CENTRO DE INVESTIGACIÓN EN TECNOLOGÍAS DE LA INFORMACIÓN Y LAS COMUNICACIONES

Healthy Cooking with Large Language Models, Supervised Fine-Tuning, and Retrieval Augmented Generation

Andrea Morales-Garzón[1], Oscar A. Rocha, Sara Benel Ramirez, Gabriel Tuco Casquino[2], Alberto Medina[3]

[1]Department of Computer Science and Artificial Intelligence, University of Granada
[2]Universidad Católica de Santa María, Perú, [3]ETSII-UPM, Universidad Politécnica de Madrid

Introduction

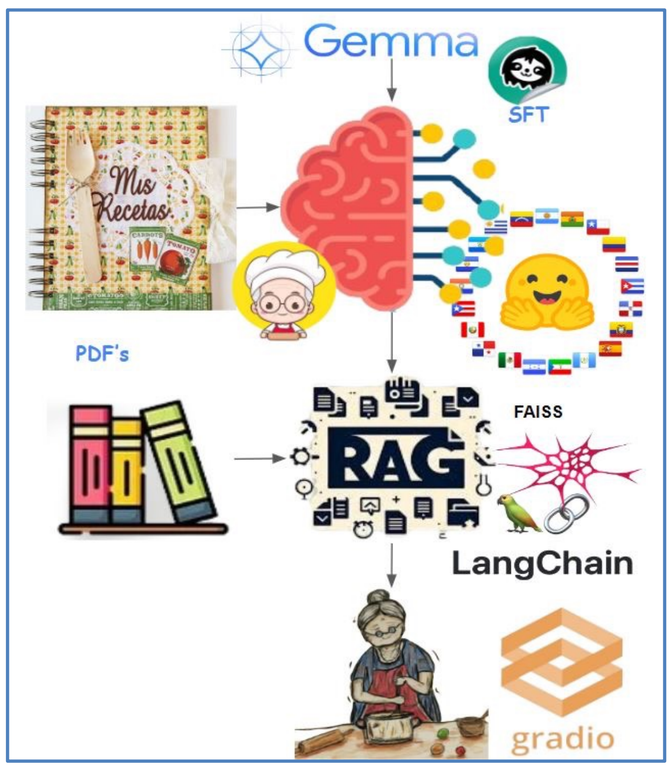
- **According to the WHO**, adopting healthy eating habits helps prevent malnutrition and diseases such as cancer, and diabetes.
- There is a **shortage of Spanish resources** to address nutrition computational problems.
- **LLMs**: **monotonous** in similar scenarios, and potentially **dangerous when dealing with diseases or allergies**.

Our contributions

- We present **RecetasDeLaAbuel@**, a corpus of **20,447 recipes** from Spanish-speaking countries.
- To the best of our knowledge, this is the **largest dataset of recipes in Spanish** available for free use.
- We fine-tuned 4bit Gemma2B (Supervised Fine-Tuning and Retrieval Augmented Generation methodologies) **to provide nutritional and cooking advice.**

ComeBien app: We tested its quality through an application that allows for nutritional and culinary context and food queries.

Methodology



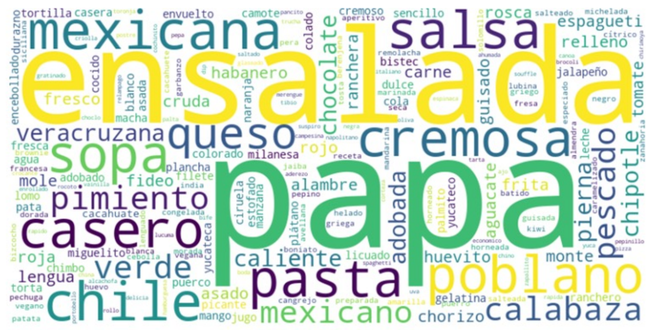
Recipe corpus

1. Web scrapping
- We scraped several web pages on Hispanic/Latin American and international cuisine written in Spanish.
- We tried to complete the recipe information by analysing the keywords of the recipe and quering Mixtral-8x7B-Instruct-v0.1

