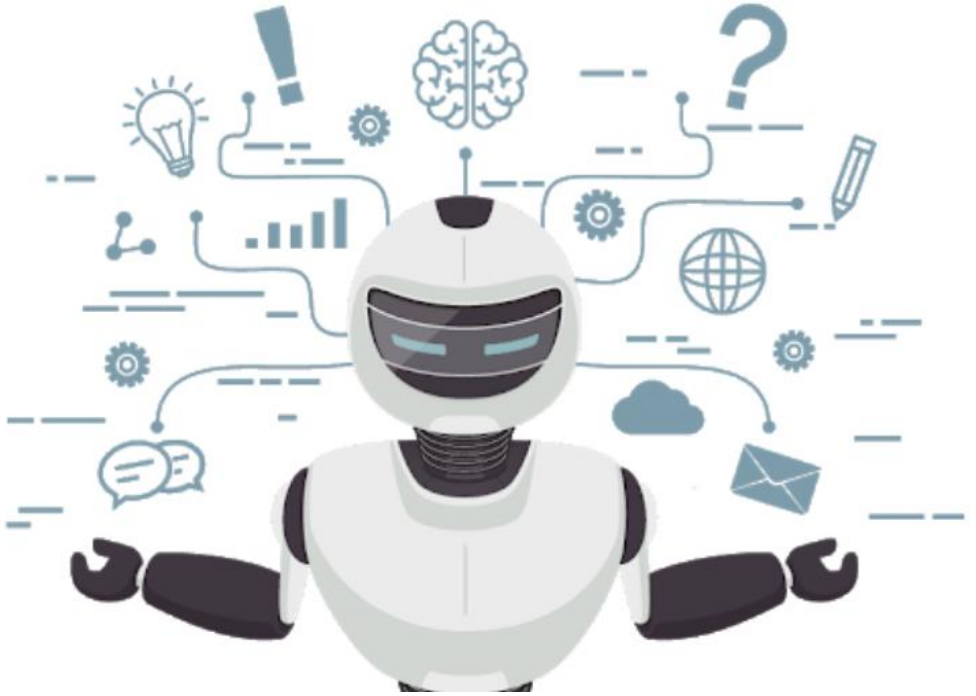
SUSTAINABILITY IN OPEN SOURCE: BOTS TO THE RESCUE

Adem Ait, Javier Cánovas, Jordi Cabot

International Summer School on Search- and Machine Learning-based Software Engineering



http://www.browserbot.com/

OPEN SOURCE

- Power of distributed peer review and transparency
- Promise: better quality, higher reliability, more flexibility and lower cost

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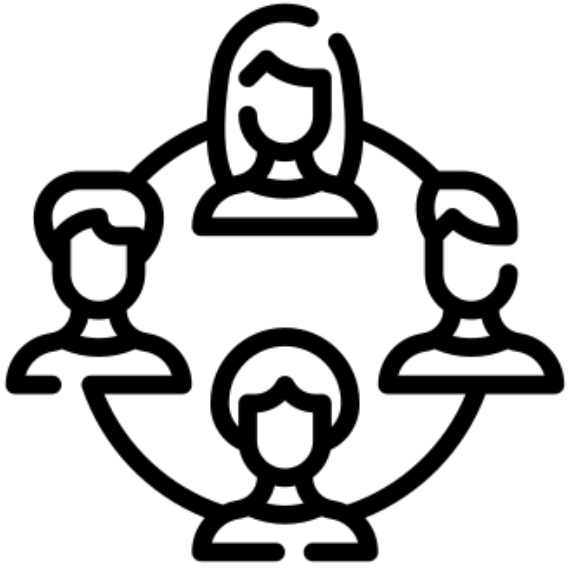
- Collaboration as the basis of Open Source development



TRAGEDY OF THE COMMONS

Only few community members are willing to participate and those who do want to contribute lack the required support to collaborate effectively

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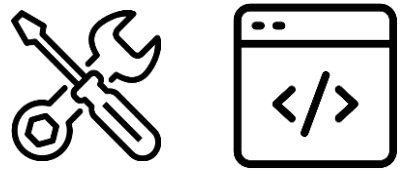

