

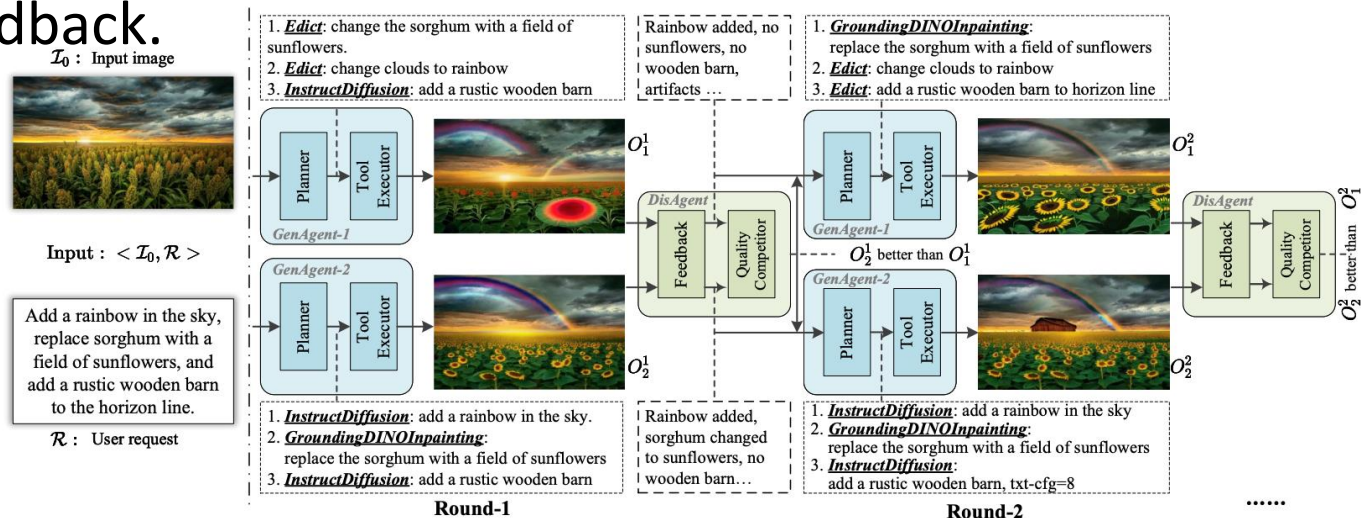
# CCA: Collaborative Competitive Agents for Image Editing

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# Problems & Ideas

- Problems of conventional image editing approaches:
  - Traditional methods struggle with complex, multi-step user instructions.
  - The black-box nature of many generative models limits their ability to learn from other models or provide transparent intermediate steps for improvement.
- Ideas: **Collaborative Competitive Agents (CCA)** uses multiple LLMs working together and in competition to perform complex image editing tasks by iteratively refining results based on feedback.



The framework of our Collaborative Competitive Agents system. Through providing feedback, the discriminator agent encourages the generator agent to engage in both collaborative learning and competition. The system's performance undergoes iterative optimization to effectively meet user requirements.

# Main Contributions

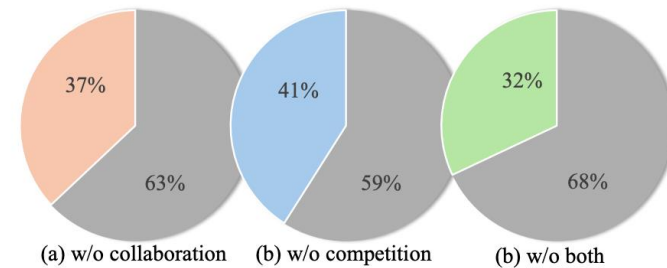
- Contributions:
  - **New generative model (CCA)**: Uses multiple LLM-based agents, with controllable steps and iterative optimization.
  - **Detailed examination of agent relationships**: Reflection, cooperation, competition among agents are integral to the system's performance;
  - **Comprehensive experiments on image editing**: Demonstrates robust handling of complex instructions.



Add a hot air balloon in the sky and make the colors more vibrant.



Transform the image into a pop art style and replace the background with a vibrant color gradient.



	IP2P	MB	ID	CCA
Txt-alignment	11%	21%	21%	47%
Visual Quality	16%	17%	23%	44%

Comparison of different image editing approaches, showing qualitative results across methods (left), ablation studies (top right), and quantitative human preference metrics (bottom right) for text alignment and visual quality.