Documentation

Technical Documentation: AI-Powered Medical Claim Processing System

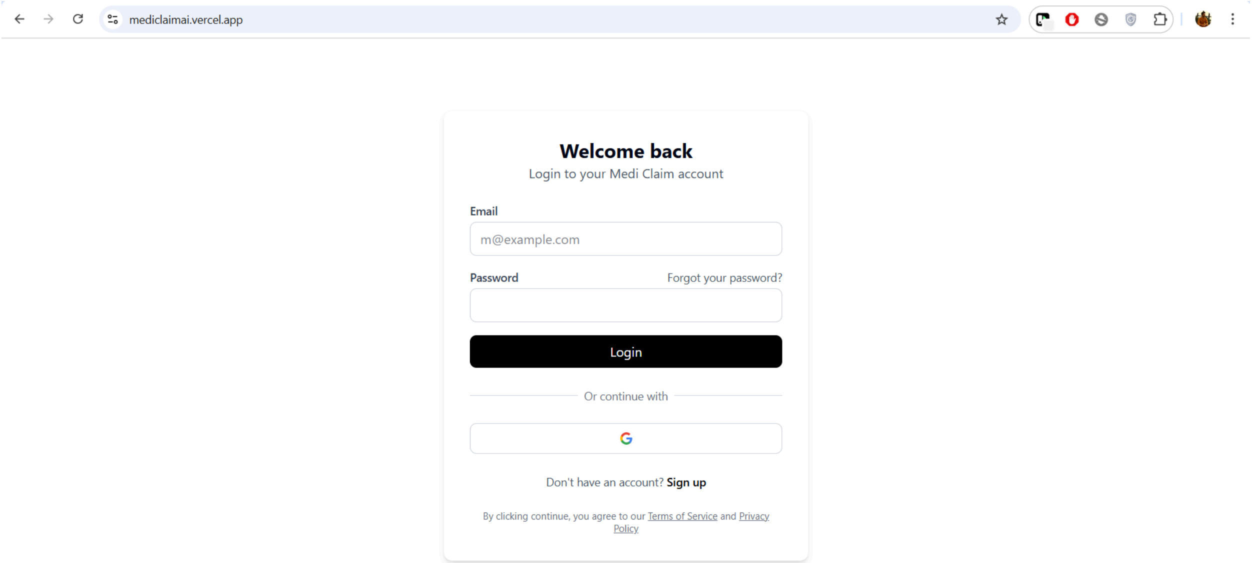
System Overview

The AI-Powered Medical Claim Processing System is a sophisticated solution designed to automate and streamline the processing of medical claims through intelligent document analysis and data extraction.

Architecture

The system follows a modern microservices architecture with the following key components:

- **Frontend Layer**- React.js-based user interface
  -ShadCn component and tailwindcss for styling

