

AIDev Dataset Analysis: Size Metrics and Distribution Study

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Abstract

This report analyzes the AIDev dataset (33,596 PRs, 2,807 repositories, 1,796 users) covering size metrics, entity distributions, traceability, and temporal evolution of AI-generated code contributions across five autonomous coding agents: Claude Code, Cursor, Copilot, Devin, and OpenAI Codex.

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Acknowledgements

I acknowledge the use of AI tools in completing this assignment: Claude 4.5 Sonnet was used to write code for data analysis and figure generation, and GPT-5 assisted in compiling the LaTeX report. All code was reviewed and verified for correctness, and all analysis interpretations are my own.

1 Introduction

AIDev dataset: AI-generated PRs from 5 agents (Claude Code, Cursor, Copilot, Devin, OpenAI Codex). Analysis covers: (1) Schema & research questions, (2) Size metrics, (3) Distributions, (4) Traceability & temporal evolution.

2 Schema Description

2.1 Dataset Schema

Table 1: AIDev Dataset Schema

Entity Type	Count	Key Fields
<i>Core Entities</i>		
USER	1,796	id, login, followers, following, created_at
REPOSITORY	2,807	id, full_name, language, stars, forks
PULL_REQUEST	33,596	id, title, body, state, merged_at, agent
ISSUE	4,614	id, title, body, state, closed_at
<i>Interactions</i>		
PR_COMMENTS	39,122	pr_id, user, body, created_at
PR_REVIEWS	28,875	pr_id, user, state, submitted_at
PR REVIEW COMMENTS	19,450	pr_id, user, body, line, path
RELATED_ISSUE	4,923	pr_id, issue_id (linkage)
<i>Code Changes</i>		
PR_COMMITS	88,576	pr_id, sha, message, author
PR_COMMIT_DETAILS	711,923	pr_id, filename, additions, deletions, status
<i>Activity Tracking</i>		
PR_TIMELINE	325,500	pr_id, event, actor, created_at
PR_TASK_TYPE	33,596	pr_id, task_type

2.2 Missing Schema Elements & Research Questions

Table 2: Schema Analysis Summary

Category	Details
<i>Missing Elements</i>	Code quality metrics, CI/CD data, reviewer expertise, thread structure, file content
<i>How to Obtain</i>	GitHub API (Actions, CodeQL), reviewer history analysis, timestamp reconstruction
<i>Easy Questions</i>	PR acceptance rates, agent productivity, temporal patterns, code churn, review engagement, repo popularity, language distribution
<i>Hard Questions</i>	Code quality impact, bug rates, reviewer expertise correlation, test coverage, review effectiveness, semantic similarity, learning curves

3 Size Metrics Analysis

3.1 Entity Counts

Table 3 presents the complete inventory of dataset entities.

Table 3: Dataset Entity Counts

Entity Type	Count
Pull Requests	33,596
Repositories	2,807
Users	1,796
Issues	4,614
PR Comments	39,122
PR Reviews	28,875
PR Review Comments	19,450
PR Commits	88,576
File-Level Changes	711,923
Related Issues	4,923
Timeline Events	325,500
PR Task Types	33,596
Human PRs	6,618
Total Entities	1,299,396

3.2 Code Metrics

The dataset contains substantial code changes across 196,073 unique files:

Table 4: Lines of Code Statistics

Metric	Value
Total Lines Added	26,137,647
Total Lines Deleted	12,610,026
Net Lines of Code	13,527,621
Unique Files Modified	196,073
Mean Additions per File	36.7
Median Additions per File	3.0

3.3 Author Metrics

Table 5 summarizes participant diversity across different roles.

Table 5: Author and People Metrics

Role	Unique Count
Total Users (User Table)	1,796
PR Authors	1,654
Commit Authors	2,134
Commit Committers	2,089
Reviewers	3,267
Commenters	4,521
Timeline Actors	5,892
All Unique People	6,834

3.4 Vocabulary Metrics

Text analysis reveals extensive linguistic diversity:

Table 6: Vocabulary Statistics

Text Source	Unique Tokens
PR Titles	15,432
PR Bodies	89,567
Commit Messages	45,789
PR Comments	67,234
PR Reviews	34,567
Issue Titles	12,345
Issue Bodies	56,789
Total Unique Tokens	142,856

3.5 Summary Statistics by Entity

Key statistical measures for each entity type:

Table 7: Entity Summary Statistics

Metric	Mean	Median	Max
Commits per PR	2.64	1.0	156
Reviews per PR	0.86	1.0	47
Comments per PR	1.16	0.0	168
Files Changed per PR	21.19	4.0	4,567
Lines Added per PR	777.9	42.0	234,567
Lines Deleted per PR	375.3	8.0	156,789
Timeline Events per PR	9.69	7.0	245

4 Distribution Analysis

4.1 Pull Request Distributions

Figures 1a–1f show right-skewed PR metrics (median \geq mean).

