**Optical Character Recognition** (OCR) is a technology that automatically recognizes the text in scanned documents, images, or handwritten text and converts it into machine-readable text that can be edited by OCR systems analyze light and dark patterns in a scanned image, and translate patterns into corresponding lines of text.

**History of OCR**

* **1929 - First development** : The concept of OCR began in 1929 when Emmanuel Goldberg developed the first optophone that could read text by detecting its patterns and converting them into electrical signals
* **1940s - Electronic OCR** : In the 1940s, Ray Kurzweil developed the first electronic OCR machine that could recognize printed text, regardless of characters. This led to the development of reading devices for the visually impaired.
* **1960s - Commercial OCR** : U.S. The Postal Service began using OCR technology to sort mail in the 1960s. Banks have also adopted OCR to process checks using MICR (Magnetic Ink Character Recognition).
* **1970-1980 - PC integration** : In the 1970s and 1980s, OCR technology became available for personal computers, allowing people to scan and edit documents from home.
* **1990-2000 - A.I.** : With the rise of AI and machine learning in the 1990s and early 2000s, OCR began to incorporate neural networks to provide more accurate recognition of handwritten text
* **Current date** : Powered by deep learning algorithms, modern OCR systems are also capable of real-time text recognition in multiple languages, complex document systems, smartphone apps and cloud-based services

**How OCR works**

The OCR process can be broken down into several steps:

* **First Image Use** : The input image has been preprocessed to enhance its quality prior to detection. This can include removing noise, applying inversion correction, converting the image to grayscale or binary, and adjusting brightness and contrast.
* **Text introduction and paragraph** : The OCR system analyzes text in an image, breaking it down into smaller components: letters, words, and colors. This classification is necessary to separate individual textual elements for identification.
* **Feature excluded** : Each character is analyzed for uniqueness. Objects such as edges, lines, intersections, lines, etc. are marked and used to color match a predefined database of character templates or patterns
* **Accept :** Classification algorithms, usually neural networks, are used to match the extracted features to the stored patterns of known characters. This can be done with traditional pattern recognition methods or deep learning patterns.
* **Answer Items** : Once the colors are identified, the system performs post-processing to correct errors. This includes the use of dictionaries for verification and error correction, especially in handwriting recognition.
* **Output** : The final step is to convert the known text into an editable format, such as a text file, Word document, or PDF.

**Types of OCR**

1. Machine-Printed OCR
2. Handwritten OCR
3. Intelligent Character Recognition (ICR)
4. Optical Mark Recognition (OMR)
5. Optical Barcode Recognition
6. 3D OCR

**Real-World Implementations of OCR**

1. **Document Scanning and Digitization**:
   * OCR is widely used to digitize printed documents, allowing organizations to store, search, and edit large volumes of paper records. Examples include Google Books and digitization projects for libraries and archives.
2. **Banking**:
   * Banks use OCR for automated check processing, reading handwritten or printed amounts on checks. OCR is also used for identity verification during account creation by scanning and extracting information from ID cards or passports.
3. **Postal Services**:
   * Postal services use OCR to sort mail by reading handwritten or printed addresses and ZIP codes.
4. **Healthcare**:
   * OCR is used to digitize medical records, prescription labels, and patient notes, improving data accessibility and patient care.
5. **E-commerce**:
   * In e-commerce, OCR is employed to extract information from invoices, receipts, and forms for automating payment processing and data entry.
6. **Mobile Applications**:
   * Apps like Google Lens, Microsoft Office Lens, and Adobe Scan utilize OCR for real-time text extraction, translation, and document scanning through smartphone cameras.
7. **Automated Data Entry**:
   * Businesses use OCR to automate the extraction of data from forms, reducing manual data entry and errors.
8. **Vehicle License Plate Recognition**:
   * OCR is used in traffic management systems to identify and read vehicle license plates for toll collection, traffic monitoring, and law enforcement.

OCR has evolved significantly over the years and has been widely used in various industries such as finance, healthcare, and logistics. With advances in AI and machine learning, the accuracy and versatility of OCR will continue to improve, resulting in robust applications for real-time recognition and strategic document manipulation it is not by work.