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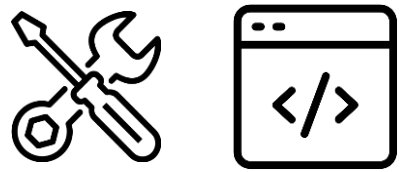
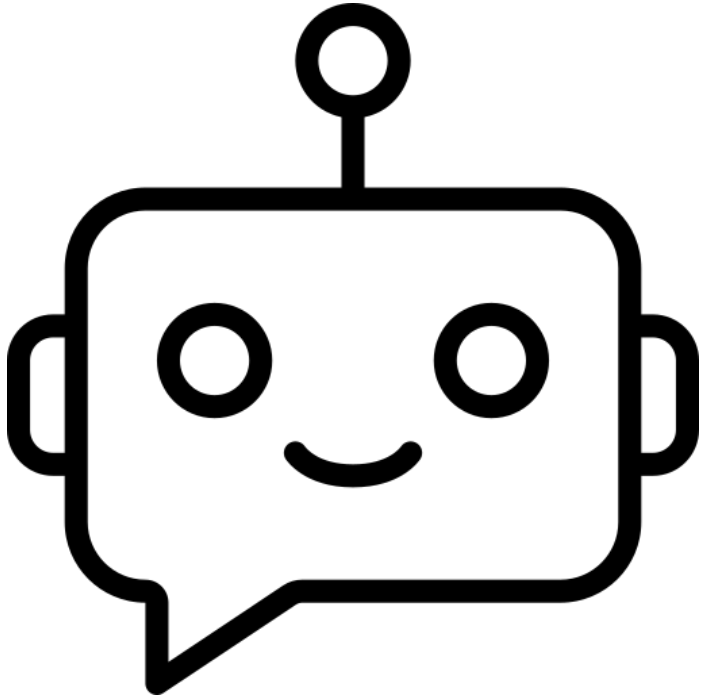


- OSS projects are much more than their codebase.

BOTS AS A SOLUTION

A software program that can execute commands, reply to messages, or perform routine tasks, either automatically or with minimal human intervention



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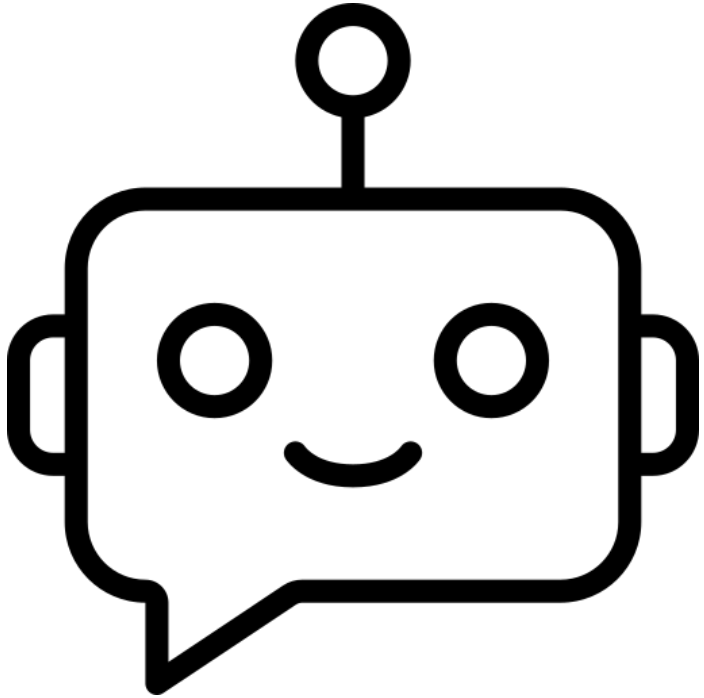

