Business Card Scanner Application

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***Abstract*—Giving your business card is still a popular method of exchanging contact details at work. But it is tedious and error-filled to add these details one by one. What this project offers is an application that lets you use your phone to scan any business cards. The images are run through Optical Character Recognition (OCR) and are also enriched with AI to recognize names, titles, phone numbers and email addresses from them. All the data is set up for users to see, save and access from their dashboards. Managing campaigns, users and subscriptions is possible from the web interface. The system went through testing using several OCR programs and AWS Textract was discovered to have the greatest number of correct results. The tool provides a practical system for handling and exporting business cards electronically.**

***Index Terms*—Campaign Tracking, Contact Management, Entity Recognition, Lead Capture, OCR, PostgreSQL, React, React Native, AWS Textract, Business Card Scanner.**

I. INTRODUCTION

At most events, conferences and meetings, business cards are widely used to connect people in the industry. Manually adding all of those contacts to your phone or CRM system can be slow and boring. With this app, OCR and AI technology will automatically read and arrange your business card contacts.

Using the app, people can scan the information from both the front and back of a business card. The software saves main details—including the person's name, company, position, phone and email—all together in one place. Users have the option to label contacts with names from ongoing campaigns, filter and group their leads and export the data they require.

The project extracts data from business cards in any shape or layout by combining OCR and AI-based entity recognition. On the web dashboard, admins can both add users and manage their campaigns.

In general, this project allows individuals and teams to control their contact list with much less manual work.

II. LITERATURE REVIEW

Title	Author(s)	Approach	Advantages	Disadvantages
Automatic Contact Importer from Business Cards for Android	Piyush Sharma, Kacyn Fujii	Image processing with OpenCV and Tesseract OCR; C++ for preprocessing, JNI for Android integration	Standalone app, handles occlusions and poor lighting well, integrates with address book	Limited scope of extracted details (name, phone, email), depends heavily on Tesseract for OCR accuracy
Design and implementation of a card reader based on built-in camera	Xi-Ping Luo, Jun Li, Li-Xin Zhen	Multi-resolution analysis for faster text detection and reduced memory usage	High computation speed, lower memory requirements, improved OCR speed through two-	Complexity in implementation, may require higher processing power for multi-resolutio

			layer classifier	n analysis
Android Project Business Card: Ecard	Islam, A. K. M.	Android-based business card application developed using Java, custom layouts, and Android Studio	Simple implementation using Java and Android SDK, customizable UI	Lacks focus on advanced image processing and OCR functionality
A robust mobile business card reader using MMCC barcode	S. K. Ong, D. Chai, A. Rassau	Uses Mobile Multi-Colour Composite (MMCC) barcode to store and read business card details	Highly accurate, avoids issues with OCR failures, works well with mobile cameras	Requires barcode on cards, reliance on specific printing methods, limits adoption to cards with barcodes

III. SYSTEM ARCHITECHTURE

1. Mobile Application (User Interface)

The mobile app is built using React Native, making it compatible with both Android and iOS devices. It allows users to:

- Scan the front and optionally the back of business cards.
- Add notes and campaign-specific tags before saving.
- View, edit, and manage scanned leads through a user-friendly interface.

2. OCR and AI-Based Entity Extraction

When a card is scanned, the image is first processed through an OCR engine (like AWS Textract) to extract raw text. This text is then passed to an AI entity recognition module—initially using OpenAI's API—to intelligently identify key details such as:

- Person's name
- Company name
- Designation
- Contact numbers
- Emails
- Website, LinkedIn, Instagram
- Address and other custom fields

The system is designed to handle multiple values for each field, such as multiple phone numbers or email addresses.

3. Web Application (Admin Interface)

The web dashboard, developed using React, Vite, and Tailwind CSS, is primarily used by organization admins. From here, they can:

- Create and manage campaigns
- Add or remove users
- Monitor progress (e.g., leads captured vs campaign goals)
- View and edit all collected lead data

This admin dashboard is accessible only to authorized users with specific roles like Org Admin or Super Admin.

