produce smart clothing using IoT and electronic sensors. In the present scenario of industry the new technology is the beginning to change the prospect of textile industry. AI has not only improved the efficiency in industry but also overall industry operations. AI covers a vast area of applications. With the help of AI designs identify trends, optimise patterns and generate 3D model garments. Revolutionary change in textile industry may come by the application of AI in the near future.

Keywords- *Operational efficiency, pattern making, quality products, machine learning, smart clothes, innovative textiles*

INTRODUCTION

In the recent past, artificial intelligence has become increasing prevalent where topics like conventional robots are capable of free communication and AI players can compete against professional athletes generate long discussions. According to information received for last 60 years AI is existing technology and it has gone to intelligent optimization in 2012, incorporating deep convolution of neural network technology into image reorganization.

With the development and innovation in AI intelligence and its applications have gone into different fields like unmanned drones, speech and image reorganization with information classification and search. These have been possible due to advanced information technologies like computer cloud system and big data application through AI. In textile industry the introduction of AI started in the year 1990with the help of primary operation of AI neural network [1].

One of the most growing areas of artificial intelligence is the textile industry. AI has found the good area with textile manufacturing, which helps with visual observation jobs such as colour matching and patterning making. Many organizations are applying AI in assisting with operations of pattern making, colour matching and dye formation and quality control. Considering the future aspect of AI in textile industry, it is expected that AI continues to play an increasing trend and it is believed their manufacturers will begin the data their machinery sensors collect internally instead only making it available to customers. It is proposed that algorithms are getting fast enough and the data is available, where changes are done automatically without manual interaction. In the near future, AI will allow textile manufacturers to create digital twin for more efficient running of SCM. The application of digital twin in supply chain area will be able to automate and manage a lot better and efficiently with reduce cost and low wastage [2].

In the textile industry, processing and manufacturing activities are divided into specific segments. Therefore, the industry needs special skilled manpower to perform the work properly. Moreover, the industry has to face continuous changes in the design and type of manufacturing and processing methods. So, problems may arise if any one does not understand the technique of the production processes. It is a delicate process and people sometimes make mistakes. But automated machines do not make such mistakes. Therefore, it is established that automated machines with AI controlled methods can perform with less mistakes. Moreover, with the increase in production the demand of products is also increasing. When these are controlled by human it becomes difficult to work under the situation of increasing or decreasing demand of products. When machines run with AI such difficulties are not faced. Therefore, in the industry processing are done by the application of AI [3].

Artificial Intelligence has the ability to make huge change in the textile industry through their activities automatically. The activities performed by AI in textile industry are summarized as: Optimise textile production, Auto scheduled predictive maintenance, Colour matching and dyeing, Quality control and defect detection, Supply chain optimization, Inventory management, Textile design assistance, Market analysis and demand forecasting, Energy management, Virtual showroom simulation, Pattern manipulation, Fabric sorting, etc [4].

With the introduction of new technologies like AI and IoT lot of changes have taken place in textiles business, which was earlier labour oriented process. Nowadays, majority of the machines in textile industry are computerized and production of specific design in large volume is significantly improved efficiency and accuracy also. Day by day, new items of various specifications are coming in the market as per the demand of the customer. Smart Textiles can monitor and share detail information about users, including bio-metric data like heart rate, blood pressure, humidity, temperature and function by AI technology with Bluetooth, Low energy, Edge Competition and Cloud Data, etc [5].

In the textile industry, there are number of areas where AI can be introduced. Textile industry is always experimenting with new technologies and materials which are developed in recent past. With the introduction of AI lot of changes are taking place in textile industry such as production process and new clothes. There are many areas in textile industry where AI may be introduced. The most important area is the fabric production. By the application of AI designers and engineers can create various fabrics having unique properties and textures. AI is also able to develop more efficient manufacturing processes. Engineers can improve efficiency and reduce wastage by using AI technique [6].

According to the report of a research, since 1980 computer algorithms and machine learning are used to aid the majority of the textile industry processes. With the application of deep learning and neural network it is possible to handle majority of the testing and quality control jobs through the technique of image processing and it is due to the rise of demand for automation. The result of the study in research programme, it indicates about three categories of processes in the textile industry which are yarn manufacturing, fabric manufacturing and colouration. AI integrated machines have improved efficiency of the machines and overall industry operations. Fundamental of AI has been challenged in real-world sense. Although a

study by the several scientists in case analysis came to the conclusion that image analysis, back propagation and neural network are suitable to use in textile testing of materials. AI can also be applied in automated processes in various situations [7].

