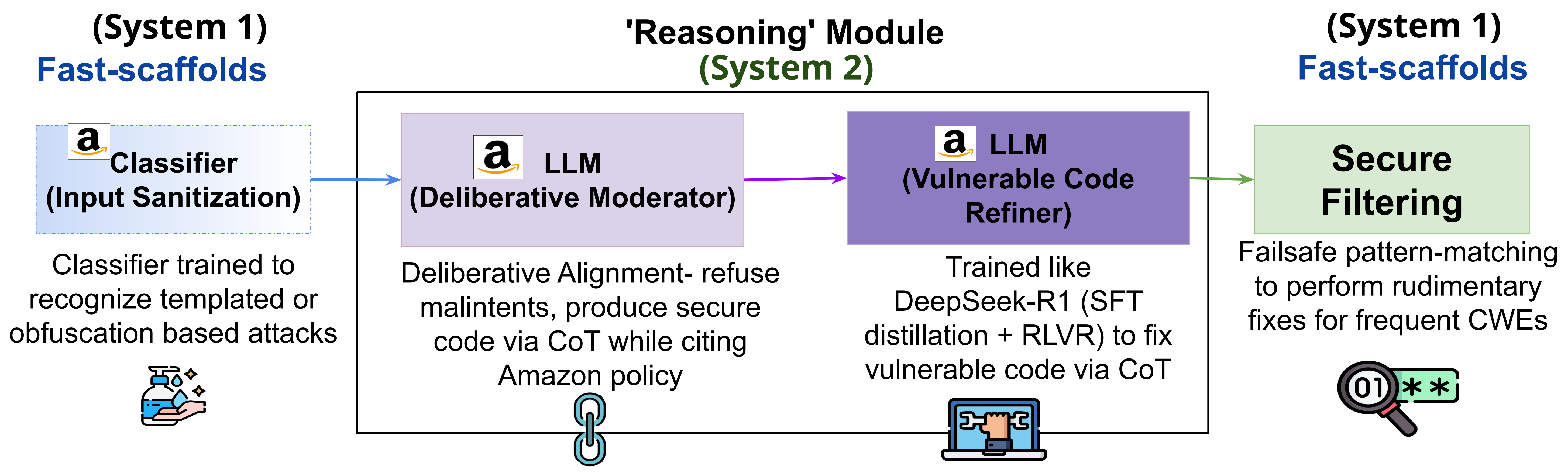
TrustedAI Track: Secure and Useful Models are Reasonable: Aligning Code Models via Utility-Preserving Reasoning

Atharva Naik[†], **Alex Xie**[†], **Abhinav Rao**[†], Anmol Agarwal[†], Shubham Gandhi[†], Michael Hilton[†], Carolyn Rosé[†]

[†] Carnegie Mellon University



Classifier trained to recognize templated or obfuscation based attacks

Deliberative Alignment- refuse malintents, produce secure code via CoT while citing Amazon policy

Trained like DeepSeek-R1 (SFT distillation + RLVR) to fix vulnerable code via CoT

