Technical Interview

Take Home Assignment

Valerio Colamattteo

Part 1 : Layout Document Analysis

The document pre-processing stage

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Understanding the layout analysis is fundamental for defining the best chunking strategy.
Used computer vision (pretrained) models for getting objects coordinates of **text**, **titles**, **tables**, **images** etc…

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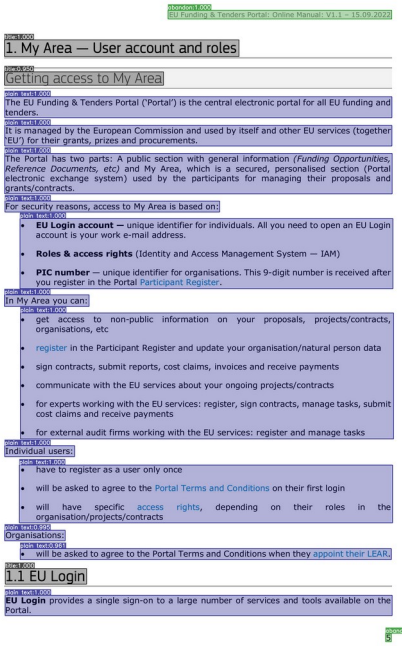
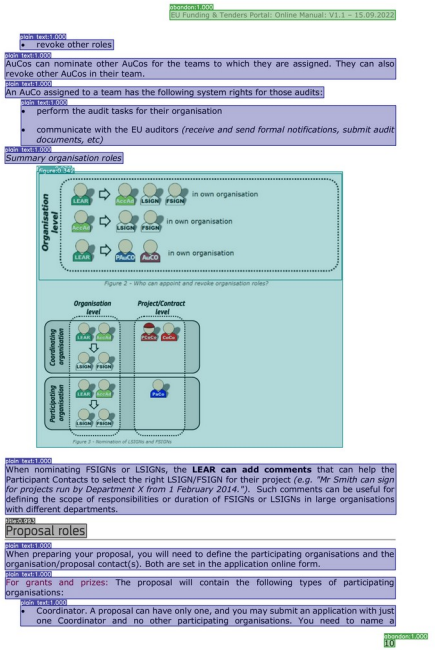
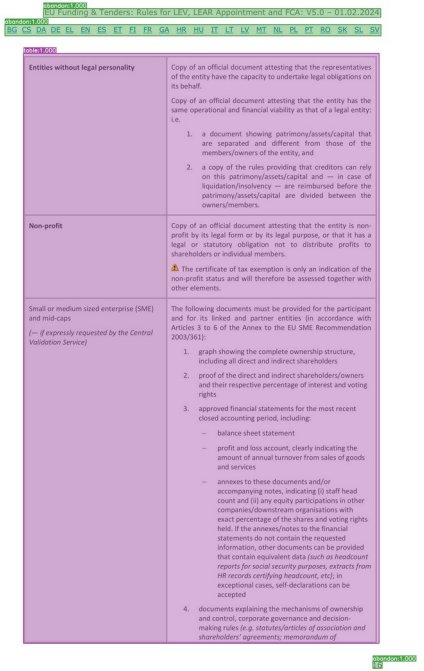
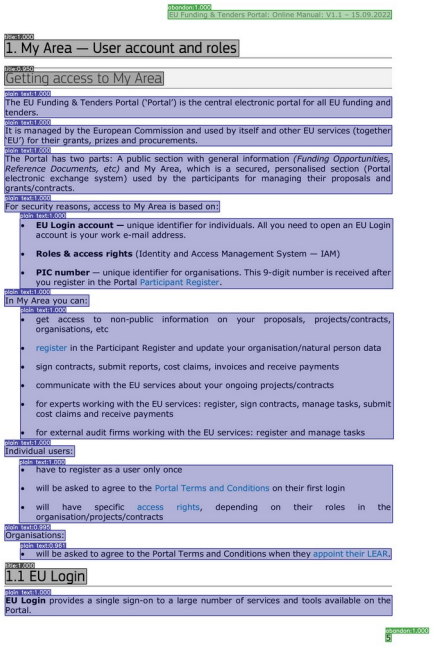






Part 1 : Layout Document Analysis

Text between two consecutive titles is treated as a single text paragraph, and transformed in a single chunk trough OCR.



abandon:1.000
EU Funding & Tenders Portal: Online Manual: V3.1 – 15.09.2022

title:1.000
1. My Area — User account and roles

title:0.950
Getting access to My Area

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Individual users:

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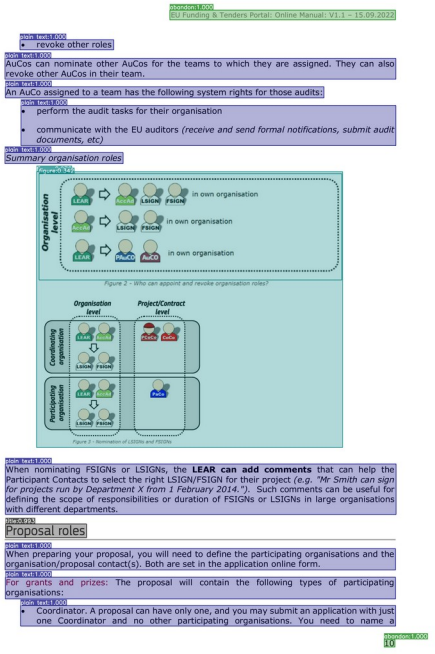

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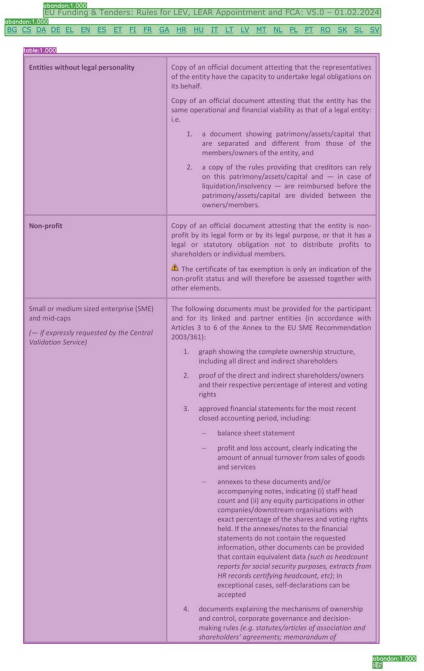

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EU Funding & Tenders: Rules for LEV, LEAR Appointment and FCA: V5.0 – 01.02.2024

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Small or medium sized enterprise (SME) and mid-caps *(— if expressly requested by the Central Validation Service)*	The following documents must be provided for the participant and for its linked and partner entities (in accordance with Articles 3 to 6 of the Annex to the EU SME Recommendation 2003/361): 1. graph showing the complete ownership structure, including all direct and indirect shareholders 2. proof of the direct and indirect shareholders/owners and their respective percentage of interest and voting rights 3. approved financial statements for the most recent closed accounting period, including: – balance sheet statement – profit and loss account, clearly indicating the amount of annual turnover from sales of goods and services – annexes to these documents and/or accompanying notes, indicating (i) staff head count and (ii) any equity participations in other companies/downstream organisations with exact percentage of the shares and voting rights held. If the annexes/notes to the financial statements do not contain the requested information, other documents can be provided that contain equivalent data *(such as headcount reports for social security purposes, extracts from HR records certifying headcount, etc)*; in exceptional cases, self-declarations can be accepted 4. documents explaining the mechanisms of ownership and control, corporate governance and decision-making rules *(e.g. statutes/articles of association and shareholders' agreements; memorandum of*

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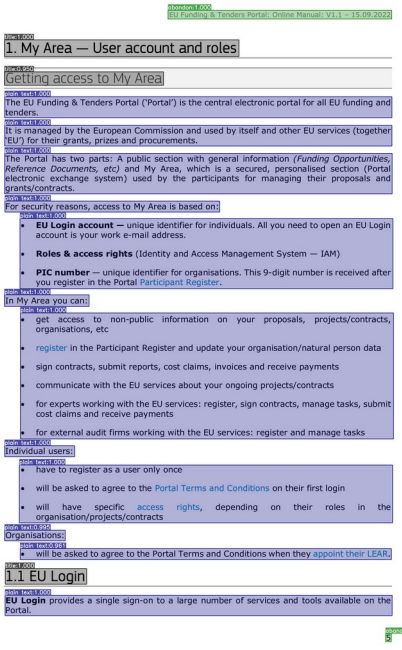
EU

Part 1 : Layout Document Analysis

Extracted tables are processed with a multimodal model through Groq API (llama-4-maverick-17b), returning formatted text



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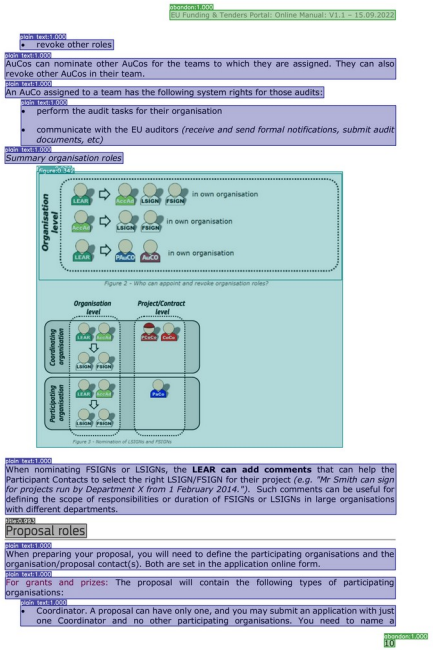

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Summary organisation roles

Figure 2 - Who can appoint and revoke organisation roles?

Figure 3 - Nomination of LSIGNs and FSIGNs

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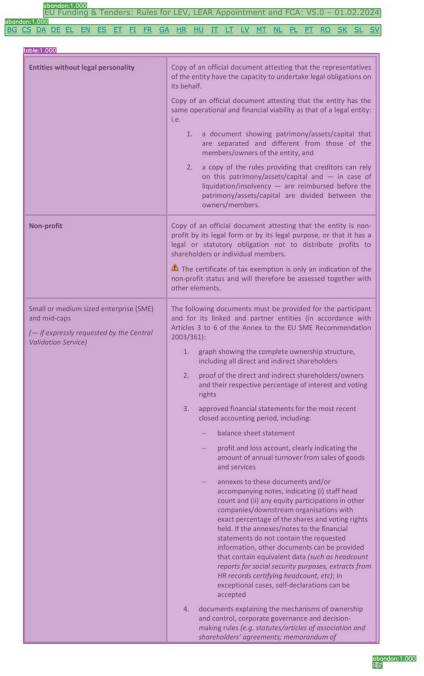

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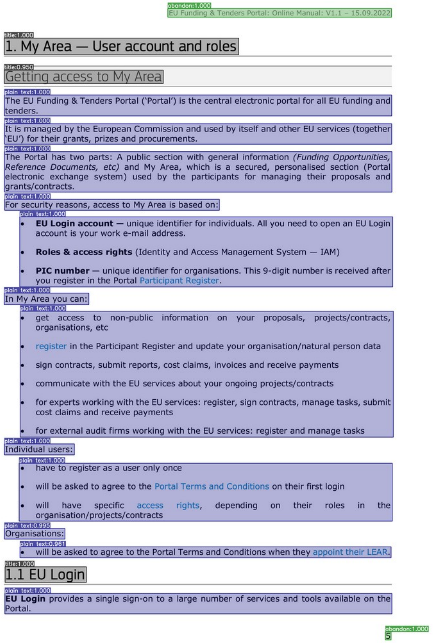
abandon:1.000
16

Part 1 : Layout Document Analysis

At now embeddings have been created on only 2 documents (related to a same grant):

AMIF-2025-TF2-AG-INTE-04-PATHWAYS_separator_om_en.pdf - AMIF-2025-TF2-AG-INTE-04-PATHWAYS_separator_rules-lev-lear-fca_en.pdf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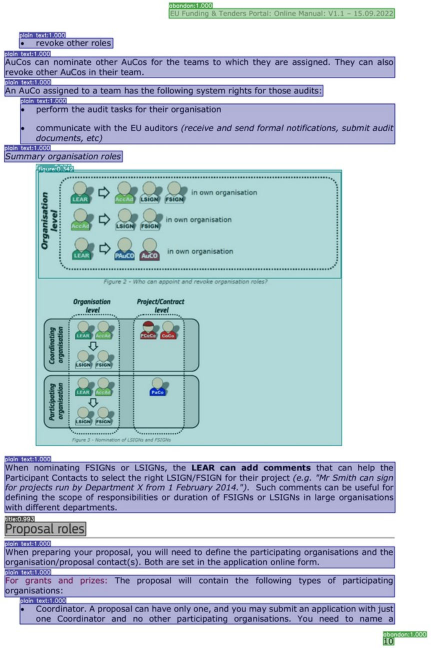
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figure:0.942

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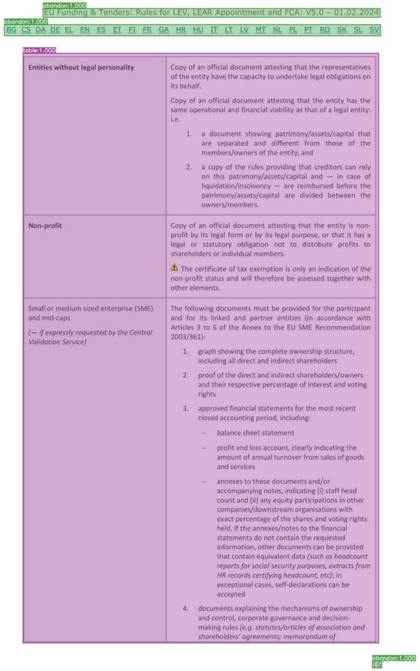
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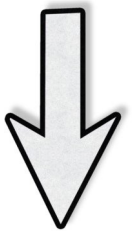
16

Part 1 : Layout Document Analysis

The document layout is organized in chapters, paragraphs and sub-paragraphs. Treating each subparagraph as a single chunk, could be effective for many (simpler) queries, but it could fall short for a bit more challenging tasks that require understanding of a broader context.