The peculiarity of fashion industry is that it always asks for new generation and development for their day to day performance. As a result of which AI has become an integral part and parcel of development and work process in the industry. AI plays the key role in shaping the future of fashion and textile market. The industry is transforming application of AI into areas of data analysis and personalized marketing to smart manufacturing and sustainability. The area of AI application in fashion is vast which serves for numerous benefits in various ways to the industry. The examples of areas covered by AI in fashion and textile industry are like data analysis and customer insights, personalized marketing, visual search, AI-driven design, trend forecasting, automated design, generative adversarial networks [8].

In fashion and textiles AI has been making huge changes. It is expected that havoc changes will be seen in the near future in the development of fashion and textiles. AI is bringing revolution in business sectors for their operational activities. Some of the branded qualities by Zara, H & M, Dior, Macy's, and Nike all are using AI in their business sectors. AI is already in progress by helping to small and big fashion units to promote goods, ameliorate deals and enhancing client experience [9].

In quality control textile manufacturing AI-powered system made significant changes. To create unique and beautiful patterns, textures and colours of textile products AI based algorithms are helping a lot. Again, through machine learning algorithms and analysis of data base in existing designs, trends and customer choices, AI made rapid progress in design process and confirm that the products serve properly as per the market demands. With the application of AI algorithms analysis images of fabrics, defect identification, irregularities and classification of textile materials on the basis of their properties, these are possible through machine vision technology [10].

ROLE OF ARTIFICIAL INTELLIGENCE IN TEXTILE INDUSTRY:

With the application of back propagation (BP) of neural network in textile industry, the main advantage is its holistic performance. The network system handles effectively the interaction

with its components and allows the error adjustment through system operations within the components for technical requirements more efficiently. But, BP algorithm may not reduce errors significantly on a large scale during application, while it can intelligently adjust specific areas to make sure of error accuracy and minimize localized errors. AI application currently is at a stage with some areas which require improvement. However, due to real-world factors a few areas/segments are dealing with AI for textile inspection. In 2018, Uster of Swiss Company manufactures automatic visual inspection equipment for textile industry. A series of machines focused on testing of quality and colour of textile products [1].

AI with machine learning are used in textile machinery to confirm pieces of apparel are cut per requirement so that no wastage of fabric part if found. It can also help to make confirmation that pattern pieces are made correctly for designs in stripe form and floral form for manufacturing. For colour matching purpose AI is also used. According to Global Key Account team manager for colour management KEN BUTTS Data Colour, the Company's Smart Match uses AI and Machine Learning in automation of dye formulation process. It was observed that when dyes were put together, an unexpected result happened. There were interactions between the two dyes when these two were combined with one another. The end result was that the first formula was almost running a formation and two corrections all at once because it was learned about how those worked together [2].

In the Textile Industry designers work with AI analyse about customers' choice and preferences with trends for creating new ideas which are expected to sell as per their demand. It helps the designers to work fast and efficiency with AI application at a cheaper rate. In each and every process of yarn formation AI has transformed the manufacturing processes at complete change. It involves all the processes such as blow room, carding, drawing, spinning to packing. With the help of AI all control are set in such a manner that quality is improved with reduced cost of production by selling production parameters according to necessary. AI has helped to reduce yarn grading errors to produce better grade of fabrics. It improves the physical properties of textile products [3].

The areas of application of artificial intelligence in textile industry are as follows: AI and machine learning help textile production processes to optimize, increase efficiency and reduce costs. AI powered sensors and monitors can indicate when machines fall it can

maintain accordingly the adjustment. It is used for the purpose of colour matching and dye formulation with accuracy. With the help of sensor cameras and ML algorithms it can improve the efficiency of quality control systems. With the help of AI optimization of production schedules are done. For the purpose of data analysis in sales and to protect future demand AI is used. Textile designers can create new patterns with design modification by AI application. AI also helps in textile market trends and also makes market forecasting. It can also improve market management. The other areas of AI application are related to visual showroom situation, pattern manipulation, fabric sorting, etc [4].

