



University of Dhaka

Department of Computer Science and Engineering

Final Project Report on *LangMastero*



CSE-2216: Application Development Lab

Team name: Quattro

Members:

Abdullah Evne Masood (03)

Ibna Afra Roza (16)

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1. Project Title

"LangMastero – A Cross-Platform Language Learning Application"

2. Introduction

With globalization and international communication on the rise, learning new languages has become more essential than ever. To support self-paced, interactive language learning, we developed **LangMastero**, a cross-platform mobile application built using **Flutter** (frontend), **FastAPI** (backend), and **MongoDB** (database). This app empowers users to enhance vocabulary, grammar, and speaking skills through interactive MCQ quizzes, daily learning modules, and visual learning aids.

- **GitHub:** <https://www.github.com/hasan-mehedii/CSE-2216-Project>
- **Video:** <https://youtu.be/-zH8NUaVHFw>
- **Video (with voice):** <https://youtu.be/-zH8NUaVHFw>
- **APK Link:** [LangMastero.apk](#)

3. Objectives

The primary goals of this project were:

- To build an intuitive, user-friendly language learning mobile app.
- To allow users to register, log in, and take interactive quizzes.
- To store and retrieve user performance and learning data using a backend service.
- To enable scalable storage using a NoSQL database (MongoDB).
- To implement clean architecture and follow industry-standard development practices.

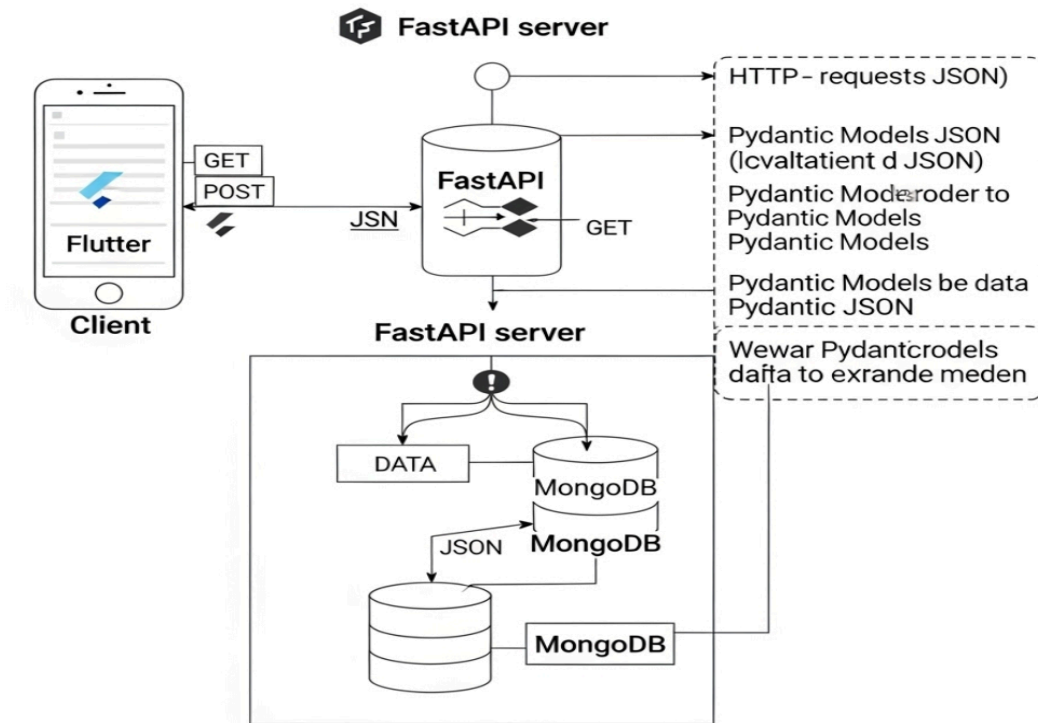
4. Features

- User Authentication (Signup/Login)
- Vocabulary, Flashcards, MCQ Quiz and Sentence Making.
- Learning Guideline with Todo List
- Support for Multiple Languages
- Live QNA with admin (Pro User)
- Pre recorded premium video classes
- Admin Dashboard (For insert JSON and manage user)
- Web version using Flutter Web
- Data stored in MongoDB (Cloud/Local)
- RESTful API powered by FastAPI

4. Technology Stack

Layer	Technology	Purpose
Frontend	Flutter	Cross platform UI development
Backend API	FastAPI	Lightweight, high-speed API
Database	MongoDB	Storing user data and quiz sets
Cloud Hosting	Render.com	For backend hosting

5. System Architecture:

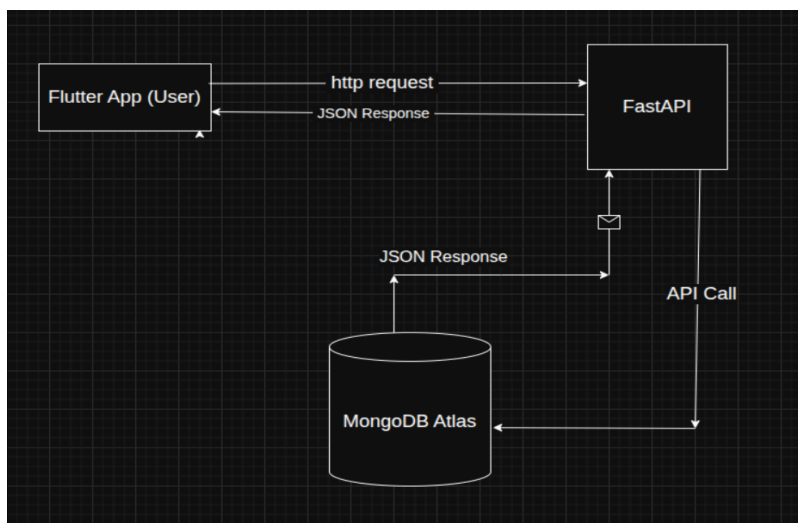


Flutter App (User) → FastAPI backend → MongoDB Atlas

Frontend: Sends login credentials, quiz answers, and fetches quiz data.