A possible (not the optimal) approach:

In case of failing, passing to the LLM not only the top-k retrieved chunks, forming the context with the entire unique paragraphs from which the top-k retrieved chunk are related to

PRO

- enlarged context
- Minimum delay (no chunking/retrieval needed)

CONTRO

- Context enlarged only intra-chapters
- Increased token usage

Table of contents

Requests to update a validation will be accepted, if submitted by the participant's LEAR and accompanied by the relevant supporting documents. ⚠ If no LEAR has been appointed yet in the Participant Register, requests for modification should be submitted after the LEAR appointment has been validated.

The 'effective date of the change' will be the date on which the act establishing the change enters into force (unless the terms of the act stipulate another date).

For SMEs and mid-caps, the effective date is the closure date of the accounting period on which the change of status is based. For cases of mergers and acquisitions that lead to the loss of the SME or mid-cap status, the effective date of change will be the date when the ownership structure changed.

The impact and practical consequences of the changes depend on each funding programme.

2.4.2 Corrections of validations

If a validation turns out to beincorrect (through an audit, ex-post check, investigation or other means), it will be corrected by the Central Validation Service. The correction will be registered with effect back to the effective date of the initial validation.

If the error is attributable to the Central Validation Service and its correction implies disadvantages for the participant, the retroactive effect may exceptionally be waived, if duly justified and in line with the principles of sound financial management and proportionality.

If the error was the fault of the participant (intentional or unintentional), its participation in on-going grants, procurements, prizes, contribution agreements, etc may be terminated and undue amounts paid may be recovered. Moreover, the participant may be fined and excluded from future EU funding (grants, procurements, prizes, contribution agreements, etc; *see Articles 135 to 145 of the Financial Regulation*). In addition, the European Anti-Fraud Office (OLAF) may be informed.

2.5 Ex-post verifications carried out by the EU — Irregularities and/or false declarations

The EU services reserve the right to carry out — at any moment — checks, reviews, audits or investigations.

If they find out that a participant did not meet the criteria for being validated or for being validated with a specific legal status *(e.g. due to false declarations)*, the modification of the validation will be registered with retroactive effect back to the effective date of the validation.

If in the meantime the participant already received EU grants, procurements, prizes, contribution agreements, etc, their participation may be terminated/withdrawn and undue amounts paid will be recovered.

In case of irregularities or false declarations, participants may moreover be fined and excluded from future EU funding (grants, procurements, prizes, contribution agreements, etc; *see Articles 135 to 146 of the Financial Regulation*).

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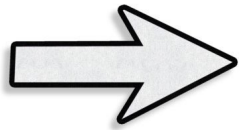
If in the meantime the participant already received EU grants, procurements, prizes, contribution agreements, etc, their participation may be terminated/withdrawn and undue amounts paid will be recovered.

In case of irregularities or false declarations, participants may moreover be fined and excluded from future EU funding (grants, procurements, prizes, contribution agreements, etc; *see Articles 135 to 146 of the Financial Regulation*).

In addition, the European Anti-Fraud Office (OLAF) may be informed.



2.4.2 Corrections of validations

If a validation turns out to beincorrect (through an audit, ex-post check, investigation or other means), it will be corrected by the Central Validation Service. The correction will be registered with effect back to the effective date of the initial validation.

If the error is attributable to the Central Validation Service and its correction implies disadvantages for the participant, the retroactive effect may exceptionally be waived, if duly justified and in line with the principles of sound financial management and proportionality.

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Requests to update a validation will be accepted, if submitted by the participant's LEAR and accompanied by the relevant supporting documents. ⚠ If no LEAR has been appointed yet in the Participant Register, requests for modification should be submitted after the LEAR appointment has been validated.

The 'effective date of the change' will be the date on which the act establishing the change enters into force (unless the terms of the act stipulate another date).

For SMEs and mid-caps, the effective date is the closure date of the accounting period on which the change of status is based. For cases of mergers and acquisitions that lead to the loss of the SME or mid-cap status, the effective date of change will be the date when the ownership structure changed.

The impact and practical consequences of the changes depend on each funding programme.

2.4.2 Corrections of validations

If a validation turns out to beincorrect (through an audit, ex-post check, investigation or other means), it will be corrected by the Central Validation Service. The correction will be registered with effect back to the effective date of the initial validation.

If the error is attributable to the Central Validation Service and its correction implies disadvantages for the participant, the retroactive effect may exceptionally be waived, if duly justified and in line with the principles of sound financial management and proportionality.

If the error was the fault of the participant (intentional or unintentional), its participation in on-going grants, procurements, prizes, contribution agreements, etc may be terminated and undue amounts paid may be recovered. Moreover, the participant may be fined and excluded from future EU funding (grants, procurements, prizes, contribution agreements, etc; *see Articles 135 to 145 of the Financial Regulation*). In addition, the European Anti-Fraud Office (OLAF) may be informed.

2.5 Ex-post verifications carried out by the EU — Irregularities and/or false declarations

The EU services reserve the right to carry out — at any moment — checks, reviews, audits or investigations.

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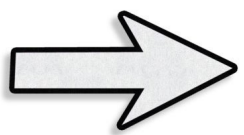
If in the meantime the participant already received EU grants, procurements, prizes, contribution agreements, etc, their participation may be terminated/withdrawn and undue amounts paid will be recovered.

In case of irregularities or false declarations, participants may moreover be fined and excluded from future EU funding (grants, procurements, prizes, contribution agreements, etc; *see Articles 135 to 146 of the Financial Regulation*).

In addition, the European Anti-Fraud Office (OLAF) may be informed.



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If in the meantime the participant already received EU grants, procurements, prizes, contribution agreements, etc, their participation may be ...

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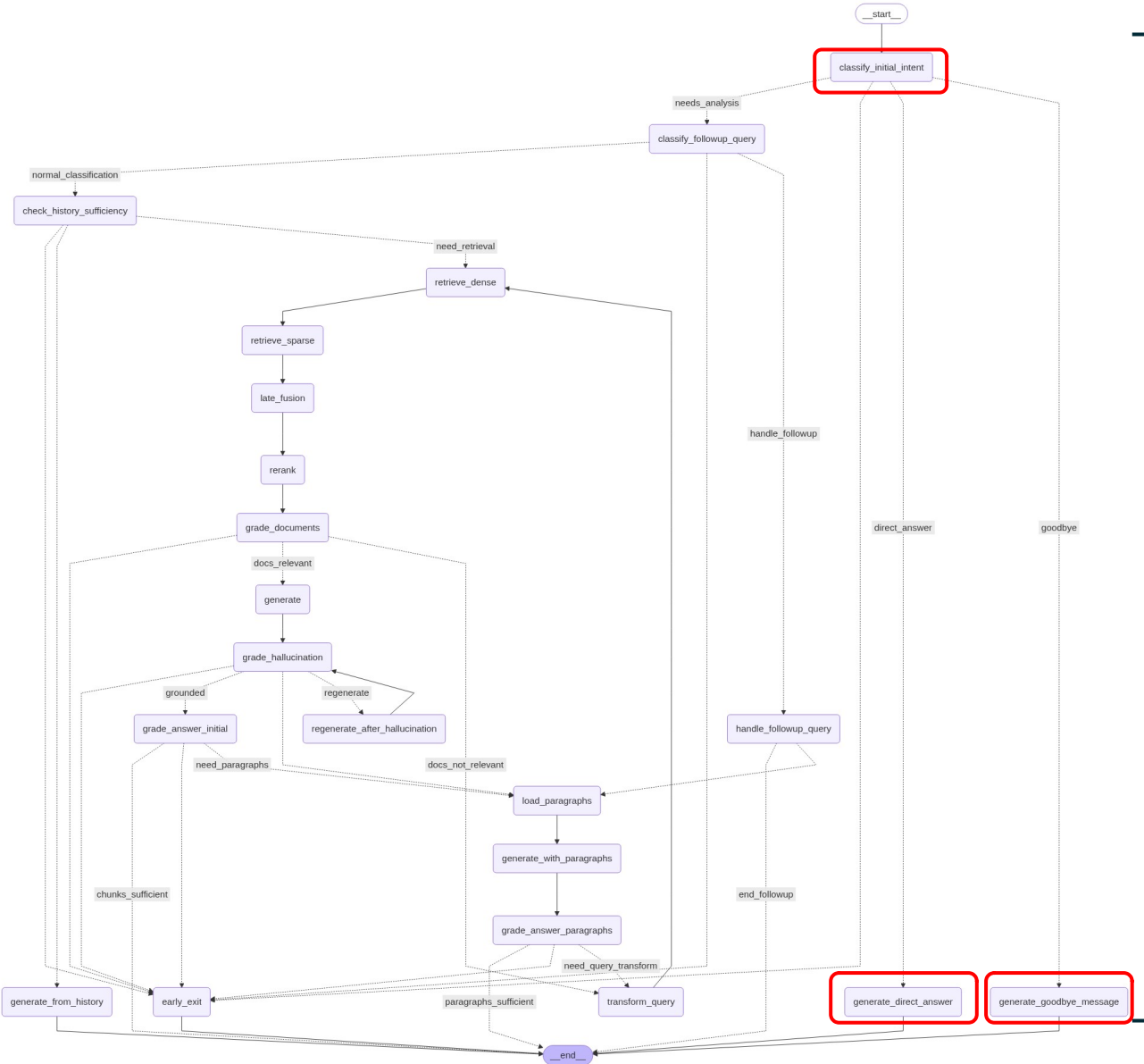
Part 2 : RAG System Design

- **Multiple agents** (LangGraph) for on-line grading of the retrieve results and quality of the answer (hallucination/relevance) in a **Self-RAG** logic
- **Hybrid-Search** (local HuggingFace) on multiple documents with **Qwen3 0.6B** (dense) + **SPLADE v3** (sparse)
- Late fusion of retrieved chunks with **RRF** or **Score-Based** approach
- **Re-Ranking** with **Qwen3 0.6B** (local HuggingFace)
- **Query classification** for normal chatbot interaction (avoid starting retrieval for a greeting query for example)
- **Short-Term Memory**: Holds information relevant to the current query for avoiding duplicating retrievals.
- **Groq API** for running LLM model - **llama-3.3-70b**
- **Gradio** web UI



