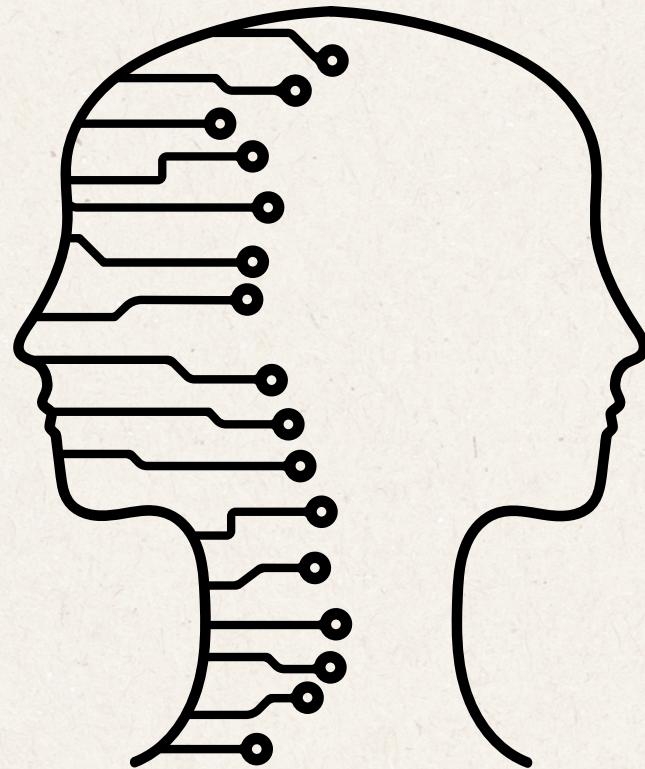
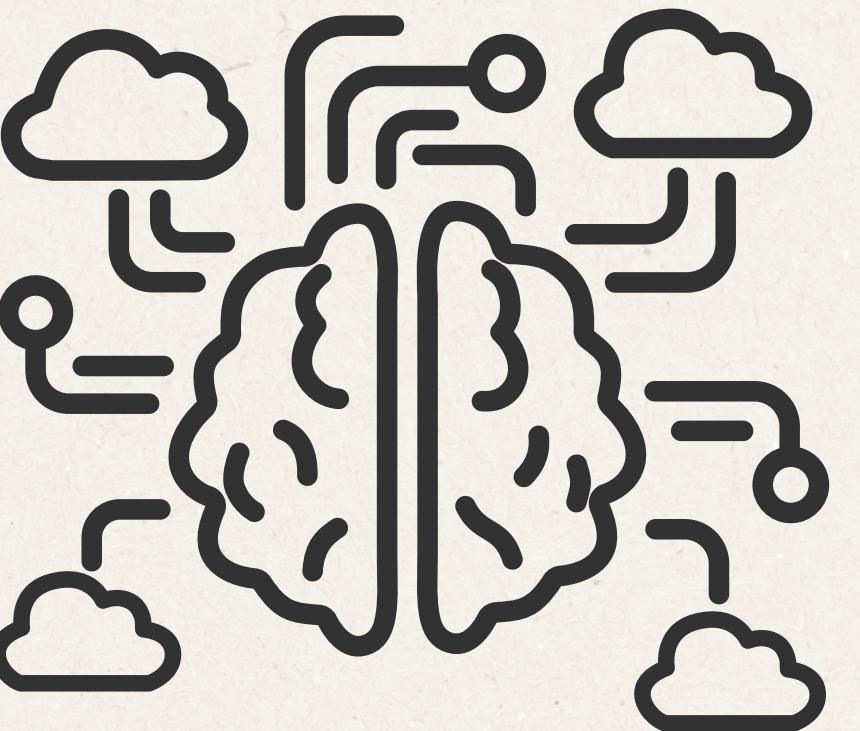