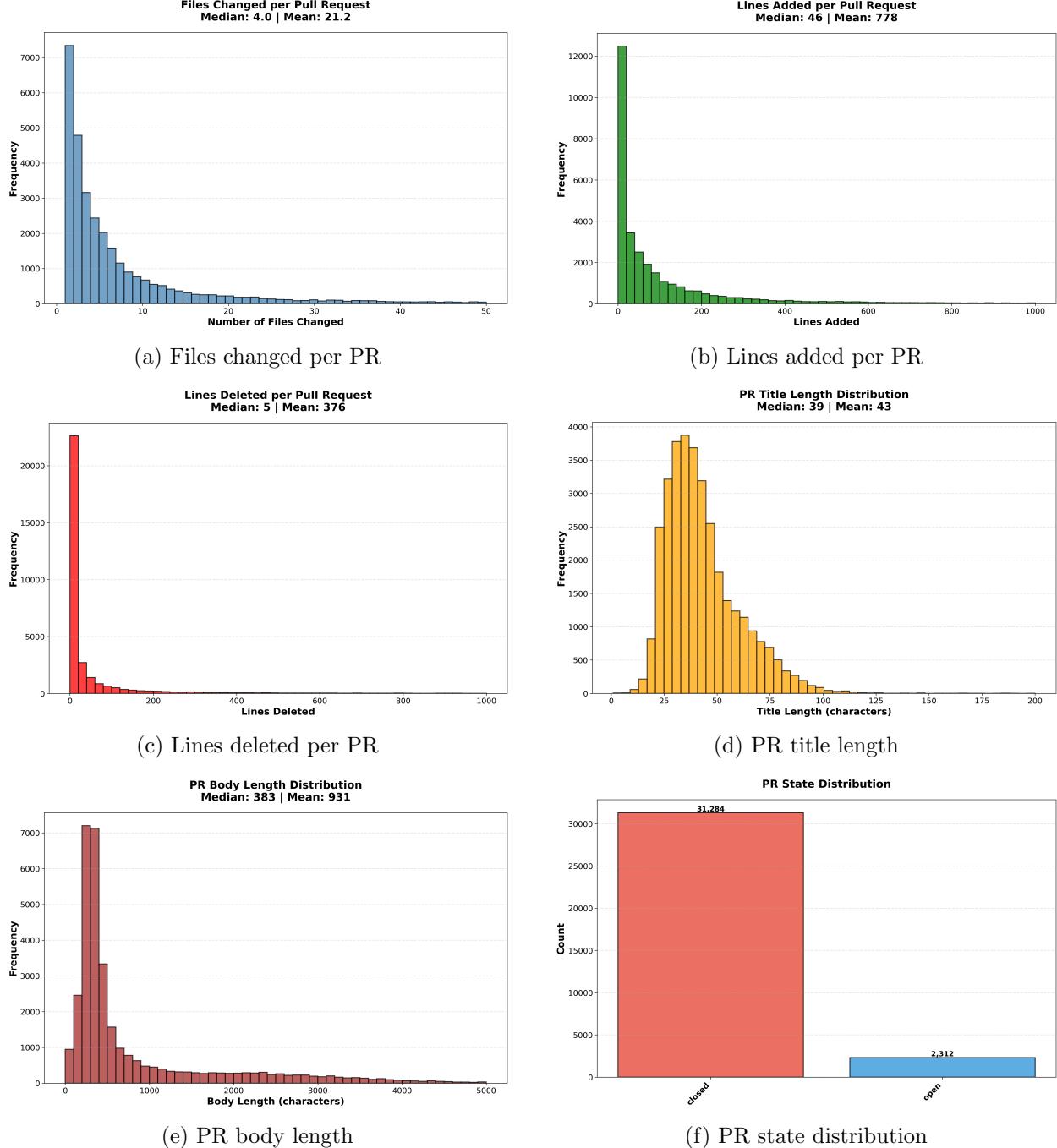


Figure 1: Pull Request Metrics Distributions (right-skewed; Median: 3 files, 46 lines added, 39 char title)

4.2 Commit, Review, and Timeline Distributions

Figures 2a–2d show collaborative activity (Median: 1-3 commits, 0-1 reviews/comments per PR).

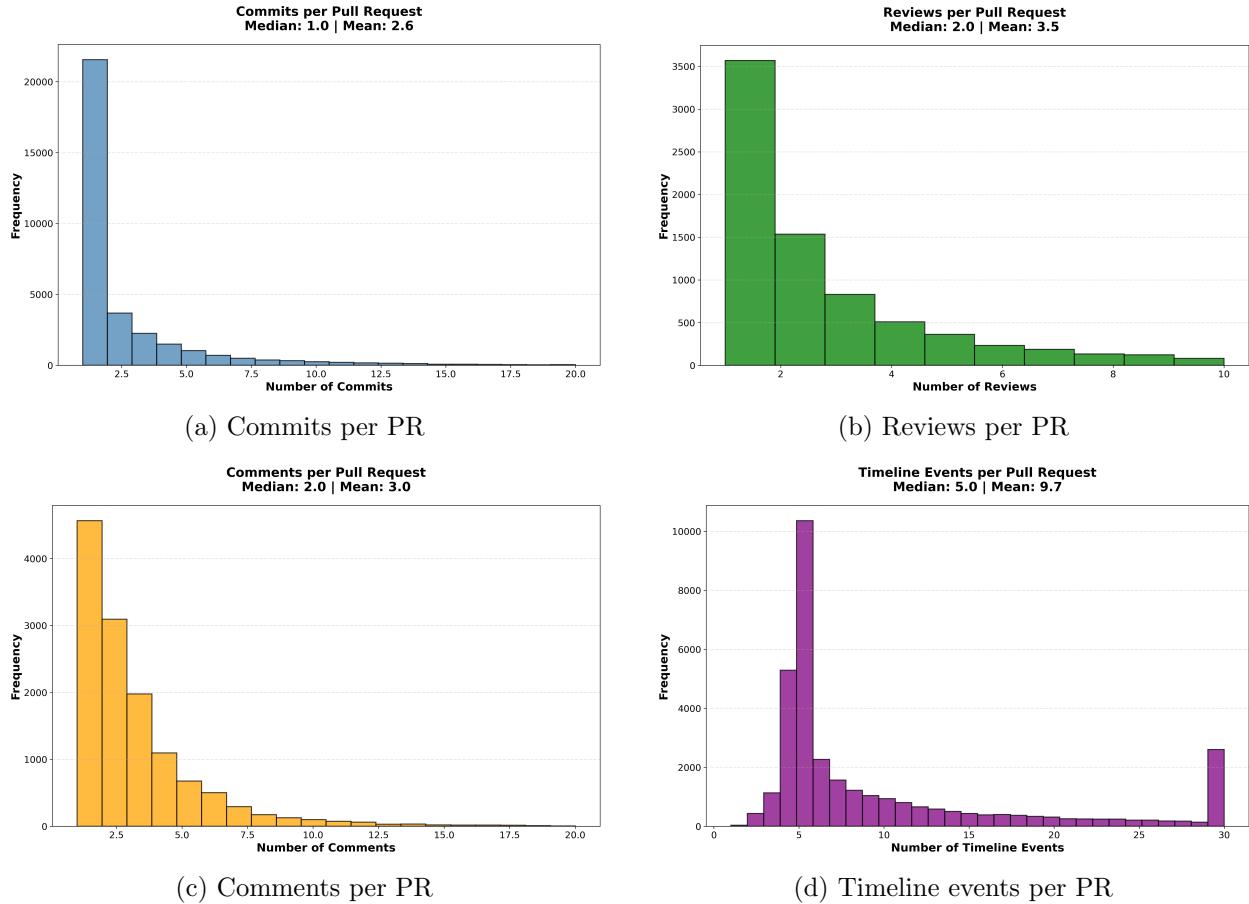
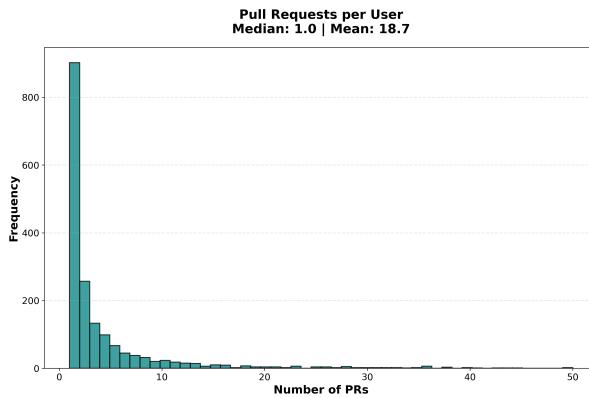


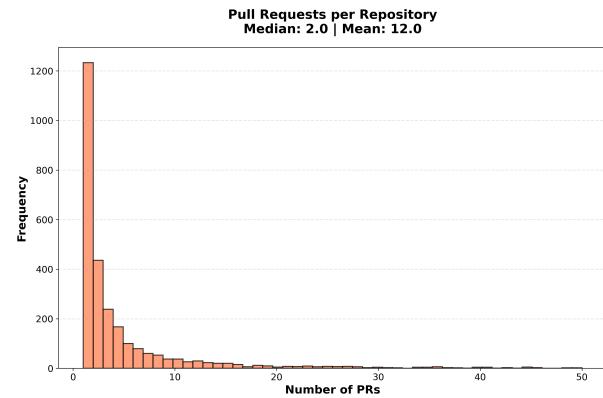
Figure 2: Collaborative Activity Distributions (Median: 2-3 commits, 0-1 reviews, 0-1 comments, 9.7 timeline events/PR)

4.3 User and Repository Distributions

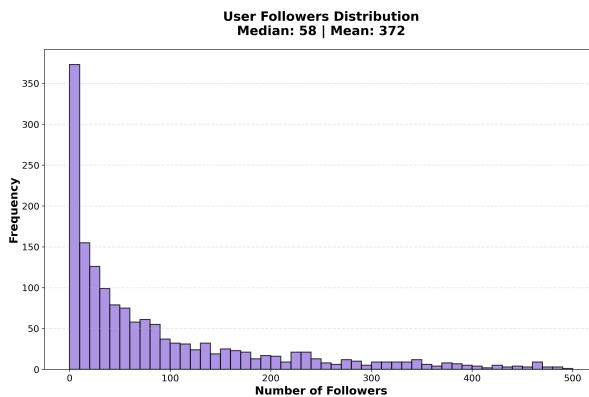
Figures 3a–3e show user/repo patterns (TypeScript: 23%, Python: 19%).