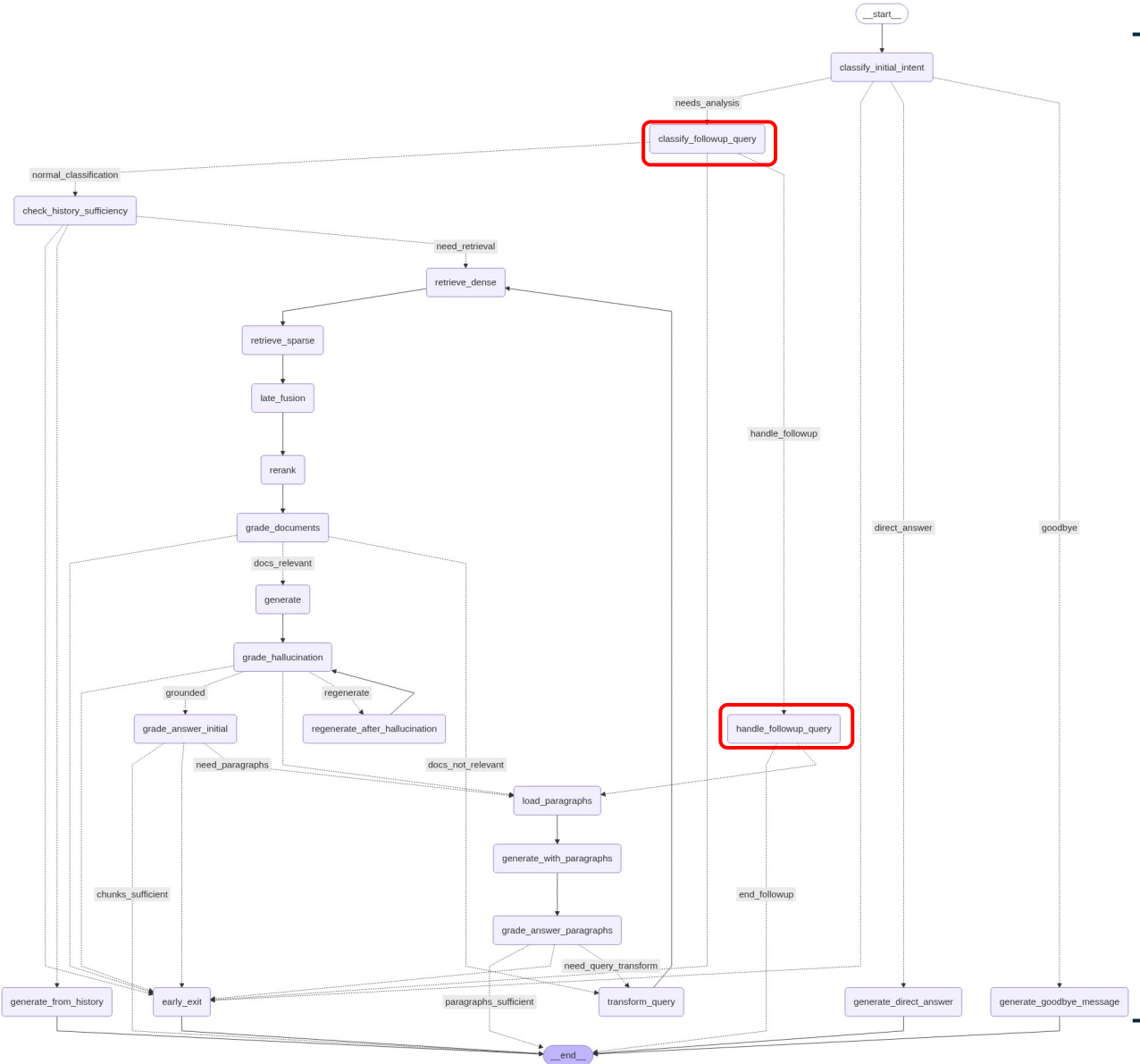
(Agentic) RAG System:

The full working logic:

- **classify_initial_intent**: decide if the input query as:

  DIRECT_ANSWER: greeting or conversational phrase
  GOODBYE: the user wants to exit the conversation
  NEEDS_ANALYSIS: proceed to the next node

- takes as input only the current query



(Agentic) RAG System:

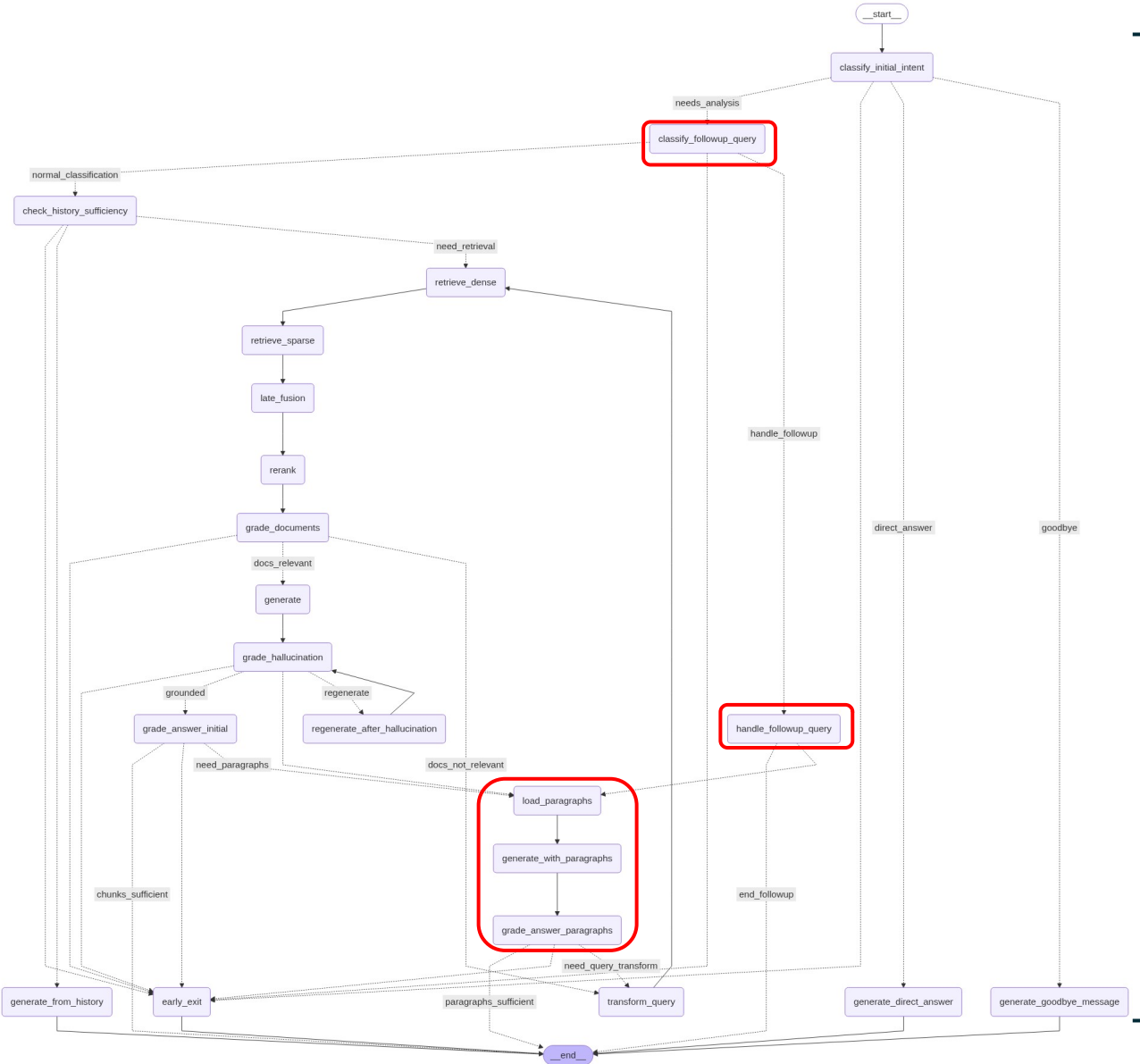
The full working logic:

- **Classify_followup_query** classify the input query as:

  FOLLOWUP: when the user asks for clarification, or a more in depth elaboration about the last query answer (“tell me more”, “not clear”, etc...)

  NON-FOLLOWUP: a totally new question respect the previous one

- takes as input only previous and current query



(Agentic) RAG System:

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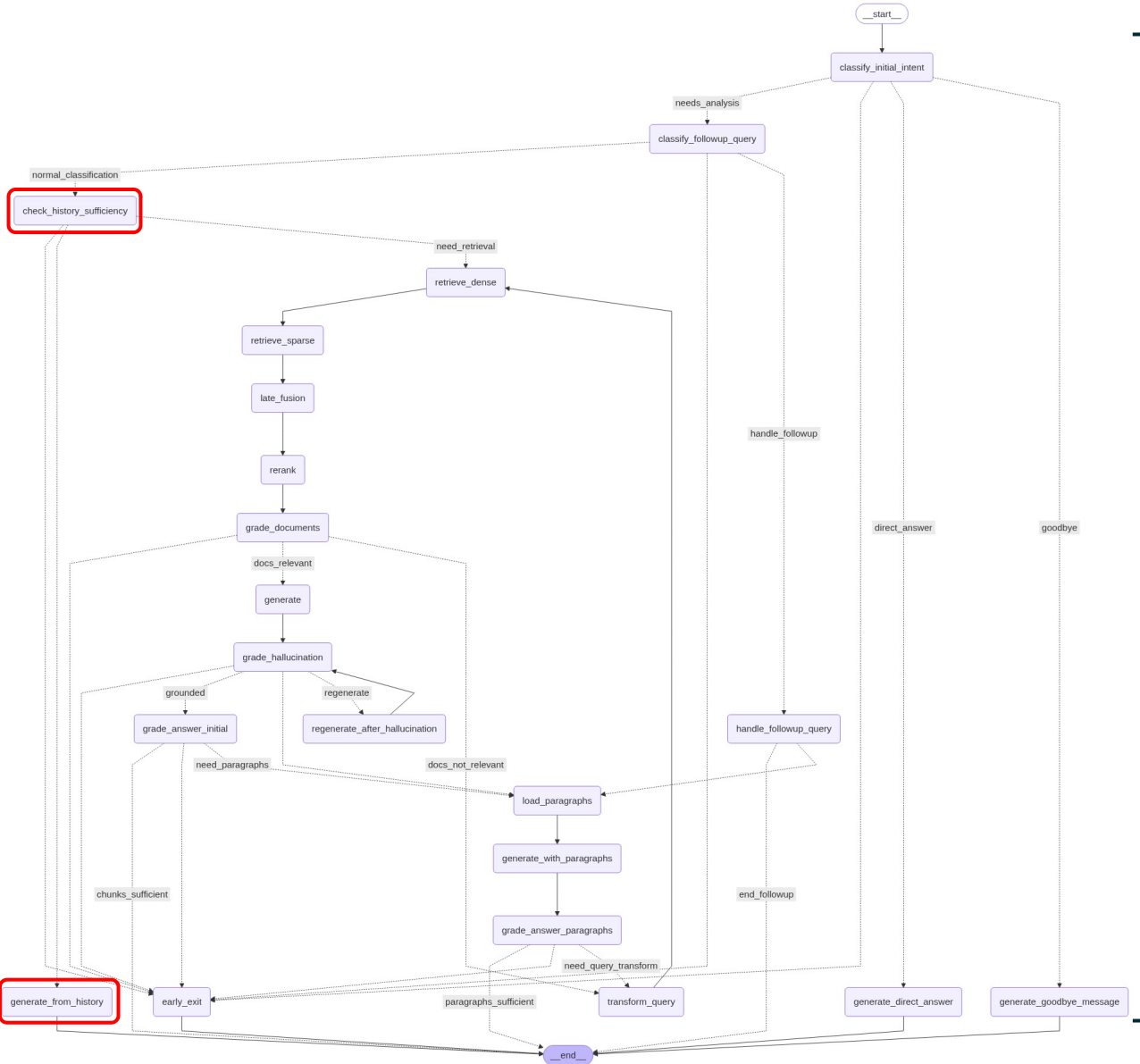
  NON-FOOLOUP: a totally new question respect the previous one