Backend: Handles routing (/login, /register, /mcq, /result etc.) and validation.

Database: Stores user profiles, quiz sets, and historical performance.



System Design

6. Key Features

-  User Authentication (Signup/Login)
-  Vocabulary, Flashcards, MCQ Quiz and Sentence Making.
-  Learning Guideline with Todo List
-  Support for Multiple Languages
-  Live QNA with admin (Pro User)
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7. Implementation Details

Frontend (Flutter)

- **Packages Used:**
 - [http](#) for API calls
 - [flutter_dotenv](#) for secure API URLs
 - [shared_preferences](#) for local session management

Also we have used `youtube_player_iframe`, `cached_network_image`, `flutter_map`, `latlong2` and many more.

- **Widgets:**
 - [LoginPage](#), [RegisterPage](#), [MCQTestPage](#)
 - Custom buttons and image cards for language visual aids

Backend (FastAPI)

- Built using asynchronous endpoints
- CORS enabled for Flutter integration
- Modular route handling ([auth.py](#), [quiz.py](#), [main.py](#))
- Example route:

```
@app.post("/submit_mcq/")  
  
async def submit_mcq(data: MCQSubmission):  
  
    # Validate and store results
```

We used email_validator, uvicorn, bcrypt, motor, passlib and many more to implement the backend. We uploaded our backend into [render.com](#) for hosting.

Database (MongoDB)

- Collections:
 - [users](#): for login credentials and personal data

```
{  
  "_id": { "$oid": "687251cfae1b951d96dd740b" },  
  "fullName": "Lionel Messi",  
  "username": "messi",  
  "email": "messi@gmail.com",  
  "phoneNumber": "01606140285",  
  "countryCode": "+88",  
  "gender": "Male",  
  "nid": "0123456789",  
  "dob": {  
    "$date": { "$numberLong": "948240000000" }  
  },  
  "password": "$2b$12$/wyJX4lGmcT/v6etCMbBW.CMQwCPooU061",  
  "is_premium": false  
}
```

- **mcqs**: list of question-answer sets.

```
"_id": { "$oid": "68725239ae1b951d96dd740c" },
"question": "The meaning of 'tree' in {selected_language}",
"languages": {
  "spanish": {
    "options": [
      "casa",
      "árbol",
      "coche",
      "sol"
    ],
    "answer_index": { "$numberInt": "1" }
  },
  "german": {
    "options": [
      "Haus",
      "Baum",
```

- **Sentence**: We inserted data just in this format:

```
_id: ObjectId('687252a0ae1b951d96dd740d')
english: "The cat is on the house/"
spanish: "El gato está en la casa/"
german: "Die Katze ist auf dem Haus/"
arabic: "القطّة على المنزل/"
french: "Le chat est sur la maison/"
chinese: "猫在房子上/"
```

- **Videos**: We inserted data just in this format:

```
"_id": { "$oid": "687252fd9ae1b951d96dd740e" },
"language": "Spanish",
"videos": [
  {
    "title": "Day 1",
    "videoId": "WHxYhsgobCM"
  },
  {
    "title": "Day 2",
    "videoId": "2SIdIAMzHH0"
  },
  {
    "title": "Day 3",
    "videoId": "hsLYD1Jyf3A"
  },
  {
    "title": "Day 4",
    "videoId": "QwzHh4fG8T"
```

- **Words:** Data were inserted in this format:

```
{
  "_id": { "$oid": "68725352ae1b951d96dd740f" },
  "english_word": "apple",
  "translations": {
    "spanish": "manzana",
    "german": "apfel",
    "arabic": "تفاحة",
    "chinese": "苹果",
    "french": "pomme"
  },
  "image_link": "https://plus.unsplash.com/premium-photo-
```

- **users:** for login credentials and personal data:

```
_id: ObjectId('68740a00310c7f38d86b61c2')
question : "Spanish of apple? 🍏"
askedBy : "neymar@gmail.com"
timestamp : 2025-07-13T19:33:20.518+00:00
answer : "check vocabulary"
answeredBy : "admin@gmail.com"
answeredAt : 2025-07-13T19:34:09.566+00:00
```

8. Individual Responsibilities

- **Abdullah Ibne Masood (Roll - 03)**

1. Sentence Building backend
2. Flash Cards
3. Forget Password
4. Backend hosting
5. Widgets tree
6. Data handling

- **Mehedi Hasan (Roll - 22)**

1. User Authentication
2. Vocabulary section
3. MCQ backend
4. Welcome page
5. MongoDB collection design





- **Ibna Afra Roza (Roll - 16)**

1. Login page UI
2. Admin and User Homescreeen
3. Admin section (Admin insertion , MCQ, Sentence, Word insert, User manage) UI design
4. MCQ test screen
5. Live QNA for admin and user

- **Nafisha Akhter (Roll - 40)**

1. Added word database for vocabulary along with image,video,sentences to MongoDB Atlas
2. Get pro version(Payment System)
3. About Us page
4. Daily routine and work schedule section
5. Student dashboard
6. Fixed timer error.

9. Future Improvements

-  AI tutor with OpenAI API
-  Downloadable lessons and offline mode
-  Tutor marketplace and booking system
-  Speech recognition for pronunciation evaluation