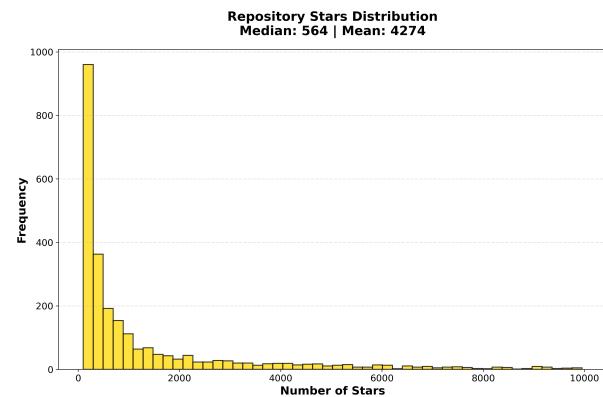
(a) PRs per user



(b) PRs per repository

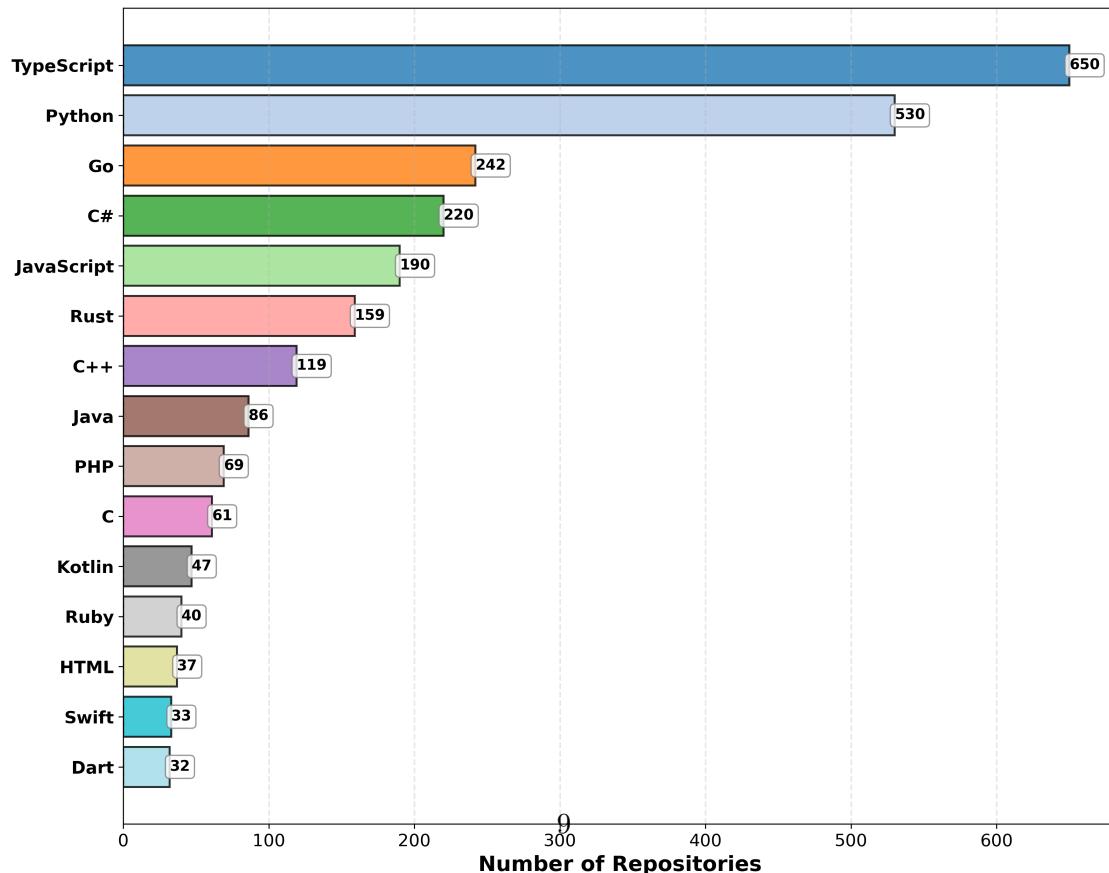


(c) User followers distribution



(d) Repository stars distribution

Top 15 Programming Languages



(e) Top 15 programming languages across repositories

4.4 File-Level Change Distributions

Figures 4a–4d show file-level changes (Median: 4 additions, 1 deletion per file).