- takes as input only previous and current query

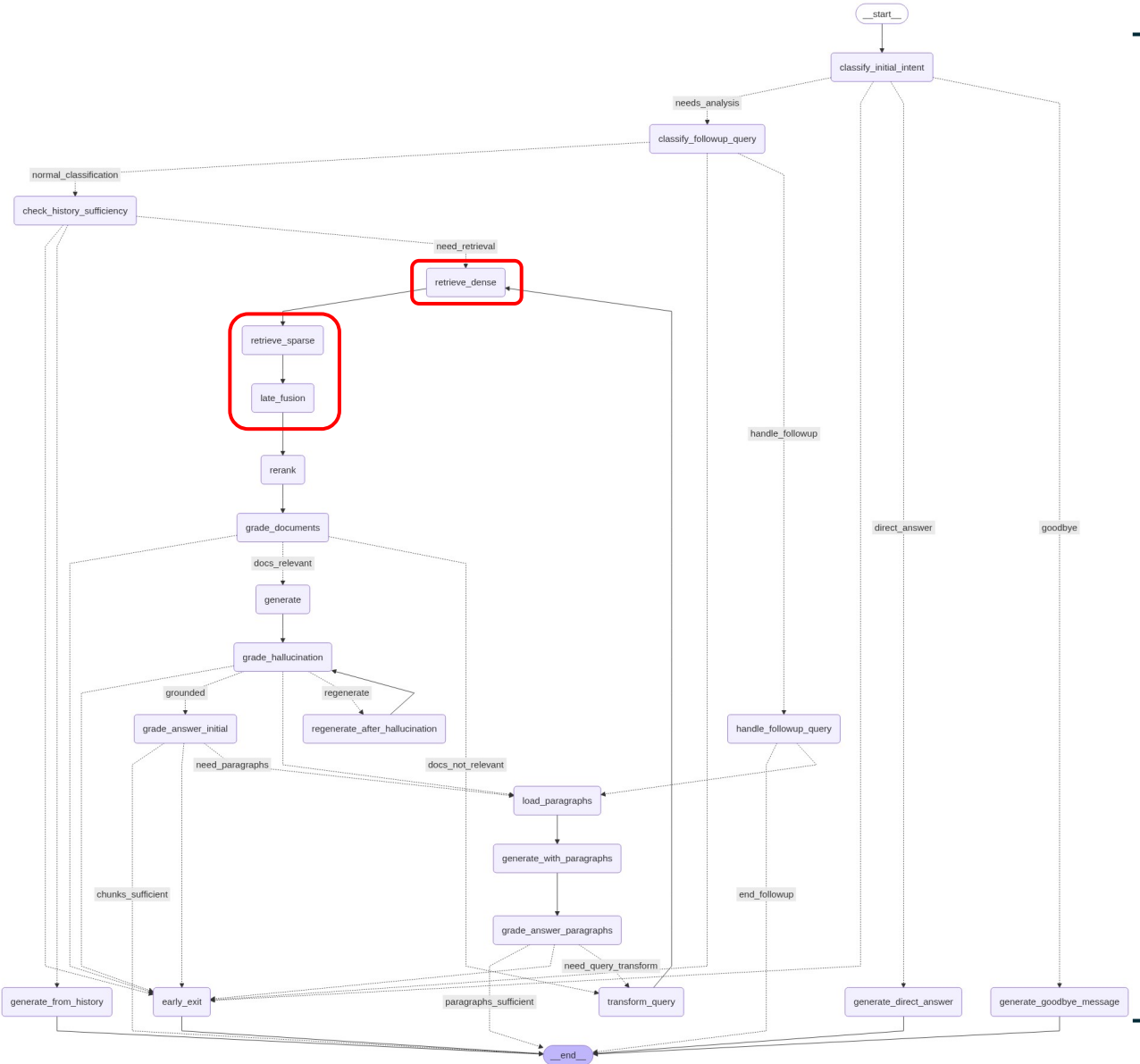
- In case of follow-up, paragraphs relative to the last retrieved chunks are loaded and used for generating a more comprehensive answer



(Agentic) RAG System:

The full working logic:

- **Check_memory_sufficiency**: before starting a new retrieval, check if chat memory is enough for answering current question. Useful in case of questions already answered or much similar to a previous one
- Take as input current query and historical context



(Agentic) RAG System:

The full working logic:

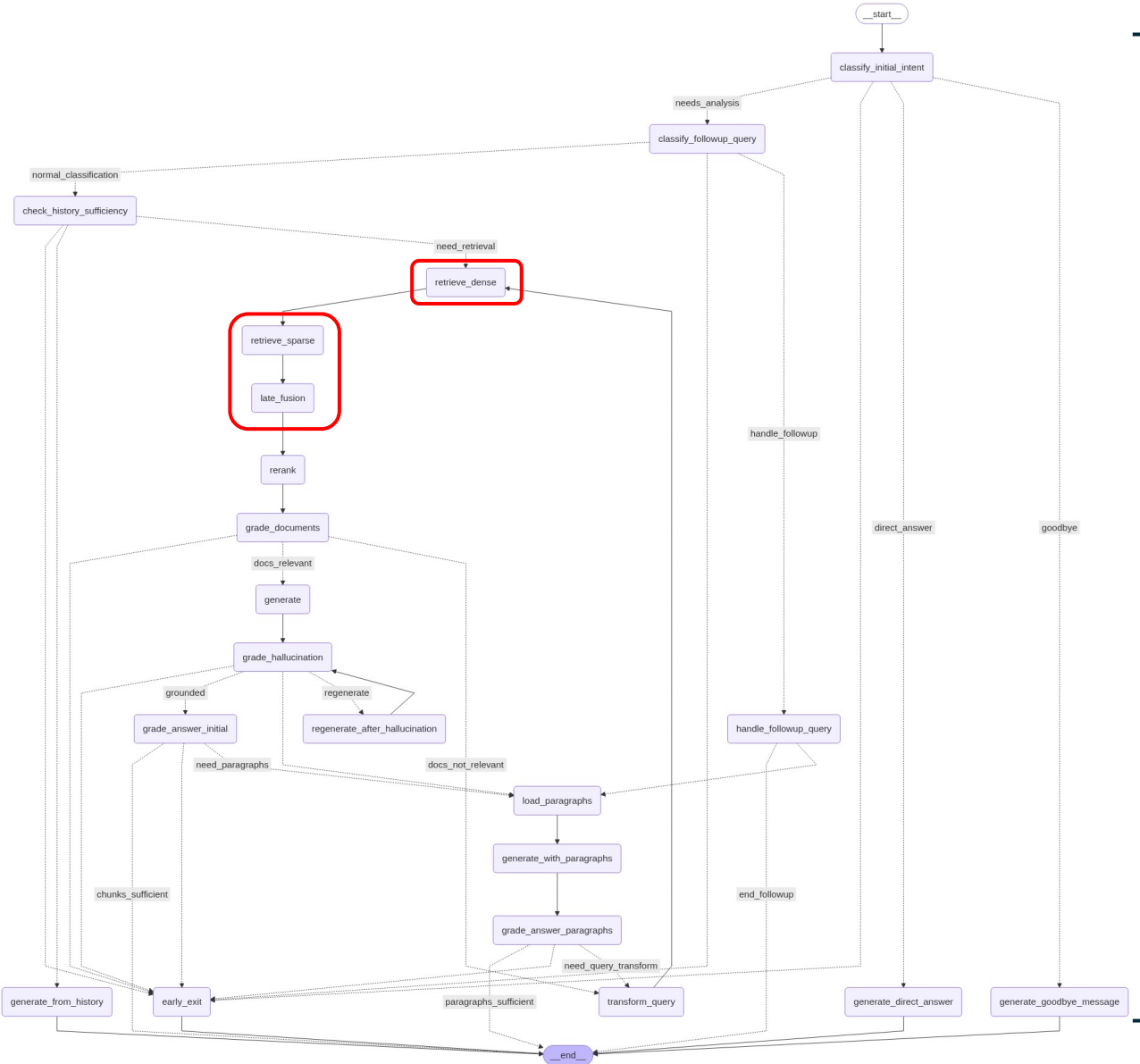
- Retrieve **dense** + **sparse** (**hybrid search**) with **late fusion** chunks merging:

  two retrieval call are made sequentially retrieving the top **5** chunks from each.

  The results are merged together according to **RRF** (reciprocal rank fusion) or **score-based** approach

- Vector DB used for both dense and sparse embeddings: **Pinecone**

- Sparse embeddings dimensionality limited to 1000, taking the top-k highest non-zero values from the original vector size of 30522

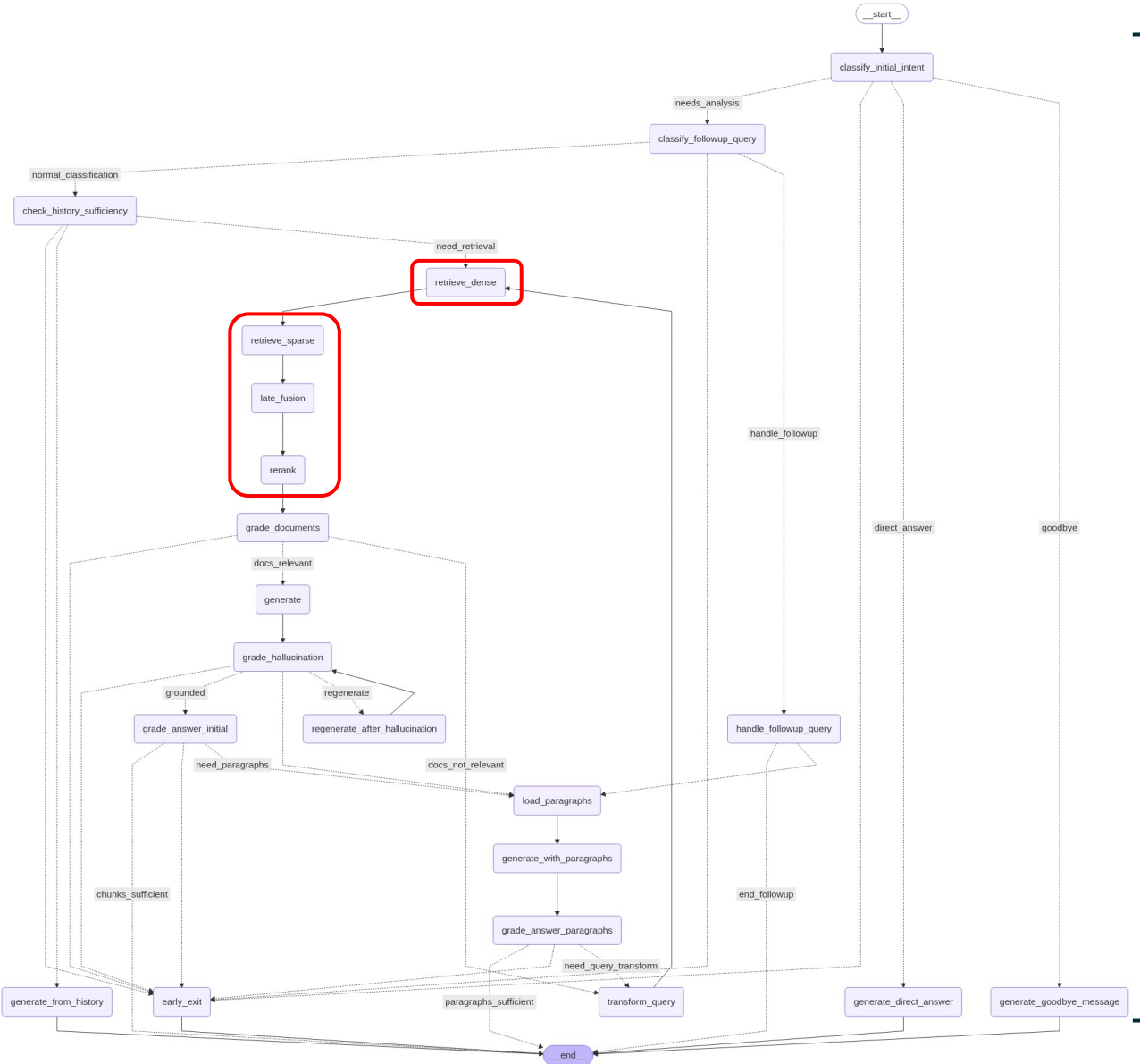


(Agentic) RAG System:

The full working logic:

- Each chunk contain the following **metadata**:

- '**chunk_id**': unique_id,
- '**context**': “chunk text...”,
- '**filename**': .txt file containing the text of the chunk
- '**init_doc**': .pdf doc to which the chunk is related to,
- '**paragraph_related**': *paragraph to which the chunks is related to,*
- '**retrieval_source**': could be 'dense+sparse', ‘dense’ or ’sparse’ ,
- '**dense_rank**': 2,
- '**sparse_rank**': 1,
- '**reranker_score**': 0.9876439571380615



