🎓 LEARNHUB

Complete Learning Management System - Architecture & Methodology

🏗️ System Architecture

Frontend Layer

React 18 + TypeScript

- React Router DOM
- Context API
- Custom Hooks

Tailwind CSS

Backend Layer

Node.js + Express

- RESTful API
- TypeScript

Middleware

- JWT Authentication

Database Layer

MongoDB + Mongoose

- NoSQL Database
- Schema Validation

Data Models

- Users & Courses

- Zara-inspired Theme
- Responsive Design

- File Upload (Multer)
- CORS & Validation

- Videos & Quizzes
- Classrooms
- Certificates

Vite Build Tool
- Fast Development
- Hot Module Reload

Controllers
- Course Management
- Quiz System
- AI Chatbot
- Certificates

External Services
- Google Gemini AI
- YouTube API

🔄 How LearnHub Works

1 User Registration → **2** Course Creation & Browsing → **3** Content Delivery (Videos) →
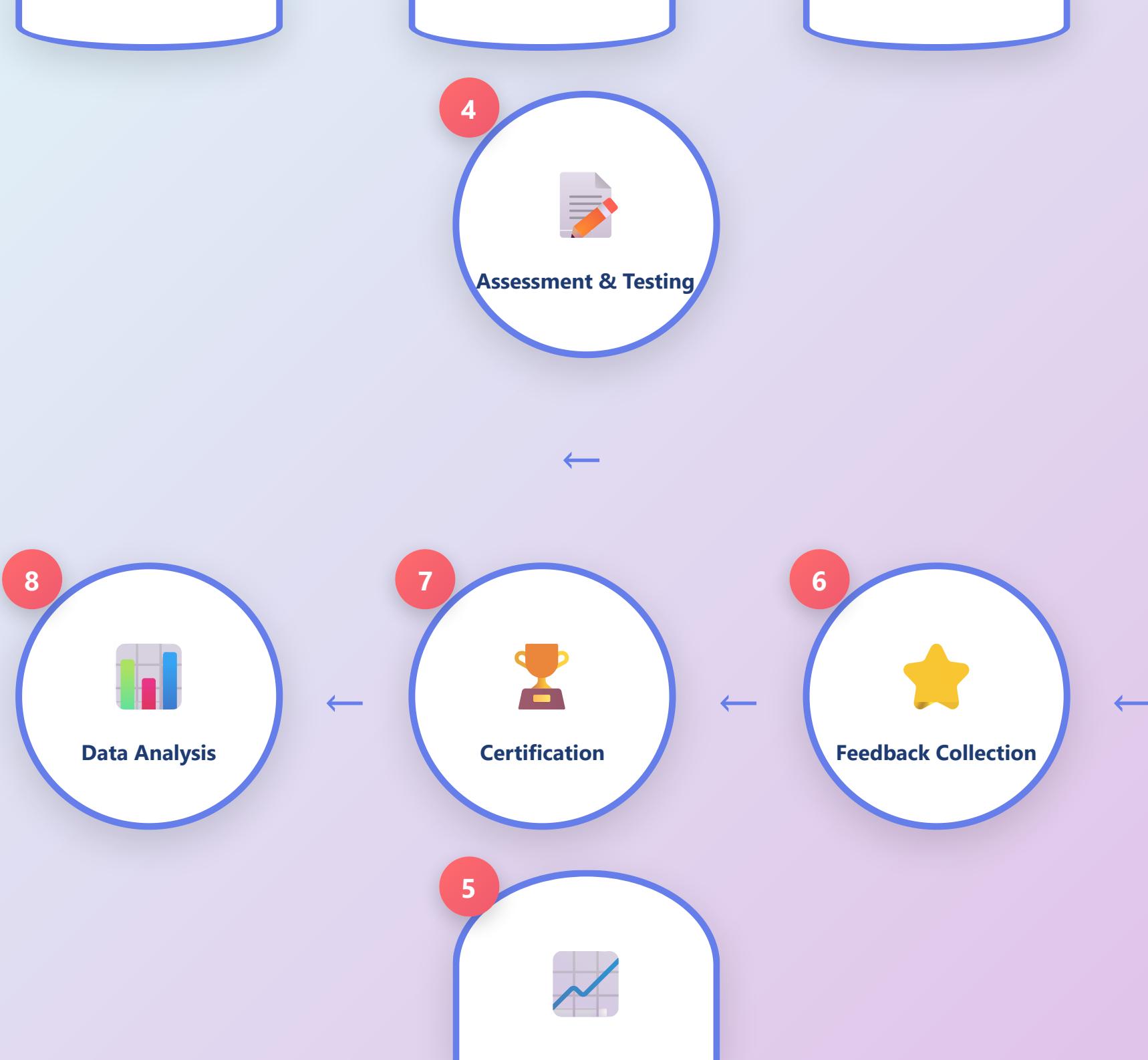
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Assessment & Testing

