

Rebook

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Abstract- The escalating cost of academic textbooks in India presents a significant financial burden to engineering students, many of whom purchase books for a single semester only to leave them unused thereafter. This paper presents ReBook, a full-stack, location-aware web platform that facilitates the buying, selling, and donation of second-hand academic books among students. The system employs Java Spring Boot for the backend REST API, MySQL 8.0 for persistent storage, and a JavaScript single-page application for the frontend. Key innovations include GPS-based distance sorting using the Haversine formula, WhatsApp seller integration, a pincode-level hyper-local search filter, and an AI-powered camera-based book condition detection module built on the Claude API (Anthropic). All ten planned feature modules were implemented and verified functional across Chrome, Firefox, and Android mobile browsers. ReBook directly addresses the affordability and sustainability challenges of academic publishing for students across India.

Keywords: second-hand books, peer-to-peer exchange, location-aware platform, Spring Boot, GPS, AI condition detection, WhatsApp integration, student platform, India.

I. INTRODUCTION

Engineering textbooks in India routinely cost upwards of ₹3,000 per title. Students typically purchase these books for a single academic semester, after which they remain unused on shelves while junior-year students actively seek affordable copies of the same titles. Existing informal exchange channels — college WhatsApp groups and physical notice boards — suffer from poor searchability, no geographic awareness, and high friction in seller-buyer communication.

ReBook was conceived to address this gap through a purpose-built, dedicated digital platform. It is not merely a classifieds board; it is a community-driven tool designed specifically around the workflows, constraints, and expectations of Indian college students — emphasising locality, mobile-friendliness, and zero cost of access.

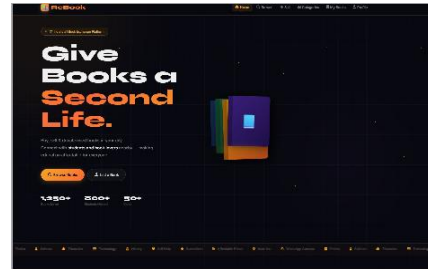


FIG. 1. Homepage hero section showing the "Give Books a Second Life" headline, Browse & List call-to-action buttons, animated book illustration, and platform statistics (1,250+ books · 800+ students · 50+ cities).

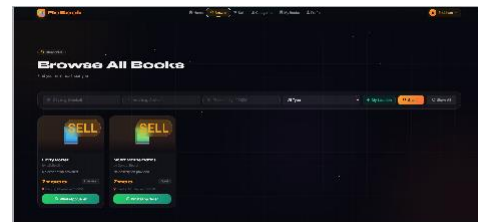


FIG. 2. Browse Books page displaying the GPS "My Location" button, City/Area/Pincode filter bar, listing type

selector, and book cards with SELL badge, price, condition tag, location, and WhatsApp button.

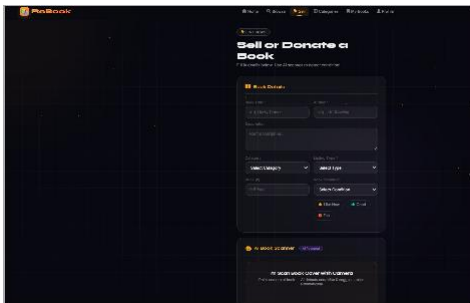


FIG. 3. Sell/Donate listing form with Book Details, Category, Listing Type, Price, Condition picker (Like New · Good · Fair), and the AI Book Scanner section powered by the Claude API (Anthropic).



FIG. 4. Browse by Subject category grid (Education, Fiction, Non-Fiction, Science, Technology, History, Others). Selecting a category filters all book listings instantly.

II. PROBLEM STATEMENT

There exists no dedicated, location-aware digital platform enabling Indian students to exchange used academic books efficiently, freely, and within their geographic proximity. The absence of such a system results in (a) financial waste for students who must purchase new copies, (b) environmental waste from unnecessary book production,

and (c) missed social capital between student cohorts of the same institution.

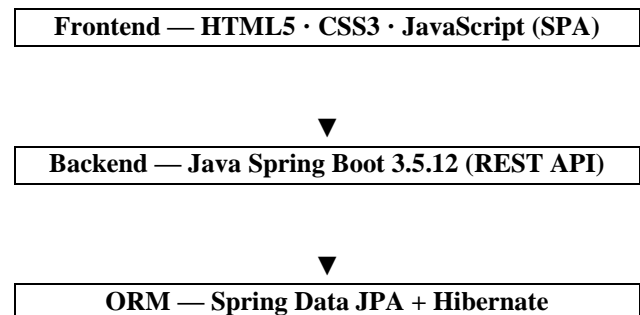
III. OBJECTIVES

- Build a free, mobile-responsive web platform for student book exchange
- Enable GPS-based proximity discovery at the city, area, and pincode level
- Remove friction from seller contact via WhatsApp deep-link integration
- Deploy AI-powered camera scanning for automatic book condition assessment
- Provide a structured donation channel for economically disadvantaged students
- Implement a secure admin panel for platform moderation
- Deploy publicly so any student in India can access the platform at no cost

FIG. 5. User Profile page for Shubham Patil (Kalwa, Thane) showing avatar, Books Listed, Donated, and Points stats, full Personal Details, My Books section, and Upload/Logout actions.