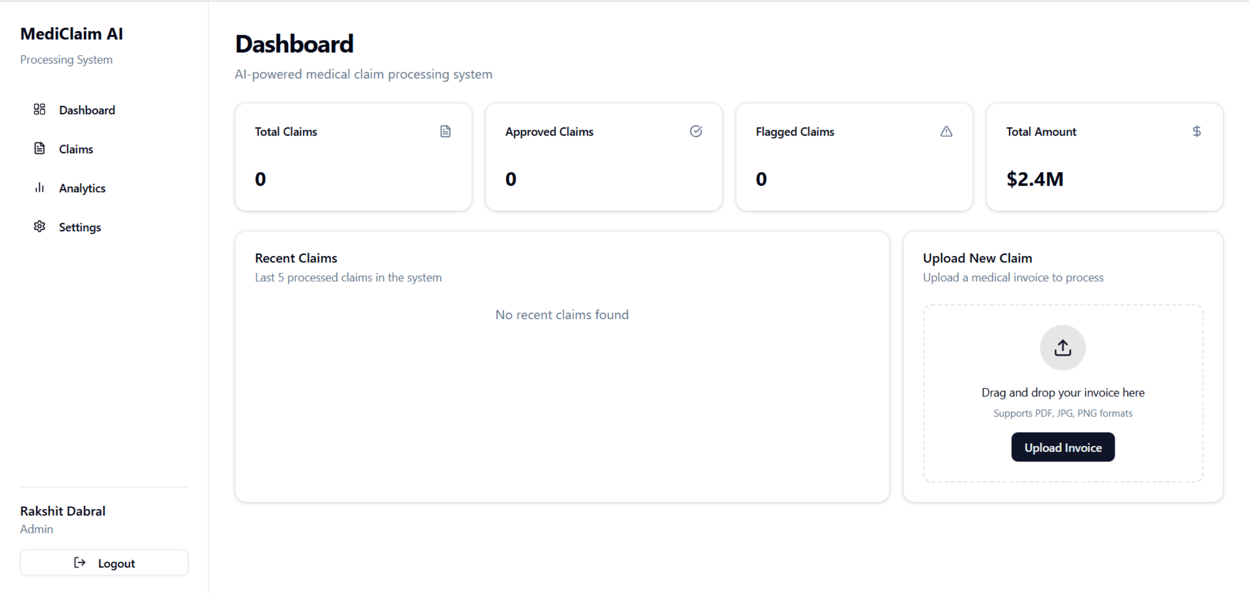


Welcome back

Login to your Medi Claim account

Don't have an account? **Sign up**

By clicking continue, you agree to our Terms of Service and Privacy Policy



Dashboard

AI-powered medical claim processing system

Total Claims	Approved Claims	Flagged Claims	Total Amount
0	0	0	$2.4M

Recent Claims

Last 5 processed claims in the system

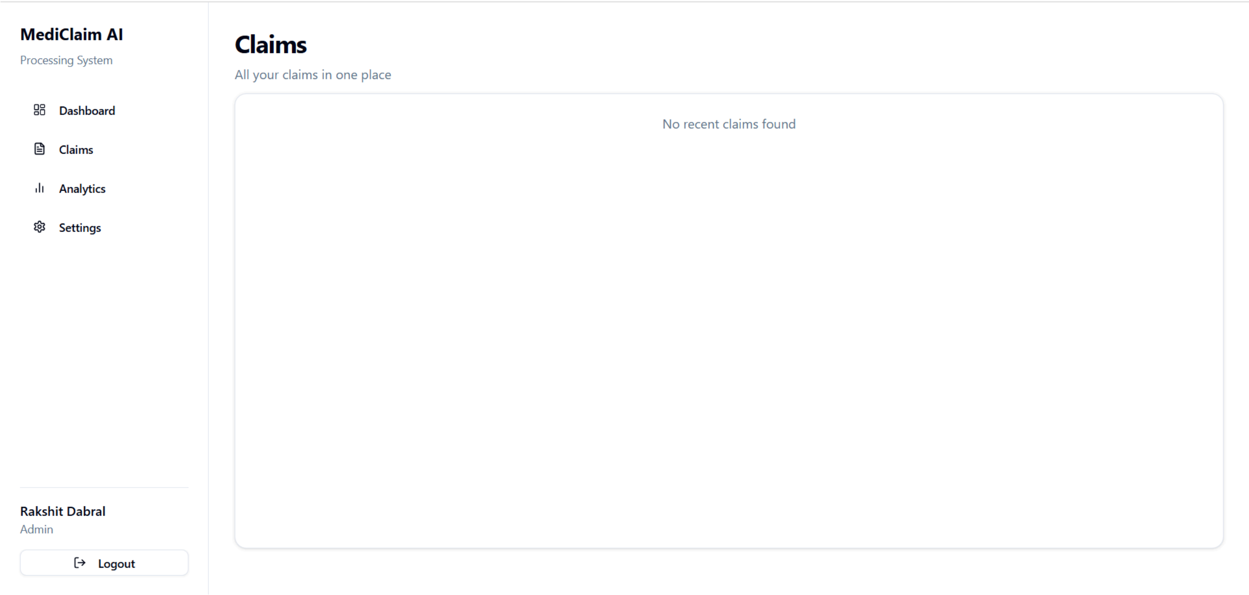
No recent claims found

Upload New Claim

Upload a medical invoice to process

Drag and drop your invoice here

Supports PDF, JPG, PNG formats



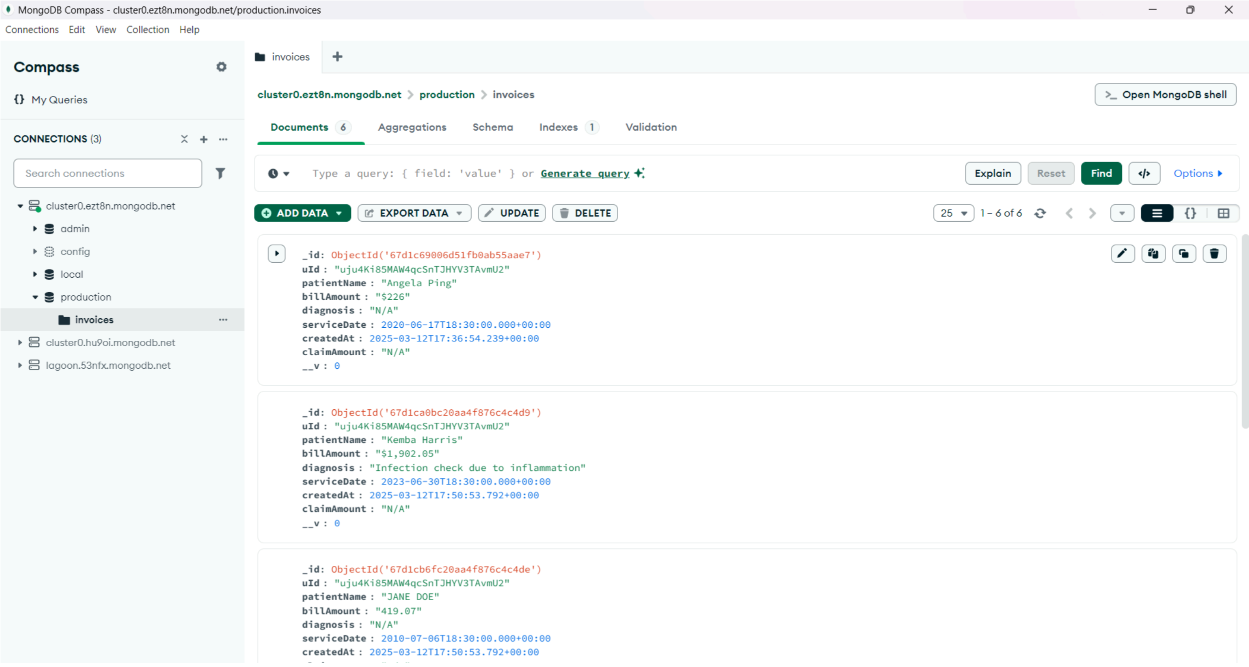
Claims

All your claims in one place

No recent claims found

- **Backend Layer**- Node.js/Express.js server
  - RESTful API architecture

  -MongoDB for storing data
- **AI Processing Layer**- GPT-4o-mini model integration
  - Custom OCR pipeline
  - Validation rules engine
- **Data Layer**- MongoDB database
  - Indexed collections for optimal performance


MongoDB Compass - cluster0.ezt8n.mongodb.net/production.invoices
Connections Edit View Collection Help
Compass
My Queries
CONNECTIONS (3)
Search connections
cluster0.ezt8n.mongodb.net
admin
config
local
production
invoices
cluster0.hu9oi.mongodb.net
lagoon.53nfx.mongodb.net
invoices
cluster0.ezt8n.mongodb.net > production > invoices
Open MongoDB shell
Documents 6
Aggregations
Schema
Indexes 1
Validation
Type a query: { field: 'value' } or Generate query
Explain
Reset
Find
Options
ADD DATA
EXPORT DATA
UPDATE
DELETE
25
1 – 6 of 6

```
_id: ObjectId('67d1c69006d51fb0ab55aae7')
uId : "uju4Ki85MAW4qcSnTJHYV3TAvmU2"
patientName : "Angela Ping"
billAmount : "$226"
diagnosis : "N/A"
serviceDate : 2020-06-17T18:30:00.000+00:00
createdAt : 2025-03-12T17:36:54.239+00:00
claimAmount : "N/A"
__v : 0

_id: ObjectId('67d1ca0bc20aa4f876c4c4d9')
uId : "uju4Ki85MAW4qcSnTJHYV3TAvmU2"