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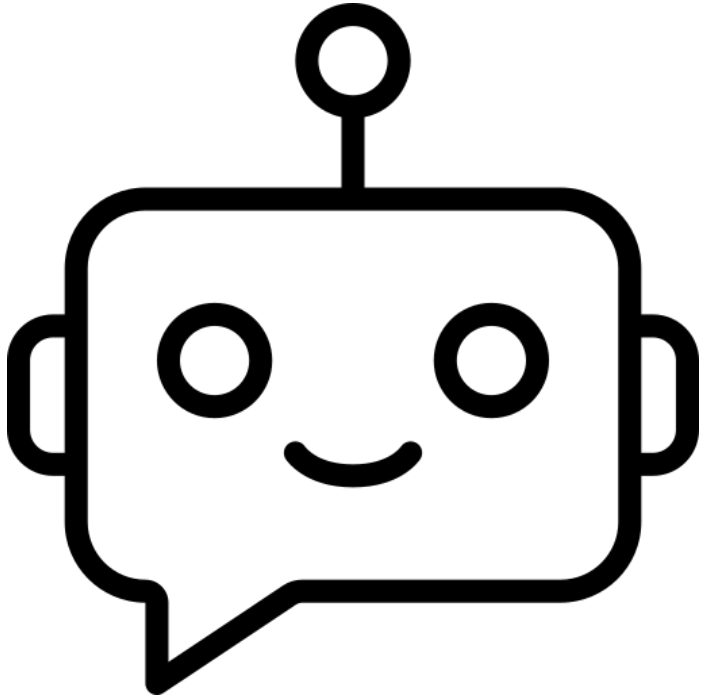

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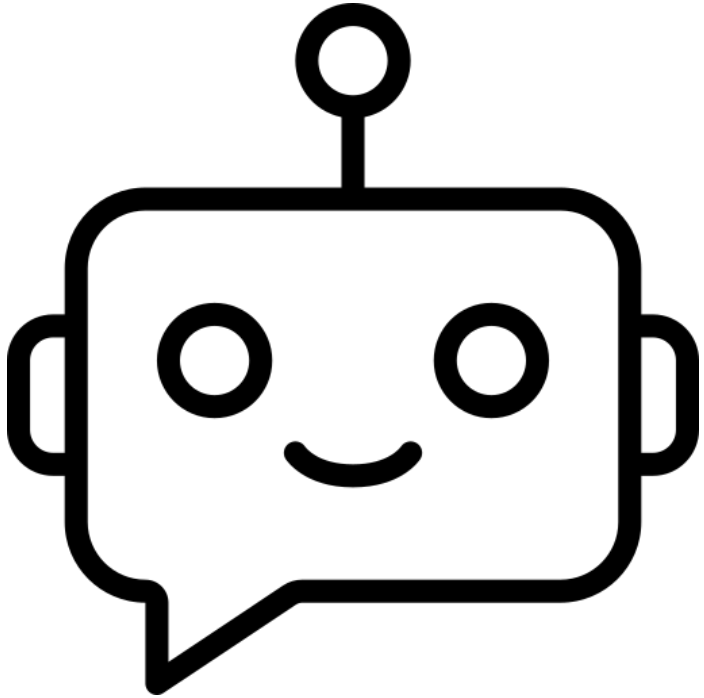
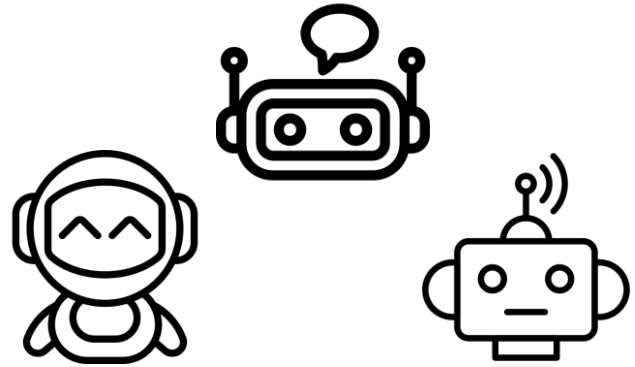
GitHub Actions



PROPOSAL

- Leverage on the help of a swarm of smart software bots to tackle the diverse tasks required to address the sustainability challenges on OSS.