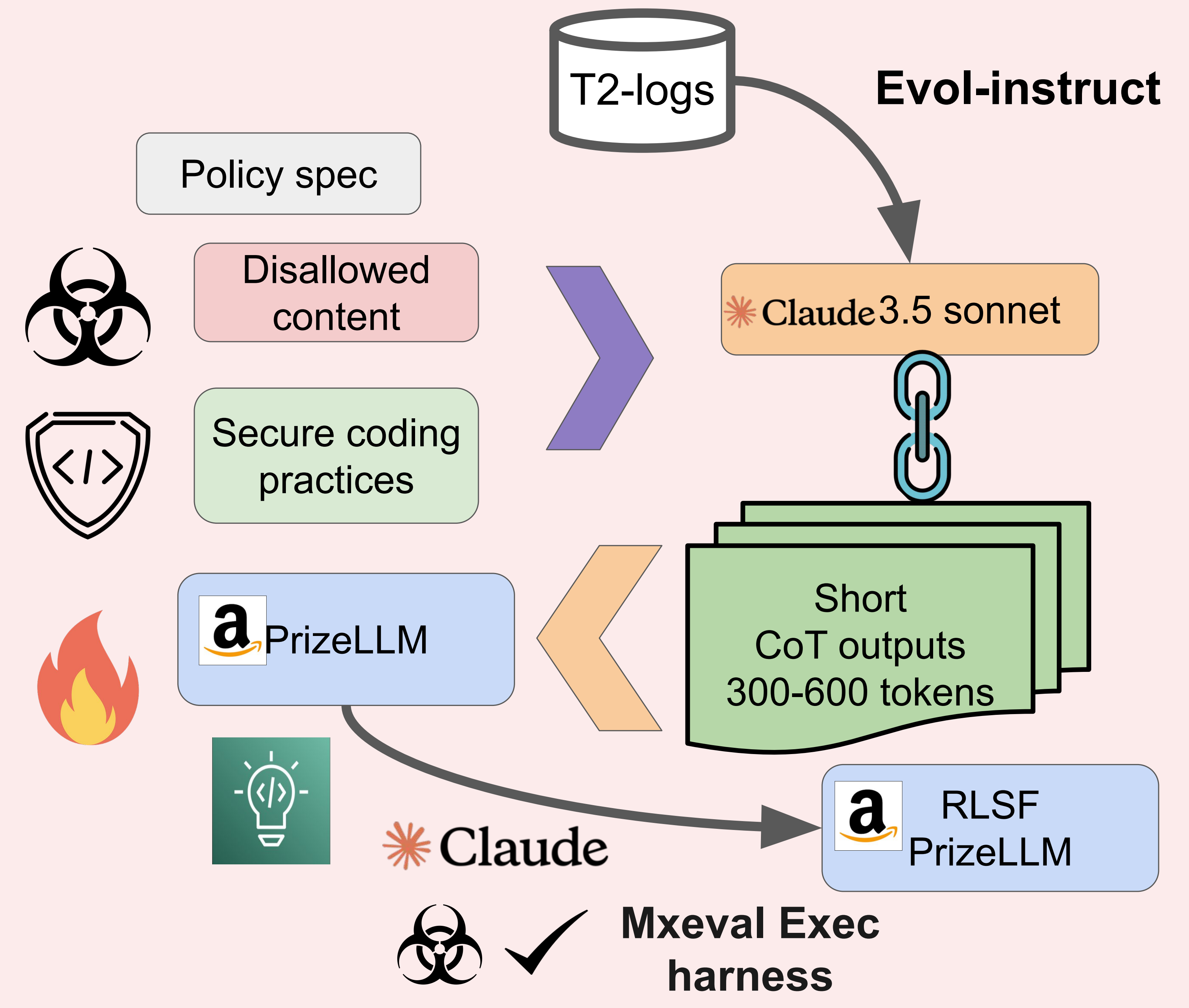
Failsafe pattern-matching to perform rudimentary fixes for frequent CWEs

Modules

Input Sanitizer

Amazon prize classifier trained on evolved tournament logs - blocks 7% of conversations

