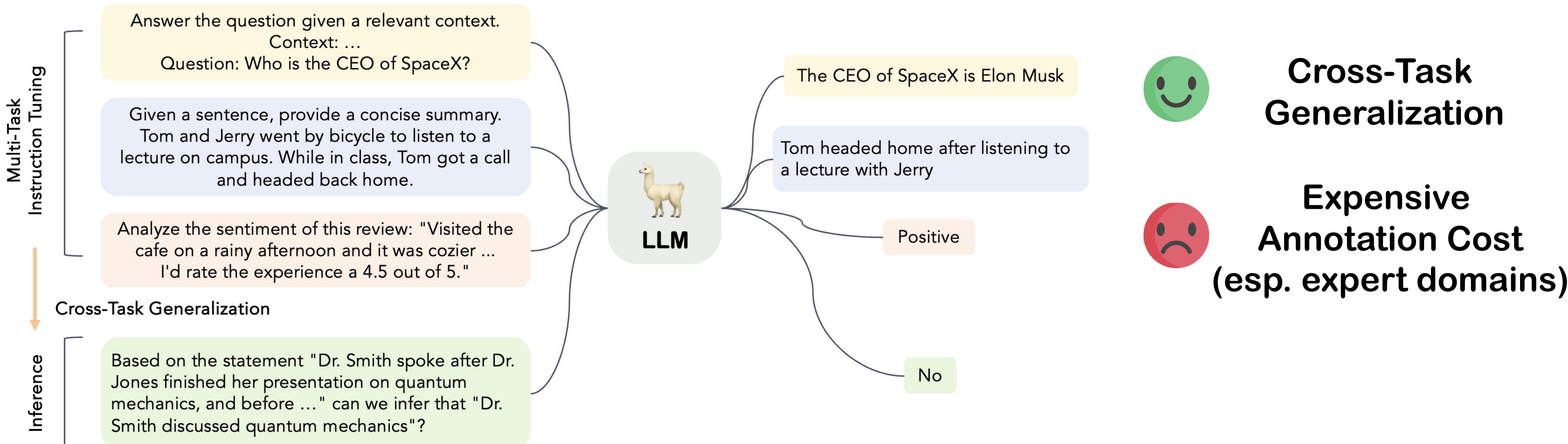


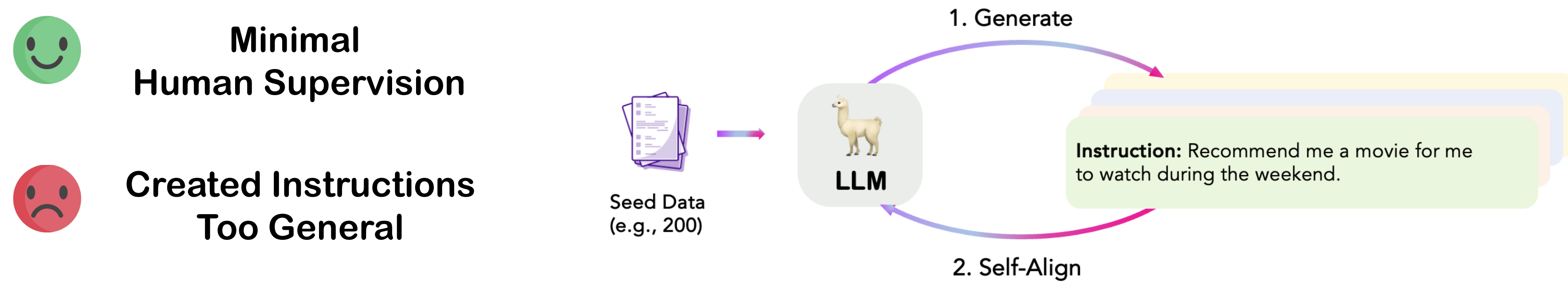
Self-Specialization: Uncovering Latent Expertise within Large Language Models