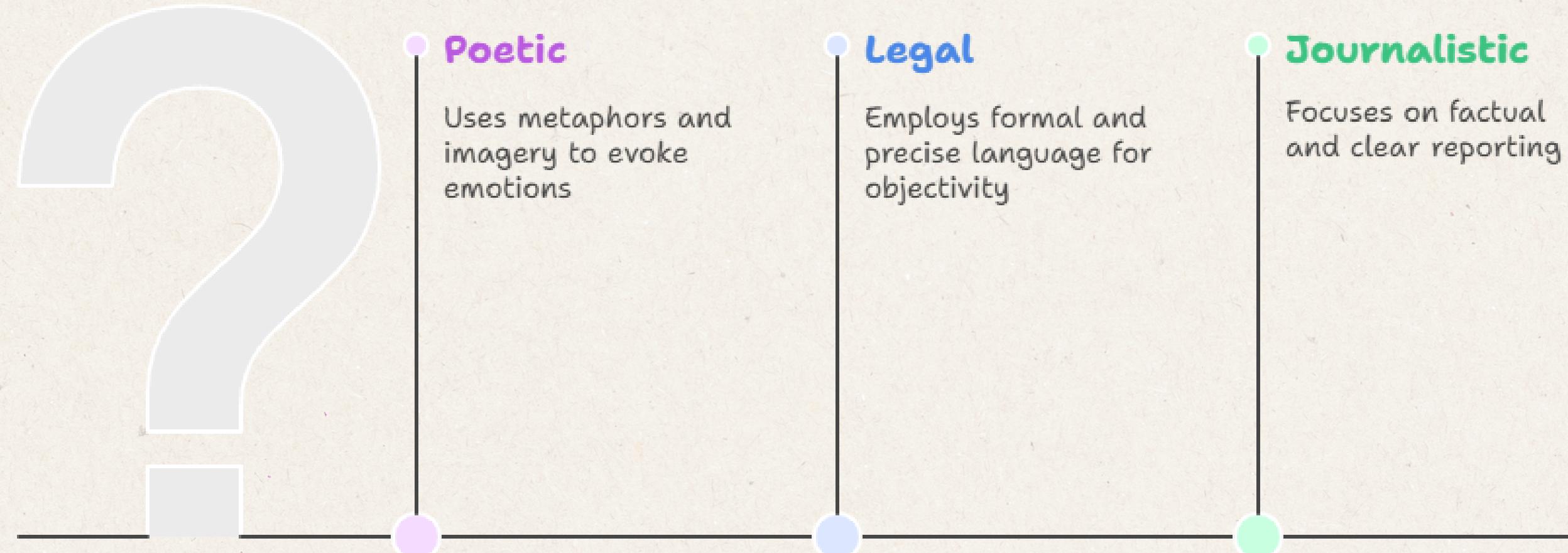
# STYLEFUSION-LORA

by: Haider Ali, CS 494



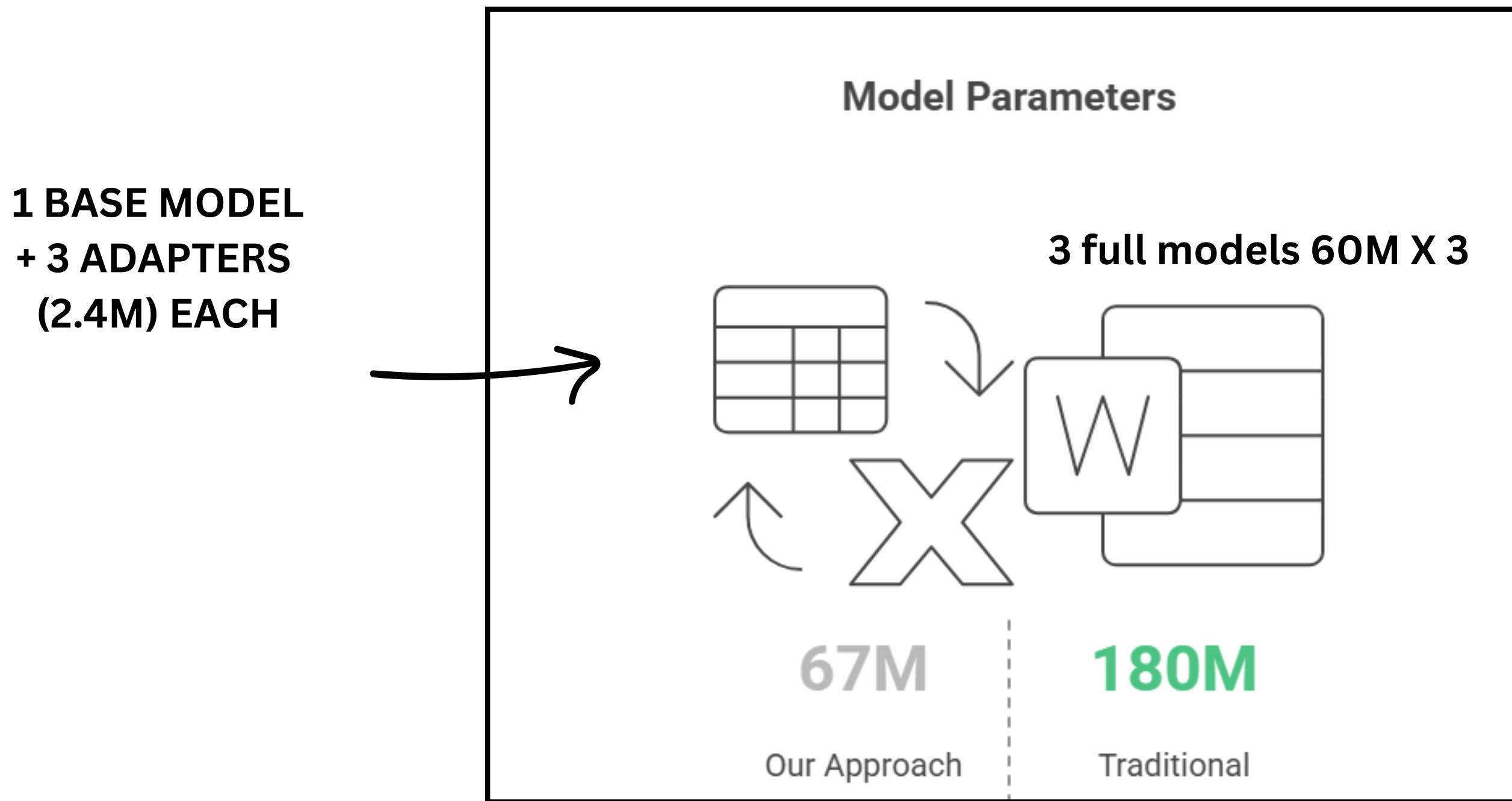
# The Problem: Controlling Writing Style

Which writing style should be used for the courthouse scene?



# COMPARISON VISUAL

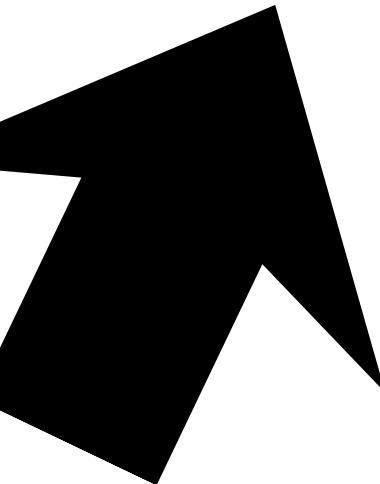