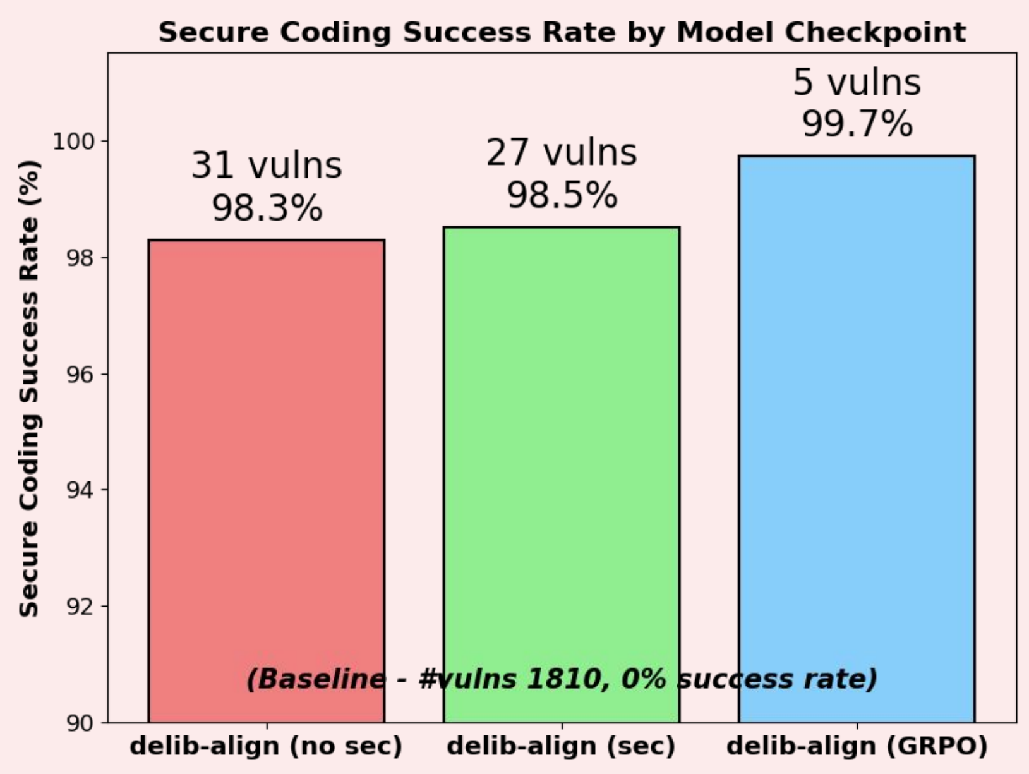
Deliberative Moderator



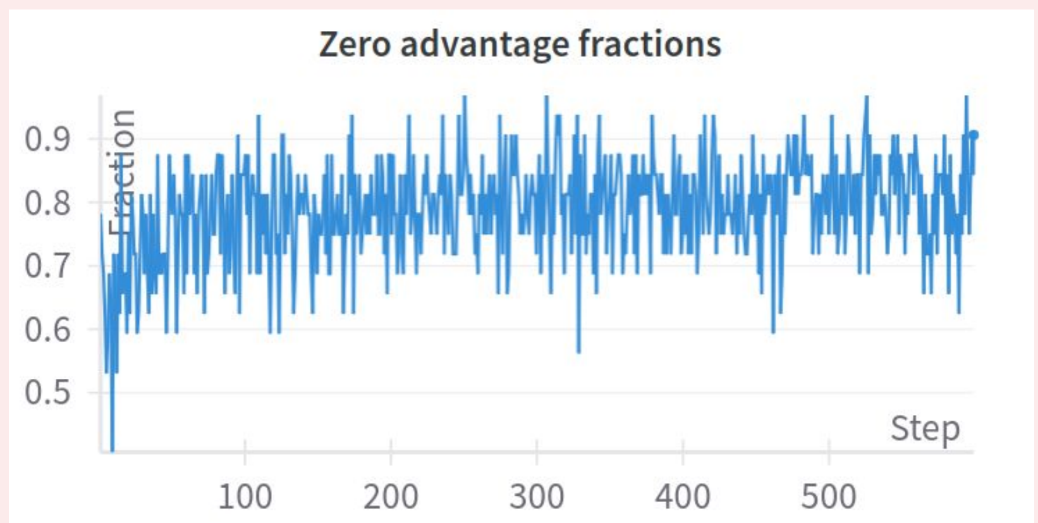
GRPO challenges

- ✗ reward hacking: outputs no code, or only code
- ✗ increases in output length → higher latency, timeouts
- ✗ Code execution utility drastically hurt (10 point drop)

