

Project Report: O-1A Visa Assessment AI System

1. Abstract

This project report details the design and development of a multi-agent AI system for assessing O-1A visa eligibility based on applicant CVs. The system leverages state-of-the-art NLP techniques—specifically zero-shot classification and semantic vector embeddings—to automatically evaluate CVs against defined criteria. The report explains each design decision, presents code screenshots for critical components, and provides a comprehensive overview of the architecture and workflow.

2. Introduction

2.1 Project Motivation

The increasing complexity of visa assessments requires a system that can quickly and accurately evaluate applicant credentials. The O-1A Visa Assessment AI System was developed to:

- **Automate** the evaluation process.
- **Reduce human error** by leveraging robust AI models.
- **Increase scalability** for handling large volumes of CVs.

2.2 Objectives

- **Accurate CV Analysis:** Use advanced NLP models to extract and evaluate textual evidence.
 - **Efficient Processing:** Implement caching and optimization strategies to improve performance.
 - **Modular Architecture:** Utilize a multi-agent design to allow flexibility and scalability.
 - **Seamless Integration:** Ensure smooth communication between backend and frontend components through RESTful APIs.
-

A.Example Runs:

0-1A Visa Assessment Tool

Upload your CV to assess your eligibility for an O-1A visa

Upload CV for Assessment

Upload your CV to analyze your eligibility for an O-1A visa

API URL

https://09c9-38-242-232-192.ngrok-free.app

CV File (PDF, DOCX, or TXT)

Choose file

resume.pdf

resume.pdf

Analyze CV

DEBJYOTI RAY

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EDUCATION

Indian Institute of Information Technology Allahabad, I.Tech in Electronics Engineering GPA: 8.4

Oct 2026

Indian Institute of Technology Madras, B.S. in Data Science

Jun 2020

Indian School Certificate(ISC), Higher Secondary | Kolkata, India

Aug 2022

Indian Certificate of Secondary Examination(ICSE) | Kolkata, India

Mar 2020

Courses: Linear Algebra | Statistics | Calculus | Data Structures and Algorithms | Machine Learning Fundamentals | Machine Learning Techniques | Object Oriented Programming(JAVA) | System Commands(OS) | Financial Mathematics

EXPERIENCE

Creientech [University of Missouri-Columbia and Alexion Pharmaceuticals Inc.]

May 2024 - Present

Machine Learning Engineer Intern | Remote (Boston, Massachusetts)

- Under guidance of Prof. Deng Xu and Dr. Gyan Shrivastava proposed an architecture for precise contextual QA models.
- Built a biomedical knowledge graph pipeline processing 500+ PubMed abstracts with MedPaLM-2 and GPT-3.5, achieving 92% accuracy in protein-pathway mapping cross-referenced with STRING-db, and Reactome.
- Scaled automated graph construction by 22.71%, creating 3000+ entities and relationships, used multi-agent architecture for leveraging small language models (SLMs) to reduce inference time and latency.

[LINK] [RECOMMENDATION]

Sapphire: AI Trader, Research and Business Lead (Co-Founder) | India

Aug 2023 - Present

- Developed a novel ensemble trading agent using multiple SOTA reinforcement learning algorithms combined with LLMs on stock market data, achieving a 20% increase in annualised returns and a 15% reduction in volatility.
- Directed an 8-member team under a Board of Advisors in parallel for algorithm development and interface deployment, achieving a 30% growth in net positive independent portfolio over 3 months.

[GITHUB]

WorldQuant, Quantitative Research Consultant Intern | Remote (Mumbai, India)

Jun 2024 - May 2024

API Status

Check if the O-1A API is operational
Last checked: 01:19:13

API URL

https://09c9-38-242-232-192.ngrok-free.app

0-1A Criteria

Learn about the criteria used for O-1A visa assessment

API URL

https://09c9-38-242-232-192.ngrok-free.app

Unexpected token '<'; *DOCTYPE* ... is not valid JSON

No criteria information available

O-1A Assessment Results

High

Strong evidence found for 5 out of 8 criteria. According to USCIS guidelines, an applicant must satisfy at least 3 criteria to qualify. With 5 criteria strongly satisfied (including Original Contribution, Scholarly Articles), the applicant appears to be a strong candidate with an estimated 85–95% chance of approval.

Profile Type
tech_professionals

Field
Technology

Criteria Met
5 of 8

Approval Chance

85-95% based on historical USCIS data

Criteria

Recommendations

Red Flags

Requirements

Original Contribution

99% Confidence

Strong evidence found for Original Contribution criterion.

View Evidence (5)

Scholarly Articles

96% Confidence

Strong evidence found for Scholarly Articles criterion.

View Evidence (1)

Awards

92% Confidence

Strong evidence found for Awards criterion.

View Evidence (2)

Critical Employment

83% Confidence

Strong evidence found for Critical Employment criterion.