## WHY THIS MATTERS? - COST AND EFFICIENCY



# LoRA

## FROZEN

- T5- Small
- 60 M parameters
- base bodel



HOW LoRa WORKS?

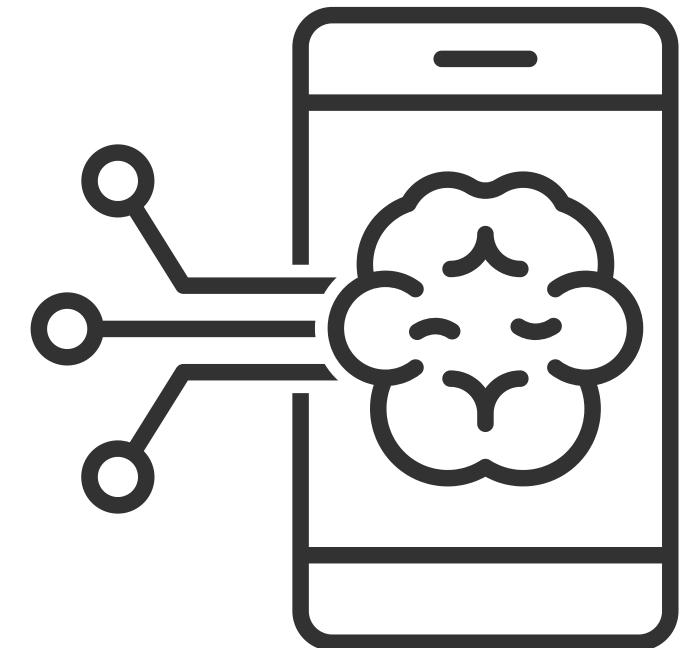
## TRAINABLE

- LoRA Adapter
- 2.4 M parameters

“

- Freeze base model (60M params) → Add small trainable matrices → Only 3.75% parameters train → 5-7 minutes per adapter → <10MB storage each