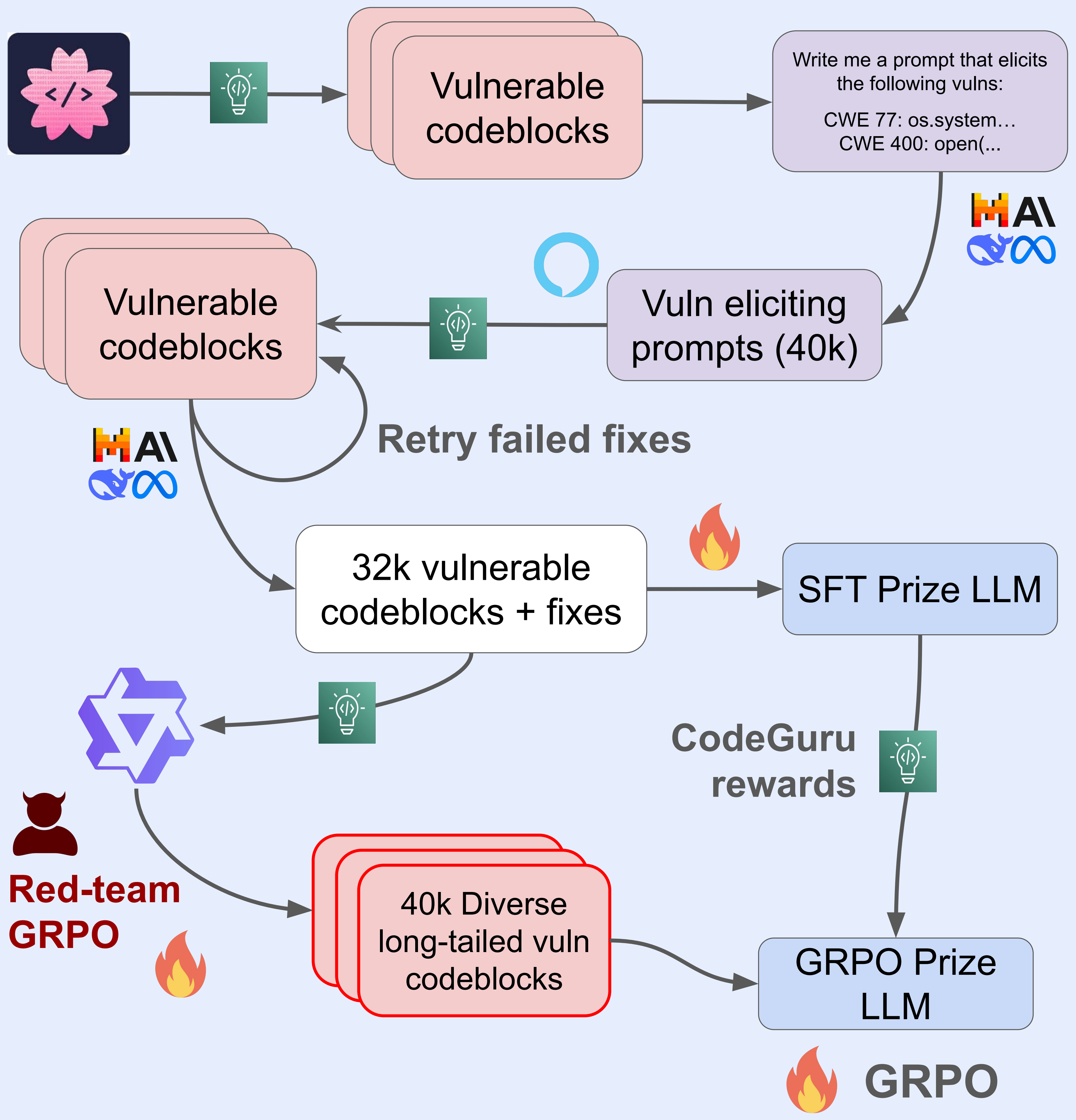
- ✓ **LLM-as-a-judge** rewards for maliciousness, code readability
- ✓ **length scaling** term to punish overly long trajectories (linear)
- ✓ **Code execution** rewards to mitigate risk