4. Backend Server

The backend is built with Node.js and Express.js. It provides APIs for:

- User authentication (sign-up, login, OTP verification)
- Role-based access control
- Card scan data submission and retrieval
- Campaign and user management

This layer acts as the bridge between the frontend and the database, handling all business logic.

5. Database

The project uses PostgreSQL as the primary database. It stores:

- User profiles and roles
- Scanned card data (images, extracted text, timestamps)
- Campaign details and user assignments
- Tags, comments, and manual entries

PostgreSQL's support for structured data and relationships makes it a reliable choice for managing complex, multi-tenant information.

IV. METHODOLOGY & IMPLEMENTATION

Planning and designing took place first, then frontend development, next backend development and finally adding OCR and entity extraction using AI to the project. Ensuring all users found the software pleasant to use while still making sure the data was accurate from business cards was a priority.

4.1 Planning and Design

The project started with designing the overall user flow and interface. Wireframes for both the mobile and web applications were created using Figma, keeping usability and minimal interaction in mind. A project flow diagram was prepared to define the interactions between users, campaigns, and lead data.

4.2 Frontend Development

- The mobile app was developed using React Native, enabling cross-platform support for Android and iOS.
- The web app interface for admins was built using React, Vite, and Tailwind CSS for a responsive and fast user experience.
- Both platforms were designed to support user authentication, card scanning, campaign tracking, and lead management.

4.3 Backend Development

- A lightweight backend was built using Node.js and Express.js to handle APIs for user management, lead storage, campaign creation, and data filtering.
- APIs were structured with role-based access, ensuring that features are available only to the correct user types (User, Org Admin, Super Admin).

4.4 Database Design

- PostgreSQL was used to store structured data, including user information, scanned leads, campaign metadata, and tagging information.
- Relationships were carefully mapped to support multi-tenant architecture and campaign-based filtering.

4.5 OCR and Entity Extraction

One of the key challenges was reliably converting unstructured text from business cards into well-organized digital fields.

OCR Tool Comparison

To determine the most effective OCR tool, we compared multiple services including:

- AWS Textract
- Tesseract OCR (open-source)
- Google Vision API

These tools were evaluated based on accuracy, speed, ease of integration, and ability to handle various fonts, layouts, and image clarity. AWS Textract showed consistently better results for structured extraction and was chosen for this project.

Entity Recognition

After OCR, raw text is sent to OpenAI's API for entity recognition. We tested different prompting techniques to improve accuracy in:

- Identifying multiple phone numbers, emails, or social links
- Parsing names, designations, and companies from different layouts
- Handling unusual formats or mixed languages

This helped us refine prompts and structure the extracted data effectively. We also explored fallback rules in case the AI missed specific fields.

4.6 Lead Management and Campaign Tracking

- Users can view, edit, and organize their scanned leads inside the app.
- Campaigns are used to group leads for specific events or purposes.
- Admins can assign users to campaigns, track progress against lead goals, and review campaign-wise analytics.

V. EVALUATION AND RESULTS

A key part of this project involved evaluating how well different OCR tools could extract meaningful information from real-world business card images. Since business cards vary widely in design, fonts, layouts, and even language, it was important to choose a tool that could handle this variability with high accuracy.

OCR Tools Compared

During development, the following OCR options were tested:

- AWS Textract
- Google Cloud Vision API
- Tesseract OCR (open-source)

Each tool was integrated into a test setup where the same set of business card images were processed and the output was compared based on accuracy, clarity of text extraction, and ease of parsing.

