GEN AI BASED EMAIL CLASSIFICATION AND OCR

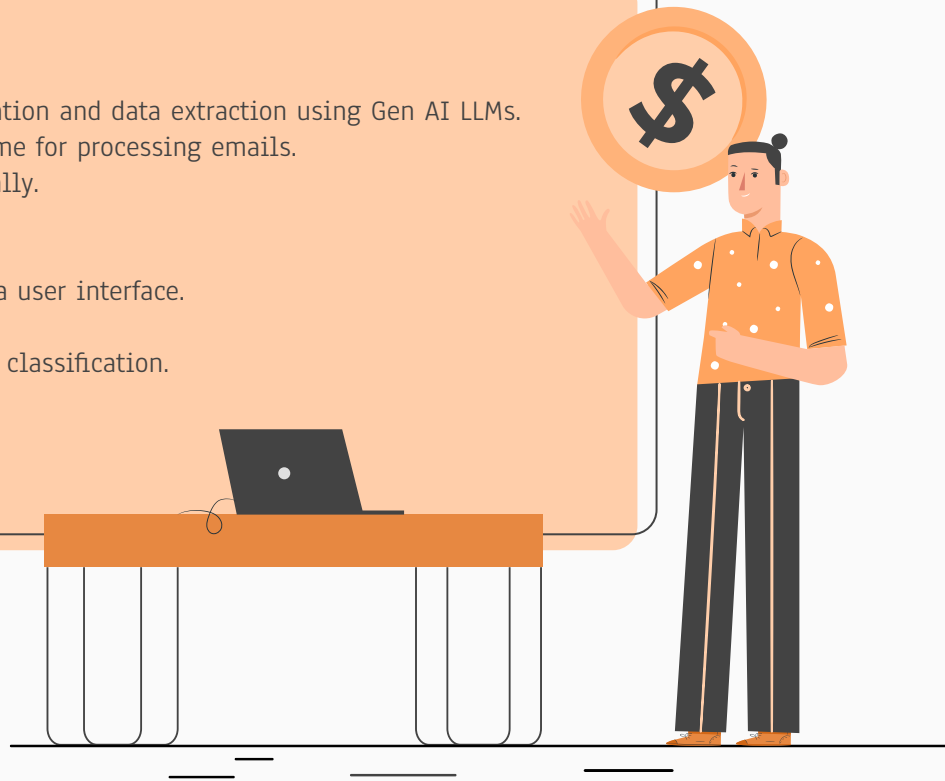
INTRODUCTION

Overview:

* This AI-powered tool automates email classification and data extraction using Gen AI LLMs.
* Enhances efficiency, accuracy, and turnaround time for processing emails.
* Generates classified service requests automatically.

Key Features:

* Users can upload emails, PDFs, and images via a user interface.
* The system extracts and classifies content.
* Helps reduce manual effort and human errors in classification.



INSPIRATION

Problem Statement:

