

# The Power of Bots: Understanding Bots in OSS Projects

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Ana Paula Chaves

Marco Aurélio Gerosa



Research funded by CNPq, FAPESP and NAU

Open Source Software (OSS)

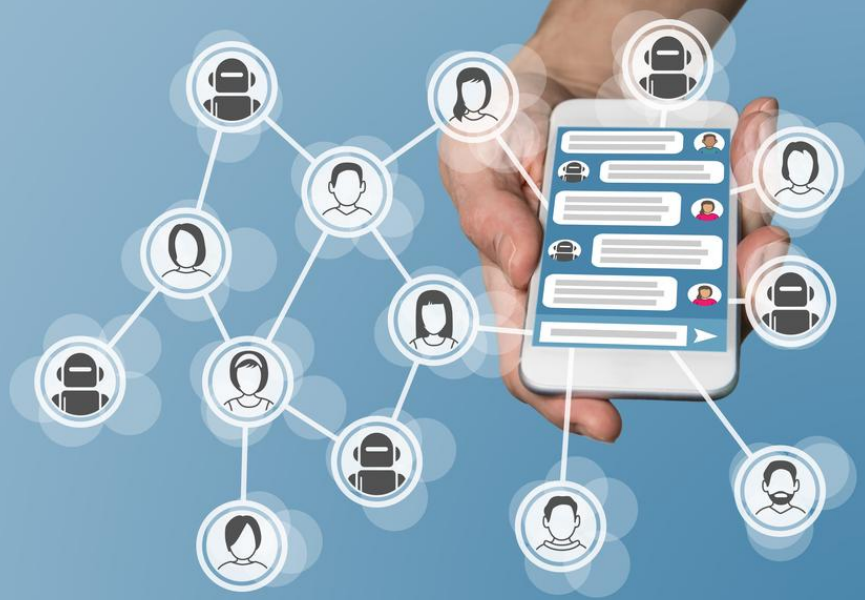


Social-coding platforms



Pull-based model





# Bots

Software agents that integrate their work with human tasks.

# How bots support software development productivity?

## Disrupting Developer Productivity One Bot at a Time

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Victoria, BC, Canada  
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# Examine the current state of bots and identify directions for future work...

2018 ACM/IEEE 11th International Workshop on Cooperative and Human Aspects of Software Engineering

## **A Framework for Understanding Chatbots and their Future\***

Elahe Paikari  
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Irvine, CA 92705 U.S.A.  
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André van der Hoek  
University of California, Irvine  
Irvine, CA 92705 U.S.A.  
andre@ics.uci.edu

... little is known about bots in OSS and their challenges



How much impact do bots have in OSS?

What challenges will bots bring to contributors and integrators of OSS?





## Facebook Community Bot

facebook-github-bot

Follow

Block or report user

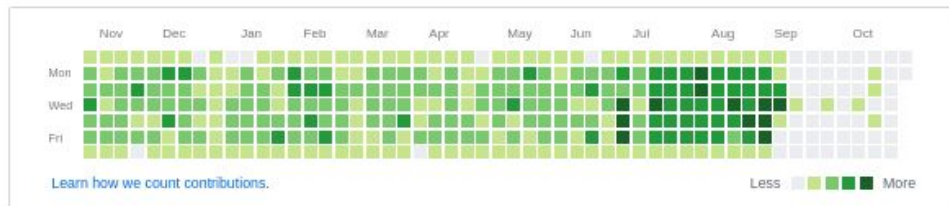
Facebook  
 Menlo Park, California  
 <https://code.facebook.com>

Overview   Repositories **0**   Stars **0**   Followers **818**   Following **0**

### Popular repositories

facebook-github-bot doesn't have any public repositories yet.

5,244 contributions in the last year



### Contribution activity

Jump to ▾

2018

2017

2016

2015

2014

Created 7 commits in 2 repositories

[WhatsApp/WADebug](#) 6 commits

[facebook/facebook-nodejs-business-sdk](#) 1 commit

Reviewed 728 pull requests in 40 repositories

Show more activity



Facebook  
Community Bot  
facebook-github-bot

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Overview Repositories 0 Stars 0 Followers 818 Following 0

facebook / react

Watch

6,500

Star

114,211

Fork

20,577

Code

Issues 340

Pull requests 117

Projects 0

Wiki

Insights

## [react-is] add back proper AsyncMode symbol, for back compat #13959

Open

wants to merge 1 commit into facebook:master from ljharb:react-is-async-mode

Conversation 2

Commits 1

Checks 0

Files changed 4

+15 -5



commented 4 days ago

Contributor

- Partial revert of #13732
- Fixes #13958.

I didn't add tests for `isAsyncMode` because #13732 didn't preserve any - happy to add them if needed.



[react-is] add back proper AsyncMode symbol, for back compat

Verified

fa814c2



facebook-github-bot added the **CLA Signed** label 4 days ago



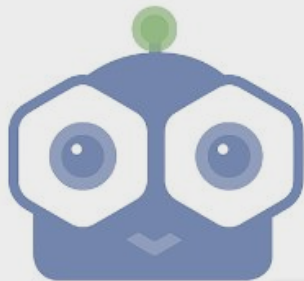
referenced this pull request 4 days ago

react-is breaking change, re AsyncMode #13958

Open

Show more activity





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facebook / react

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Code Issues 340 Pull requests 117 Projects 0 Wiki Insights

facebook-github-bot doesn't have any public repositories yet.  
[react-is] add back proper AsyncMode symbol, for back compat #13959



facebook-github... commented 5 days ago

+ 😊 ...

