Project Summary: Dynamic PDF Bill Translation System (English → Hindi)

1. Project Objective
To build a web-based system that converts specific dynamic fields (party name and address) in a structured, software-generated PDF bill from English to Hindi, while preserving the original layout, formatting, and design of the bill. The system is designed for deployment on Render (backend) and Vercel (frontend).

2. Problem Statement
Traditional PDF translation methods such as OCR or full document rewriting fail because they distort layout, introduce errors, and cannot handle dynamic invoice fields safely. In billing documents, party details change for every invoice, and any layout distortion makes the document unusable professionally.

3. Key Design Principle
Do not modify the original PDF structure. Instead, visually replace only the required text using precise coordinates. This guarantees zero layout distortion and professional output.

4. Core Concept Used
Overlay-Based Text Replacement. The system identifies the exact location of the English text, places a rectangular overlay on top of it, and writes the Hindi translation inside the same area.

5. Scope of Translation
Translated dynamically: Party Name, Party Address.
Not translated: Invoice number, dates, amounts, GST numbers, tables, totals.

6. System Architecture
User Browser → Frontend (Next.js on Vercel) → Backend API (Flask on Render) → PDF Processing Engine → Translated PDF Download.

7. Detailed Workflow
Step 1: User uploads a structured invoice PDF through the web interface.
Step 2: Backend extracts text along with precise coordinates from the PDF.
Step 3: Party name and address region is detected using a fixed template or anchor labels.
Step 4: Extracted English party details are dynamically translated to Hindi while preserving numbers and formatting.
Step 5: A white rectangular overlay is placed over the original English text.
Step 6: Hindi text is written inside the same rectangle using a Unicode Hindi font with automatic wrapping and font-size adjustment.
Step 7: The final PDF is generated with layout intact.
Step 8: The user downloads the translated PDF.

8. Reliability of the Approach
This method ensures layout safety, supports dynamic content, avoids OCR errors, and is fast and scalable.

9. Deployment Strategy
Backend: Flask-based stateless API deployed on Render.
Frontend: Lightweight upload and download interface deployed on Vercel.

10. Final Outcome
The system generates professional, layout-safe Hindi bills with dynamic party information translation and production-ready deployment capability.

11. Project Classification
Template-Aware, Coordinate-Based PDF Language Transformation System.