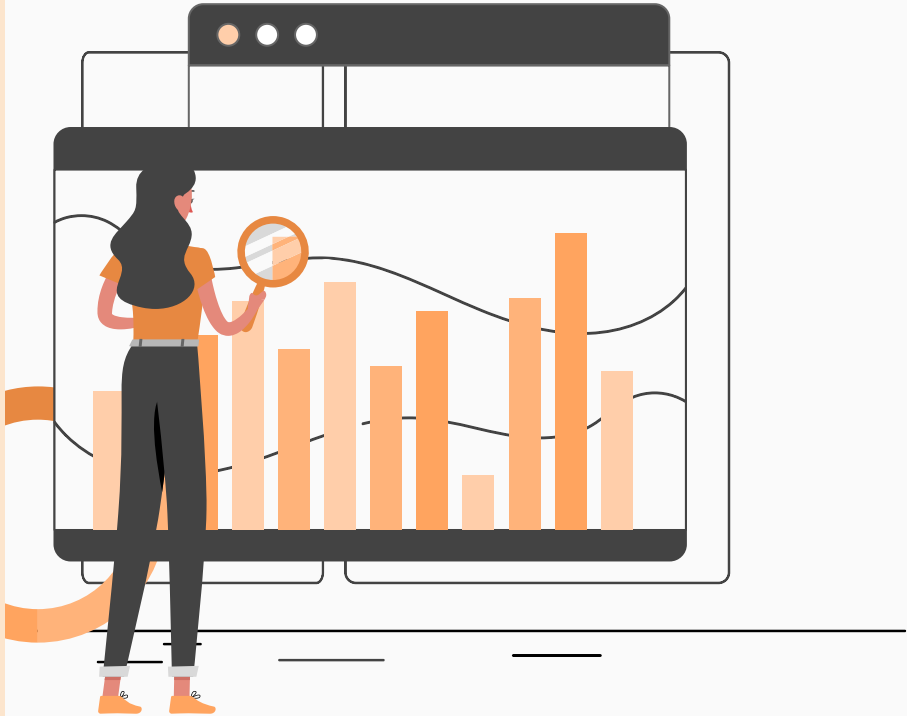
- Current manual process requires a team of gatekeepers.
- Time-consuming and prone to human errors.
- Inconsistent data extraction and classification.

Objective:

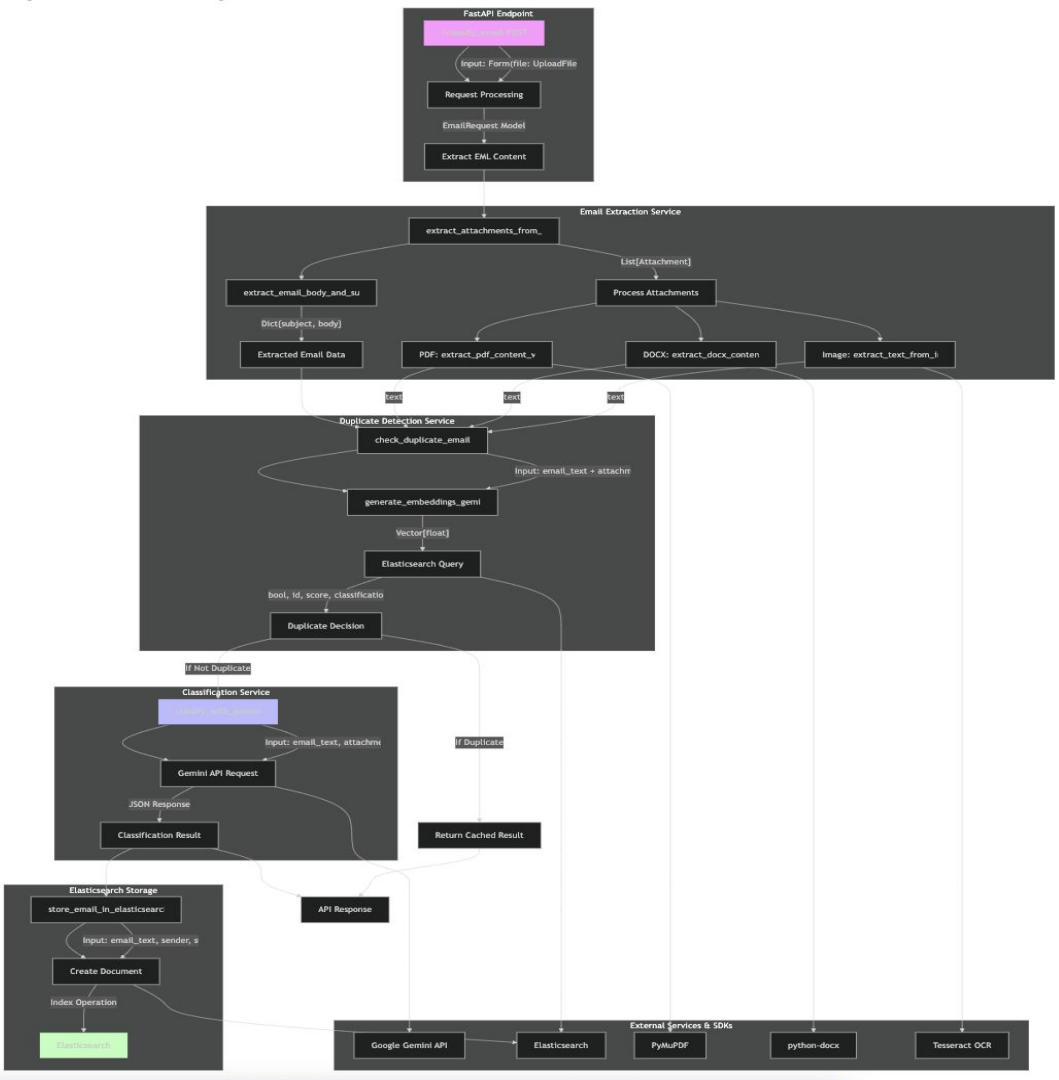
- Automate the entire email classification and data extraction process
- Reduce human intervention while improving accuracy and speed.