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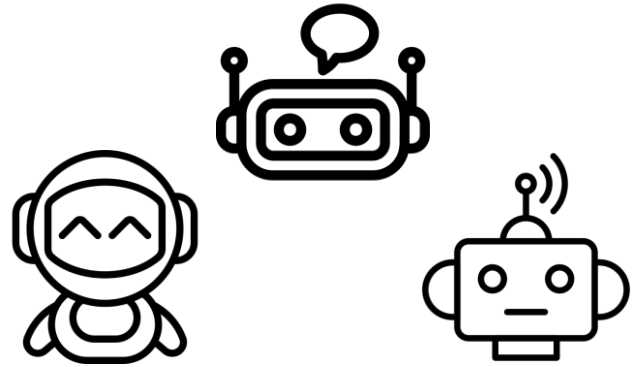
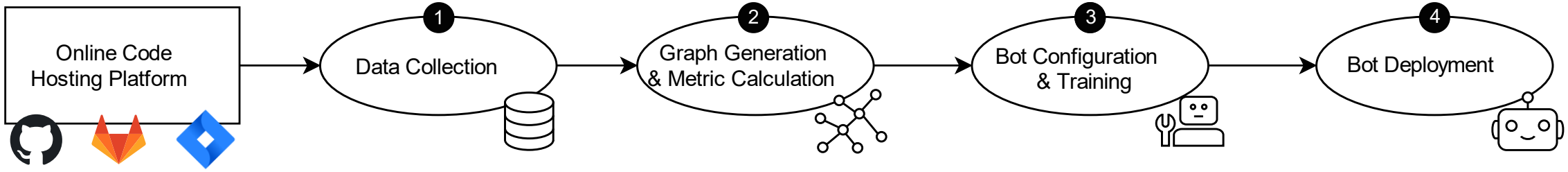


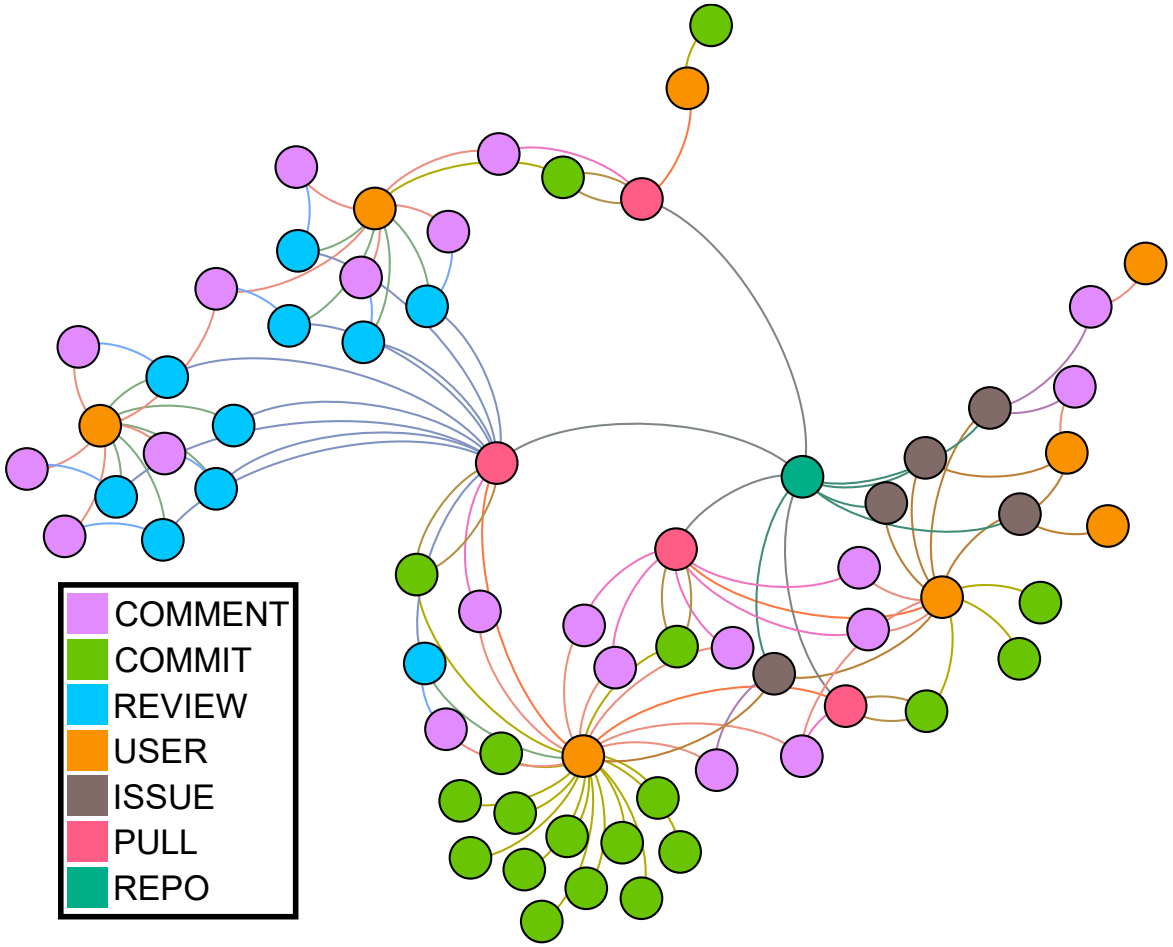
- We define a process composed of four phases: (1) data collection, (2) graph generation and metric calculation, (3) bot configuration and training, and (4) bot deployment.



