



Priyadarshini College of Engineering , Nagpur
Department of Computer Technology
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“Handwritten Character Recognition Using CNN”

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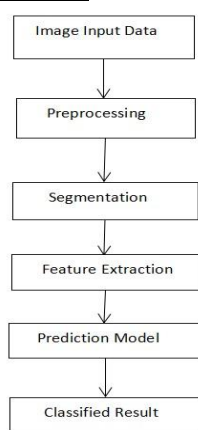
Abstract

Handwritten character recognition has found application in a wide range of industries, including banking, healthcare, and many more that handle handwritten documents. Handwritten Character Recognition (HCR) is the process of transforming handwritten text into a format that can be read by machines. Handwritten characters can vary in form, size, and placement, even if they are written by the same person. This makes them challenging to identify. Scholars have utilized many techniques, features, and classifiers to streamline the process of handwritten text recognition. Nowadays, the ability to recognize handwritten writing is almost essential. Initially, we had to compose texts by hand when utilizing this technology, which resulted in several errors. Handwritten text recognition is practically essential in today's environment. We made a lot of blunders when we had to compose texts by hand when we first started using this technology. Physical work was needed for data administration in the physical world in order to meticulously arrange things, which resulted in waste and inefficiency. Traditional storing methods have also been hampered by the need for long-term data storage. Thankfully, we have the ability to efficiently organize, store, and access data thanks to current technology. We have expedited the saving and retrieving of data that was kept in the traditional manner by implementing software for handwritten text recognition. Furthermore, this technique enhances the data's security in yet another way.

Introduction

Handwritten character recognition is the process of efficiently reading and converting handwritten text into digital representation. Numerous applications, such as the automatic processing of forms, the digitalization of paper documents, and the enhancement of accessibility for individuals with visual impairments, depend on this technology. Advanced algorithms and machine learning approaches are used to accomplish accurate handwritten character recognition. These algorithms enable the system to effectively recognize and classify individual characters by analyzing the structural and contextual elements of handwritten text. The system's goal is to mimic human comprehension and interpretation of various handwriting variations and styles. The first step in the procedure is obtaining the handwritten text using tablets or digital pens. To achieve the best recognition performance, the recorded text is subsequently preprocessed to eliminate any noise or undesirable artifacts. After that, the system carries out feature extraction, which involves measuring and identifying pertinent handwriting features such line patterns, stroke shapes, and spatial relationships. Once features are retrieved, the system maps them to the appropriate character classes using machine learning models such artificial neural networks, support vector machines, and hidden Markov models. Large databases of annotated handwriting samples are used to train these models, enabling them to pick up on the patterns and variances found in various writing styles. Following categorization, post-processing is applied to the identified characters to enhance readability and accuracy overall. This could entail using optical character recognition (OCR) techniques to handle variances in writing styles, fixing any misclassified characters, and smoothing uneven strokes. In summary, handwritten character recognition is a challenging process that converts handwritten text into a digital format with accuracy using machine learning.

Working



CO's

- CO 1:** Acquire a sound technical knowledge for problem identification and formulation through the prior knowledge, literature, review and original ideas.
- CO 2:** Use software engineering tools to analyse, design, implement, validate and maintain a project.
- CO 3:** Develop solution to the identified problems by applying and integrating the knowledge acquired throughout his/her undergraduate study and modern techniques.
- CO 4:** Prepare and present a well-organized progress of a project in written and verbal form periodically.

CO 5: Work in a team and communicate with superiors, peers and the community.

CO 6: To publish and share their project works with outside world at national and international level.

PO's

- 1.Engineering knowledge :** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- 2.Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problem reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- 3.Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental Considerate.
- 4.Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the data.
- 5.Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
- 6. The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues, and the consequent responsibilities relevant to the professional engineering practice.

9.Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10.Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11.Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12 . Life-long learning: Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PSO'S:

- 1.**An ability to analyze a problem and identify its solution by applying knowledge of computing and fundamental concepts appropriate to the discipline.
- 2.**An ability to design and develop a computerized systems using conventional and modern techniques, tools for solving real world engineering problems of varying complexity.
- 3.**An ability to employ the knowledge of programmed specific domains for professional growth and pursuing higher education to meet the current industrial needs.

Publications

1. IJRCIT Journal, Special Issue, Vol 2, Issue 1, June-2024
2. International Journal of Creative Research Thoughts (IJCRT),Volume 12,Issue 4 April 2024 ISB/ISSN no 2320-2882

Conclusion

With the advent of contemporary methods like neural networks and deep learning, machine learning has the ability to accomplish much more than simple jobs like text recognition. Convolution neural networks have made it possible for us to scan and understand words with even higher accuracy than we could previously achieve with traditional OCR, which relied on photo sensor technology to collect physical features and turn them into a database. Over the years, numerous methods—including pre-processing, segmentation techniques, feature extraction procedures, and classification methods—have been studied for the recognition of handwritten English alphabets. However, to increase accessibility for handwritten English alphabets, a functional software tool is still needed. Training a model to read complete handwritten or non-handwritten papers and translate the printed text into many languages is one potential remedy.