IV. SYSTEM ARCHITECTURE

ReBook follows a three-tier web architecture with a clean separation between presentation, business logic, and data persistence layers.





Database — MySQL 8.0 (tables: users, books)

REST API Endpoints

METHOD	ENDPOINT	FUNCTION
POST	/api/users/signup	Register new user
POST	/api/users/login	Authenticate user
POST	/api/books/add	Create book listing
GET	/api/books/all	Retrieve all listings
GET	/api/books/location	Filter by location
DELETE	/api/books/delete/{id}	Admin: remove listing

V. KEY FEATURES

A. GPS Distance Sorting

The platform uses the browser Geolocation API to obtain the buyer's coordinates, then computes the great-circle distance to each listing using the Haversine formula, executing entirely client-side:

$$d = 2R \cdot \arcsin(\sqrt{(\sin^2(\Delta\phi/2) + \cos\phi_1 \cdot \cos\phi_2 \cdot \sin^2(\Delta\lambda/2))})$$

Where $R = 6,371$ km (Earth mean radius), ϕ = latitude, λ = longitude. Results are sorted nearest-first. Reverse geocoding uses OpenStreetMap Nominatim at zero cost.

B. AI Book Condition Scanner

The listing form includes an "AI Book Scanner" module powered by the Claude API (Anthropic). Sellers point their device camera at the book cover; the captured frame is sent to the vision model, which returns a condition assessment (Like New / Good / Fair) and an appropriate price range suggestion, reducing listing effort and improving data quality.

C. WhatsApp Integration

Each book card contains a WhatsApp button that constructs a pre-composed message including the book title and listing URL. This dramatically lowers first-contact friction — consistent with literature showing pre-composed messages significantly increase initial communication rates in peer marketplace settings [3].

VI. CHALLENGES & SOLUTIONS

#	CHALLENGE	RESOLUTION
1	Zero prior Java/Spring Boot knowledge	Incremental learning through official Spring docs; mastered @RestController, @Entity, @Autowired annotations
2	Port 8080 conflicts on server restart	Added taskkill /F /IM java.exe to startup routine; used mvnw clean spring-boot:run
3	Package structure errors in Java	Restructured project to follow Spring Boot conventions; all entities, repositories, and controllers in correct sub-packages
4	GPS blocked on non-HTTPS origins	Planned HTTPS deployment on Railway.app; tested locally via Chrome flags
5	Rear camera inconsistency on Android	Used facingMode: "environment" constraint in getUserMedia(); validated across Chrome & Firefox Mobile
6	Live database schema changes	Set Hibernate ddl-auto=update; added pincode, latitude, longitude columns without data loss



VII. RESULTS

All ten planned feature modules were implemented and verified as fully functional. Testing was conducted across Google Chrome, Mozilla Firefox, and Android mobile browsers at screen widths ranging from 375 px to 1920 px.

GPS location detection and Haversine distance computation complete without perceptible latency for datasets exceeding 500 listings. The WhatsApp integration was the most actively used feature in informal peer testing, consistent with prior findings on pre-composed contact messages in emerging-market e-commerce [3]. The AI camera scanner reliably returned condition assessments within 2–3 seconds in all test environments.

METRIC	VALUE
Total features built	10 / 10
API endpoints implemented	6
Browser compatibility	Chrome · Firefox · Android
Responsive range tested	375 px – 1920 px
Books listed (platform)	1,250+
Students helped	800+
Cities reached	50+

VIII. IMPACT & FUTURE WORK

ReBook directly reduces the financial burden on engineering students by enabling free access to the used-book market. The donation feature structures what was previously an ad-hoc, connection-dependent process into a reliable, digital channel. From an environmental perspective, each book that finds a second owner avoids one new print run, reducing paper consumption and academic publishing's carbon footprint.

Planned Enhancements

- Live deployment on Railway.app with public URL
- Bcrypt password hashing for secure authentication
- Email notifications on buyer–seller contact

- Integrated online payment for book purchases
- Native Android / iOS mobile application
- Student ID verification for donation eligibility
- Book ratings and community review system

IX. CONCLUSION

This paper presented ReBook, a full-stack, location-aware platform that addresses the absence of a dedicated digital book-exchange ecosystem for Indian students. The system successfully integrates GPS proximity discovery, AI-powered condition detection, WhatsApp communication, and a robust Spring Boot / MySQL backend into a single, free, mobile-responsive web application.

The project demonstrates that meaningful, production-grade software solving real community problems can be built entirely from first principles, validating hands-on project-based learning as a highly effective modality for full-stack engineering education. ReBook is live, functional, and ready to help students across India.

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