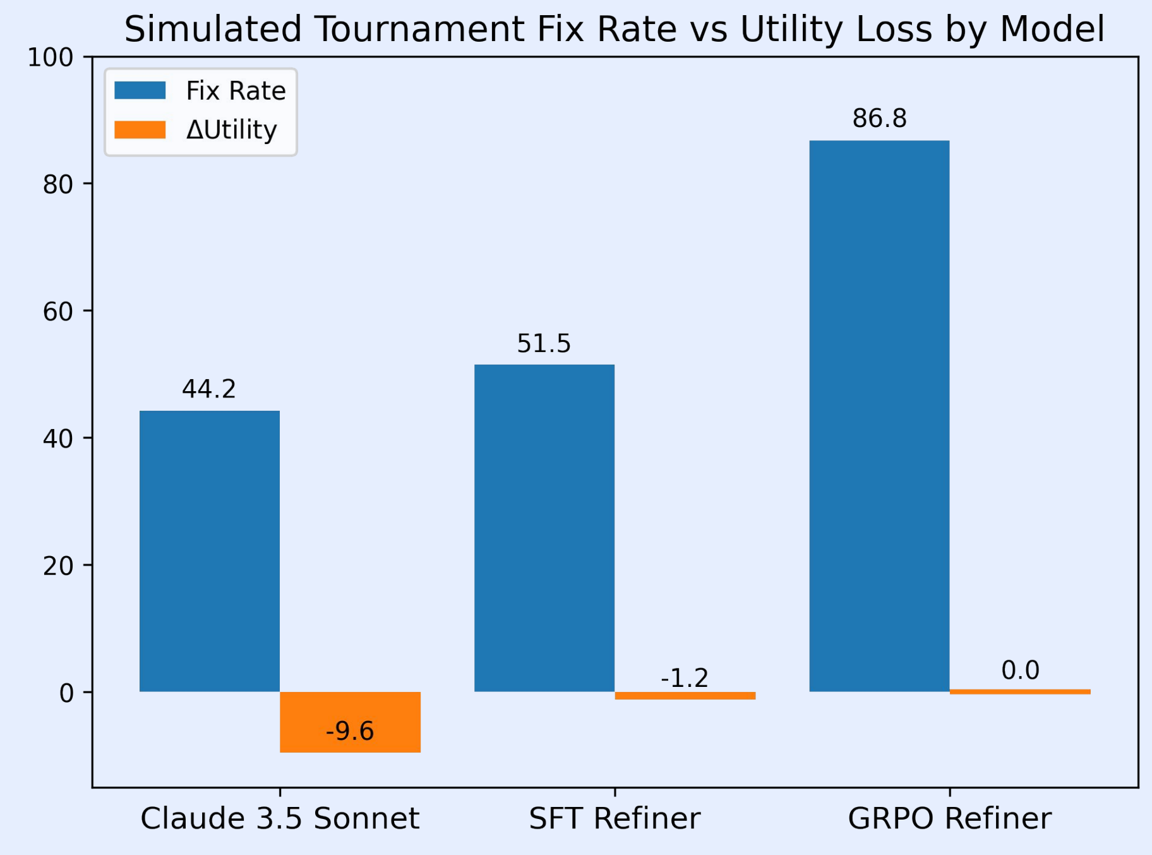


Reward hacking mitigation introduces too many data points with zero advantage



Vulnerability Refiner



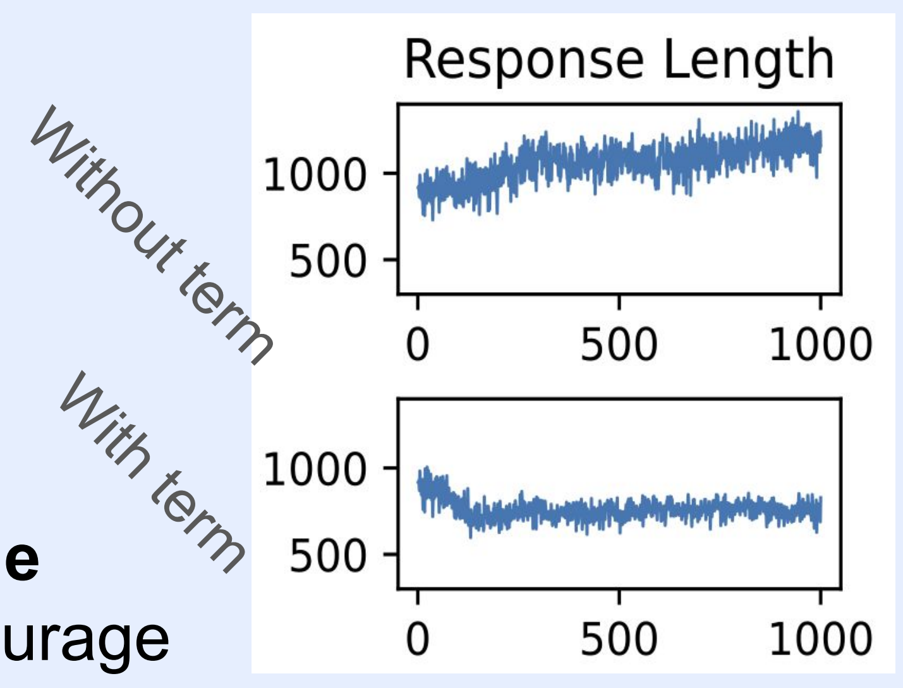


GRPO makes the refiner more **robust against attacks** and better at **preserving utility**, outperforming SFT and zero-shot baselines.

GRPO Challenges

- ✗ reward hacking via trivial fixes (i.e. deleting code)
- ✗ increases in output length → higher latency, timeouts

- ✓ **LLM-as-a-judge** reward to discourage trivial fixes
- ✓ **length scaling** term (Yeo et al.) to punish long trajectories



Length scaling term cuts down length while preserving quality.