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Data Analysis

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Certification

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Feedback Collection

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5

Progress Tracking

📦 System Modules

1 Authentication Module

Registration: User signup with role selection

Login: JWT-based authentication

Authorization: Role-based access control

Profile: User profile management

2 Course Management

Catalog: 14 complete courses

Enrollment: Easy course registration

Content: Videos, lessons, materials

Progress: Track completion status

3 Video Learning System

Player: YouTube & custom videos

Tracking: Auto-save progress

Resume: Continue from last position

Completion: Mark videos as complete

4 Assessment System

Quizzes: Multiple choice questions

Grading: Automatic scoring

Feedback: Instant results

Assignments: Submit & grade

5 AI Chatbot

AI Assistant: Google Gemini powered

24/7 Help: Always available

Context: Course-specific answers

6 Classroom Module

Create: Teachers create classrooms

Join: Students use code to join

Manage: Lessons & assignments

Guidance: Learning support

Statistics: Performance tracking

7 Certificate System

Generation: Auto-create certificates

Templates: Custom HTML design

Verification: Unique certificate ID

Download: PDF format

8 Analytics & Reports

Dashboard: Visual statistics
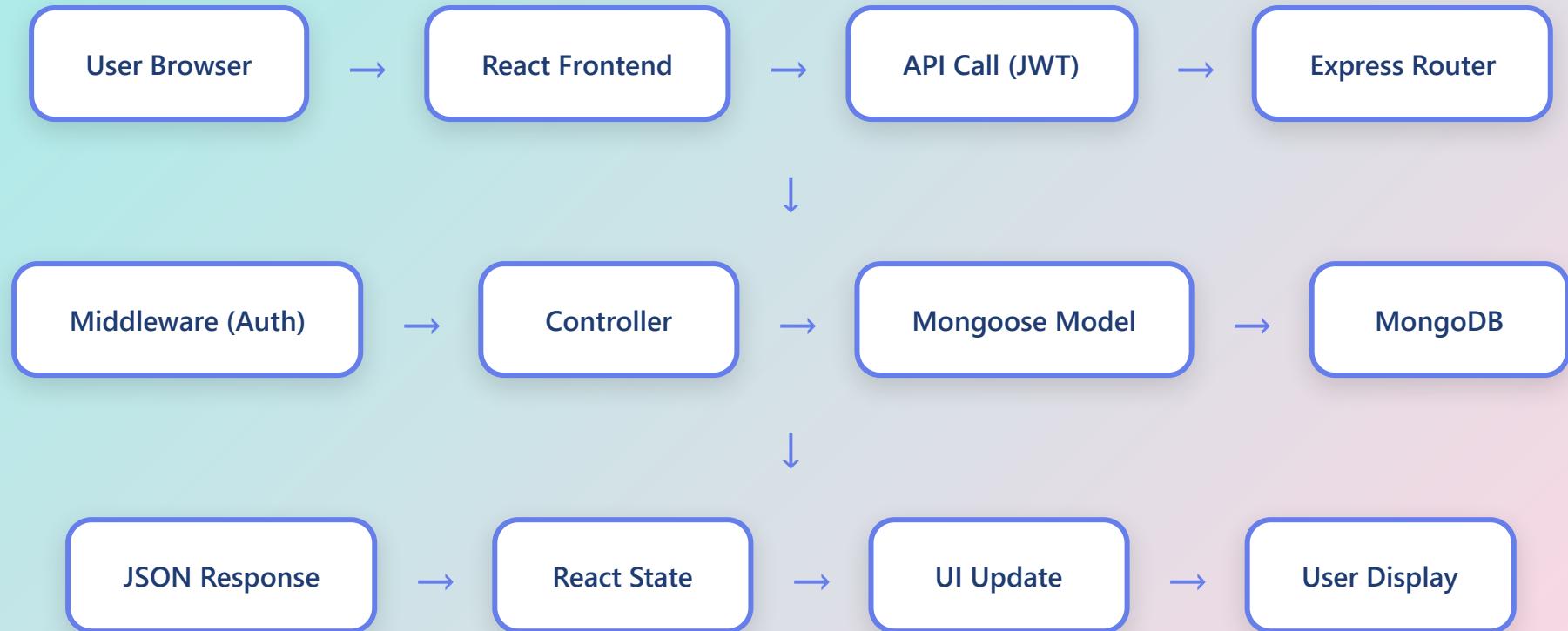
Progress: Track learning journey

Performance: Quiz scores & grades

Insights: Learning patterns

💾 Request-Response Data Flow

User Browser → React Frontend → API Call (JWT) → Express Router

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Middleware (Auth) → Controller → Mongoose Model → MongoDB

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JSON Response → React State → UI Update → User Display

⚙️ Technology Stack

Frontend Technologies

✓ React 18

Backend Technologies

✓ Node.js

Database & Services

✓ MongoDB

- ✓ TypeScript
- ✓ Vite
- ✓ Tailwind CSS
- ✓ React Router DOM
- ✓ Context API
- ✓ Axios

- ✓ Express.js
- ✓ TypeScript
- ✓ JWT (jsonwebtoken)
- ✓ bcryptjs
- ✓ Multer
- ✓ Nodemon

- ✓ Mongoose ODM
- ✓ Google Gemini AI
- ✓ YouTube API
- ✓ File Storage
- ✓ Certificate Gen.

LearnHub - Complete Learning Management System

Built with React, Node.js, MongoDB & AI Integration

Repository: github.com/PriyadarshanLG/LevelUp