Test Dataset

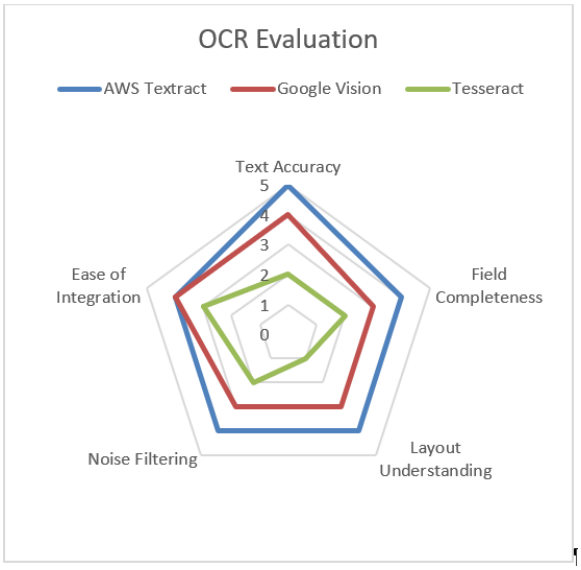
A dataset of 50+ business card images was used for evaluation. These cards included:

- Minimalistic designs with clean text
- Visually heavy cards with logos, icons, and decorative fonts
- Cards with multiple phone numbers, emails, and addresses
- Cards with non-standard layouts (e.g., vertical orientation or dense blocks of text)

Performance Metrics

Each OCR tool was evaluated based on:

- Text accuracy: How correctly it read the printed text
- Field completeness: Whether all key elements (name, phone, email, etc.) were captured
- Noise filtering: Ability to ignore irrelevant elements like design artifacts
- Layout understanding: How well the tool grouped related items together



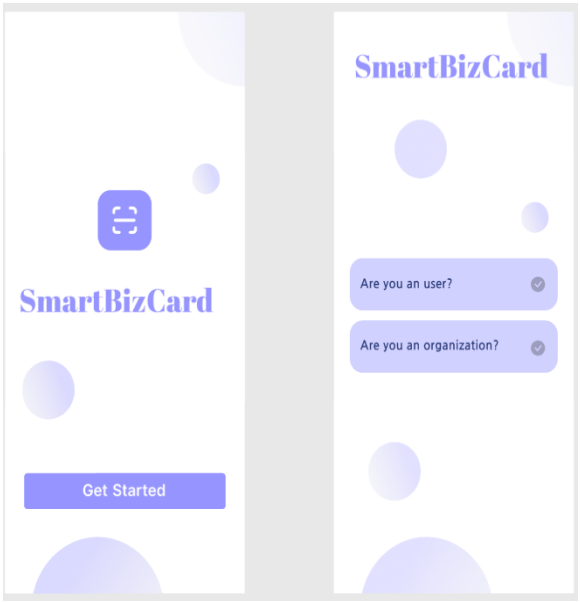
Results

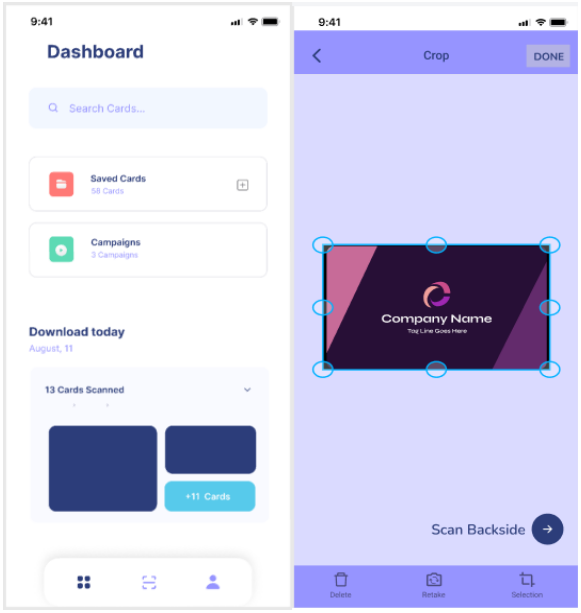
- AWS Textract performed the best overall. It handled both simple and complex card layouts with high accuracy, and was able to extract multiple fields cleanly.
- Google Vision API produced decent results for simpler cards but sometimes missed grouped information or misclassified details.
- Tesseract, while free and customizable, struggled with modern card layouts and had the highest rate of errors, especially in design-heavy cards.