ARTIFICIAL INTELLIGENCE IN FASHION AND TEXTILES:

In the present scenario in fashion industry a rapid change is taking place for the purpose of evaluating and process information along with time consumption. AI is doing tremendous job. Advanced technologies like data analysis, NLP, and virtual assistance provide AI to work for communication with manufacturers, retailers and customers. It is observed that AI tools are trained in data quality and quantity, analysis prior to fashion data, assessment of customers' requirements and their choices, study on competitors and market trend. AI tools were developed by a team of professionals in AMAZON to analyse and understand photographs to generate new fashion designs, which are known as machine-assisted design. AI stylist applications for the market allow users to browse clothes online. This is done by the help of photograph as per input and the software recommendation for style is based on the type, complexity and preference as per the trends. Smart clothing shows by continuous monitoring on heart rate, and critical bio-metrics [5].

Textile industry is one of the oldest and important industries of the World. Although AI is a new technology but textile industry is of no exception in its application for the industry. With the application of AI, it is possible to create new designs and variable products. AI can generate new ideas of products by data analysing of customers' requirements. AI can streamline the production processes and also identify bottlenecks, and can also make their operations more efficiently. Marketing of textile products can be done by AI application. With the help of AI market target and development of market campaigns are also possible [6].

Since 1980s with the help of computer algorithms and machine learning technique, the majority of textile testing processes are performed. With the increase demand for automation deep learning and neural network system the majority of textile testing for quality control are performed by image processing. Artificial Intelligence (AI) technique when applied in different sectors of textile industry, the study of the article was searched and reviewed. The observation and findings through the research work were categorized into three groups were based on the operation s and processes of the textile industry, which includes yarn manufacturing, fabric manufacturing and colour processing. It was concluded that the research work was performed through the analysis of AI neural network applications in textile sector [7].

PROSPECT OF ARTIFICIAL INTELLIGENCE IN TEXTILES AND FASHION INDUSTRY:

Application of Artificial Intelligence in textile and fashion industry is vast, which offers numerous advantages for different processes and areas. AI operated machines and robots are being applied to automated systems for repetitive tasks in textile and garment industry. The technique of AI application not only streamlines production processes but ensures consistent quality performance. The speciality of fashion industry is that it is constantly evolving by innovative approach and keeping it ahead of the trend. With the advancement of technology AI has become an integral part of the dynamic landscape to play the important role to shape the future of textiles and fashion industry. In spite of its transformation potentiality the role of AI in the textile and fashion industry is very challenging approach. It is highly concerned with job loss due to automation and potential biases in Al algorithms which must be addressed. But, the techniques of innovation, increase efficiency and sustainability can outweigh these concerns and keep a positive change in the industry through AI approach [8].

Ai has made a revolution in the textile and their manufacturing area and also in marketing and customer service in business sectors. It is popular in fashion brands such as ZARA, H & M, DIOR, MAEY'S and NIKE by the application of AI in business models. AI is always helping small and large fashion companies to promote goods, ameliorate deals and enhance the client experience. New design creation and improvement in the current designs AI is helping a lot. AI can also identify design, pattern optimization and generate 3D models for garments. Other important areas are improvement in production, efficiency and reducing

waste in the manufacturing of textiles [9].

AI has the ability to analyse huge amount of data and learn from patterns and their application by algorithm assisted designers to create unique and appealing textile patterns, textiles and colours in various applications. In the production AI enhances efficiency and good quality control in the manufacturing processes. Machine learning algorithms and analysis of databases which are related to existing design trends as per the customers' choice, AI expedites the design process and confirm that the products are matching as per the demand of the market. The important areas of significant improvement taking place are the efficiency and quality control. Automation in textile industry for quality control helps the manufacturers to identify faults for the purpose of minimizing waste and improving overall production which help the AI integrated techniques [10].

CONCLUSION

The theoretical analysis of artificial intelligence suggested by the experts that in various aspects of textile and fashion industry AI can be incorporated. In fashion industry AI can help sure about patterned fabric pieces are cut correctly for designs produced. AI has a big future of textile industry. With the introduction of new technologies like AI and IoT has made changes in the business of textile industry. There are various ways by virtue of which AI can be applied in the textile industry. AI supported automation techniques have improved not only the machine efficiency but also overall industry operations. The innovation of AI and its applications have led to the development of intelligent textiles, which can adopt environmental conditions and colour changing activities as per the customer needs. AI has its long future for H & M group to achieve vision on a climate positive value-chain by 2040. With the help of AI the textile industry has revolutionized the manufacturing process by transforming product design and development processes.

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