REGULAILTION

PROJECT REVIEW:

Navigating complex regulations is time-consuming and manual. We're building an **intelligent model** that unifies banking regulations into a single, automated source.

Strategic Novelty:

- Unified regulatory intelligence hub.
- Explainable decisions with real-source citations.

Practical Value:

- **Cuts Costs:** Addresses the $270B annual manual research spend.
- **Stops Fines:** Prevents $6.6B in penalties (2023 baseline).
- **Transparency:** Audit-ready explanations for complex decisions.

STRATEGIC LITERATURE REVIEW

Article & Year	Task & Methods	Project Relation
VeriCite Oct 13, 2025	Prevent hallucinations in RAG via multi-stage verification (NLI-based)	Establishes evidence-grounded, explainable QA alignment for auditing needs
Intelligent Legal Systems Feb 13, 2025	Synthetic data fine-tuning for legal Q&A using Chain-of-Thought prompting	Validated our approach; applied specifically to Israeli banking regulations
RAG vs Fine-tuning Jan 18, 2024	Case study on Domain-Specific QA comparing RAG, FT, and Hybrid pipelines	Validates our Hybrid architecture; FT for style and RAG for factual precision

DATA ARCHITECTURE

Our custom-built dataset comprises **six critical dimensions** to ensure compliance and explainability:

- **Question:** Natural language banking queries.
- **Context:** Relevant regulatory document chunks.
- **Answer:** Precise Yes/No responses.
- **Citation:** Precise regulatory text from chunk.
- **Explanation:** Grounded reasoning.
- **Source:** Specific authority references.

Generation Pipeline:

We applied specific requirement prompts to **GPT-4o-mini** as a teacher model, followed by manual data validation for reliability.

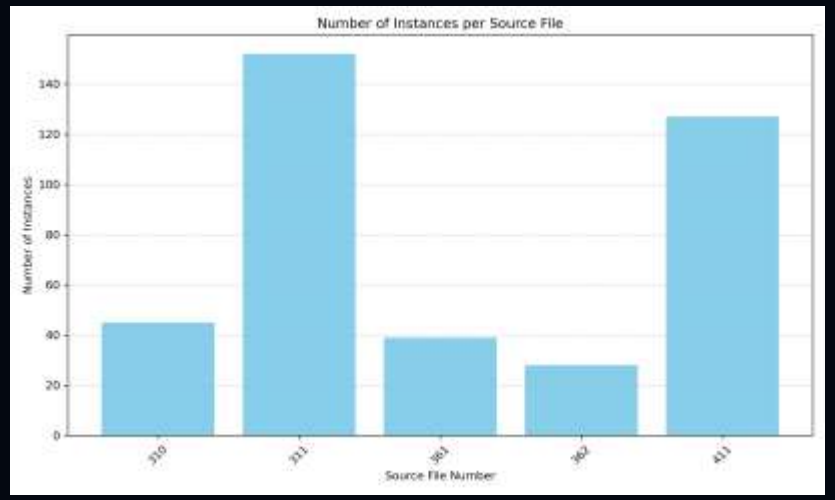
```
prompt_template = """
You are a strict data generator for banking regulation compliance.
Based **STRICTLY** on the provided context, generate **3 distinct** training examples.

Context:
"{context}"

Task:
Generate a JSON LIST containing 3 different "Yes/No" Question-Answer pairs.

Requirements:
1. **question**: Practical question by a bank employee (e.g., "Am I allowed to...", "Must we report...").
2. **answer**: "Yes" or "No".
3. **citation**: **CRITICAL**: This must be a **VERBATIM COPY-PASTE** from the text.
   - Extract the sentence EXACTLY as it appears in the text, including punctuation and weird spacing.
   - **DO NOT** rephrase, summarize, or fix grammar.
   - **DO NOT** combine two different sentences into one.
   - If the sentence is cut off in the context, copy only what is visible.
4. **explanation**: A short, professional rationale (1 sentence).
   - **STYLE**: Write as a factual statement or principle.
   - **FORBIDDEN**: DO NOT refer to "the text", "the passage", "this section", "the document", or "it says".
   - **BAD EXAMPLE**: "The text mentions that risk assessments are vital."
   - **GOOD EXAMPLE**: "Risk assessments are vital to ensure long-term stability."
5. **source_details**: Format: "Header, Section X" (or just Header).

Output format: Return ONLY a valid JSON LIST of objects.
"""
```