Instruction-Tuning & Self-Alignment

Multi-Task Tuning with Human Annotated Instructions

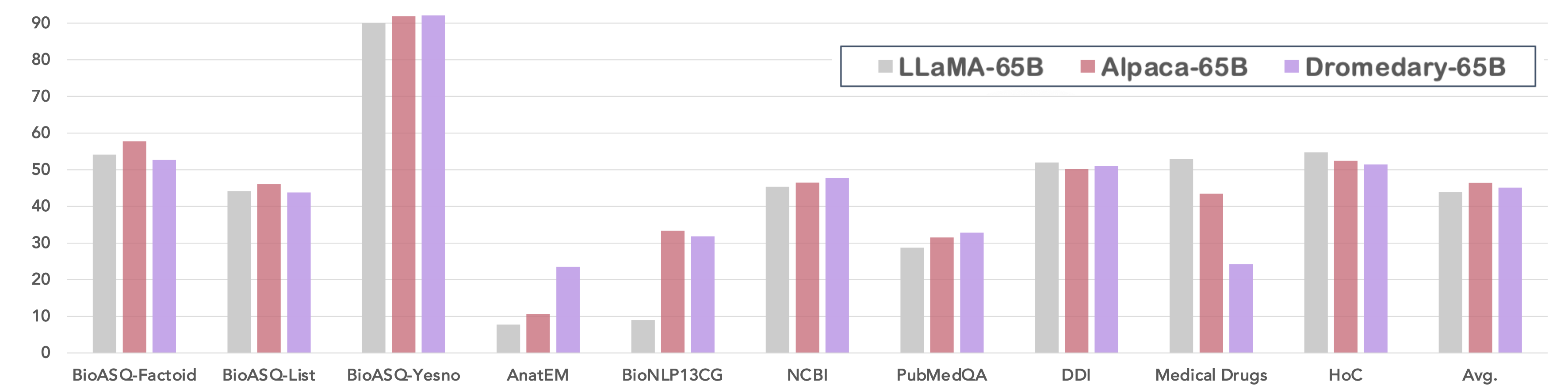


Aligning with Self-Generated Instructions



Preliminary Study

“Aligning to handle a broad set of instructions with only minimal supervision” - Great! Do these generally aligned LLMs also generalize well in specialized domains ?



Avg. Score (Δ)
 Alpaca-65B: 46.39 (+2.52)

Self-Align
 Alpaca-65B: 45.10 (+1.23)

Only a slight advantage over the base model, although they are aligned to handle a broad set of instructions

Self-Specialization for Uncovering Domain Expertise

Domain-Specific Seed Instructions (e.g., 80)

