# Hamza Mirza

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## Education

**Indian Institute of Technology Madras** **Expected Graduation: 2027**
*Bachelor of Science in Data Science* *India*

## Relevant Coursework

- Data Structures & Algorithms
- Database Management Systems
- Object-Oriented Programming
- Operating Systems
- Computer Networks

## Projects

**AI Educational Video Generator** | *Python, EasyOCR, Faster-Whisper, Gemini, MoviePy*
- Designed and implemented an end-to-end AI pipeline that converts educational PDFs/images and teacher narration into synchronized instructional videos.
- Integrated OCR, speech transcription, LLM-based annotation planning, timeline generation, and video rendering into a modular multi-stage workflow.
- Built synchronization logic to align AI-generated annotations with narration timestamps, enabling progressive teacher-style solution visualization.
- Generated structured JSON artifacts for debugging, validation, and workflow inspection.

**Advanced Backend Architecture Project** | *Node.js, Express.js, MongoDB, TypeScript*
- Designed and implemented a layered backend architecture using controllers, routes, middleware, models, and utility modules.
- Implemented JWT-based authentication, authorization, refresh token workflows, and secure user account management features.
- Integrated Cloudinary and Multer for media upload pipelines including avatar and cover image management.
- Built reusable utilities for asynchronous request handling, centralized error management, and standardized API responses.

**Question & Solution Image Mapping Automation** | *Python, Pandas, OpenPyXL*
- Developed a metadata-driven automation utility to reconstruct question-solution relationships from Excel records and hash-based image filenames.
- Implemented deterministic mapping, validation, and sequential output generation for educational content workflows.
- Built verification pipelines using checksum validation, file consistency checks, and completeness auditing to ensure output integrity.
- Designed non-destructive processing workflows with structured logging and reproducible execution.

**Validated Backend API System** | *Node.js, TypeScript, Prisma, PostgreSQL*
- Developed type-safe REST APIs using Prisma ORM and Zod validation with modular backend architecture patterns.
- Designed reusable middleware for request validation, centralized error handling, and asynchronous request management.
- Structured relational database models and backend workflows using PostgreSQL and Prisma ORM.
- Built standardized API response utilities for reliable and maintainable backend operations.

## Technical Skills

**Languages**: TypeScript, JavaScript, Python, Java, SQL, C
**Backend**: Node.js, Express.js, REST APIs, Prisma ORM, Authentication & Authorization, Zod
**Databases**: PostgreSQL, MongoDB, MySQL, Redis
**AI & Automation**: Gemini API, EasyOCR, Faster-Whisper, Workflow Automation, LLM Integrations
**Developer Tools**: Git, GitHub, Docker, Postman, Cloudinary, Multer, FFmpeg

## Leadership / Extracurricular

- Selected participant in PW-IOI technical training program focused on problem solving and software engineering fundamentals.
- Core member of a student tech club contributing to technical discussions, debugging sessions, and collaborative problem solving.