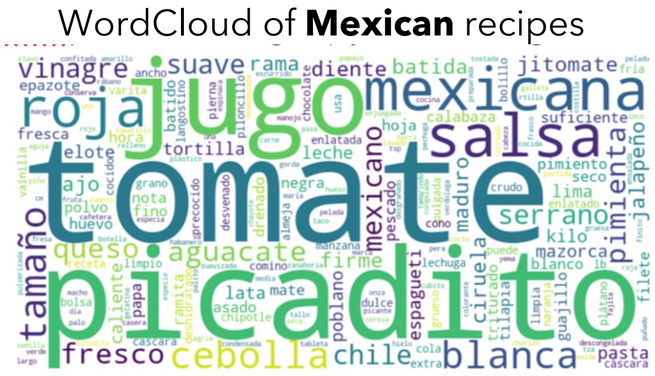
2. Data preprocessing and homogenisation.
- We performed data curation on specific fields.
- We have homogenized the corpus fields to facilitate the acquisition of statis- tics and visualization.

3. Creation of the instruction corpus in two fases:
1. We curated the corpus removing NAs, line breaks and concatenating texts.
2. We created a corpus of synthetic instructions using the LLM Genstruct.

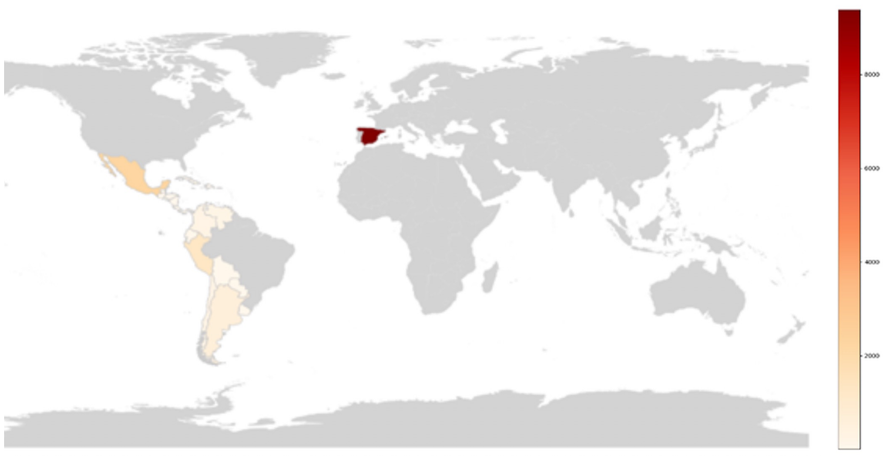
WordCloud of **recipe titles**



WordCloud of **Mexican** recipes



Country representation



Heatmap with represented countries in the corpus recipes.

Supervised Fine Tuning (SFT)

1. SFT with Gemma
- Gemma2B with 4Bit Quantization.
- We extracted a UTF-8 subset of 2.5k recipes of 3 attributes forming the question/answer pair (Recipe name vs ingredients and preparation steps).
- 8 epochs and 1550 steps.

2. SFT Hiperparameters
- Max. input tokens 4096
- LoRA r=16, α=16.
- Two batches
- Four gradient accumulation steps, 5 warmup steps
- 2e-4 learning rate
- Adamw_8bit optimizer, 0.01 weight drop rate and linear Schedule.
- 19M trained parameters

3. Training results
- Model **loss**, which is decreasing (1.8 at 200 steps and 1.3 at 1500 steps) with ±0.05 shallow ripple.
- **BERTScore** to compare the original recipes to those generated by the Gemma model. Precision: 0.67, recall: 0.71 and f1: 0.69.

Conclusions

- **RecetasDelaAbuel@** has been generated, trained and validated.
- **Most extensive corpus of recipes in Spanish.**

Future work

- **Extend experimentation** with other LLMs.
- Use **MoE** and **Retrieval Augmented Generation** (RAG) of traditional recipe books.

Environmental impact

- **Total estimated emissions** are 0.7 kg eq. CO2, obtained through the ML CO2 Impact website

https://huggingface.co/datasets/somosnlp/RecetasDeLaAbuela

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UNIVERSIDAD DE GRANADA

Andrea Morales Garzón - amoralesg@decsai.ugr.es – 16/06/2024
Dept. of Computer Science and Artificial Intelligence, University of Granada