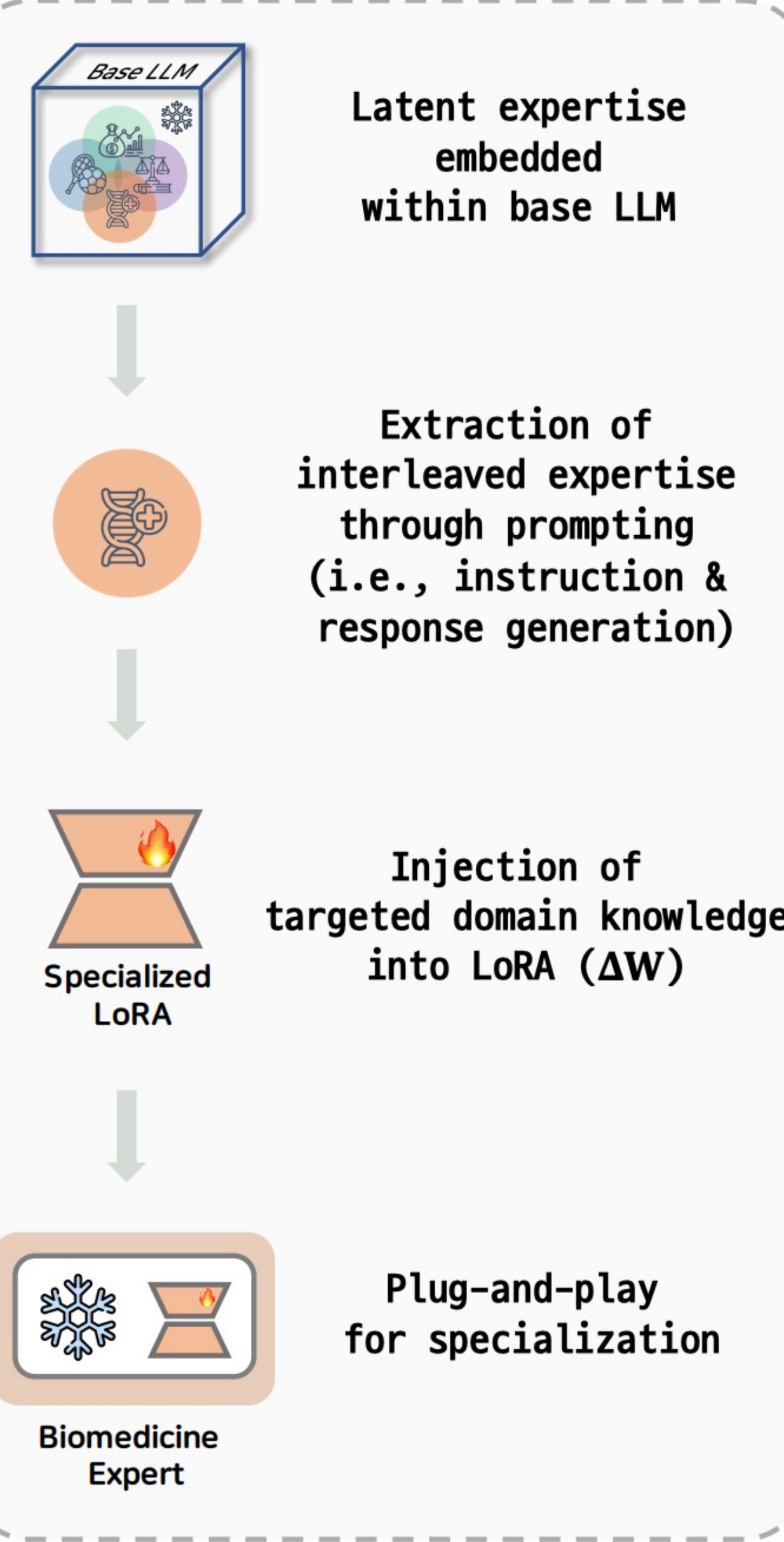
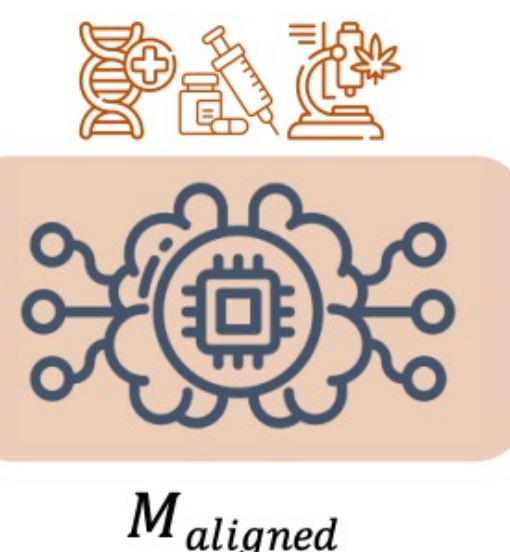
1. Domain-Specific Instruction Generation

- Instruction: Generate a list of drugs which can be used for the treatment of the given symptom.
- Instruction: Given medication records, predict possible drug-drug interactions.
- Instruction: You are given data of genetic variations and mutations, generate a comprehensive report.
- ...
- Instruction: Provide an answer to the following question about the patient's medical history.