”



“

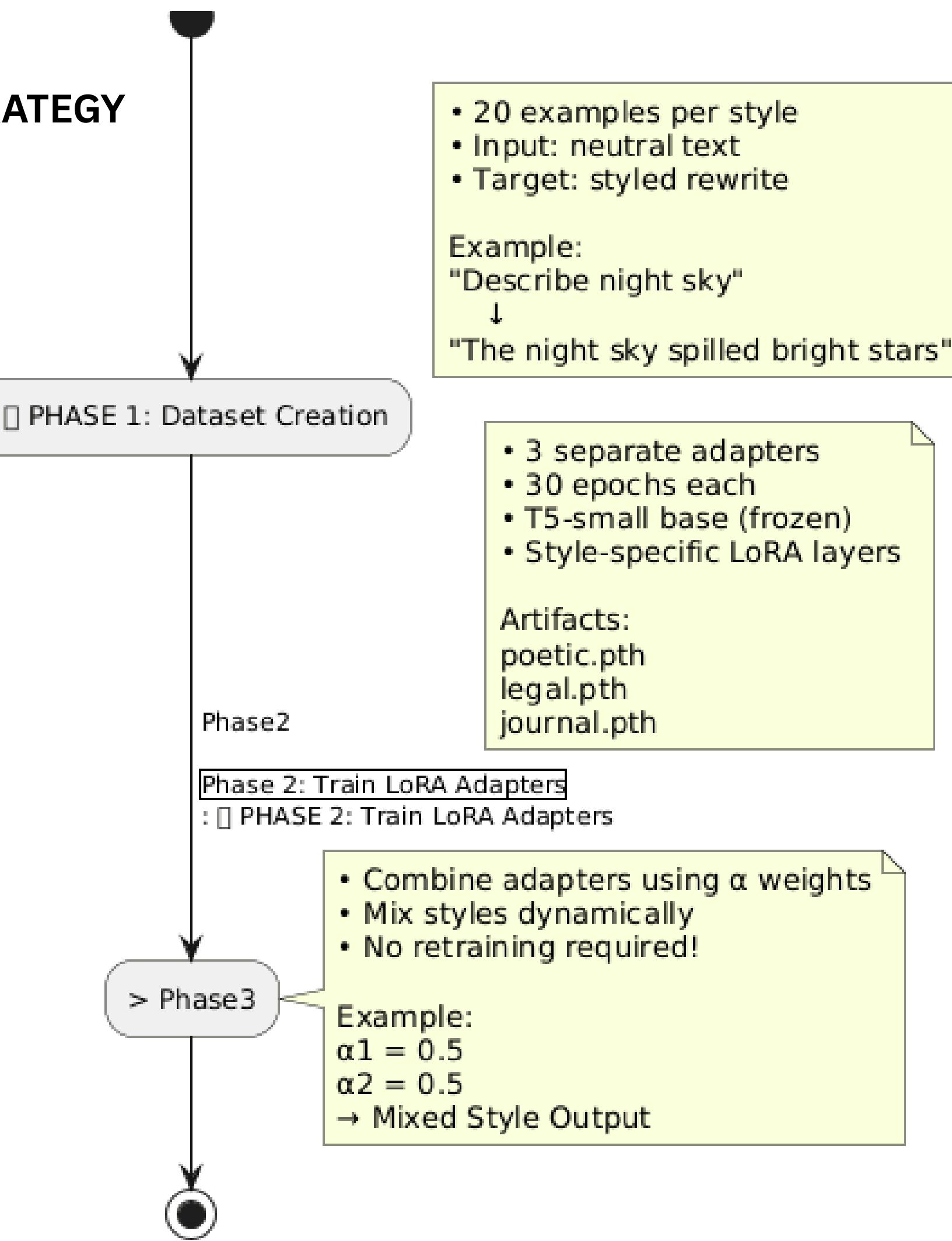
$$h = W_0x + BAx$$