View Evidence (4)

✓ O-1A Assessment Results

High

Strong evidence found for 5 out of 8 criteria. According to USCIS guidelines, an applicant must satisfy at least 3 criteria to qualify. With 5 criteria strongly satisfied (including Original Contribution, Scholarly Articles), the applicant appears to be a strong candidate with an estimated 85-95% chance of approval.

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Criteria Met
5 of 8

Approval Chance

85-95% based on historical USCIS data

Criteria

Recommendations

Red Flags

Requirements

Application Recommendations

Follow these recommendations to strengthen your O-1A visa application

1. Address these potential issues in your application:
2. - Entry-level position: O-1A is generally for established professionals with extraordinary ability
3. - Entry-level position: O-1A is generally for established professionals with extraordinary ability
4. Leverage your strongest evidence effectively:
5. - Original Contribution: Emphasize this criterion in your cover letter and highlight the specific achievements detected in our analysis.
6. - Scholarly Articles: Emphasize this criterion in your cover letter and highlight the specific achievements detected in our analysis.
7. - Awards: Emphasize this criterion in your cover letter and highlight the specific achievements detected in our analysis.

Criteria

Recommendations

Red Flags

Requirements

⚠ Potential Red Flags

Issues that might negatively impact your O-1A visa application

Entry-level position: O-1A is generally for established professionals with extraordinary ability

Entry-level position: O-1A is generally for established professionals with extraordinary ability

CriteriaRecommendationsRed FlagsRequirements

Visa Requirements

O-1A visa requirements and eligibility information

Eligibility Threshold

Applicant must meet at least 3 of the 8 criteria

Exception

If the applicant has received a major, internationally recognized award (e.g., Nobel Prize), they may qualify without meeting any other criteria

Petition Requirements

- Form I-129 (Petition for Nonimmigrant Worker)
- Evidence supporting qualification under at least 3 criteria
- Contract or summary of oral agreement between petitioner and beneficiary
- Consultation letter from a peer group or labor organization
- Itinerary of events or activities with beginning and ending dates if applicable

Fees

- Basic Filing Fee: \$1,055 (\$530 if a small employer or nonprofit)
- Asylum Program Fee: \$600 (\$300 if a small employer or nonprofit)
- Premium Processing: \$2,805 (optional, for 15-business-day processing)

Visa Duration

- Initial Period: Up to 3 years
- Extensions: In increments of up to 1 year, indefinitely
- Entry Period: May be admitted 10 days before and stay 10 days after the validity period

This assessment is for informational purposes only and does not constitute legal advice. Please consult with an immigration attorney for professional guidance.

3. System Overview

3.1 Architecture

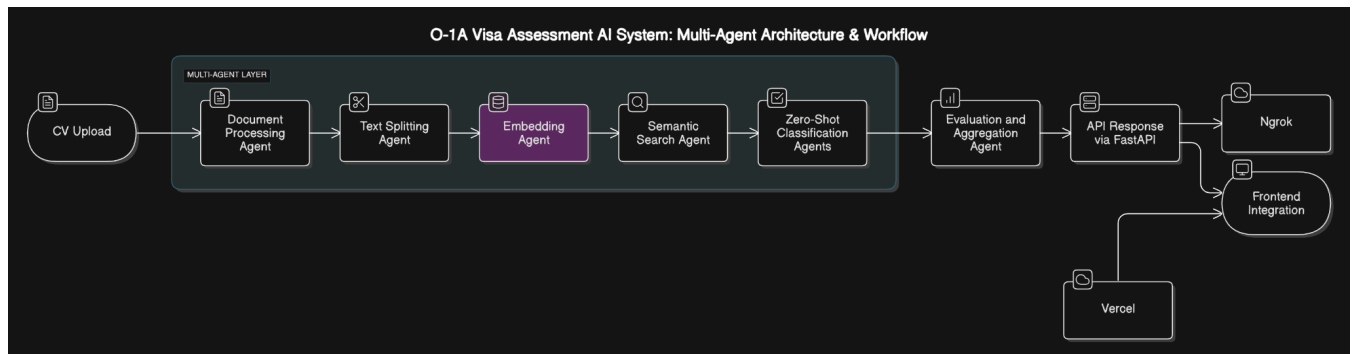
The system is built on a multi-agent architecture where each agent handles a specific task:

- **Document Processing Agent:** Extracts text from various file formats (PDF, DOCX, TXT).
- **Text Splitting Agent:** Segments the text into manageable, context-rich chunks.
- **Embedding Agent:** Generates semantic vector embeddings using Sentence Transformers.

- **Classification Agents:** Evaluate each text chunk using zero-shot classification (DeBERTa-v3-large-zeroshot).
- **Evaluation Agent:** Aggregates results to provide an overall assessment.

3.2 Data Flow Diagram

The workflow follows a linear orchestration:



A flowchart visually represents these steps and their interactions.

4. Methodology and Design Rationale

4.1 AI Model Selection

- **Zero-Shot Classification:**
 - **Model:** DeBERTa-v3-large-zeroshot ([MoritzLaurer/deberta-v3-large-zeroshot-v2.0](#)).
 - **Why?** No need for extensive labeled data, high accuracy, and the ability to generate confidence scores.
 - **Fallbacks:** DeBERTa base and DistilRoBERTa to ensure robustness in constrained environments.