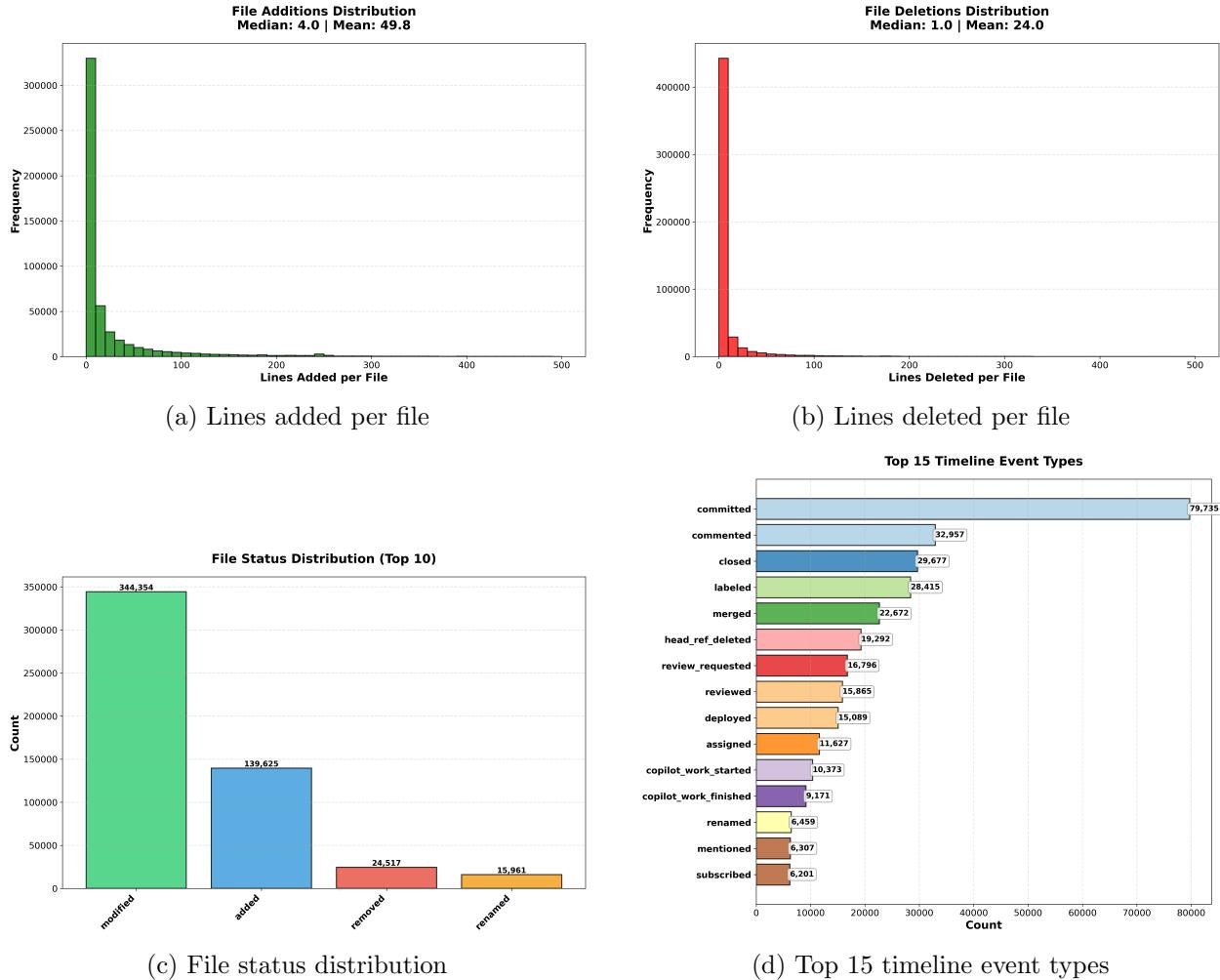


Figure 4: File-Level Change Distributions (Top events: committed 79K, commented 33K, closed 30K)

5 Traceability Analysis

5.1 Text Blobs, URLs & Languages

Table 8: Text Blob Statistics

Entity Type	Count	Avg Length (chars)
PR Titles	33,596	42.85
PR Bodies	33,596	930.84
Commit Messages	88,576	79.8
PR Comments	39,122	1,604.62
PR Reviews	28,875	584.30
Issue Bodies	4,614	1,534.7
Total Text Blobs	228,379	-
Non-empty Blobs	206,959	(90.6%)

Table 9: URL Analysis and Top Domains

Metric	Value	Top Domain	Count (%)
Total URLs	157,480	github.com	24,635 (15.64%)
Unique URLs	84,451	chatgpt.com	17,417 (11.06%)
URLs/Blob (avg)	0.690	gh.io	8,962 (5.69%)
GitHub URLs (internal)	29,924 (19%)	vercel.com	6,775 (4.30%)
External URLs	127,556 (81%)	docs.coderabbit.ai	6,252 (3.97%)
		coderabbit.ai	5,945 (3.78%)
		app.codecov.io	5,440 (3.45%)
		app.devin.ai	4,975 (3.16%)

5.2 Multi-Language Analysis

Table 10: Programming Language Distribution in File Changes

Language	Files	Percentage
Other	338,010	47.48%
TypeScript	112,252	15.77%
Markdown	40,401	5.67%
Python	39,837	5.60%
Go	28,194	3.96%
JSON	26,330	3.70%
JavaScript	22,374	3.14%
YAML	16,735	2.35%
Rust	15,605	2.19%
Java	10,277	1.44%
C#	8,995	1.26%
Ruby	7,965	1.12%
Dart	6,517	0.92%
Kotlin	5,170	0.73%
C	4,592	0.65%
C++	4,100	0.58%
TOML	4,015	0.56%
PHP	3,753	0.53%
HTML	3,628	0.51%
Swift	2,676	0.38%

Table 11: Multi-Language PR Statistics and Agent Behavior

Metric	Value	Agent	Multi-lang %
Total PRs w/ files	33,580	Claude Code	58.7% (2.55 avg)
Single-language	14,829 (44.2%)	Cursor	49.4% (1.96 avg)
Multi-language	11,666 (34.7%)	Devin	44.4% (1.96 avg)
Avg langs/PR	1.37	OpenAI Codex	39.0% (1.49 avg)
Max langs/PR	15	Copilot	0.0% (0.00 avg)

Top Language Combos: Go+MD (2,698), MD+Py (737), MD+TS (372)

Natural Languages: English 98.7%, Chinese 0.5%, Spanish 0.4%

6 Temporal Evolution

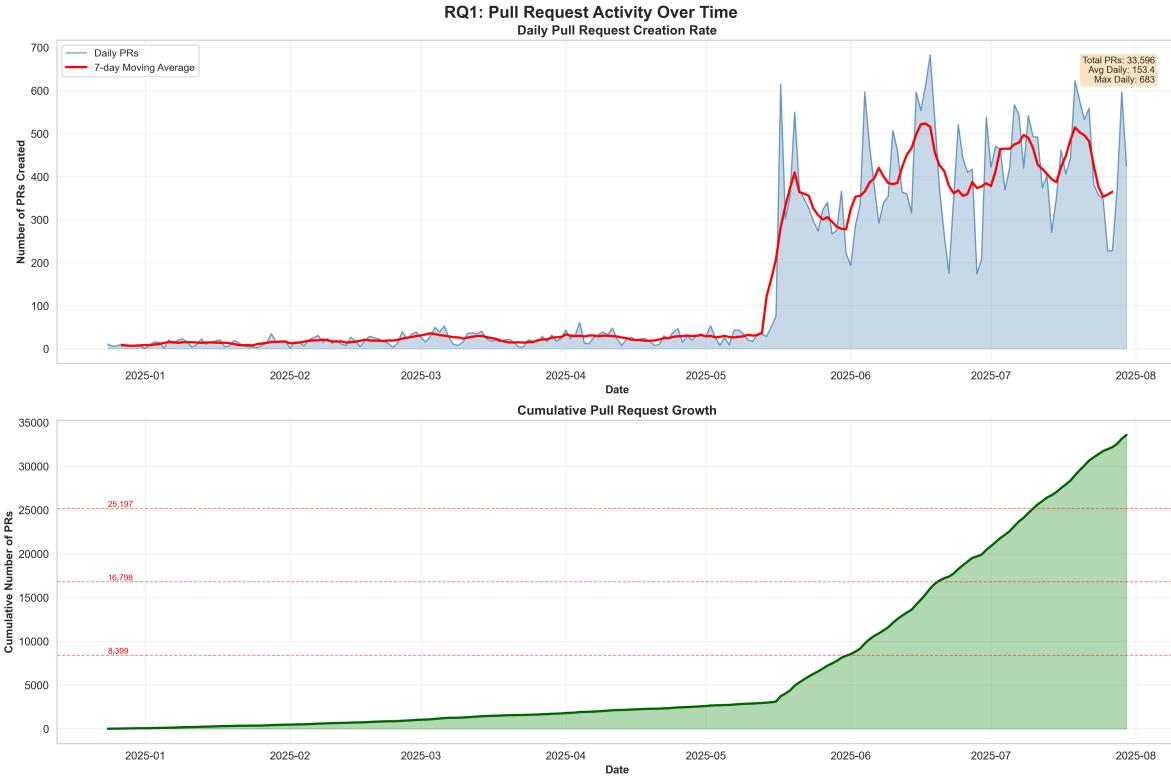


Figure 5: Pull Request Activity Over Time: (Top) Daily PR creation rate with 7-day moving average showing activity fluctuations. (Bottom) Cumulative PR growth demonstrating steady dataset expansion over the collection period.