(Agentic) RAG System:

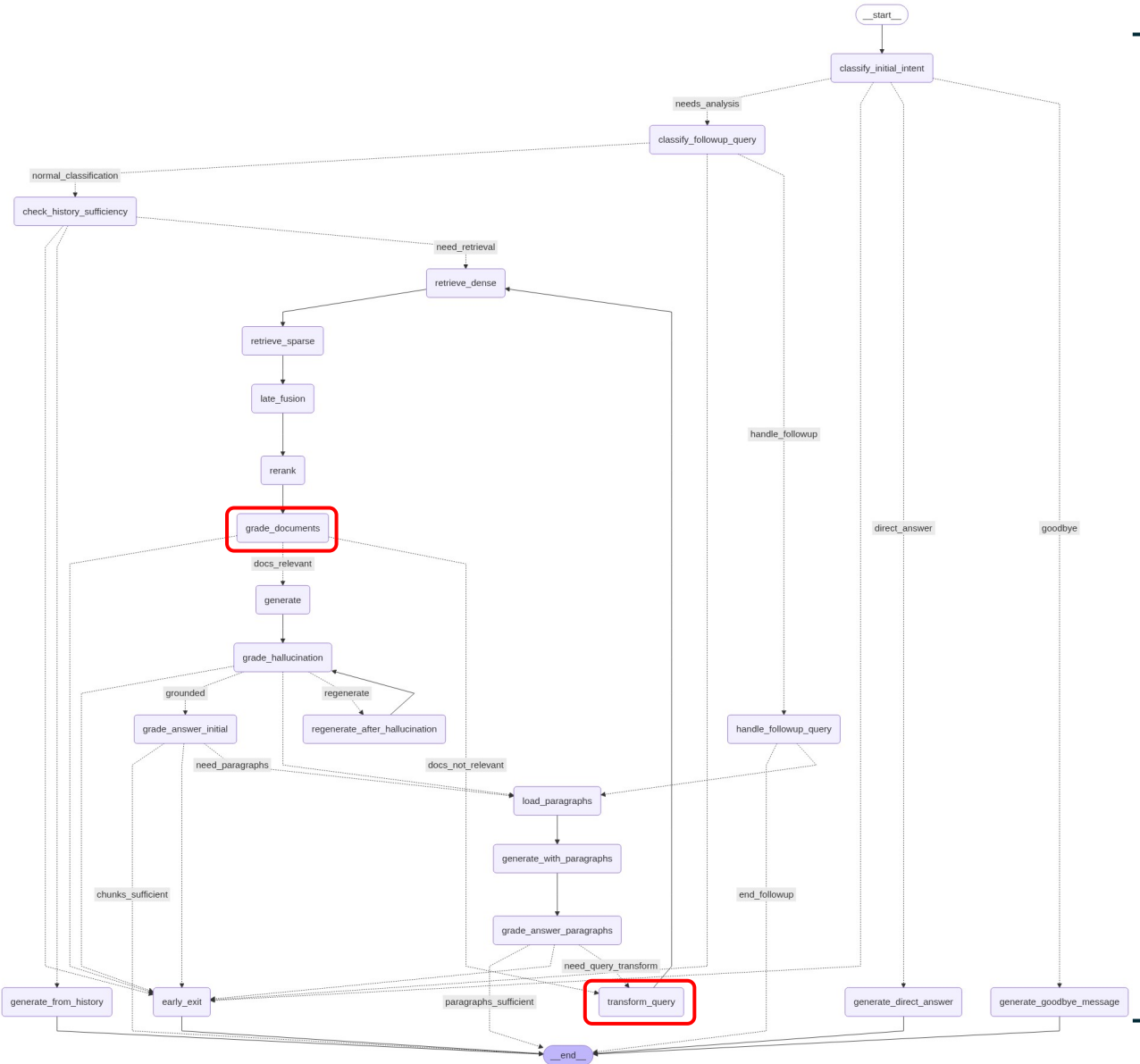
The full working logic:

- Retrieve **dense** + **sparse** (**hybrid search**) with **late fusion** chunks merging:

  two retrieval call are made sequentially retrieving the top **5** chunks from each (local models, from Huggingface).

  The results are merged together according to **RRF** (reciprocal rank fusion) or **score-based** approach

- **Re-Ranking**: getting the top-3 chunks from the retrieved (and merged) ones (local model, from Huggingface).

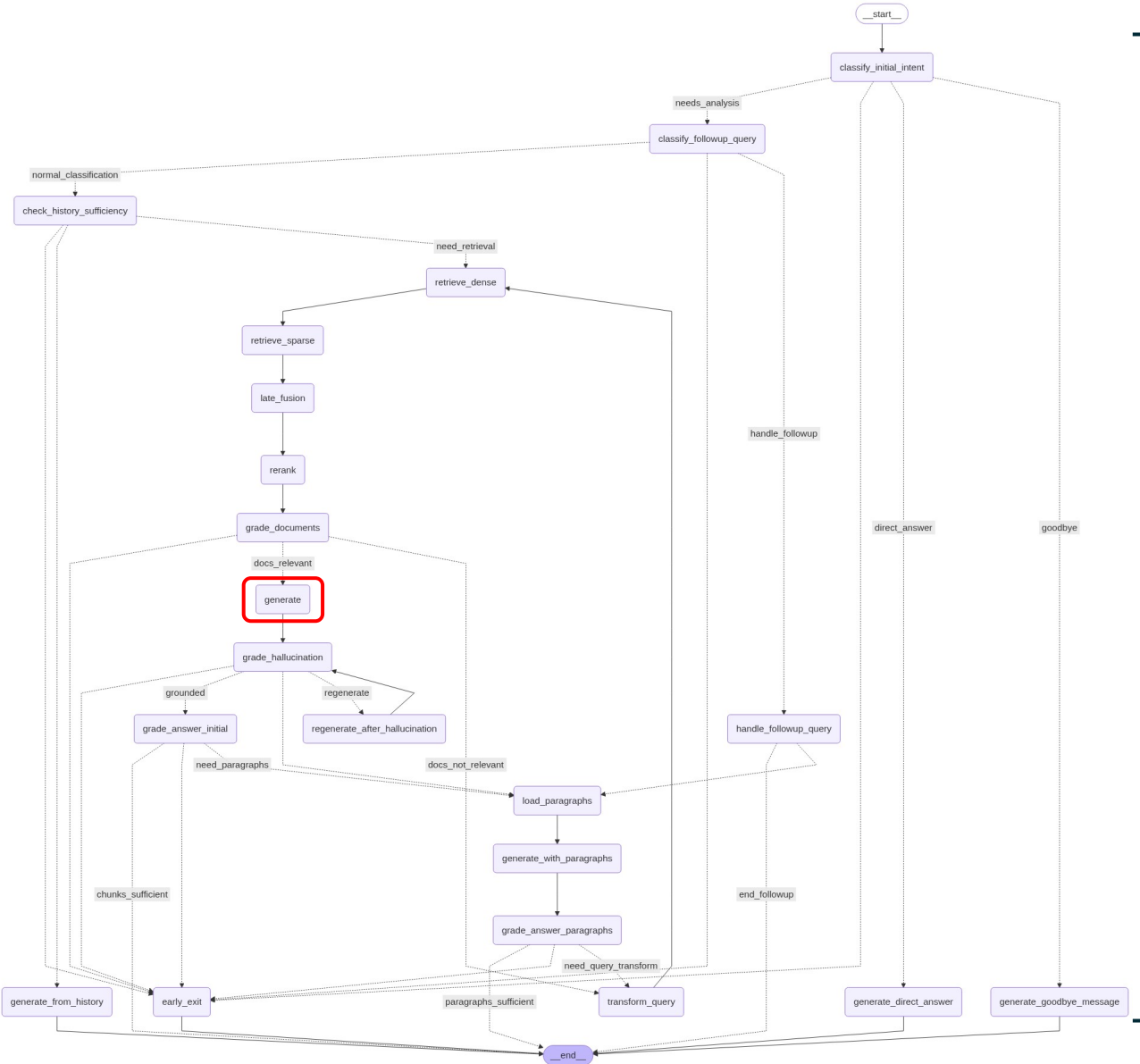


(Agentic) RAG System:

The full working logic:

- **Retrieval grader**: The retrieved results are passed to an LLM for evaluating if they are relevant or not to the current query. For each of them a binary score (“Yes/No”) is returned

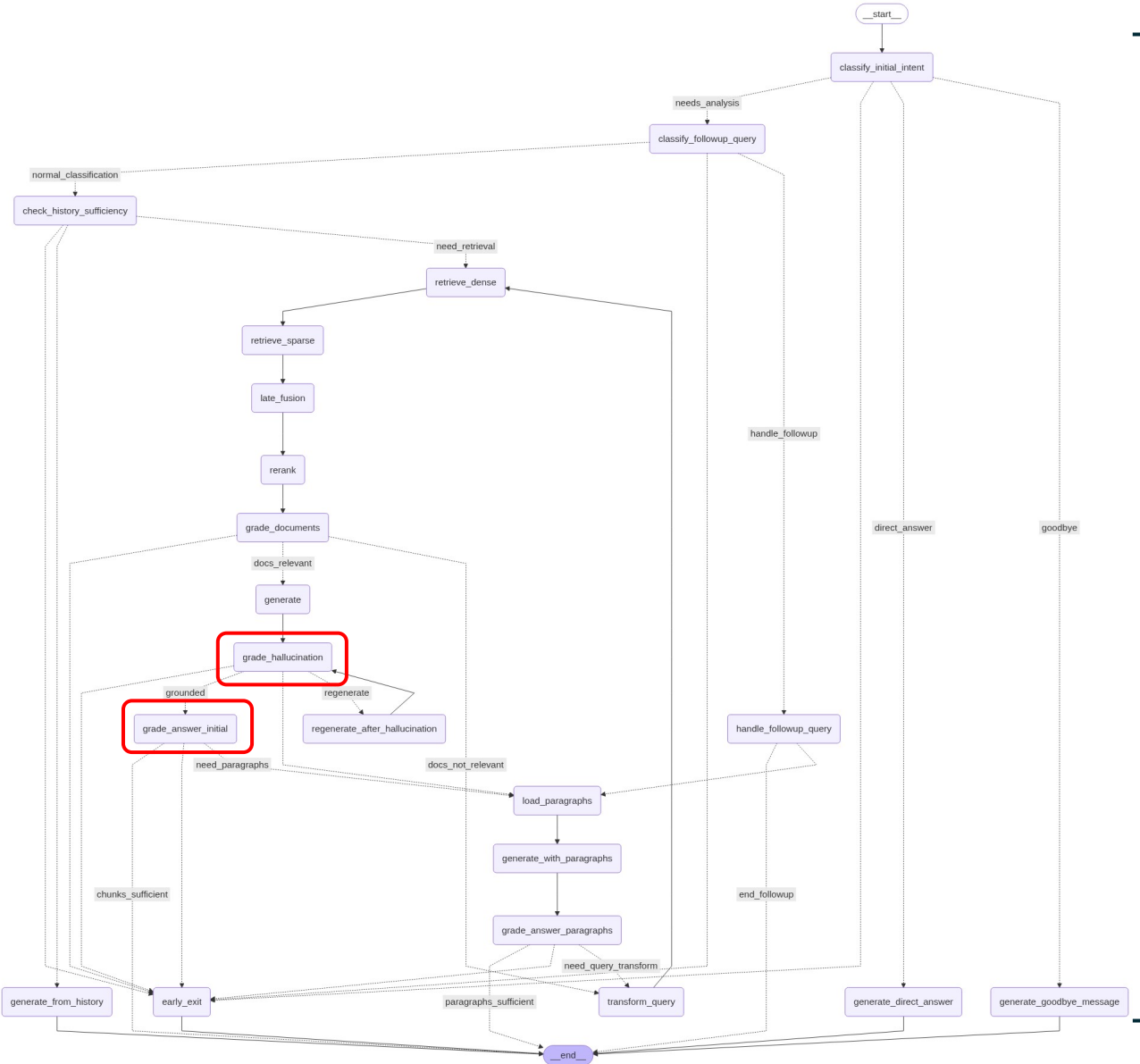
- If no one chunk survived, **query_transformation** node is called: the question is rewritten and the rag cycle restarts.



