

Part 2 — LLM-Only System

Model name: gemini-2.5-flash-lite

Temperature: default value 1.0

Conversation analysis examples

LM-only approach performs better than rules-based system

1. Substitution

User: Can I use brown sugar instead of white sugar?

LLM

```
- User: Can I use brown sugar instead of white sugar?  
Yes, you can **definitely use brown sugar instead of white sugar** in this persimmon bread recipe.  
  
Here's what you should consider:  
  
* **Flavor:** Brown sugar will add a slightly richer, molasses-like flavor to the bread, which often complements the sweetness of persimmons very well.  
* **Moisture:** Brown sugar contains molasses, which adds a bit more moisture to baked goods. This can result in a slightly softer and moister bread.  
* **Quantity:** You can generally substitute brown sugar 1:1 for white sugar. So, use **1/2 cup of brown sugar**.  
  
You might notice a slight difference in the color of the finished bread, with it being a bit darker. Enjoy your persimmon bread!
```

Rules-based system

```
- User: Can I use brown sugar instead of white sugar
```

```
https://www.google.com/search?q=white+sugar+substitute
```

In the rules-based system, we can only provide external links for substitution. For LLM, it can give advice on the substitution directly.

2. Vague references

User: Where do I need a bowl?

LLM

```
- User: Where do I need a bowl?  
You need a bowl for the following steps:  
  
* **Step 2: Combine flour, cinnamon, salt, nuts, and raisins in a small bowl.** This is where you'll mix your dry ingredients together.  
* **Step 3: Blend eggs, sugar, and oil in a large bowl.** This is where you'll create your wet ingredients base. You'll also be adding the persimmon pulp mixture to this same **large bowl**.  
  
So, you'll need **two bowls**: one small bowl for the dry ingredients and one large bowl for the wet ingredients and then for combining everything.
```

Rules-based system

```
- User: go to step 4
```

```
Step 4: Combine flour, cinnamon, salt, nuts, and raisins in a small bowl.
```

```
- User: where do i need a bowl
```

```
I'm not sure I understood. Could you say that differently?
```

```
- User: where do i need a small bowl
```

```
You use the small bowl in step 4.
```

```
- User: where do i need a large bowl
```

```
You use the large bowl in step 5.
```

In our system, we need to specify the accurate tool in the question, “small bowl” or “large bowl”. However, in LLM, it can list all the bowls used in the recipe and show correct information of each.

3. Information not included in the recipe

User: How can I tell if the batter looks right?

LLM

- User: How can I tell if the batter looks right?

To tell if the batter looks right, you're looking for a few key characteristics that indicate it's properly mixed and ready for baking:

- * **Consistency:** The batter should be **thick but pourable**. It shouldn't be runny like pancake batter, nor should it be stiff and difficult to stir. When you lift a spoonful or spatula, the batter should slowly fall off in thick ribbons.
- * **Homogeneity (No Visible Pockets of Dry Ingredients):** When you fold in the flour mixture (Step 4), you should no longer see large clumps of dry flour. Everything should be integrated into a uniform batter. A few tiny specks of flour are usually fine, but you shouldn't see distinct streaks or pockets of dry ingredients.
- * **Smoothness (Mostly):** While it's not going to be perfectly smooth due to the addition of persimmon pulp, nuts, and raisins, the base of the batter (from the wet ingredients and flour) should be relatively smooth and well-combined. The persimmon pulp might give it some texture and color.
- * **Color:** The color will be influenced by the persimmon pulp. It will likely be a warm, orangey-brown hue, depending on how ripe and how much pulp you used.

In summary, aim for a batter that is:

- * **Thick, but not stiff.**
- * **Well-combined, with no visible dry streaks.**
- * **A uniform color (likely orangey-brown).**

If it seems too dry and stiff, you might have over-mixed or didn't have enough liquid (though the persimmon pulp usually adds plenty). If it's too thin and runny, you might have added too much liquid or not enough dry ingredients. The description "pourable" from Step 4 is a good indicator.

Rules-based system

- User: go to step 8

Step 8: Pour batter into prepared pan.

- User: How can I tell if the batter looks right

I'm not sure I understood. Could you say that differently?

For rules-based system, it can only find answers from the given data. If the user inputs questions not mentioned in the original recipe, it can't reply. LLM can handle these questions properly.

LLM-only approach fails or struggles

1. Misunderstood the user's instruction

User: Go back one step.

User: Again

- User: go back one step

No problem! I've gone back one step.