frozen      trainable

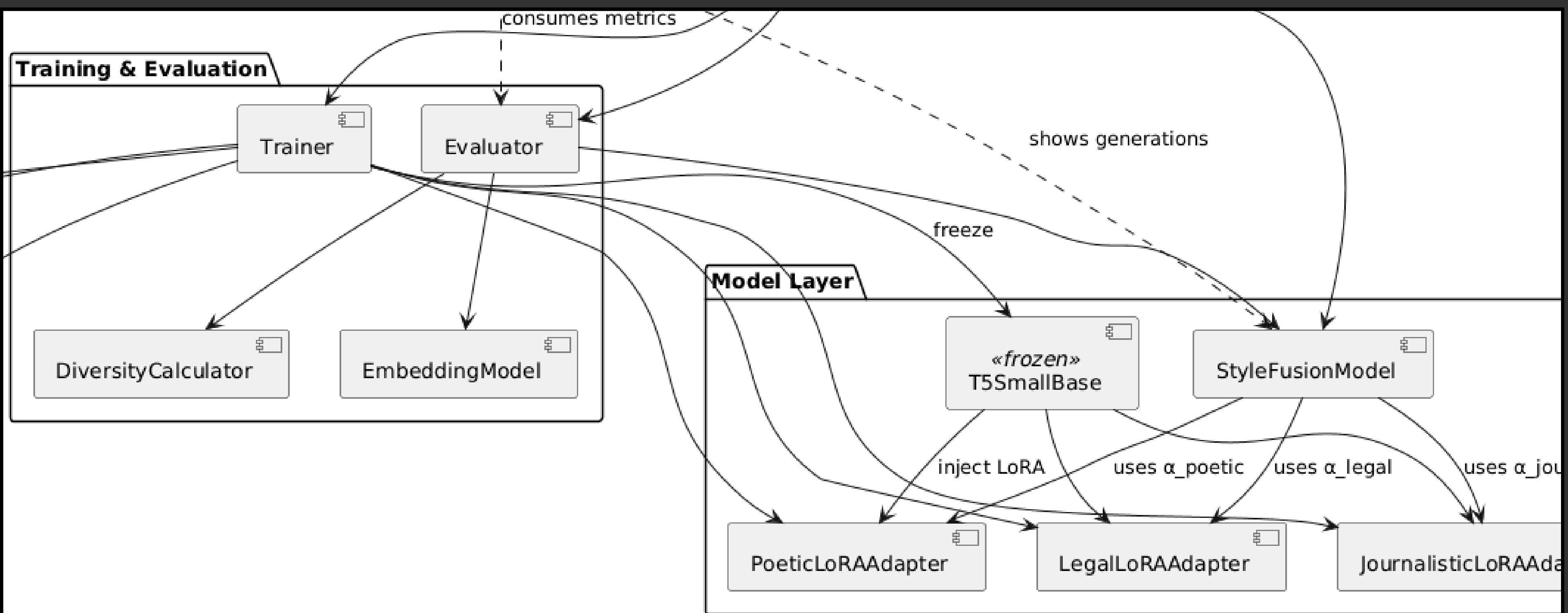
”