CHALLENGES

CHALLENGE 1: MINING COLLABORATION GRAPHS

A collaboration graph is a directed graph where nodes represent project assets and edges represent relationships between them.



COLLABORATION GRAPH EXAMPLE

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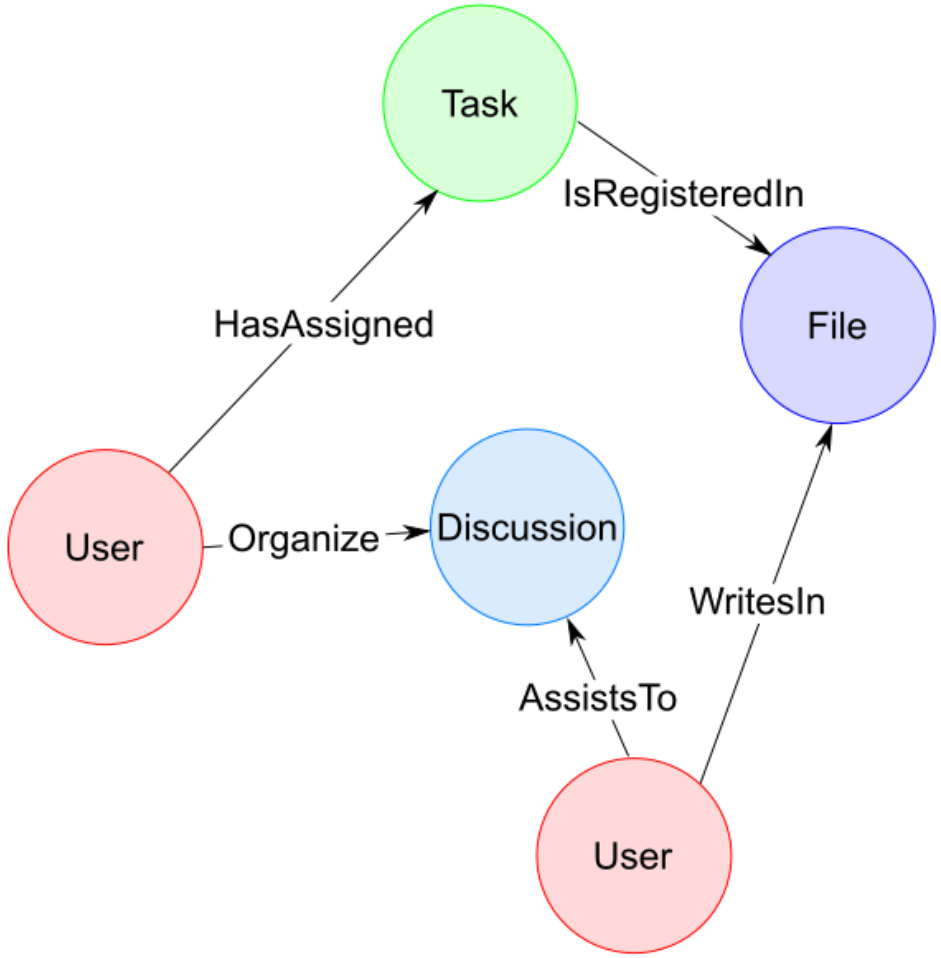
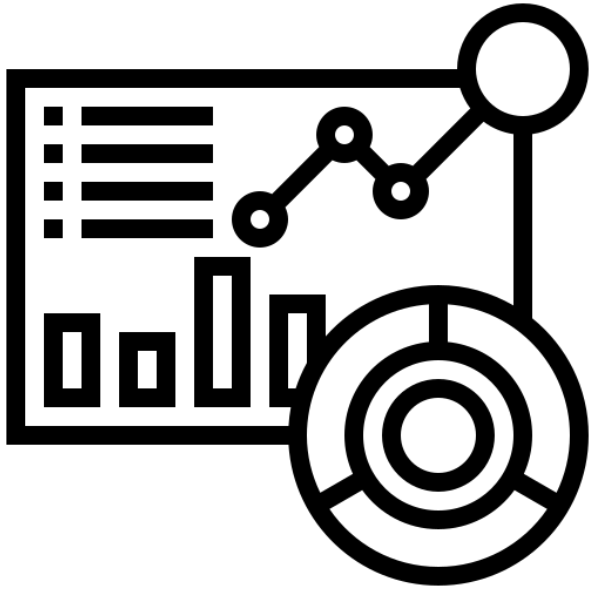