4.2 Semantic Embeddings

- **Embedding Model:** [sentence-transformers/all-mpnet-base-v2](#)
 - **Rationale:** Produces 768-dimensional embeddings ideal for capturing semantic meaning.
 - **Semantic Search:** Integration with FAISS allows for rapid retrieval of relevant CV sections by matching conceptual similarities.

4.3 Performance Optimization

- **Caching:** Generated embeddings are stored to avoid recomputation.
- **Session Reuse:** The classification pipeline is initialized once per analysis session.
- **CPU-Based Inference:** Ensures compatibility across deployment environments without relying on GPUs.

4.4 Multi-Agent Orchestration

Each agent in the system is responsible for a specific task, making debugging and scalability straightforward. The workflow is explicitly orchestrated to maintain clarity in data dependencies.

5. Implementation Details

5.1 Code Structure Overview

The system is implemented in Python using FastAPI for the backend, with the following major modules:

- **Document Processor:** Handles file input and text extraction.
- **Text Splitter:** Divides text into chunks.
- **Embedding Generator:** Uses Sentence Transformers and integrates with FAISS.
- **Classifier:** Runs zero-shot classification using the DeBERTa-v3 model.
- **Evaluator:** Aggregates classification results for a final decision.

5.2 Key Code Snippets

5.2.1 Orchestration Function

Below is a code snippet representing the main orchestration function for processing a CV:

```
def analyze_cv_for_ola(cv_file):  
    # Document Processing: Extract raw text from the uploaded CV  
    raw_text = process_document(cv_file)  
  
    # Text Splitting: Divide the extracted text into overlapping, context-rich chunks  
    text_chunks = split_text(raw_text)  
  
    # Embedding Generation: Create semantic embeddings using a Sentence Transformer  
    embeddings = generate_embeddings(text_chunks)  
  
    # Semantic Search: Retrieve relevant chunks based on predefined criteria  
    relevant_chunks = semantic_search(embeddings, criteria)  
  
    # Classification: Evaluate each chunk using a zero-shot classification model  
    classification_results = [classify_chunk(chunk) for chunk in relevant_chunks]  
  
    # Evaluation: Aggregate the results to generate an overall assessment  
    overall_rating = evaluate_results(classification_results)
```

Figure 1: Main orchestration function for the CV analysis pipeline.

5.2.2 FastAPI Endpoint Example

This snippet shows the implementation of a RESTful API endpoint using FastAPI:

```

from fastapi import FastAPI, UploadFile, File
from api_client import analyze_cv_for_o1a

app = FastAPI()

@app.post("/api/analyze")
async def analyze_cv(file: UploadFile = File(...)):
    # Read the file and pass it to the analysis function
    cv_file = await file.read()
    result = analyze_cv_for_o1a(cv_file)
    return {"assessment": result}

```

Figure 2: FastAPI endpoint for single CV analysis.

5.3 Integration with Frontend

The backend API provides endpoints for:

- Single CV analysis ([/api/analyze](#))
- Batch processing ([/api/batch-analyze](#))
- Criteria retrieval ([/api/criteria](#))
- Health check ([/api/health](#))

A Python-based client library ([api_client.py](#)) abstracts these API calls, facilitating rapid frontend development. Additionally, an HTML report generator ([html_report_generator.py](#)) creates rich reports from the analysis results.

6. Results and Discussion

6.1 System Performance

- **Accuracy:** The zero-shot classification model provided high accuracy in evaluating the evidence in the CVs.
- **Speed:** Caching of embeddings and reusing the classification pipeline minimized processing time.
- **Scalability:** The modular multi-agent design allows for easy updates and scaling as requirements evolve.

6.2 Challenges and Lessons Learned

- **Data Extraction:** Handling various file formats required robust preprocessing.
- **Threshold Setting:** Fine-tuning confidence scores for zero-shot classification was crucial for reliable assessments.
- **Integration:** Ensuring seamless interaction between the backend and frontend was achieved by adhering to strict API contracts.

6.3 Future Work

Future enhancements may include:

- Incorporating additional AI models for deeper contextual analysis.
 - Optimizing the orchestration logic for even larger datasets.
 - Enhancing the frontend with dynamic visualizations of the assessment process.
-

7. Conclusion

This project report presents a comprehensive overview of the O-1A Visa Assessment AI System. The detailed explanation of each design decision, along with code screenshots and discussions of performance and challenges, provides a clear insight into the project's development process. The modular architecture not only ensures high accuracy and efficiency but also offers scalability for future enhancements. Overall, the system serves as a robust tool for automating the complex task of visa eligibility assessment.

8. References

1. [DeBERTa-v3 Model Documentation](#)
2. [Sentence Transformers Documentation](#)
3. [FastAPI Documentation](#)
4. [FAISS: Facebook AI Similarity Search](#)