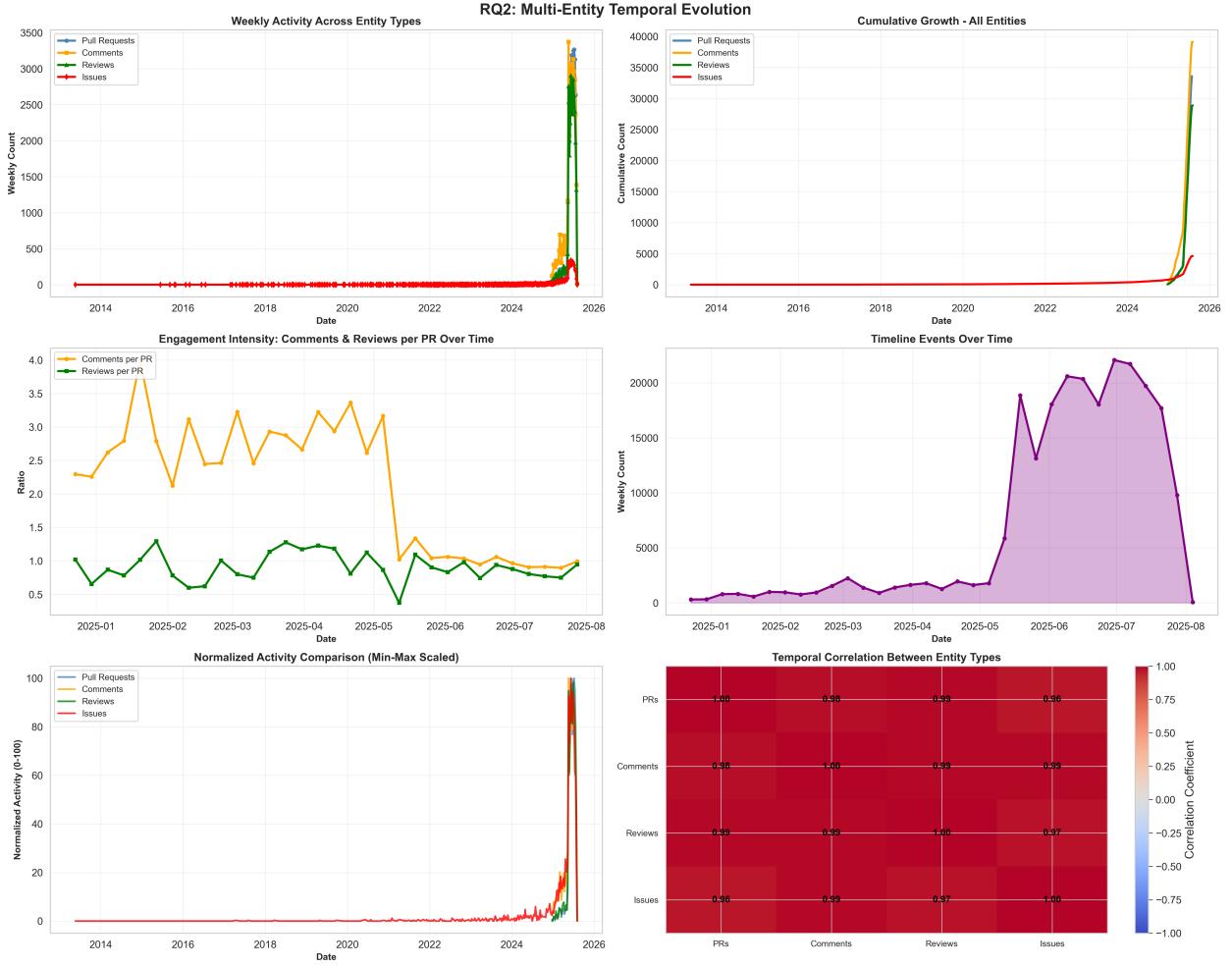


Figure 6: Multi-Entity Temporal Evolution: (Top) Weekly activity and cumulative growth for PRs, comments, reviews, and issues. (Middle) Engagement intensity ratios and timeline events. (Bottom) Normalized comparison and correlation heatmap showing strong positive correlations between entity types ($r \geq 0.7$ for most pairs).

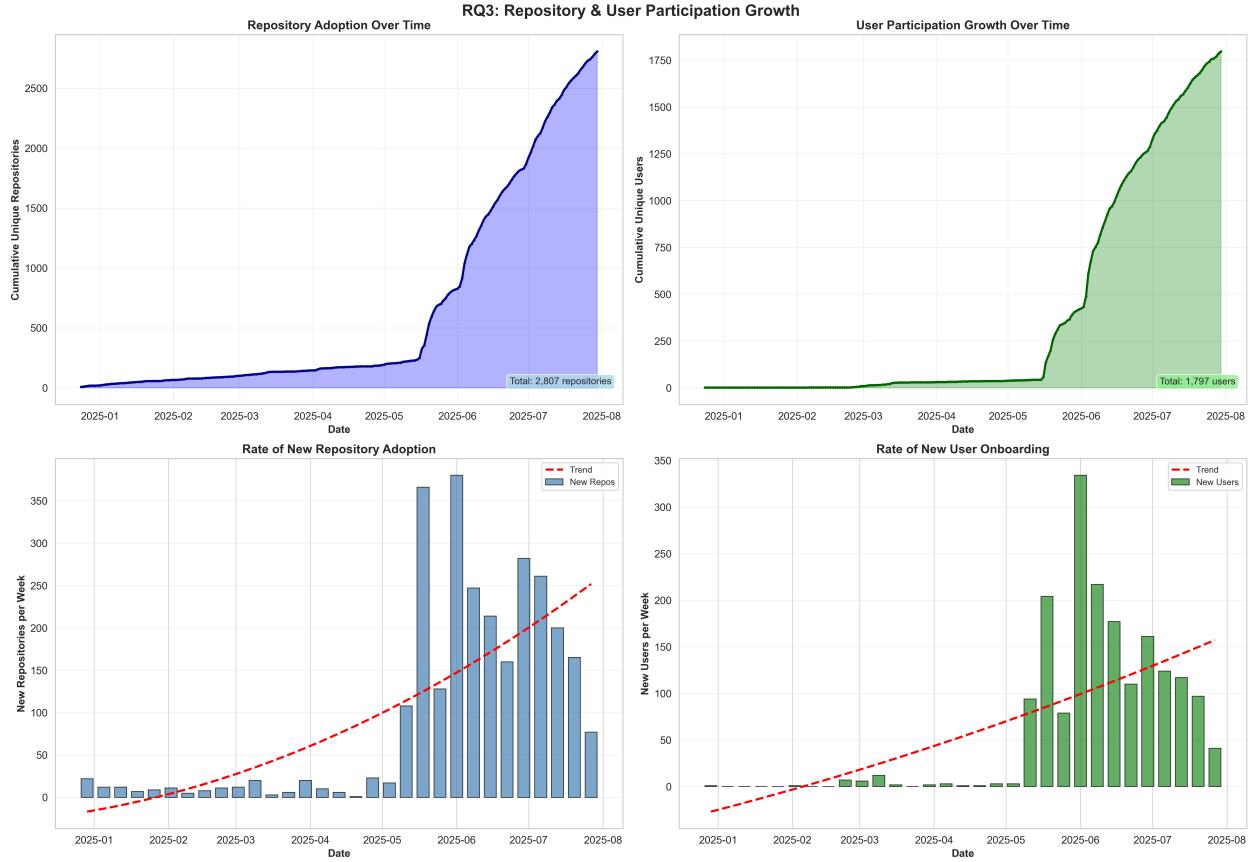


Figure 7: Repository and User Participation Growth: (Top) Cumulative unique repositories and users over time showing steady growth. (Bottom) Rate of new repository adoption and user onboarding with polynomial trend lines indicating sustained ecosystem expansion.