CHALLENGE 2: GRAPH-SPECIFIC METRICS

- Extract significant metrics to describe behaviors, patterns, or identification of roles.



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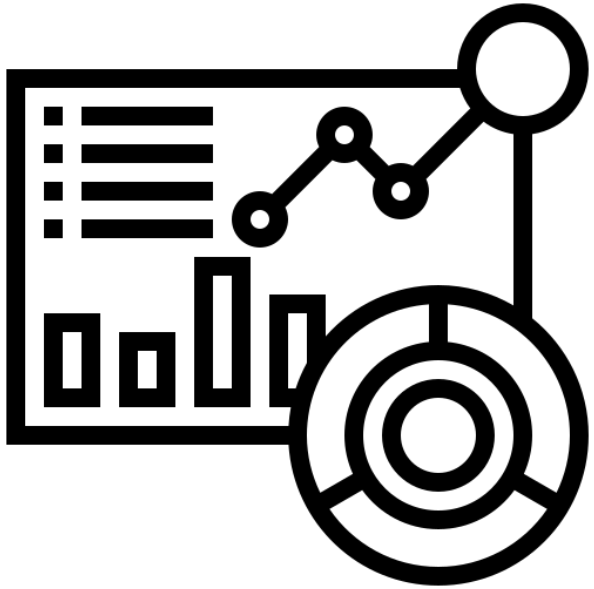
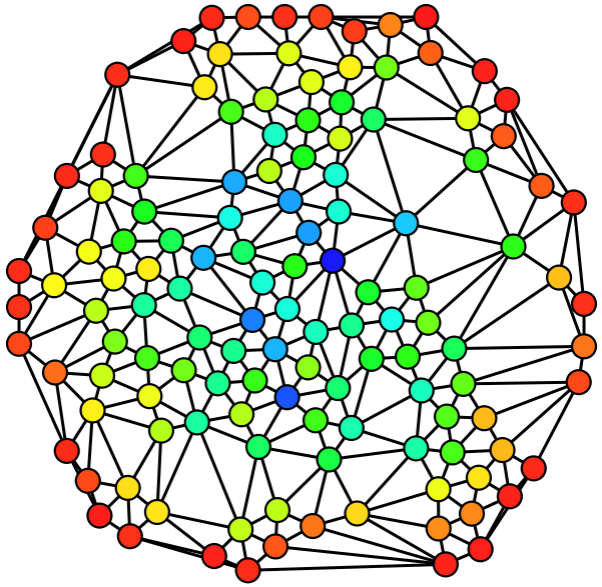