Thank you for your pull request and welcome to our community. We require contributors to sign our Contributor License Agreement, and we don't seem to have you on file. In order for us to review and merge your code, please sign up at <https://code.facebook.com/cla>. **If you are contributing on behalf of someone else (eg your employer)**, the individual CLA may not be sufficient and your employer may need the corporate CLA signed.

If you have received this in error or have any questions, please contact us at [cla@fb.com](mailto:cla@fb.com). Thanks!

+15 -5

Reviewers

No reviews

Assignees

No one assigned

Labels

CLA Signed

Projects

None yet

Milestone

No milestones

- Created 7 commits [react-is] add back proper AsyncMode symbol, for back compat Verified ✓ fa814c2
- facebook-github-bot added the CLA Signed label 4 days ago
- harb referenced this pull request 4 days ago
- Reviewed 728 pull requests react-is breaking change, re AsyncMode #13958 Open

Show more activity

# Research questions

**RQ1.** How **common** are bots in GitHub projects?

**RQ2.** How do the **characteristics of pull requests** compare before and after the bot adoption?

**RQ3.** How do **contributors and integrators** perceive bots' support during the pull request submission process?

# Research questions

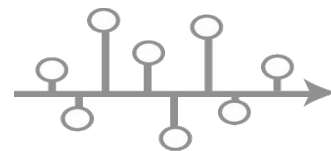
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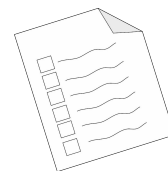
**RQ3.** How do contributors and integrators perceive bots' support during the pull request submission process?



Manual analysis of 351 projects  
(CL=95%, CI=5%)



Quantitative analysis of time series



Survey with 3,371 contributors  
and 368 integrators

# Research questions

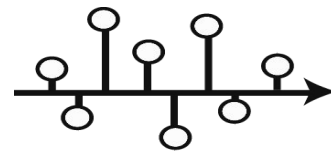
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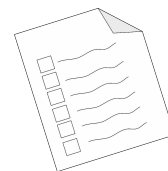
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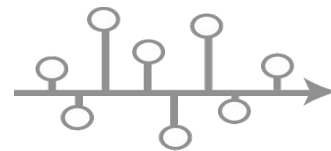
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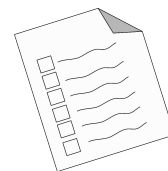
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# RQ1. How common are bots in GitHub projects?

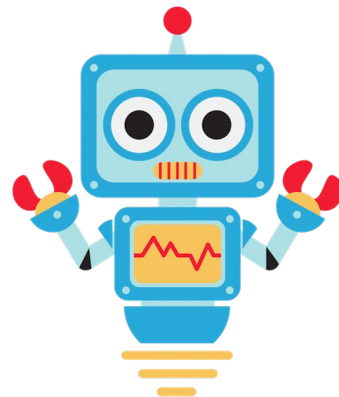
We identified that ...

48

different bots in

93

projects



... almost one-third of the projects adopted at least one bot.



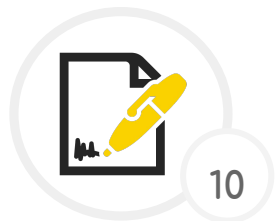
Review code



Review pull requests



Welcome newcomers

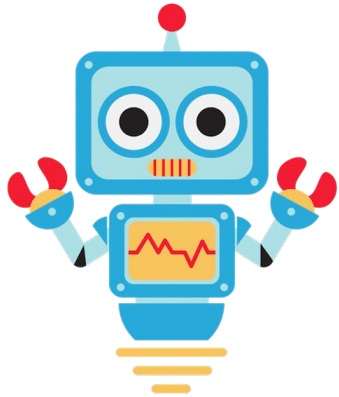


Ensure license  
agreement signing



Assign reviewers

**RQ2.** How do the characteristics of pull requests compare before and after the bot adoption?



The differences related to **number of commits**, **number of changed files**, and **closed time** before and after bot adoption were not consistent.



# RQ3. How do contributors and integrators perceive the relevance of bot support during the pull request process?

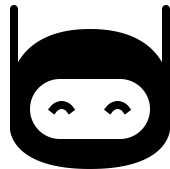
Based on your experience, it was easier to contribute to the project when assisted by...



| Assisted by              | #of answers (%) |
|--------------------------|-----------------|
| Bots only                | 7 (3.4%)        |
| Project members only     | 9 (4.4%)        |
| Bots and project members | 189 (92.2%)     |

### RQ3. How do contributors and integrators perceive the relevance of bot support during the pull request process?

The most recurrent challenge is that bots have poor decision support mechanisms (39 mentions).



We are not smart enough yet.

# RQ3. How do contributors and integrators perceive the relevance of bot support during the pull request process?



Improvements proposed by contributors and integrators.

# What we found...

**RQ1.** Almost **one-third** of the projects adopted at least **one** bot.

**RQ2.** The most noticeable difference regarded the **number of comments** per pull request.

**RQ3.** Contributors want **smart bots** and integrators want **bots that satisfy their needs**.



# Thank you!

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 [mairieli@ime.usp.br](mailto:mairieli@ime.usp.br)

 [@mairieliw](https://twitter.com/mairieliw)

Credits to **Freepik** for the images used in this presentation!



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