2. Domain-Specific Knowledge-Guided Response Generation

(Instruction, Input, Output)

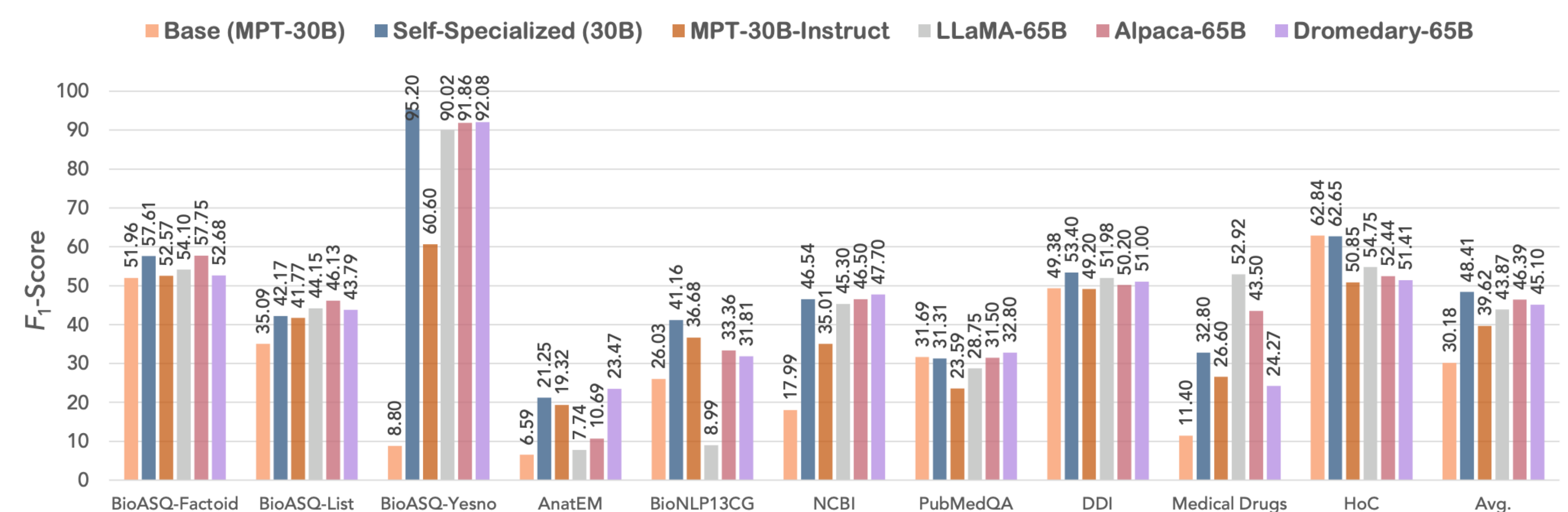
3. Triggering Specialization



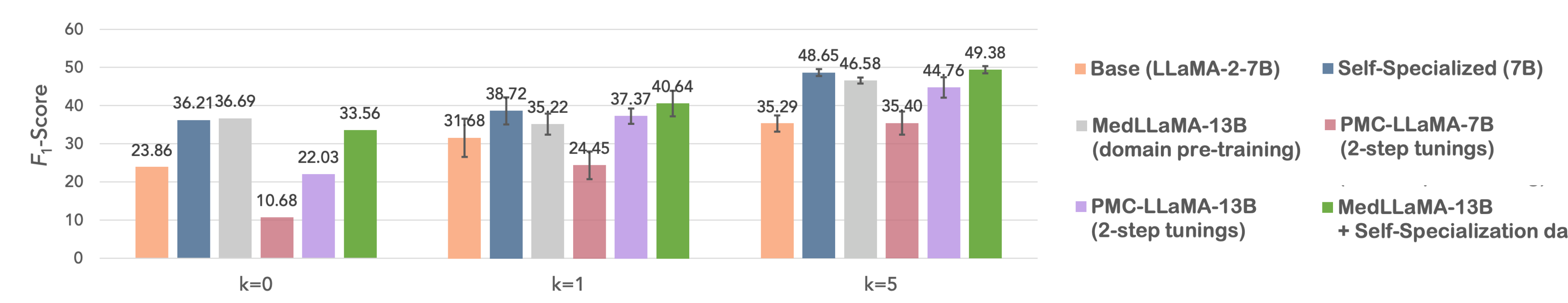
(a) Self-Specialization Process