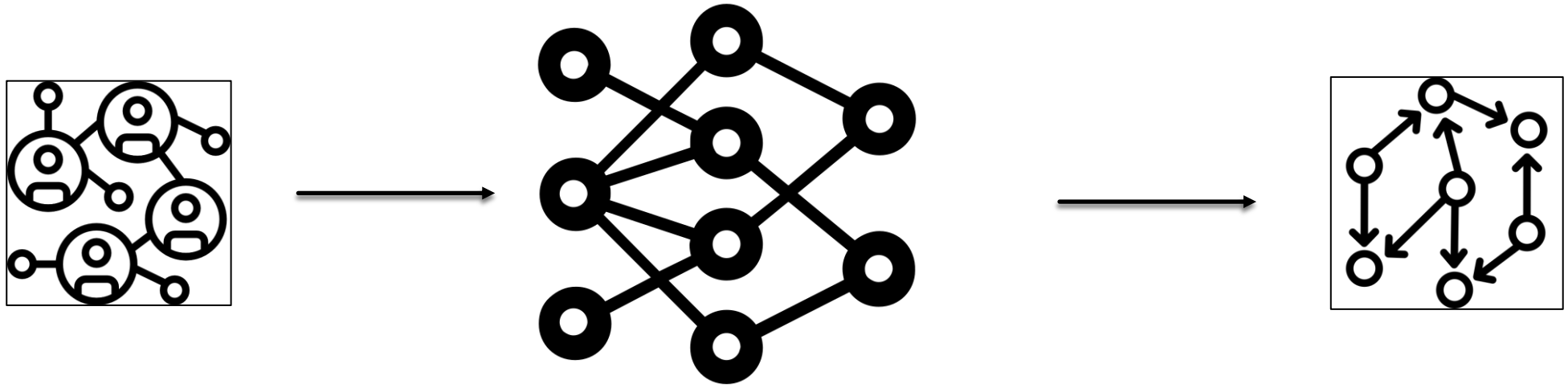
- Graph metrics: degree measures, distance measures, connectivity, centrality



https://en.wikipedia.org/wiki/File:Graph_betweenness.svg

CHALLENGE 3: GRAPH ML METHODS

- A GNN is a neural network that can directly be applied to graphs and provides a convenient way for node-level, edge-level, and graph-level prediction tasks



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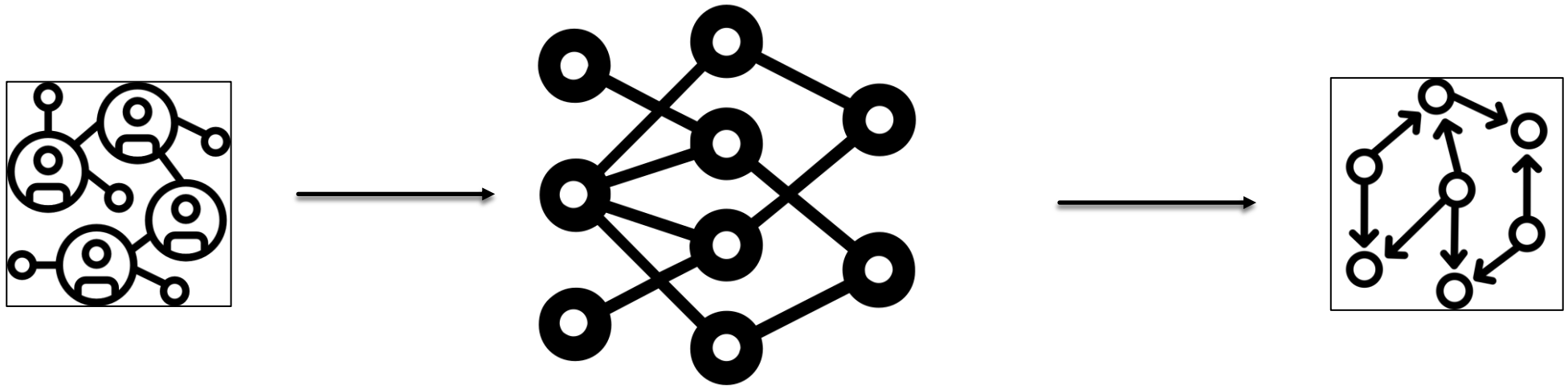

