

HEC / Polytechnique AI Academic Assistant

Technical & Strategic Working Document

1. Vision & Philosophy

The objective is not to build a generic chatbot, but an institutional AI agent that is structured, governed, traceable, and evolutive.

Core principles:

- LLM-agnostic architecture (no vendor lock-in, A/B testing capability)
- RAG-first approach (answers grounded in sources)
- Human-in-the-loop validation
- Institution-ready design (logs, permissions, governance)

2. Current Demo Features

Architecture:

- RAG pipeline
- Vector database
- Web interface
- Public institutional data
- Confidence scoring
- User feedback system

Functionalities:

- Academic regulations Q&A;
- Public deadlines
- Program structure questions
- Semantic search across documents

- Source citation
- Low-confidence detection

3. Target Technical Stack

Frontend:

- Next.js (App Router)
- Tailwind CSS

Backend:

- Node.js API layer
- Zod validation
- Rate limiting middleware

Database:

- PostgreSQL
- pgvector extension
- Row-Level Security

RAG Layer:

- LlamalIndex
- Hybrid search (BM25 + vector)

LLM Layer:

- Abstracted LLMProvider interface
- OpenAIProvider / GeminiProvider
- Fixed embeddings provider

Auth:

- Phase 1: Magic link
- Phase 2: Azure AD integration

Observability:

- Structured logs
- Analytics dashboard
- Latency and cost monitoring

4. Future Features

Short term:

- Admin back-office
- Document import (PDF/DOCX/URL)
- Draft → Publish workflow
- Analytics

Mid term:

- Microsoft authentication
- Structured deadlines table
- Calendar sync

Advanced:

- Supervised autonomous agents
- FAQ suggestion engine
- Question clustering
- Weekly admin digest

5. Identified Blockers

- Microsoft Azure AD integration approval
- Access to internal APIs
- Editorial governance
- GDPR compliance clarification
- Official positioning decision

6. Areas Where Collaboration Is Needed

Technical:

- Advanced RAG tuning
- Production-grade security

Institutional:

- API access
- Azure AD integration
- Data governance validation

Strategic:

- Hi! PARIS framing
- Cross-school structuring