(b) Abstraction of Process

Results in Biomedical Domain

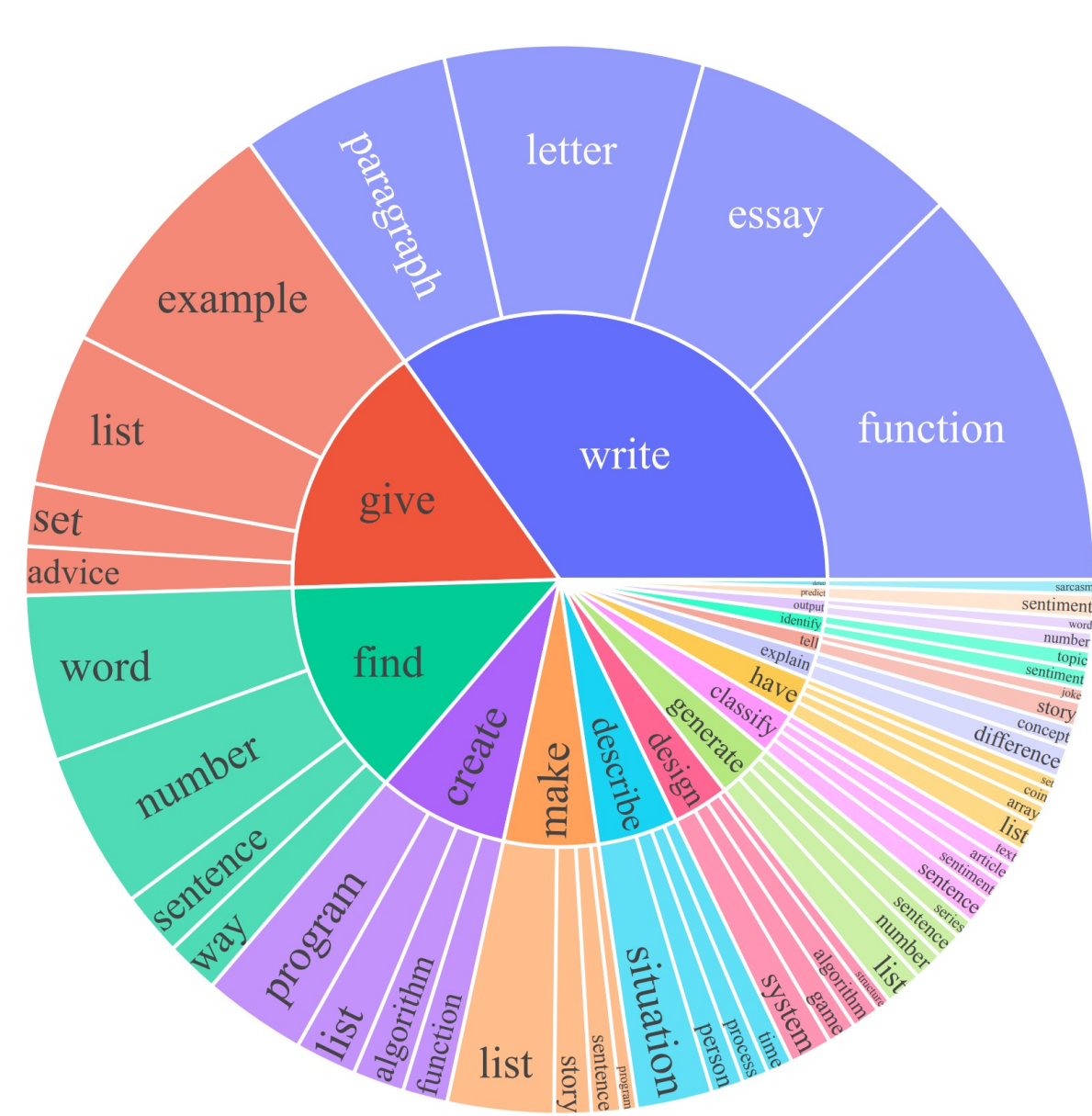


Self-specialization significantly improves its base model (up to 18 points!), even surpassing 65B models