WHAT IT DOES ⚙️

- **Content Extraction :** Extracts text from emails and their attachments.
- **OCR for PDFs and Images :** Uses pytesseract and PyMuPDF for image and PDF text recognition.
- **Context-Based Data Extraction :** Uses LLMs to extract relevant data based on the email context.
- **Duplicate Detection :** Generates vector embeddings stored in Elasticsearch to identify duplicate emails.
- **Email Classification :** Categorizes emails into predefined request types using Gen AI LLMs.
- **Handling Multi-Request Emails :** Identifies primary intent when multiple requests exist in a single email.
- **Priority-Based Extraction :** Users can set priority rules for extracting important information first.
- **User Interface :** Users can upload emails and view classification responses.
- **Handling Disputes for Duplicates :** If an email is wrongly marked as a duplicate, the user can dispute it, and the system will reclassify it.



ARCHITECTURE DIAGRAM



HOW WE BUILT IT 🛠️

Backend:

- **FastAPI** ⟶ API framework.
- **Uvicorn** ⟶ Runs the FastAPI application
- **Elasticsearch** ⟶ Stores email data and performs similarity searches.
- **Google Gemini (GenAI)** ⟶ Text classification and embeddings.
- **Spacy** ⟶ NLP processing.
- **pytesseract** ⟶ OCR for image-based text extraction.
- **PyMuPDF (fitz)** ⟶ PDF text extraction.
- **docx library** ⟶ Extracts text from DOCX files.
- **BeautifulSoup** ⟶ Parses HTML content from emails.

Frontend:

- **ReactJS** ⟶ UI for uploading files and viewing responses.

Tools Used:

- **Postman** ⟶ API testing.
- **Jupyter & VSCode** ⟶ Development environment.
- **Canva** ⟶ Demo video creation.

CHALLENGES WE FACED 🚧

- **OCR Implementation for PDFs:**
    - Initially used pdf2image, but it did not convert PDFs to images properly.
    - Switched to PyMuPDF and pytesseract, improving accuracy.
- **LLM Prompt Optimization:**
    - Faced difficulty in getting reliable classification results.
    - Optimized LLM prompts and fine-tuned responses for better accuracy.