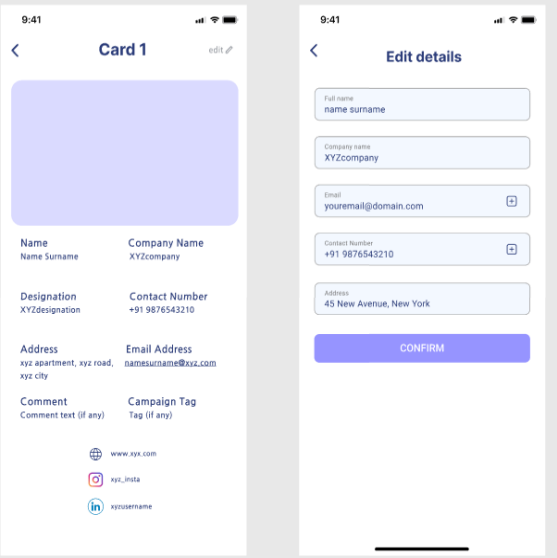
Entity Recognition Results

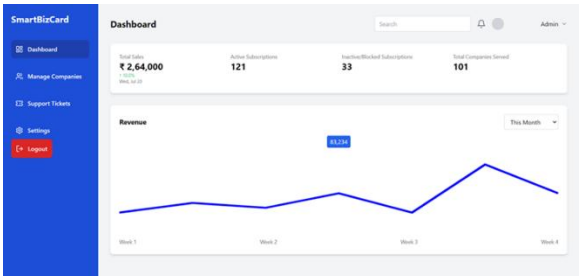
The raw text from OCR was then fed to an AI model (via OpenAI API) to find out names, job roles and contact information. Because of this, the software became smarter at understanding the raw text, especially when its structure made straightforward extraction tough.

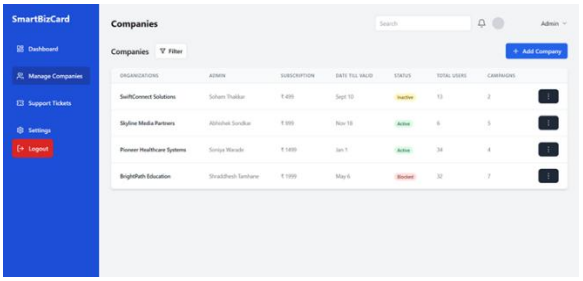
After manual review, using AWS Textract and AI entity recognition resulted in an average correctness of more than 90% in accessing business card features from the dataset.











VI. CONCLUSION

With the use of OCR and AI, this project shows how a practical and quick business card scanner app can be developed. Since users can gather and sort business cards into an app, it handles a challenge faced by many companies and professionals.

With entity recognition, AWS Textract was the quickest and most precise tool by far for extracting clean data from different card layouts. Using the app, users have access to tagging, organizing leads and seeing admin dashboards; it isn't only used for scanning alone.

React, React Native, Node.js and PostgreSQL are among the modern tools used to build the system so it works well on both the mobile and web sides.

VII. FUTURE SCOPE

While the current version of the project meets the primary objectives, there are several areas for future improvement and expansion:

- Advanced Analytics: Adding dashboards for tracking user activity, campaign performance, and lead conversion rates.
- CRM Integrations: Syncing the app with popular CRM tools like HubSpot, Salesforce, or Zoho to streamline follow-ups.
- In-App Communication: Allowing users to send emails or messages to scanned contacts directly from the app.
- Multilingual OCR: Expanding OCR capabilities to support multiple languages and regional business card formats.
- Offline Scanning: Enabling card scanning and temporary data storage even when the device is offline.

These improvements would make the app even more valuable to businesses looking to modernize their contact management process.

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