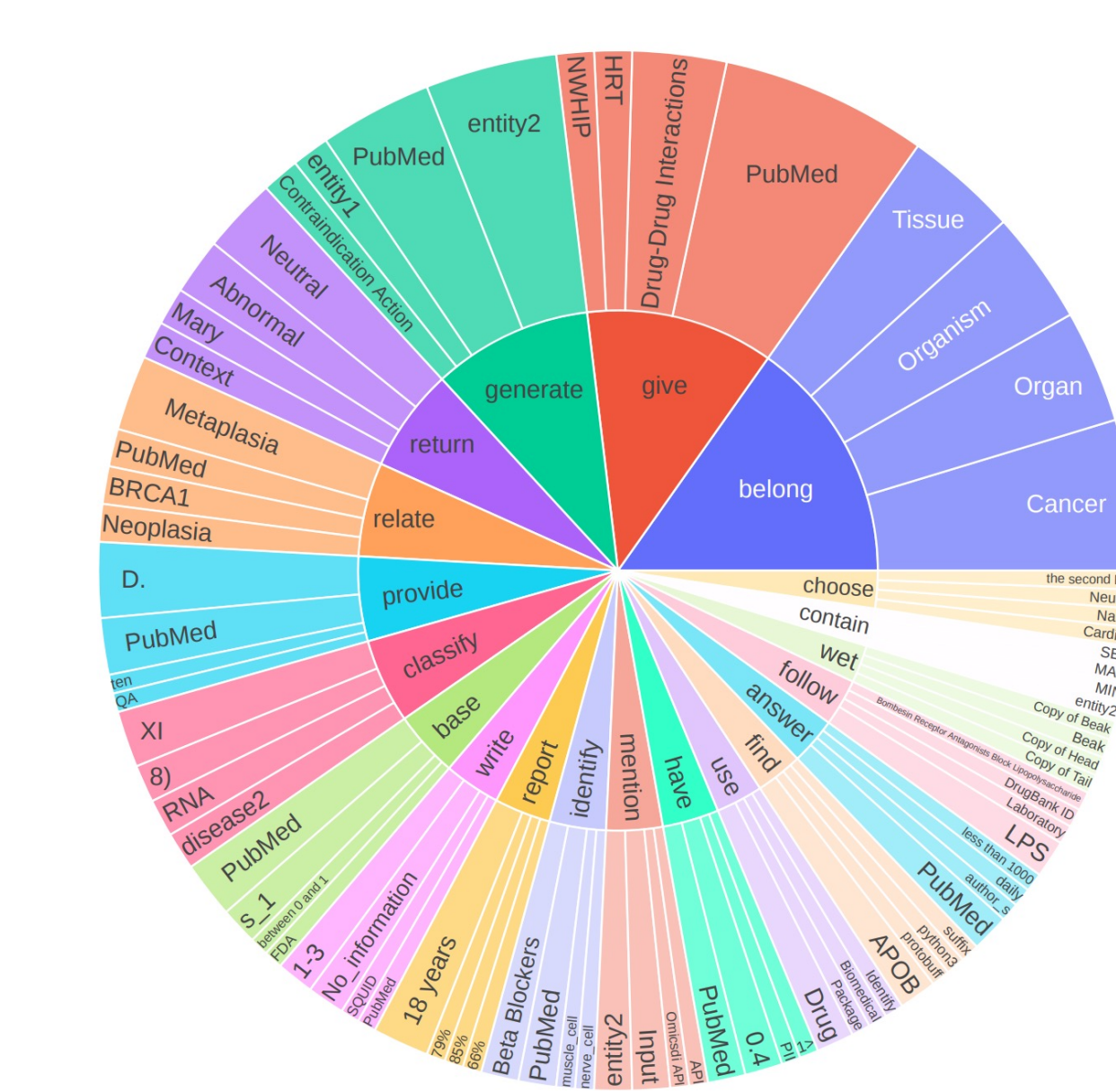


Self-specialization is on par or more effective than extensive domain pre-training + complementary