(Agentic) RAG System:

The full working logic:

- **Generate**: LLM call for a first answer generation (Groq API, llama-3.3-70B)

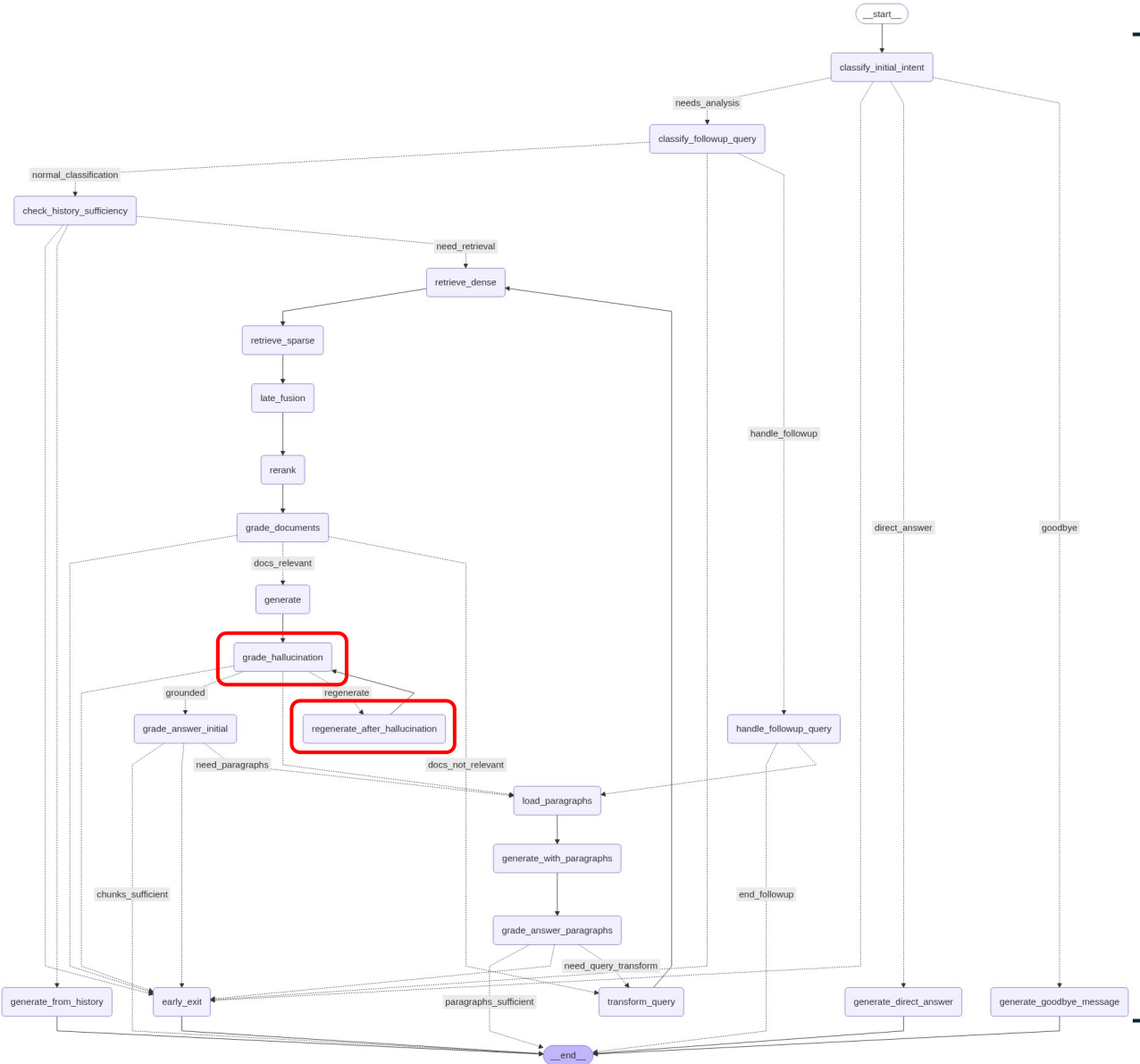


(Agentic) RAG System:

The full working logic:

- **Hallucination_grader**: checks if the answer produced by the LLM is grounded to the passed context, no hallucination is present in it

- **Answer_relevancy_grader**: checks if the answer produced by the LLM call is relevant to the query, that is it effectively addresses the user question

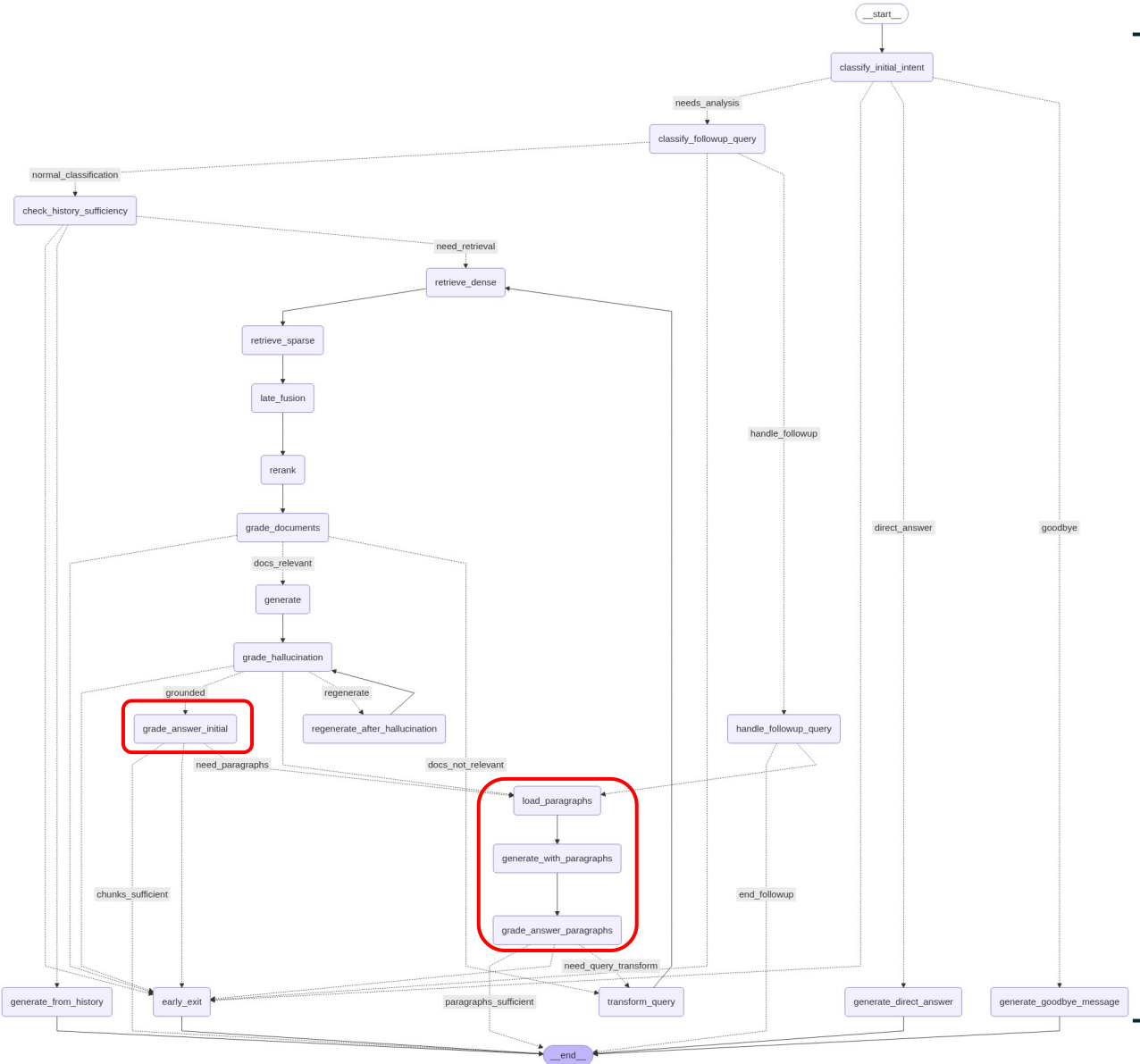


(Agentic) RAG System:

The full working logic:

- **Hallucination_grader**: checks if the answer produced by the LLM is grounded to the passed context, no hallucination is present in it

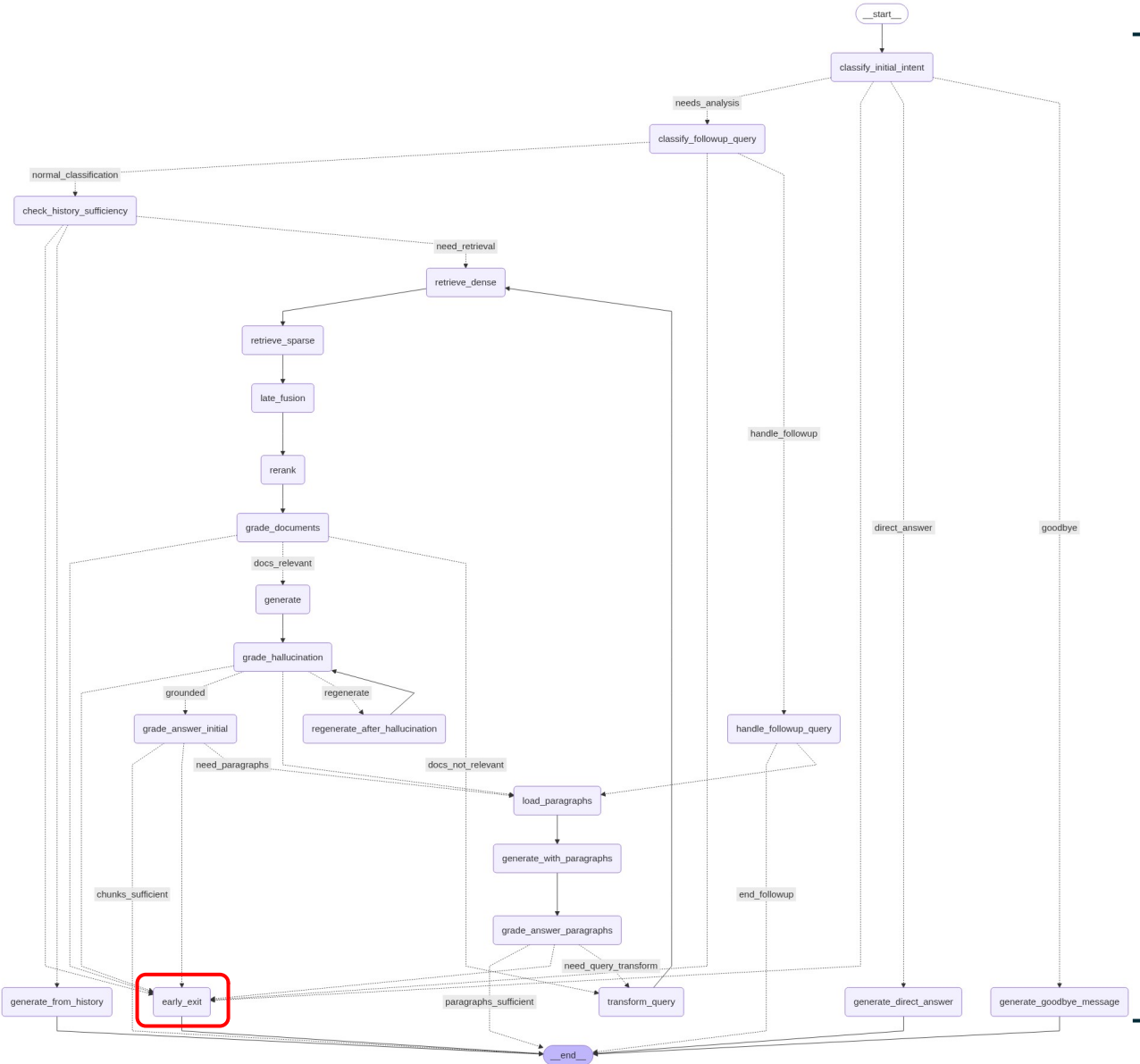
- In case of detected hallucination, another attempt is made and a new answer is generated by the LLM trough the node **regenerate_after_hallucination**



(Agentic) RAG System:

The full working logic:

- In case of not relevant answer, **paragraphs** relative to the last retrieved chunks are loaded and used for generating a more comprehensive answer.
  The relevancy of the new answer is then graded



(Agentic) RAG System:

The full working logic:

- **Early_exit**: It's a (double) stop condition. A timer is started at the input of each new query and for each visited node a counter is increased. When the number of iteration for a single query becomes greater than a threshold (15) or the entire rag takes longer than a fixed amount of time for returning the answer (60 seconds), the system is automatically interrupted returning a default message to the user ("Sorry! I have no answer at the moment for your question").