TECH STACK 

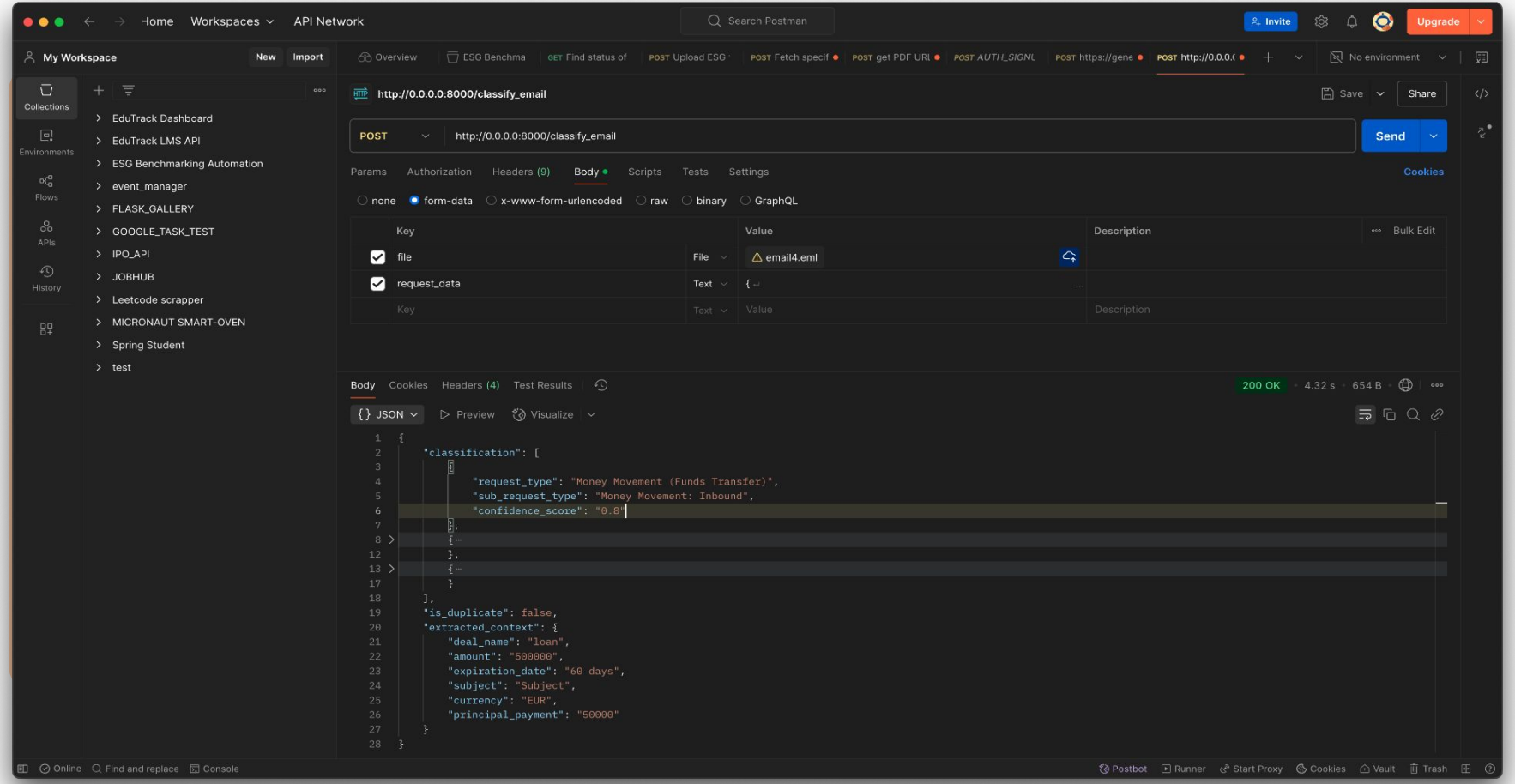
COMPONENT	Technology Used
FRONTEND	HTML, CSS, React, TypeScript
BACKEND	Python, FastAPI, Google GenAI
DATABASE	Elasticsearch
GEN AI MODELS	LLM: "gemini-2.0-flash", Embeddings: "text-embedding-004"

API REQUEST FORMAT

```
{
"file_path":"/Users/sparsh/Downloads/structured_sample_email_pdfs/email_4.pdf",
"sender":"sparsh",
"subject":"Test email",
"user_disputes_duplicate":true,
"priority_rules" : {
    "content_weightage": 0.7,
    "attachment_weightage": 0.3,
    "keywords_priority": {}

}
```

API RESPONSE



THANKS

OUR TEAM

Sparsh - GitHub | LinkedIn

Ashish - GitHub | LinkedIn

Madhurya - GitHub | LinkedIn

Ashwini - GitHub | LinkedIn

Saraiah - GitHub | LinkedIn