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MEDXPERT: Digitizing Medical Prescriptions Using AI and UHID Integration

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***Abstract*—This paper introduces MEDXPERT, an intelligent medical prescription digitization system that integrates OCR, NLP, UHID-based authentication, and digital security standards. It enables real-time prescription generation, verification, and access through a unified interface supporting handwritten, typed, and voice inputs. The system ensures accuracy, accessibility, and integration with India's ABDM health infrastructure, reducing manual errors and improving data continuity. We present the system's architec...**

Keywords— Prescription Digitization, UHID, AI in Health-care, NLP, OCR, ABDM, Smart Health, React, Django

I. Introduction

Handwritten medical prescriptions remain a significant con-tributor to patient misdiagnosis, incorrect medicine dispensing, and healthcare inefficiencies in India. Despite rapid digitiza- tion in various domains, healthcare remains highly dependent on physical documents. India's Ayushman Bharat Digital Mis- sion (ABDM) aims to link all health records to a Unique Health ID (UHID), yet the adoption at the prescription level remains minimal. MEDXPERT addresses this problem with a secure, AI-driven platform that ...

II. Motivation and Problem Definition

Traditional prescription workflows lack consistency and ac-cessibility. The absence of digital records leads to incomplete patient history, repeated tests, and adverse drug interactions. Moreover, pharmacists often struggle to interpret illegible handwriting. MEDXPERT is built to address:

- Misinterpretation of doctor handwriting by patients or pharmacists.
- Absence of centralized medical history tracking.
- Lack of intelligent input tools for digital prescription creation.

The motivation is to empower doctors with intuitive tools and patients with permanent, portable access to their prescriptions.

III. System Overview and Architecture

System Architecture Layers:

- **User Interface Layer:** React.js-based platform designed for ease of use on tablets and desktops. Supports text input, handwriting capture using canvas, and voice recog- nition.
- **Processing Layer:** Integrates OCR (Tesseract.js), NLP for transcription, fuzzy drug name search, and auto-suggestion based on input stream.
- **Data Layer:** Stores prescriptions, user roles, drug meta- data, and UHID-linked records in PostgreSQL. Data is encrypted with AES-256 and validated with hash checks.

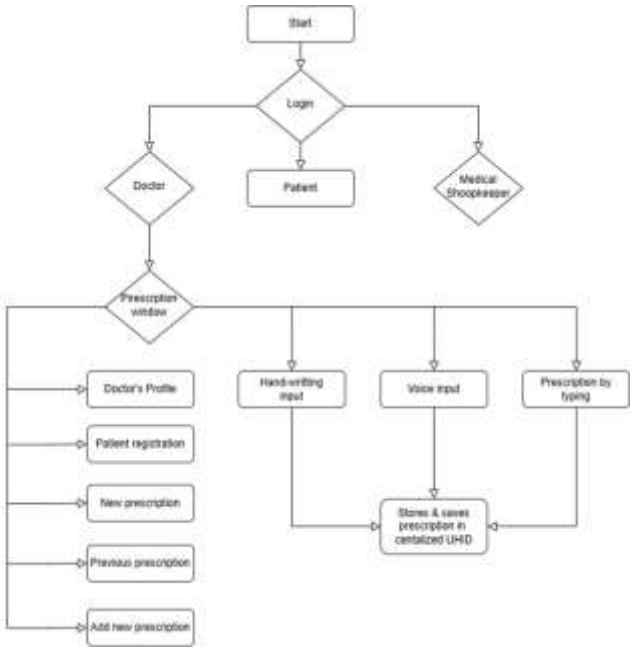

Fig. 1. Architecture Overview of MEDXPERT System

IV. Module Description

Doctor Interface:

- Login with OTP or password linked to hospital profile.
- Create prescriptions via handwriting or speech.
- Drug suggestions and auto-completion supported.
- Real-time preview and secure PDF generation.

Patient Dashboard:

- UHID-based access to full prescription history.
- Track past doctors and treatment cycles.
- Export prescriptions for second opinions or emergency care.

Pharmacist Portal:

- View patient prescriptions via QR code or UHID lookup.
- Confirm authenticity via digital signature or hash.
- Dispense medicines accurately and store issuance data.

V. Implementation Details

The backend is developed in Python using Django REST framework. APIs are integrated for:

- OCR text extraction from canvas images.
- Voice-to-text conversion using Web Speech API.
- Fuzzy match of drug names using Fuse.js.
- Generation of PDFs using PDFKit.

Data validation and access control is handled using JSON Web Tokens (JWT). Test coverage includes:

- Cross-browser compatibility (Chrome, Firefox, Edge).
- Load testing with JMeter: 100 concurrent users with
¡150ms latency.
- OCR on 400+ stylus samples with 90.2% accuracy.
- Voice recognition accuracy at 93.5% across 500+ medical sentences.

VI. Security and Privacy Measures

Ensuring patient privacy is a cornerstone of the system:

- Role-based access controls ensure only authorized users view sensitive data.
- Data in motion and at rest is encrypted using HTTPS and AES-256.
- Every prescription includes a digital checksum and times- tamp.
- Audit logs track all user activity for accountability.

VII. Comparative Study

Compared to manual workflows, MEDXPERT reduces pre- scription creation time by over 35%, enhances readability by digitizing entries, and reduces the chance of incorrect drug dispensation. A brief comparison:

- **Manual Entry:** Time-consuming, no storage, high chance of error.
- **Basic EHR:** Structured but lacks real-time AI tools.
- **MEDXPERT:** Multimodal input, smart validation, UHID integration.

VIII. Challenges Faced

- Accurate OCR on stylus handwriting required tuning.
- Complex drug names needed dynamic dictionary updates.
- Training models to avoid transcription of background noise in voice inputs.
- Ensuring privacy without compromising usability for patients.

IX. Future Scope

To expand the utility of the platform:

- Multilingual voice recognition and local language OCR.
- Smart drug interaction alerts and allergy tracking.
- Live sync with government health portals and private hospitals.
- Integration with wearable health trackers and teleconsul- tation apps.

X. Conclusion

MEDXPERT offers a scalable and AI-integrated solution for prescription digitization. It serves doctors, patients, and pharmacies in a unified ecosystem. Its impact lies in reducing errors, improving patient outcomes, and supporting India's digital health objectives. Through continuous development and collaboration with healthcare institutions, MEDXPERT can become a national standard for prescription and medical record interoperability.

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