Limits and Ways of Improvements

- The usage of better ocr model (LLM based). Currently only *pytesseract* and *paddleOCR* have been tried
- System running only on 2 documents related to a single grant. Easily extendable to other documents of a same grant. For multiple grants, could be useful to make a DB for each one and adding a grant_document_classifier node
- The usage of paragraphs could be not enough for broadest queries, ranging several chapters
- No reasoning mechanism, agentic template (like React, LLMCompiler)
- Re-ranking system seems not always working properly. The relative node is not activated by default
- The usage of SaaS models for query classification, that would deeply improve overall performances
- A deeper testing/evaluation of the entire system (ragas)

Command line examples

```
    Grant Funding Assistant - Chat Session Started!

Special Commands:
  -       '/history' - Show conversation history
  -       '/clear' - Clear conversation history
  -       '/config' - Show current configuration
  -       '/stats' - Show memory statistics
============================================================

    You: There is any deadline for the submission?

    ---CLASSIFY INITIAL INTENT---
    Node iteration: 1
INFO:httpx:HTTP Request: POST https://api.groq.com/openai/v1/chat/completions "HTTP/1.1 200 OK"
    Initial Intent: NEEDS_ANALYSIS

    ---DECISION: QUERY NEEDS FURTHER ANALYSIS---

    ---CLASSIFY FOLLOW-UP QUERY---
    Node iteration: 2
    First message in chat session → Skipping follow-up detection

    ---DECISION: PROCEED TO NORMAL CLASSIFICATION---

    ---CHECKING HISTORY SUFFICIENCY---
    Node iteration: 3
No prior chat history available. Proceeding to retrieval.

    ---DECISION: PROCEED TO RETRIEVAL---

    ---DENSE RETRIEVE---
    Node iteration: 4

=== DENSE SEARCH RESULTS (Top 5) ===
Dense 1: AMIF-2025-TF2-AG-INTE-04-PATHWAYS_separator_om_en_56 - Score: 4805.7124
Dense 2: AMIF-2025-TF2-AG-INTE-04-PATHWAYS_separator_om_en_88 - Score: 4663.9507
Dense 3: AMIF-2025-TF2-AG-INTE-04-PATHWAYS_separator_om_en_82 - Score: 4577.4800
Dense 4: AMIF-2025-TF2-AG-INTE-04-PATHWAYS_separator_om_en_130 - Score: 4474.3574
Dense 5: AMIF-2025-TF2-AG-INTE-04-PATHWAYS_separator_om_en_90 - Score: 4419.5737
INFO:__main__:Dense search retrieved 5 results
    Retrieved 5 dense documents

    ---SPARSE RETRIEVE---
    Node iteration: 5

=== SPARSE SEARCH RESULTS (Top 5) ===
Sparse 1: AMIF-2025-TF2-AG-INTE-04-PATHWAYS_separator_om_en_82 - Score: 21.9117
Sparse 2: AMIF-2025-TF2-AG-INTE-04-PATHWAYS_separator_om_en_56 - Score: 21.0833
Sparse 3: AMIF-2025-TF2-AG-INTE-04-PATHWAYS_separator_om_en_91 - Score: 21.0532
Sparse 4: AMIF-2025-TF2-AG-INTE-04-PATHWAYS_separator_om_en_71 - Score: 20.1475
Sparse 5: AMIF-2025-TF2-AG-INTE-04-PATHWAYS_separator_om_en_92 - Score: 19.9388
INFO:__main__:Sparse search retrieved 5 results
    Retrieved 5 sparse documents

    ---LATE FUSION---
    Node iteration: 6
INFO:__main__:RRF combined 5 dense + 5 sparse = 8 total results
    Reranker is disabled. Truncating to top 3 combined results.

    Late fusion search results (rrf method):

    === COMBINED RESULTS (RRF METHOD) ===
    Combined 1: AMIF-2025-TF2-AG-INTE-04-PATHWAYS_separator_om_en_56 - Score: 0.0325 [dense+sparse] (Dense: 1, Sparse: 2)
    Combined 2: AMIF-2025-TF2-AG-INTE-04-PATHWAYS_separator_om_en_82 - Score: 0.0323 [dense+sparse] (Dense: 3, Sparse: 1)
    Combined 3: AMIF-2025-TF2-AG-INTE-04-PATHWAYS_separator_om_en_88 - Score: 0.0161 [dense] (Dense: 2, Sparse: None)
    Combined into 3 documents using rrf

    === FILTERING CHUNKS FOR RELEVANCE ===
    Total chunks to evaluate: 3
    Node iteration: 7

    Evaluating chunk 1/3 (ID: AMIF-2025-TF2-AG-INTE-04-PATHWAYS_separator_om_en_56, Paragraph:
3.1.1_Search_funding_opportunities_—_Find_a_call), length: 556 characters
INFO:httpx:HTTP Request: POST https://api.groq.com/openai/v1/chat/completions "HTTP/1.1 200 OK"
    RELEVANT - Adding to filtered results

    Evaluating chunk 2/3 (ID: AMIF-2025-TF2-AG-INTE-04-PATHWAYS_separator_om_en_82, Paragraph: 3.1.4_Submit_a_proposal_—
_Portal_Submission_System), length: 555 characters
INFO:httpx:HTTP Request: POST https://api.groq.com/openai/v1/chat/completions "HTTP/1.1 200 OK"
    RELEVANT - Adding to filtered results

    Evaluating chunk 3/3 (ID: AMIF-2025-TF2-AG-INTE-04-PATHWAYS_separator_om_en_88, Paragraph: 3.1.4_Submit_a_proposal_—
_Portal_Submission_System), length: 862 characters
INFO:httpx:HTTP Request: POST https://api.groq.com/openai/v1/chat/completions "HTTP/1.1 200 OK"
    RELEVANT - Adding to filtered results

    Number of relevant docs: 3 ---> DECISION: GENERATE ANSWER!

    ---GENERATE ANSWER---
    Node iteration: 8
Deadline models

INFO:httpx:HTTP Request: POST https://api.groq.com/openai/v1/chat/completions "HTTP/1.1 200 OK"
    Generated answer (preview): The provided context indicates that there are deadlines for submission, which vary depending on the ...

    CHECK HALLUCINATIONS
    Node iteration: 9
INFO:httpx:HTTP Request: POST https://api.groq.com/openai/v1/chat/completions "HTTP/1.1 200 OK"
Hallucination Score (Retry count: 0):       ⇒  GENERATION IS GROUNDED IN DOCUMENTS
    ---DECISION: GENERATION IS GROUNDED, CHECK IF IT ANSWERS QUESTION---

    ---GRADE ANSWER (INITIAL ATTEMPT WITH CHUNKS)---
    Node iteration: 10
There is any deadline for the submission?

INFO:httpx:HTTP Request: POST https://api.groq.com/openai/v1/chat/completions "HTTP/1.1 200 OK"
Answer Score:      ⇒ GENERATION ADDRESSES QUESTION (CHUNKS SUFFICIENT)
    ---DECISION: CHUNKS ARE SUFFICIENT, ENDING---


============================================================
    Query:
There is any deadline for the submission?

    Answer:
The provided context indicates that there are deadlines for submission, which vary depending on the topic's submission procedure. For
single-stage topics, a full proposal must be submitted by the call deadline, while two-stage topics require a short outline proposal for stage 1
and a full proposal for stage 2 if invited. Additionally, some topics have multiple cut-off dates for continuous submission and evaluation. It is
recommended to submit proposals at least 48 hours before the deadline to avoid technical issues.
============================================================

    Execution Stats:
  - Query type: NEEDS_ANALYSIS
  - Used history: False
  - Iterations: 10
  - Time elapsed: 6.01 seconds
  - Chat history: 2 messages
```

```
    Grant Funding Assistant - Chat Session Started!
Special Commands:
  -     '/history' - Show conversation history
  -     '/clear' - Clear conversation history
  -     '/config' - Show current configuration
  -     '/stats' - Show memory statistics
============================================================

    You: who can sign the lear ?

    ---CLASSIFY INITIAL INTENT---
    Node iteration: 1
INFO:httpx:HTTP Request: POST https://api.groq.com/openai/v1/chat/completions "HTTP/1.1 200 OK"
    Initial Intent: NEEDS_ANALYSIS

    ---DECISION: QUERY NEEDS FURTHER ANALYSIS---

    ---CLASSIFY FOLLOW-UP QUERY---
    Node iteration: 2
previous_query: There is any deadline for the submission? question: who can sign the lear ?

INFO:httpx:HTTP Request: POST https://api.groq.com/openai/v1/chat/completions "HTTP/1.1 200 OK"
NEW_QUERY
    New independent query → Proceeding to normal classification

    ---DECISION: PROCEED TO NORMAL CLASSIFICATION---

    ---CHECKING HISTORY SUFFICIENCY---
    Node iteration: 3

INFO:httpx:HTTP Request: POST https://api.groq.com/openai/v1/chat/completions "HTTP/1.1 200 OK"
    History is not sufficient. Proceeding to retrieval.

    ---DECISION: PROCEED TO RETRIEVAL---

    ---DENSE RETRIEVE---
    Node iteration: 4

=== DENSE SEARCH RESULTS (Top 5) ===
Dense 1: AMIF-2025-TF2-AG-INTE-04-PATHWAYS_separator_om_en_138 - Score: 4566.6333
Dense 2: AMIF-2025-TF2-AG-INTE-04-PATHWAYS_separator_rules-lev-lear-fca_en_41 - Score: 4528.4004
Dense 3: AMIF-2025-TF2-AG-INTE-04-PATHWAYS_separator_om_en_13 - Score: 4511.5537
Dense 4: AMIF-2025-TF2-AG-INTE-04-PATHWAYS_separator_om_en_136 - Score: 4504.3418
Dense 5: AMIF-2025-TF2-AG-INTE-04-PATHWAYS_separator_om_en_134 - Score: 4466.6700
INFO:__main__:Dense search retrieved 5 results
    Retrieved 5 dense documents

    ---SPARSE RETRIEVE---
    Node iteration: 5

=== SPARSE SEARCH RESULTS (Top 5) ===
Sparse 1: AMIF-2025-TF2-AG-INTE-04-PATHWAYS_separator_rules-lev-lear-fca_en_41 - Score: 27.9342
Sparse 2: AMIF-2025-TF2-AG-INTE-04-PATHWAYS_separator_om_en_134 - Score: 26.3086
Sparse 3: AMIF-2025-TF2-AG-INTE-04-PATHWAYS_separator_om_en_139 - Score: 25.7932
Sparse 4: AMIF-2025-TF2-AG-INTE-04-PATHWAYS_separator_om_en_137 - Score: 24.3619
Sparse 5: AMIF-2025-TF2-AG-INTE-04-PATHWAYS_separator_om_en_23 - Score: 23.8634
INFO:__main__:Sparse search retrieved 5 results
    Retrieved 5 sparse documents

    ---LATE FUSION---
    Node iteration: 6
INFO:__main__:RRF combined 5 dense + 5 sparse = 8 total results
    Reranker is disabled. Truncating to top 3 combined results.

    Late fusion search results (rrf method):

    === COMBINED RESULTS (RRF METHOD) ===
    Combined 1: AMIF-2025-TF2-AG-INTE-04-PATHWAYS_separator_rules-lev-lear-fca_en_41 - Score: 0.0325 [dense+sparse] (Dense: 2,
Sparse: 1)
    Combined 2: AMIF-2025-TF2-AG-INTE-04-PATHWAYS_separator_om_en_134 - Score: 0.0315 [dense+sparse] (Dense: 5, Sparse: 2)
    Combined 3: AMIF-2025-TF2-AG-INTE-04-PATHWAYS_separator_om_en_138 - Score: 0.0164 [dense] (Dense: 1, Sparse: None)
    Combined into 3 documents using rrf

    === FILTERING CHUNKS FOR RELEVANCE ===
    Total chunks to evaluate: 3
    Node iteration: 7

    Evaluating chunk 1/3 (ID: AMIF-2025-TF2-AG-INTE-04-PATHWAYS_separator_rules-lev-lear-fca_en_41, Paragraph:
3.2_List_of_documents_and_information), length: 865 characters
INFO:httpx:HTTP Request: POST https://api.groq.com/openai/v1/chat/completions "HTTP/1.1 200 OK"
    RELEVANT - Adding to filtered results

    Evaluating chunk 2/3 (ID: AMIF-2025-TF2-AG-INTE-04-PATHWAYS_separator_om_en_134, Paragraph: 3.2.5_Grant_signature), length:
412 characters
INFO:httpx:HTTP Request: POST https://api.groq.com/openai/v1/chat/completions "HTTP/1.1 200 OK"
    NOT RELEVANT - Excluding from results

    Evaluating chunk 2/3 (ID: AMIF-2025-TF2-AG-INTE-04-PATHWAYS_separator_om_en_138, Paragraph: 3.2.5_Grant_signature), length:
348 characters
INFO:httpx:HTTP Request: POST https://api.groq.com/openai/v1/chat/completions "HTTP/1.1 200 OK"
    NOT RELEVANT - Excluding from results

    Number of relevant docs: 1 ---> DECISION: GENERATE ANSWER!

    ---GENERATE ANSWER---
    Node iteration: 8

INFO:httpx:HTTP Request: POST https://api.groq.com/openai/v1/chat/completions "HTTP/1.1 200 OK"
    Generated answer (preview): The LEAR documents must be signed by persons who are legal representatives of the participant. This ...

    CHECK HALLUCINATIONS
    Node iteration: 9
INFO:httpx:HTTP Request: POST https://api.groq.com/openai/v1/chat/completions "HTTP/1.1 200 OK"
Hallucination Score (Retry count: 0):     ⇒  GENERATION IS GROUNDED IN DOCUMENTS
    ---DECISION: GENERATION IS GROUNDED, CHECK IF IT ANSWERS QUESTION---

    ---GRADE ANSWER (INITIAL ATTEMPT WITH CHUNKS)---
    Node iteration: 10
who can sign the lear ?

INFO:httpx:HTTP Request: POST https://api.groq.com/openai/v1/chat/completions "HTTP/1.1 200 OK"
Answer Score:     ⇒ GENERATION ADDRESSES QUESTION (CHUNKS SUFFICIENT)
    ---DECISION: CHUNKS ARE SUFFICIENT, ENDING---


============================================================
    Query:
who can sign the lear ?

    Answer:
The LEAR documents must be signed by persons who are legal representatives of the participant. This means that only individuals who
have the legal authority to represent the participant can sign the LEAR. The signatures can be either handwritten or qualified electronic
signatures, as long as they correspond to the names indicated in the official identity documents. The names of the legal representative and
LEAR in the documents must match those in their official identity documents.
============================================================

    Execution Stats:
  - Query type: NEEDS_ANALYSIS
  - Used history: False
  - Iterations: 10
  - Time elapsed: 8.66 seconds
  - Chat history: 4 messages
```