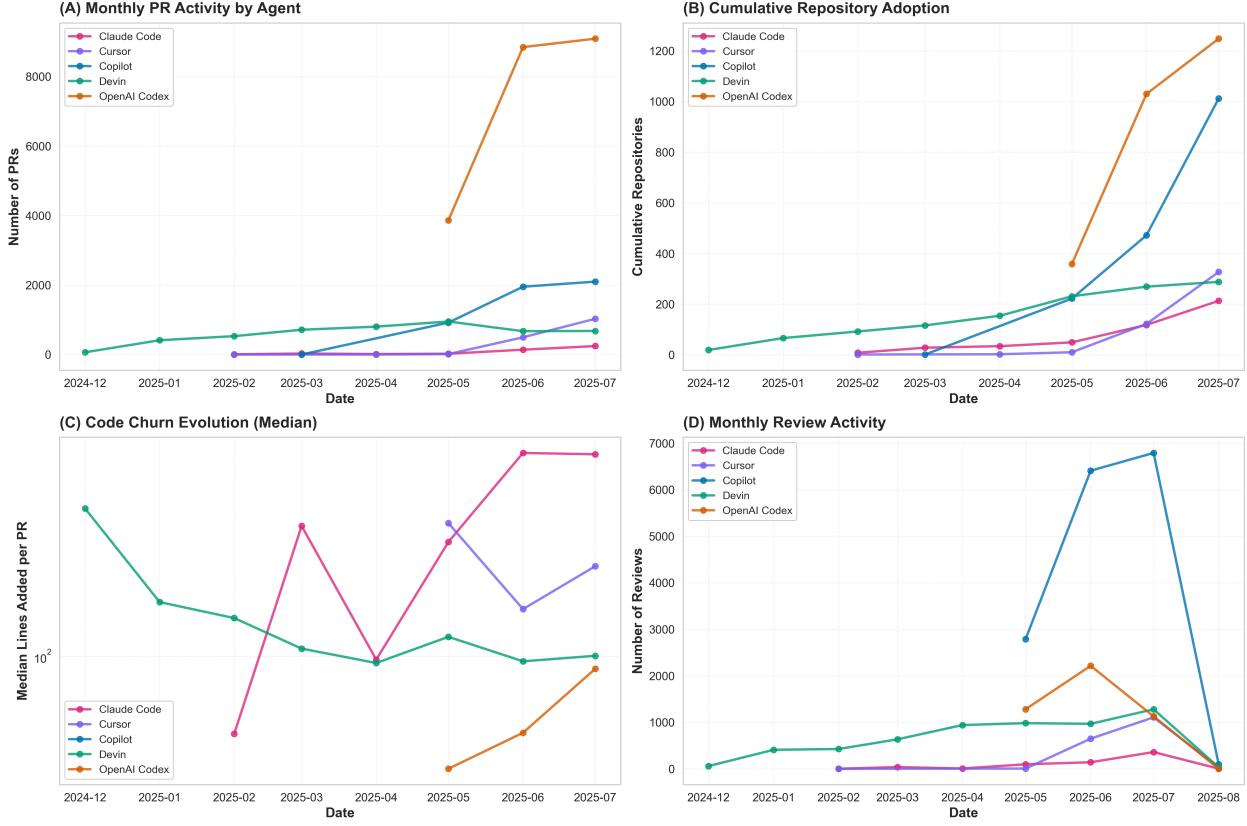


Figure 8: Temporal Evolution by Agent: Four-panel time-series analysis showing (Top Left) Monthly PR activity by agent, (Top Right) Cumulative repository adoption, (Bottom Left) Code churn evolution (median lines added), (Bottom Right) Monthly review activity. Reveals distinct growth trajectories and seasonal patterns.

7 Agent-Specific Analysis

7.1 Agent Adoption & Acceptance

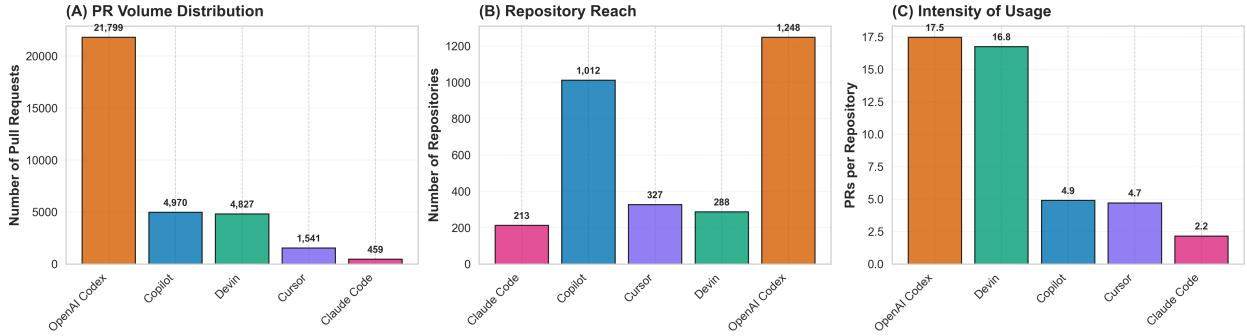


Figure 9: Agent Adoption Landscape: (Left) PR volume distribution showing OpenAI Codex dominates with 21,799 PRs (64.89%). (Middle) Repository reach across agents. (Right) Intensity of usage (PRs per repository) with OpenAI Codex at 17.5 PRs/repo.

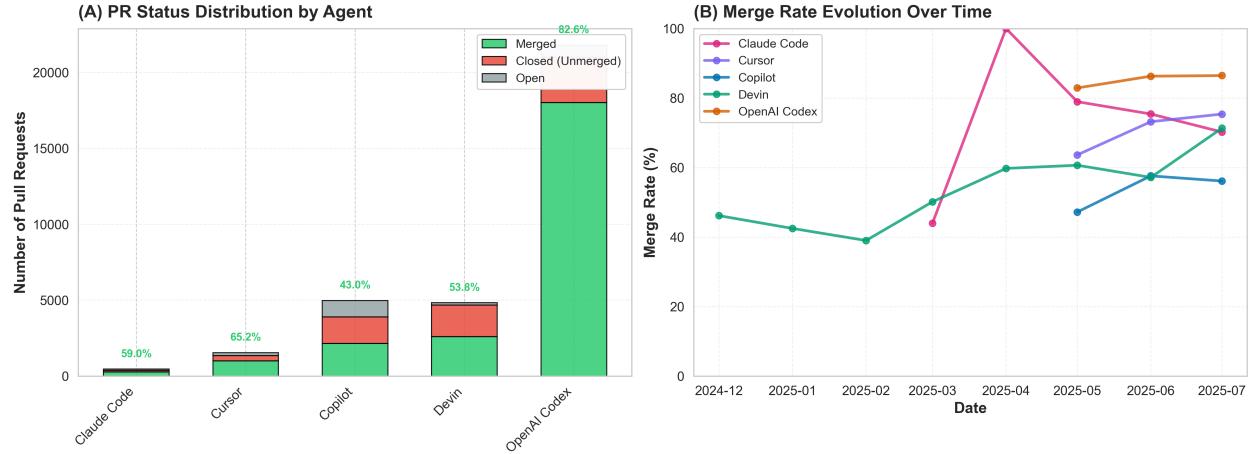


Figure 10: PR Acceptance Rates: (Left) PR status distribution by agent showing merge rates from 43% (Copilot) to 82.6% (OpenAI Codex). (Right) Temporal trends in merge rates over time, indicating evolving patterns.