**Training: ~6 minutes | Storage: ~8MB | Trainable: 3.75%**

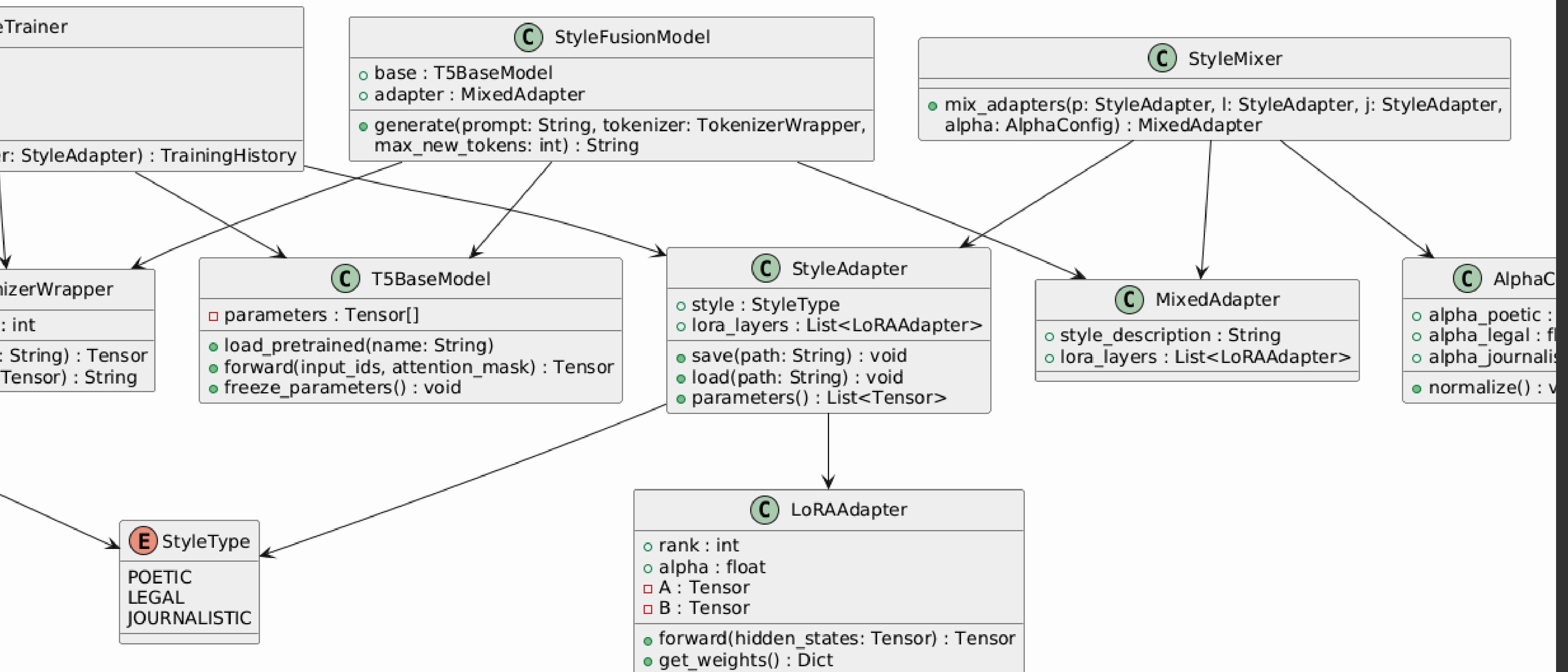
# OUR STRATEGY

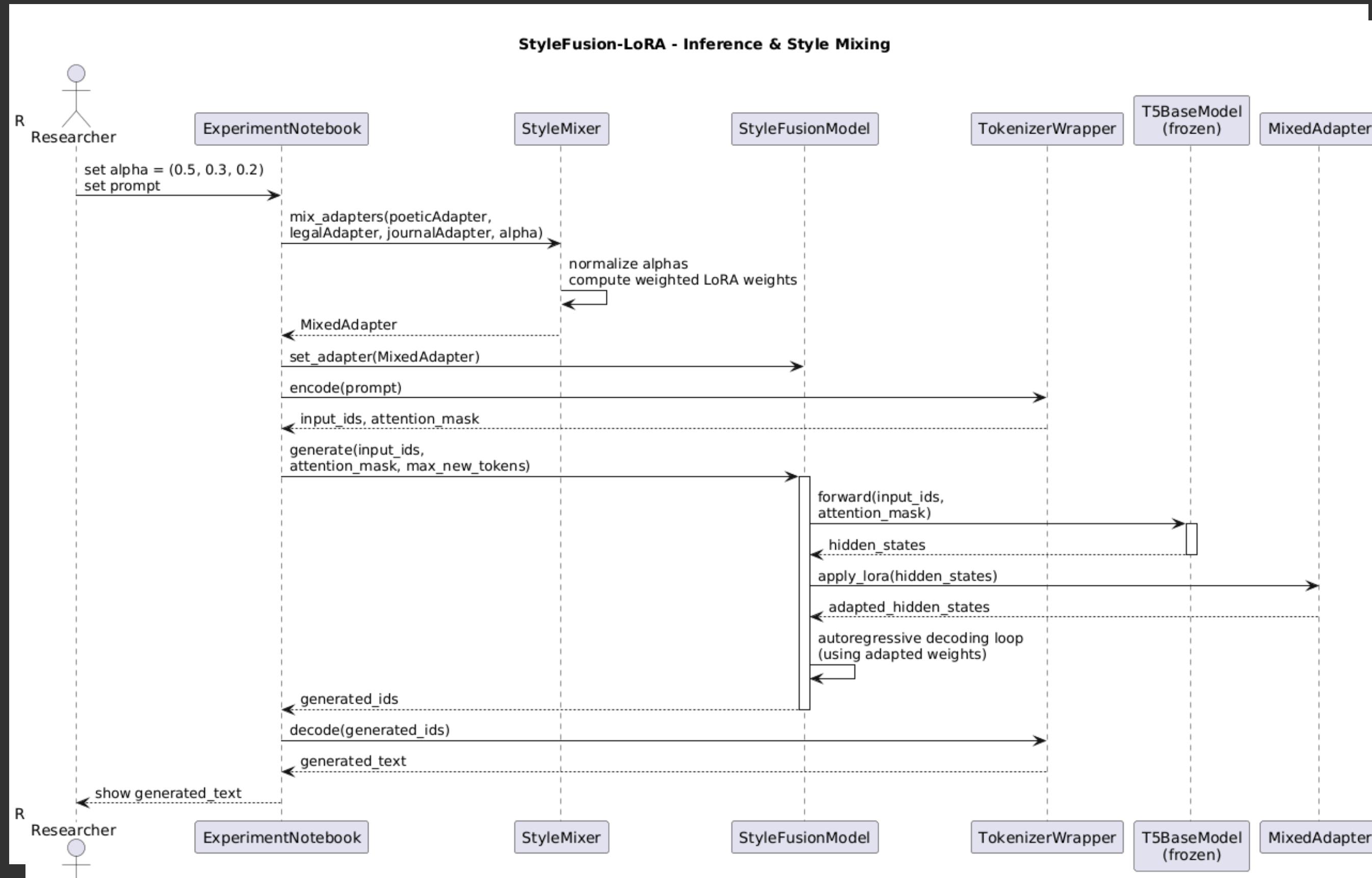


# SYSTEM COMPONENTS



## StyleFusion-LoRA - Core Classes





### ***Experimental Results Summary***

#### Training Convergence

- All three adapters converged within 30 epochs.

#### Final losses:

- Poetic: 3.02
- Legal: 2.27 (best)
- Journalistic: 2.61

#### Training efficiency:

- Only 3.75% of parameters were trainable (2.4M of 60M).
- Each adapter trained in 5–7 minutes.
- Storage: <10MB per adapter.

Convergence success rate: 100%

### ***Style Similarity Performance***

- Poetic model: highest poetic similarity (0.49) → strong poetic alignment.
- Legal model: highest legal similarity (0.55) → clear legal style dominance.
- Journalistic model: highest journalistic similarity (0.30) → factual, concise style.
- Each model best matches its own target style, confirming successful style learning.

## *What Worked*

- **Parameter efficiency:** 96% reduction ( $60M \rightarrow 2.4M$ ).
- **Adapters learned styles well:** clear, measurable patterns.
- **Fast training:** 5–7 minutes per adapter.
- **Modular design:** each style trains independently.
- **Low storage:** <10MB per adapter.

## **What Didn't Work**

- **Naive weight interpolation:** caused instability.
- **Poor language control:** multilingual leakage appeared.
- **Too little data:** 20 examples wasn't enough for coherence.
- **Seq2seq sensitivity:** unstable autoregressive decoding.
- **Averaging adapters isn't enough:** needs better composition methods.

## Conclusion & Future Directions (Summary)

### Key Findings

- LoRA enables highly efficient style learning, requiring only a small fraction of trainable parameters.
- Individual adapters performed successfully, each capturing its target style clearly.
- However, simple weight mixing is unstable, leading to multilingual leakage and incoherence.
- Better composition methods are needed for reliable multi-style blending.

**SCAN THIS FOR THE FULL REPORT:**



*LINK FOR BETTER PRESENTATION QUALITY:*  
[https://www.canva.com/design/DAG6zPSPPu0/T957h5qDyoBoC5K6ffXrPw/edit?  
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&utm\\_medium=link2&utm\\_source=sharebutton](https://www.canva.com/design/DAG6zPSPPu0/T957h5qDyoBoC5K6ffXrPw/edit?utm_content=DAG6zPSPPu0&utm_campaign=designshare&utm_medium=link2&utm_source=sharebutton)