patientName : "Kemba Harris"
billAmount : "$1,902.05"
diagnosis : "Infection check due to inflammation"
serviceDate : 2023-06-30T18:30:00.000+00:00
createdAt : 2025-03-12T17:50:53.792+00:00
claimAmount : "N/A"
__v : 0

_id: ObjectId('67d1cb6fc20aa4f876c4c4de')
uId : "uju4Ki85MAW4qcSnTJHYV3TAvmU2"
patientName : "JANE DOE"
billAmount : "419.07"
diagnosis : "N/A"
serviceDate : 2010-07-06T18:30:00.000+00:00
createdAt : 2025-03-12T17:50:53.792+00:00
```

Performance Optimization

Key performance features include:

- Caching mechanisms for frequently accessed data
- Database query optimization
- Load balancing for high availability
- Asynchronous processing for large workloads

Working of the Solution

The system follows a secure and efficient workflow for processing medical claims:

1. **User Authentication:** Firebase authentication system ensures secure access, allowing only registered users to utilize the service.
2. **Document Upload:** Users can upload medical claim documents through a secure interface.
3. **AI Processing:** The uploaded documents are processed by the GPT-4o-mini model, which extracts relevant features and information from the claims.

4. **Data Storage:** Extracted information is securely stored in MongoDB, with each record uniquely identified by the user's Firebase UID for proper data segregation and retrieval.
5. **Validation:** The system performs automated validation checks to ensure data accuracy and completeness.
6. **Results Generation:** Processed claims are presented to users through an intuitive interface, showing extraction results and any necessary actions.
7. **Deployment:** Backend services are deployed on Render for scalability and reliability, while the frontend is served through Vercel's global CDN network for optimal performance and minimal latency.