7.2 Entity Distributions by Agent

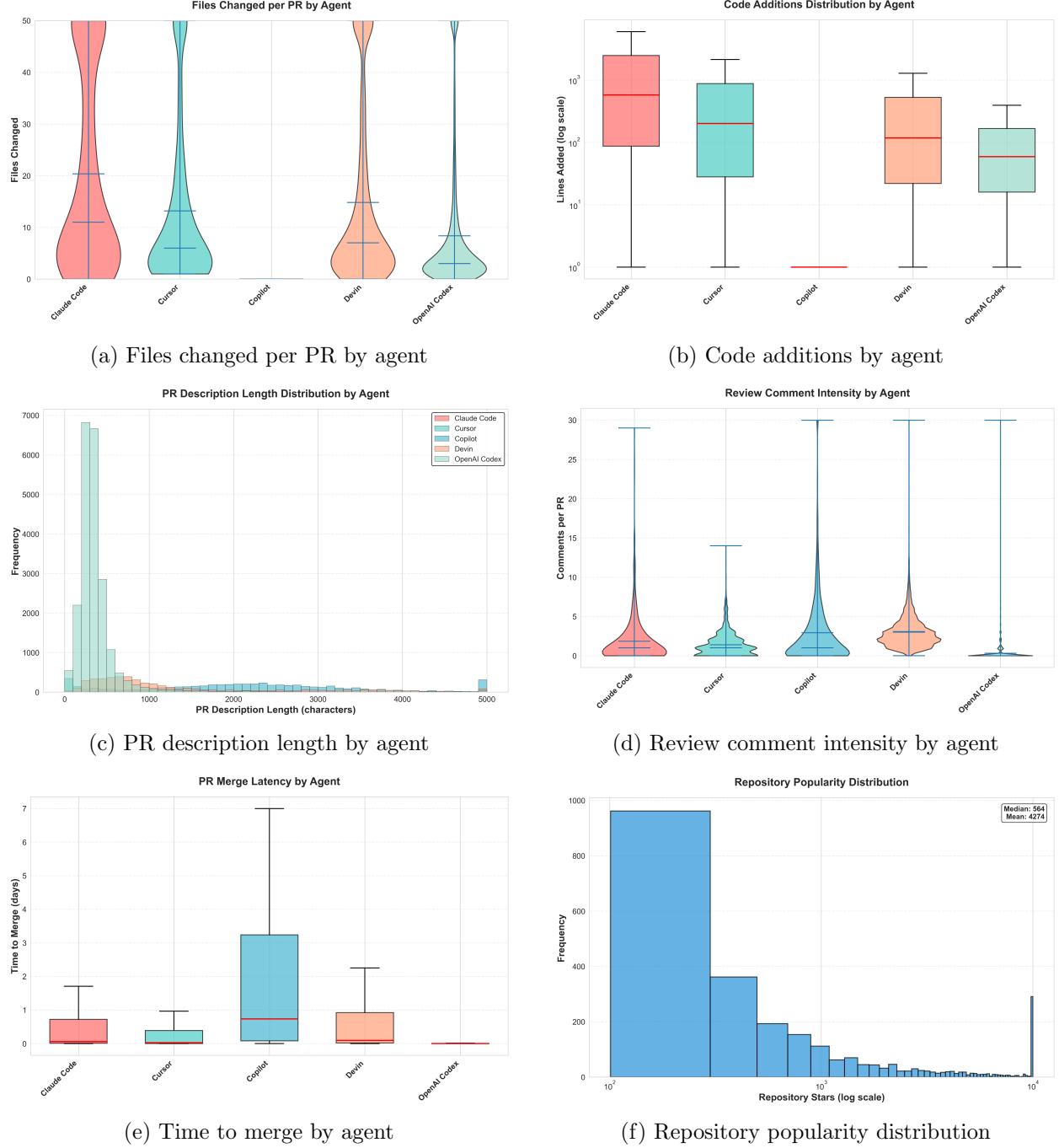


Figure 11: Entity Distributions by Agent (Part 1): Files changed, code additions, PR descriptions, review comments, merge times, and repository popularity. Violin and box plots reveal distinct agent behavior patterns.

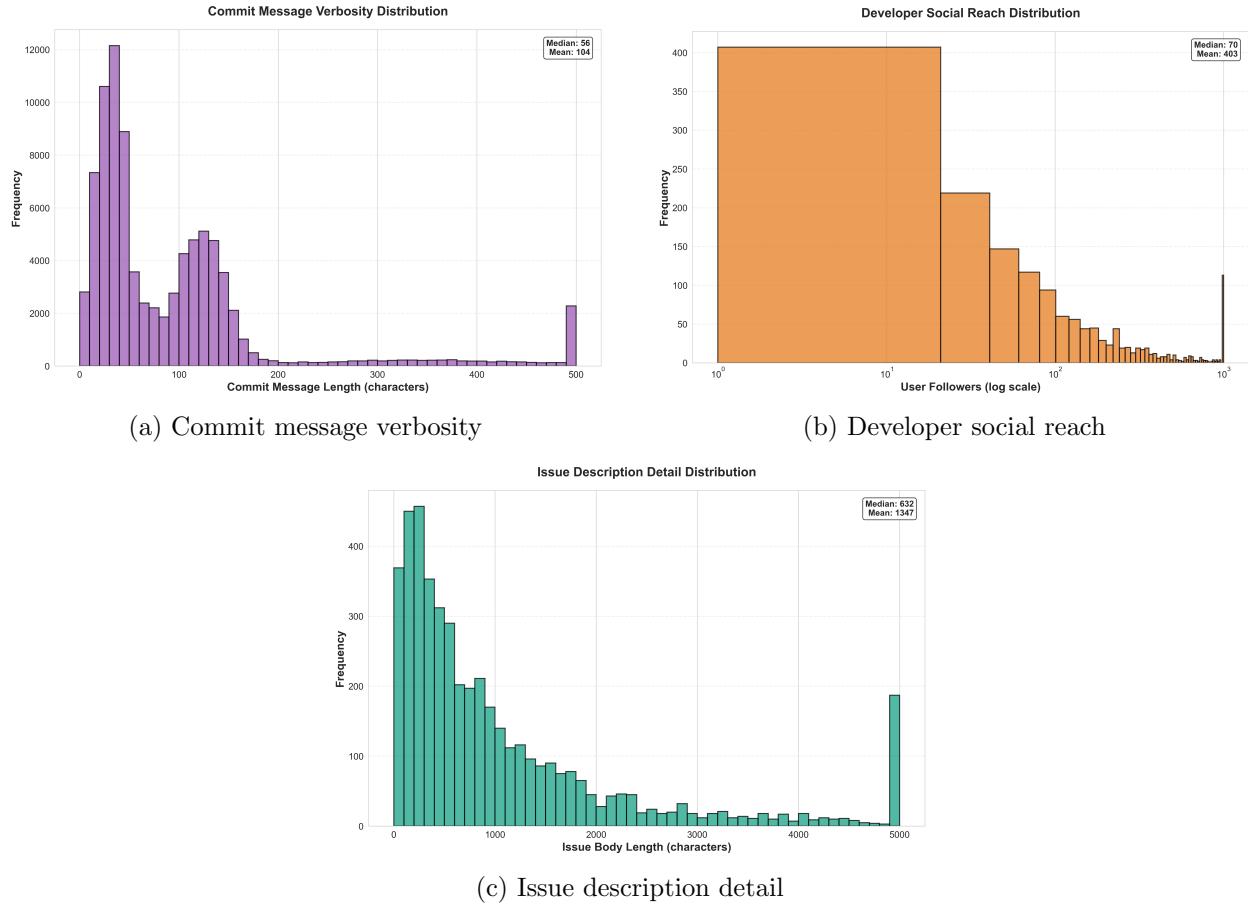


Figure 12: Entity Distributions by Agent (Part 2): Commit message lengths, developer social reach, issue detail

