**Case Study: Eye-Care Chatbot Optimization**

**Objective**

The goal of this case study is to explore the challenges and solutions encountered during the development of an intelligent, domain-specific chatbot for eye care services using advanced AI models and tools.

**Problem Statement**

The chatbot was designed to handle queries related to eye health, vision, and eye care services. However, during implementation, two significant issues were identified:

1. **Tool Integration Failure**:
   * Tools intended for fetching external data were not invoked correctly by the chatbot.
   * This led to incomplete or irrelevant answers, undermining the chatbot's effectiveness.
2. **Inconsistent Responses**:
   * The language model often strayed from the eye-care domain, providing unrelated or generalized answers.
   * The intent recognition and prompt structure failed to enforce domain-specific boundaries.

**Proposed Solutions and Implementation**

**1. Enhanced Prompt Design**

The prompt format was redesigned to provide stricter instructions, ensuring the chatbot adhered to the eye-care domain. The updated prompt:

prompt = (

f"""<|begin\_of\_text|><|start\_header\_id|>system<|end\_header\_id|>

instruction: You are a creative assistant for eye care services. You must ONLY provide information directly related to eye health, vision, and eye care services.

If the user's query is not related to eye care, respond with EXACTLY this message:

'I apologize, but I can only answer questions related to eye care. If you have any eye-related questions, I'd be happy to help.'

<|eot\_id|>

<|start\_header\_id|>user<|end\_header\_id|>

{user\_query}<|eot\_id|><|start\_header\_id|>assistant<|end\_header\_id|>

"""

)

**Key Adjustments in the Prompt**:

* **Domain Restriction**: Ensured the chatbot explicitly focused on eye care-related queries.
* **Fallback Mechanism**: Introduced a default response for out-of-scope questions to maintain clarity and user trust.

**2. Tool Integration Optimization**

The tools used by the chatbot often returned inaccurate or irrelevant data due to improper execution flow. To resolve this:

* **Direct Tool Execution**: Configured tools to directly return their outputs by setting tool\_name.return\_direct = True.  
  This bypassed additional processing layers, minimizing errors and improving response accuracy.

**Example Update**:

tool\_name.return\_direct = True # Forces the tool to directly return the result.

**3. Model Selection and Customization**

The **Hugging Face Endpoint (LLama)** was used as the core language model due to its capability to handle complex queries. Its performance was further refined with the optimized prompt and tools.

**Key Outcomes**

1. **Increased Accuracy**:
   * The updated prompt and tool configurations ensured the chatbot provided domain-specific, accurate responses.
2. **Improved User Experience**:
   * Responses were aligned with user intent, and out-of-scope queries were gracefully handled.
3. **Enhanced Maintainability**:
   * The modular approach to prompt and tool optimization simplified debugging and updates.

**Conclusion**

This case study highlights the critical role of prompt engineering and tool integration in the success of domain-specific chatbots. By optimizing the prompt format and ensuring tool reliability, the chatbot for eye care services effectively met user needs while staying within its intended scope.