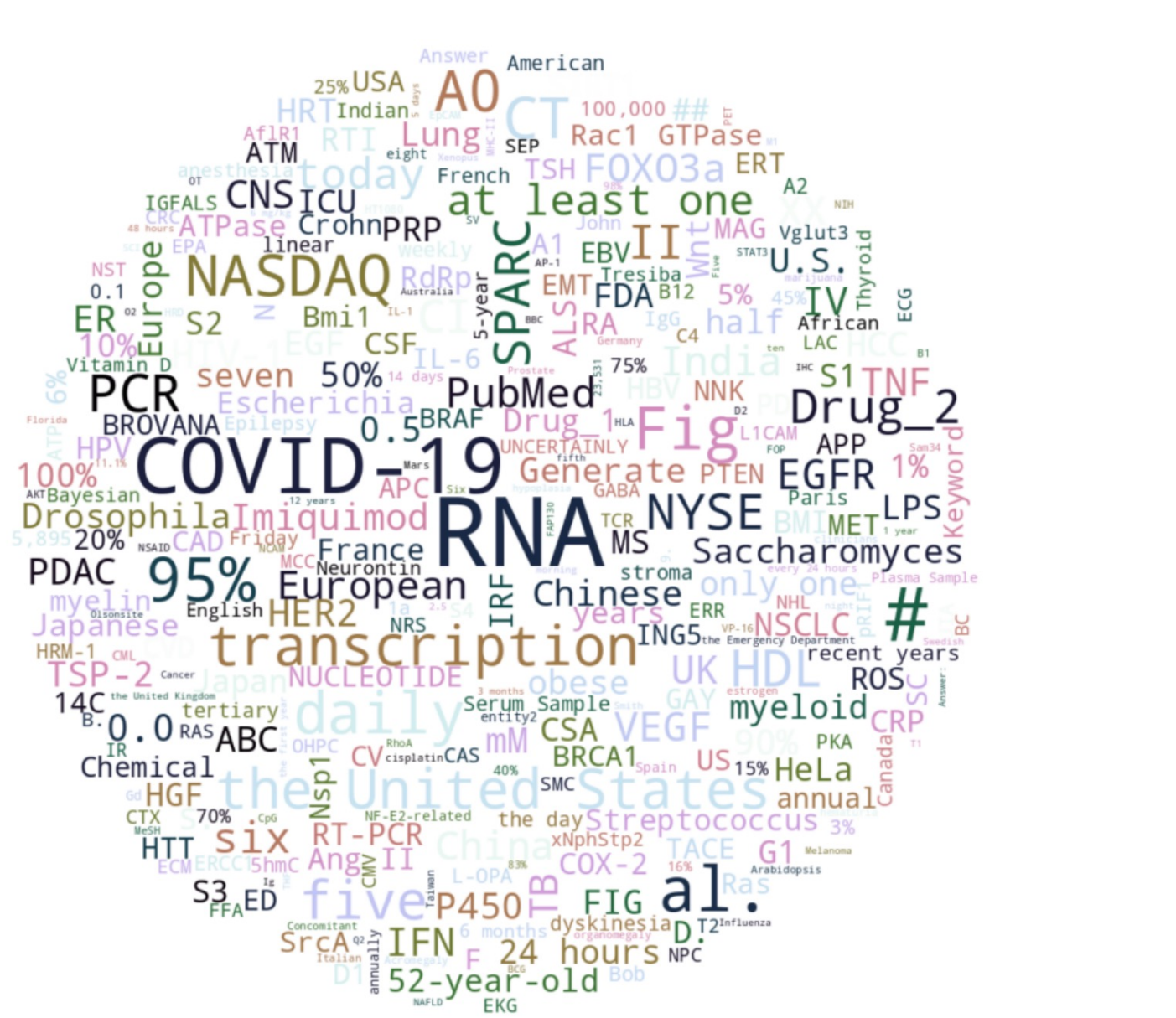
Generated Data through Self-Specialization



General (from Self-Instruct)



Specialized (Target: Biomedicine)



Key Takeaways

Q. Can we self-align LLMs with an expert domain like biomedicine with limited supervision?

- Benchmarking of General-Purpose Aligned Models**
 Highlighting the intrinsic challenge of encoding vast general knowledge into a finite set of parameters
- Exploring a Lightweight Solution, Self-Specialization**
 Targeted self-alignment to uncover latent expertise within LLMs with minimal supervision
- Findings**
 - Remarkable effectiveness in biomedical and financial domains
 - Highly efficient and practical: Tuning with QLoRA on single A100 (using 5K generated data, ~3 hrs)