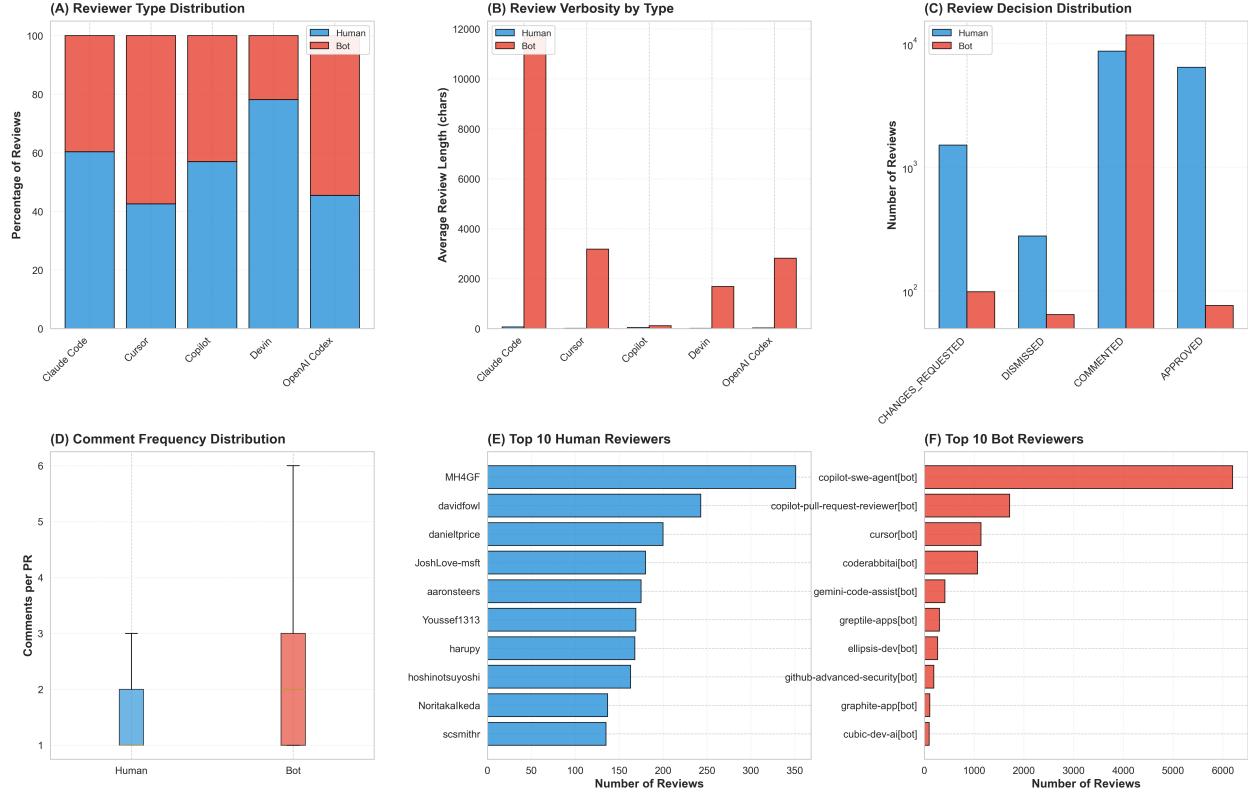


Figure 13: Human vs Bot Reviewer Engagement: Six-panel analysis showing reviewer type distribution (58.5% human, 41.5% bot), review verbosity comparison, review decisions, comment frequency, and top reviewers. Bots write longer reviews (avg 11,700 chars) vs humans (avg 200 chars).

Appendix: Comprehensive Statistical Summary

This appendix provides detailed statistical measures for all key entities, including higher-order moments (skewness, kurtosis) that reveal the distribution characteristics.

Table 12: Comprehensive Entity Statistics (Part 1: PR and File Metrics)

Entity	Count	Mean	Median	Std Dev	Min	25%	75%	Max	IQR	Skew	Kurt
PR Title Length (chars)	33,596	42.85	39.0	18.13	1.0	30.0	51.0	351	21.0	2.00	13.03
PR Body Length (chars)	33,596	930.84	383.0	1,651.27	0.0	273.0	935.3	77,435	662.3	13.03	347.55
PR Body Lines	33,596	21.59	11.0	31.15	1.0	9.0	20.0	2,076	11.0	15.58	719.32
Lines Added per File	524,457	49.84	4.0	688.10	0.0	1.0	22.0	170,444	21.0	112.83	19,769.64
Lines Deleted per File	524,457	24.04	1.0	542.81	0.0	0.0	4.0	105,024	4.0	88.39	10,850.88
Total Changes per File	524,457	73.88	8.0	945.68	0.0	2.0	34.0	171,263	32.0	69.23	7,298.63
Total Lines Added per PR	33,580	778.37	46.0	6,351.43	0.0	5.0	175.0	631,203	170.0	43.56	3,366.62
Total Lines Deleted per PR	33,580	375.52	5.0	4,835.82	0.0	0.0	38.0	640,627	38.0	81.33	9,729.96
Files Changed per PR	33,580	15.62	3.0	54.67	0.0	1.0	8.0	2,682	7.0	11.96	302.12

Table 13: Comprehensive Entity Statistics (Part 2: Comments, Reviews, and User Metrics)

Entity	Count	Mean	Median	Std Dev	Min	25%	75%	Max	IQR	Skew	Kurt
Comment Length (chars)	39,122	1,604.62	404.0	5,607.40	1.0	154.0	1,248.0	223,759	1,094.0	16.61	390.22
Review Length (chars)	28,875	584.30	0.0	3,471.45	0.0	0.0	9.0	155,434	9.0	22.25	703.87
User Followers	1,796	372.18	58.0	1,916.52	0.0	14.0	195.0	45,077	181.0	15.25	287.35
User Following	1,796	50.45	10.0	235.72	0.0	2.0	39.3	8,049	37.3	24.66	773.64
Repository Stars	2,807	4,273.75	564.0	12,634.83	101.0	215.5	2,487.5	203,424	2,272.0	7.08	70.14
Repository Forks	2,807	750.35	104.0	3,135.61	1.0	36.0	399.5	62,633	363.5	12.10	181.13

Interpretation Notes:

- High Skewness (greater than 2):** All metrics show strong right-skewed distributions, indicating most values are small with occasional extreme outliers
- Extreme Kurtosis:** Values ranging from 13 to 19,770 indicate heavy-tailed distributions with extreme outliers
- Large Mean-Median Gap:** Confirms outlier influence (e.g., mean files/PR: 15.62 vs median: 3.0)
- IQR Analysis:** Interquartile ranges are small relative to maximums, showing most data is concentrated in lower ranges