Next-token selection

LLM

N-th layer (final layer)

24th layer

16th layer

8th layer

Early exit

Early exit

Early exit

16   24   32   8

Layer Contrasting $\mathcal{F}(\cdot, \cdot)$

Layers status s_t

Embedding

Logits

Decoding Objective:

$$a_t \cdot \mathcal{F}(q_N(x_t), q_M(x_t)) + (1 - a_t) \cdot q_M(x_t)$$

Active Decision a_t

YES   NO

Policy $\pi_\theta(a_t \mid s_t)$

16   24   32   8

Next token ✅

Prompt: *Charmaine will be 16 years old in 12 years. How old will she be 4 years from now?*

Sequential-level

Greedy: Charmaine will be 16 years old in 12 years. 12 years from now, **she will be 16 + 12 = 28 years old.** 4 years from now, she will be **28 - 4 = 24 years old. The answer is 24.**

DoLa: In 12 years, Charmaine will be **16 + 12 = 28 years old**. 4 years later, she will be **28 + 4 = 32 years old. The answer is 32.**

ActLCD: In 12 years, Charmaine will be 16 years old. That means **she is currently 4 years old.** In 4 years, she will be **8 years old. The answer is 8.** ✅

In | 12 | years | Charmaine | will | be | 16 | years | old. | That | means | she | ⋯ ⋯ | 8

☐ Standard processing

☐ Layer contrasting

R_1 R_2 R_3 R_4 ⋯ ⋯ R_t

Cumulative reward

$$\sum_{t=1}^{T} R(s_t, a_t)$$