We are now at **Step 3: Blend eggs, sugar, and oil in a large bowl. Stir baking soda into persimmon pulp until well blended; add to sugar mixture.**

In this step, you are:

1. Combining the **wet ingredients**: eggs, sugar, and vegetable oil in a large bowl.
2. Mixing the **baking soda** into the **persimmon pulp**. It's important to get this well blended so the baking soda is evenly distributed.
3. Adding the **persimmon pulp mixture** to the large bowl with the egg, sugar, and oil mixture.
4. You'll then stir all of these wet ingredients and the persimmon pulp together until they are well combined.

Ready to move forward again?

- User: again

Okay, I've gone back another step.

We are now at **Step 2: Combine flour, cinnamon, salt, nuts, and raisins in a small bowl.**

In this step, you are:

1. Gathering your **dry ingredients**: all-purpose flour, ground cinnamon, salt, chopped walnuts, and raisins.
2. Mixing all of these together in a **small bowl**.
3. This ensures that the leavening agent (baking soda, which is added later) and flavorings are evenly distributed throughout the dry ingredients before they are combined with the wet ingredients.

Let me know when you're ready to proceed!

In this situation, LLM will go back one more step since it keeps tracks of the user's chat history.

However, the user just wants to repeat the step that it's in, not going back again. I tested this user input for several times, it returns unstable output. Sometimes, it will repeat the state; sometimes it goes back again.

```
- User: go back one step
Going back one step, we are now at **Step 2**:

**Combine flour, cinnamon, salt, nuts, and raisins in a small bowl.**

- User: again
I am at **Step 2**:

**Combine flour, cinnamon, salt, nuts, and raisins in a small bowl.**
```

2. Lost track of state

```
- User: go back one step
Okay, I'm going back to **Step 3**:

**Step 3: Blend eggs, sugar, and oil in a large bowl. Stir baking soda into persimmon pulp until well blended; add to sugar mixture.**

What can I help you with regarding this step?

- User: what is in the bowl now
In the **large bowl** at the end of Step 3, you will have:

* The blended mixture of:
  * 2 large eggs
  * ½ cup white sugar
  * ½ cup vegetable oil
* And the mixture of:
  * 1 cup persimmon pulp
  * 1 teaspoon baking soda (which has been stirred into the persimmon pulp)

So, in essence, the large bowl now contains the wet ingredients and the leavening agent (baking soda) combined with the persimmon pulp.

- User: what is in the small bowl now
In the **small bowl** at the end of Step 3, you will have:

* 1 ½ cups all-purpose flour
* 1 teaspoon ground cinnamon
* ½ teaspoon salt
* ½ cup chopped walnuts
* ½ cup raisins

This is the dry ingredient mixture that was prepared in Step 2.

- User: what is the oven temperature now
The oven temperature was set in **Step 1**.

At this point in the recipe (after Step 3), the oven temperature is **325 degrees F (165 degrees C)**.

- User: go to next step
Okay, I'm moving to **Step 5**:

**Step 5: Bake in the preheated oven until a toothpick inserted into the center of the cake comes out clean, about 1 hour to 1 hour 15 minutes.**

What would you like to know about this step?
```

In this example, the user is in step 3 at the beginning. Then after asking several questions, the user said “go to next step”. The system then moved to step 5. This shows lost track of state.

3. Question not in the recipe

```
- User: Can I use melted butter instead of oil?
Yes, you can generally **use melted butter instead of vegetable oil** in this persimmon bread recipe.

Here's what you should consider:

* **Quantity:** You can usually substitute melted butter 1:1 for vegetable oil. So, you would use **½ cup of melted butter**.
* **Flavor:** Butter will add a richer, more distinct flavor to the bread compared to neutral vegetable oil. Many people prefer the taste of butter in baked goods.
* **Texture:** Butter contains some water, which can sometimes lead to a slightly different texture. However, for this type of quick bread, the difference is usually very subtle and acceptable.
* **Cooling:** Make sure the butter is **melted and slightly cooled** before adding it to the other wet ingredients. You don't want to scramble the eggs with hot butter.

So, feel free to swap it out! You'll likely end up with a delicious and flavorful persimmon bread.
```

When the answer can't be found in the original recipe, LLM tends to answer it on its own. In this example, it responds to the user that melted butter can replace oil 1:1. However, in real situation, using melted butter results in a drier end product, so we should use a bit more than the original oil when doing the substitution.