BigCharts-R1: Enhanced Chart Reasoning with Visual Reinforcement Finetuning

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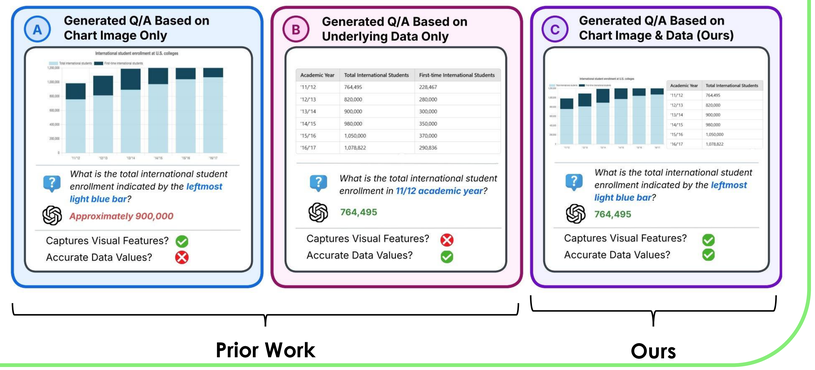
(1) Motivation

(a) The Chart Data Challenge: *Metadata* vs. *Diversity*

Real-world Charts
(Diverse, but no Metadata)

Synthetic Charts
(Homogenous, but with Metadata)

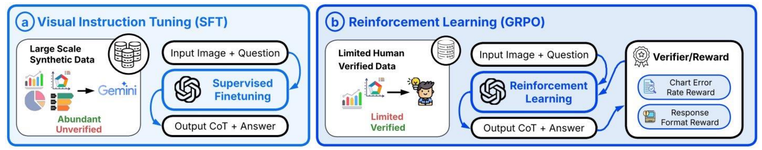
(b) Limitations of Current Chart QA Data Generation



(2) Contributions

(a) BigCharts: Generating Diverse Charts with Rich Metadata

(b) A Training Framework that Combines Supervised Fine-Tuning (SFT) and Reinforcement Learning



Reward Functions

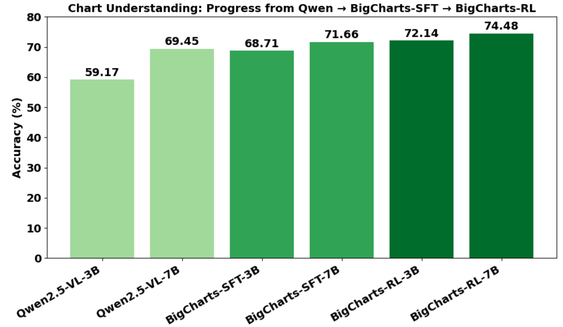
$$ER(y, \hat{y}) = \frac{|y - \hat{y}|}{y} \qquad R_{CERM}(y, \hat{y}) = \begin{cases} \frac{1}{1 + ER(y, \hat{y})}, & \text{if both } y \text{ and } \hat{y} \text{ are numeric} \\ 1, & \text{if non-numeric and } y = \hat{y} \\ 0, & \text{otherwise} \end{cases}$$

$$R_{fmt} = \begin{cases} 1, & \text{if valid response structure} \\ 0, & \text{otherwise} \end{cases} \qquad R_{total} = R_{CERM} + R_{Fmt}$$

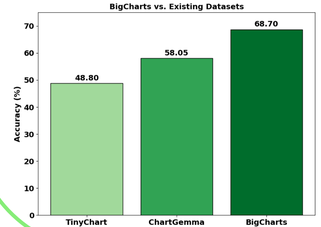
(3) Evaluation

Average score across five benchmarks (FigureQA, DVQA, PlotQA, ChartQA, CharXiv)

(a) Supervised Fine-Tuning (SFT) on the BigCharts Dataset boosts performance, with our Reinforcement Learning (RL) method delivering even greater gains.



(b) BigCharts Dataset Outperforms Existing Datasets



(c) Impact of Replotted Charts on QA Accuracy