Grant Funding Assistant - Chat Session Started!

Special Commands:
- '/history' - Show conversation history
- '/clear' - Clear conversation history
- '/config' - Show current configuration
- '/stats' - Show memory statistics
==

You: Hello! this is Valerio

---CLASSIFY INITIAL INTENT---
Node iteration: 1
INFO:httpx:HTTP Request: POST https://api.groq.com/openai/v1/chat/completions "HTTP/1.1 200 OK"
Initial Intent: DIRECT_ANSWER

---DECISION: PROVIDE DIRECT ANSWER---

---GENERATE DIRECT ANSWER---
Node iteration: 2
INFO:httpx:HTTP Request: POST https://api.groq.com/openai/v1/chat/completions "HTTP/1.1 200 OK"
Generated direct answer (preview): Hello Valerio, it's nice to meet you. I'm here to help with any questions you have about grant fundi...

==
Query:
Hello! this is Valerio

Answer:
Hello Valerio, it's nice to meet you. I'm here to help with any questions you have about grant funding, from eligibility criteria to application processes. How can I assist you today?
==

Execution Stats:
- Query type: DIRECT_ANSWER
- Used history: False
- Iterations: 2
- Time elapsed: 0.71 seconds
- Chat history: 2 messages

You: what can u do for me >?

---CLASSIFY INITIAL INTENT---
Node iteration: 1
INFO:httpx:HTTP Request: POST https://api.groq.com/openai/v1/chat/completions "HTTP/1.1 200 OK"
Initial Intent: DIRECT_ANSWER

---DECISION: PROVIDE DIRECT ANSWER---

---GENERATE DIRECT ANSWER---
Node iteration: 2
INFO:httpx:HTTP Request: POST https://api.groq.com/openai/v1/chat/completions "HTTP/1.1 200 OK"
Generated direct answer (preview): I can help you with any questions related to grant funding, such as deadlines, requirements, eligibi…

==
Query:
what can u do for me >?

Answer:
I can help you with any questions related to grant funding, such as deadlines, requirements, eligibility criteria, and application processes. I have access to specialized documents and can assist you in understanding funding opportunities and procedures. What specific aspect of grant funding would you like to know more about, Valerio?
==

Execution Stats:
- Query type: DIRECT_ANSWER
- Used history: False
- Iterations: 2
- Time elapsed: 1.02 seconds
- Chat history: 4 messages

You: u know my name >?

---CLASSIFY INITIAL INTENT---
Node iteration: 1
INFO:httpx:HTTP Request: POST https://api.groq.com/openai/v1/chat/completions "HTTP/1.1 200 OK"
Initial Intent: NEEDS_ANALYSIS

---DECISION: QUERY NEEDS FURTHER ANALYSIS---

---CLASSIFY FOLLOW-UP QUERY---
Node iteration: 2
Previous query was 'DIRECT_ANSWER' (not RETRIEVAL_NEEDED) → Skipping follow-up detection

---DECISION: PROCEED TO NORMAL CLASSIFICATION---

---CHECKING HISTORY SUFFICIENCY---
Node iteration: 3

INFO:httpx:HTTP Request: POST https://api.groq.com/openai/v1/chat/completions "HTTP/1.1 200 OK"
History is sufficient. Generating answer from context.

---DECISION: GENERATE FROM HISTORY---

---GENERATING ANSWER FROM HISTORY---
Node iteration: 4
INFO:httpx:HTTP Request: POST https://api.groq.com/openai/v1/chat/completions "HTTP/1.1 200 OK"
Generated answer from history (preview): Yes, I know your name. You're Valerio. We introduced ourselves at the beginning of our conversation....

==
Query:
u know my name >?

Answer:
Yes, I know your name. You're Valerio. We introduced ourselves at the beginning of our conversation.
==

You: bye

---CLASSIFY INITIAL INTENT---
Node iteration: 1
Initial Intent: GOODBYE

---DECISION: GOODBYE DETECTED---

---GENERATE GOODBYE MESSAGE---
Node iteration: 2
Generated goodbye message: It was a pleasure assisting you. Thank you for using our grant funding assistance service. We wish you all the best and hope to be of help again in the future. Goodbye!

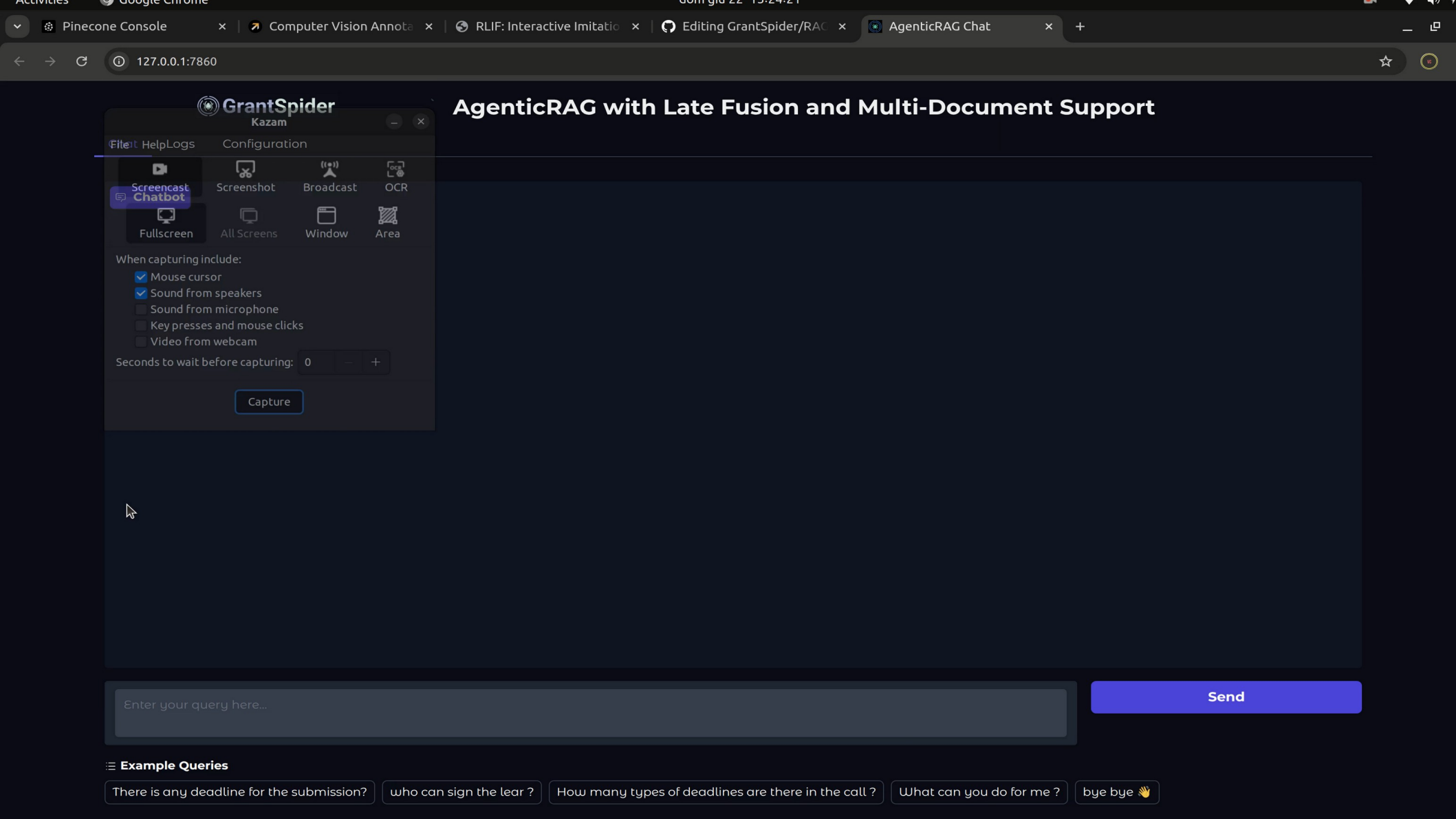
==
Query:
bye

Answer:
It was a pleasure assisting you. Thank you for using our grant funding assistance service. We wish you all the best and hope to be of help again in the future. Goodbye!
==

Chat session ended. De-initializing pipeline...

---DE-INITIALIZING PIPELINE---
Releasing models from memory...
Clearing CUDA cache...
Pipeline de-initialized successfully.
Thank you for using the Grant Funding Assistant. Goodbye!
langgraph-tutorial-modvc@valerio-Predator:~/Theory/NLP2/RAG/AgenticRAG/myRAg$

Gradio Web UI


Pinecone Console
Computer Vision Annota
RLIF: Interactive Imitatio
Editing GrantSpider/RAG
AgenticRAG Chat
127.0.0.1:7860
GrantSpider
Kazam
File
Logs
Configuration
Screencast
Screenshot
Broadcast
OCR
Chatbot
Fullscreen
All Screens
Window
Area
When capturing include:
Mouse cursor
Sound from speakers
Sound from microphone
Key presses and mouse clicks
Video from webcam
Seconds to wait before capturing:
0
Capture
AgenticRAG with Late Fusion and Multi-Document Support
Enter your query here...
Send
Example Queries
There is any deadline for the submission?
who can sign the lear ?
How many types of deadlines are there in the call ?
What can you do for me ?
bye bye

Technical Interview

Take Home Assignment

Valerio Colamattteo