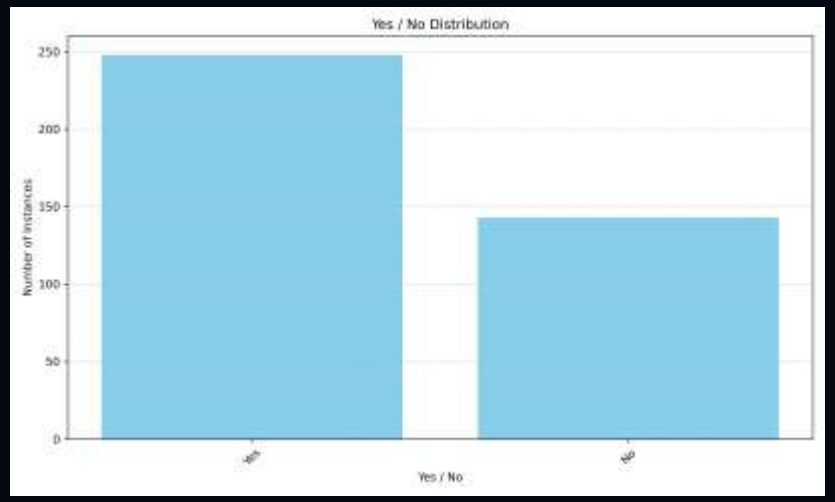

```
"question": "Must the board of directors approve the banking corporation's credit policy statement?",
"context": "Supervisor of Banks: Proper Conduct of Banking Business [10] (11/23)  \nCredit Risk Management \nPage 311-7 \n \n \
"answer": "Yes",
"citation": "The board of directors of a banking corporation shall devise a credit management strategy, construct a risk manage
"explanation": "The board of directors is responsible for the approval and review of the credit policy statement.",
"source": "311-7, Supervisor of Banks, Page 311-7"
```

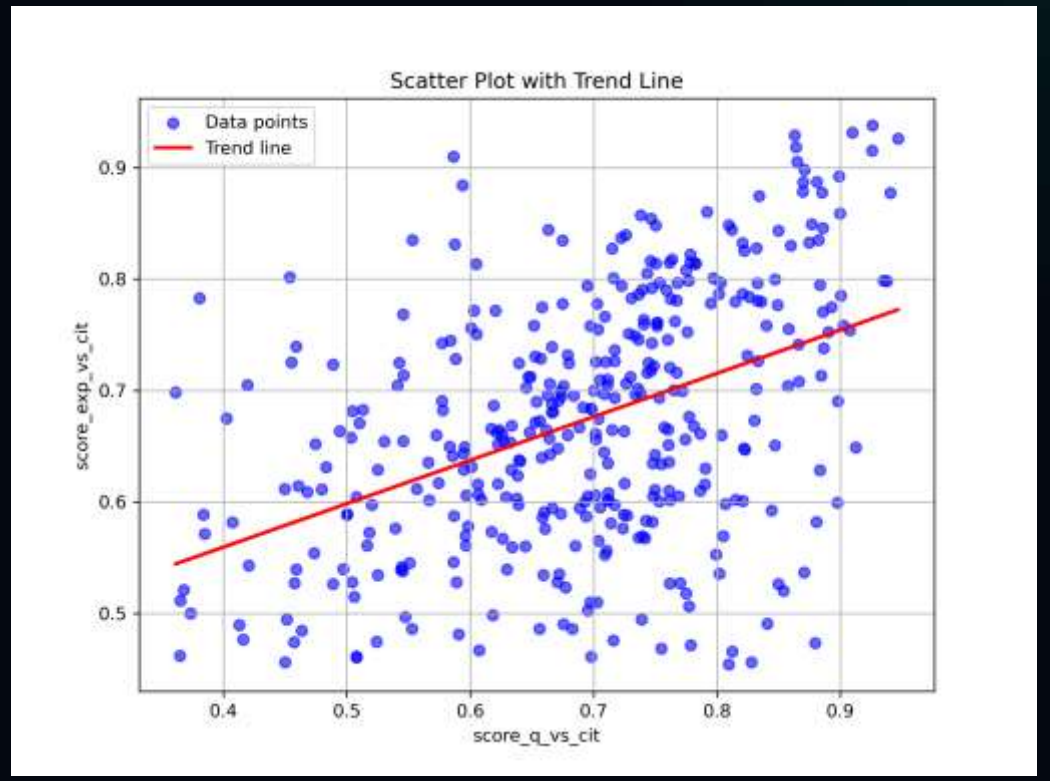
DATA VALIDATION PIPELINE

- **Citation Integrity:** Ensures the quoted text exists word-for-word in the source chunk.
- **Semantic Relevance:** Vector-based **Cosine Similarity check** (>0.35) between Question and Citation.
- **Logical Grounding:** Vector-based **Cosine Similarity check** (>0.45) between Explanation and Citation.
- **After validation:** 391 examples.

EXPLORATORY DATA ANALYSIS







BASELINE SOLUTION & RESULT

- **Model selection:** Llama 3.1 8B due to its exceptional instruction-following capabilities.
- **Dataset preparation**: we convert the dataset to **Alpaca format** and split them 341 train, and 50 test.
- **Training Technique:** We finetuned the model using **LoRA** to efficiently specialize the model on legal syntax while preventing "catastrophic forgetting" of its base knowledge.
- **Inference Results:** achieved **98%** success in **Answer Correctness**, and **82%** in **Exact Verbatim Citation**.

TECHNICAL FUTURE ROADMAP

Data Engineering

Scale training to 2,000+ examples. Introduce Negative Sampling to teach "N/A" handling for missing info.

Advanced Evaluation

End-to-End metrics: Retrieval Hit Rate and LLM-Judge for qualitative explanation checks.

RAG Implementation

Transition to vector database architecture for automatic fetching of regulatory sections.

VeriCite FrameWork

Implement strict post-processing to programmatically cross-reference citations against source text.