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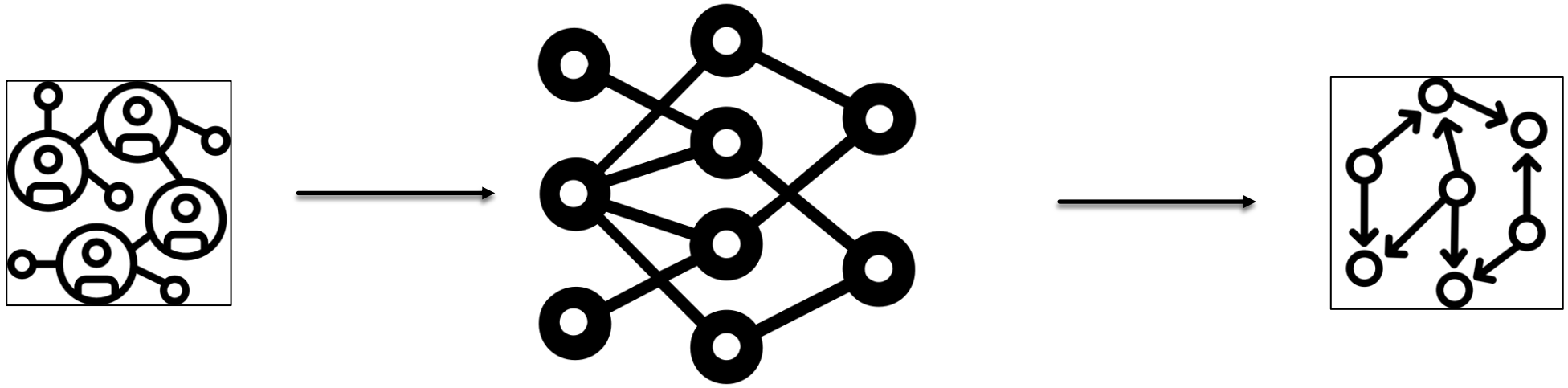

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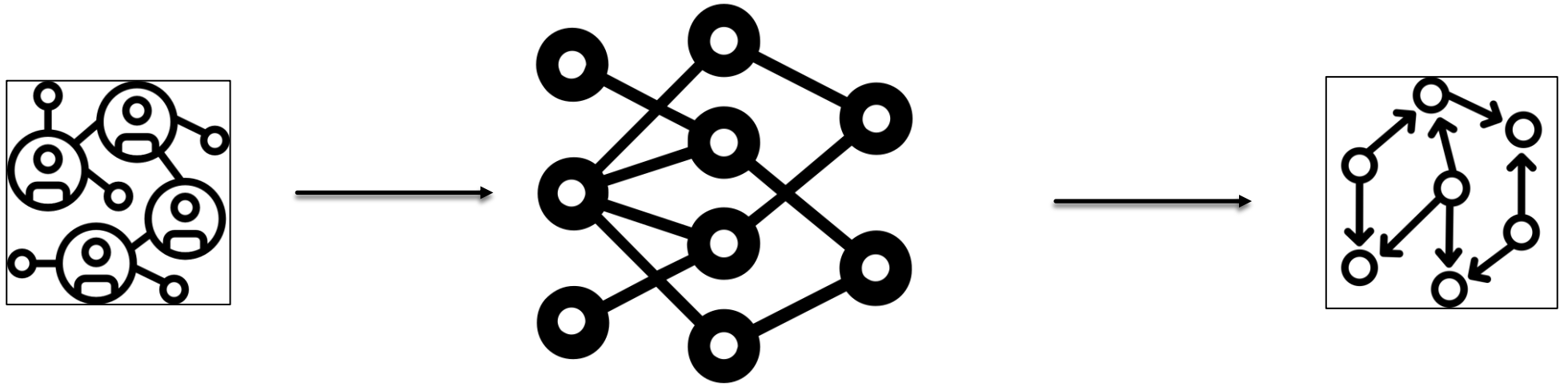
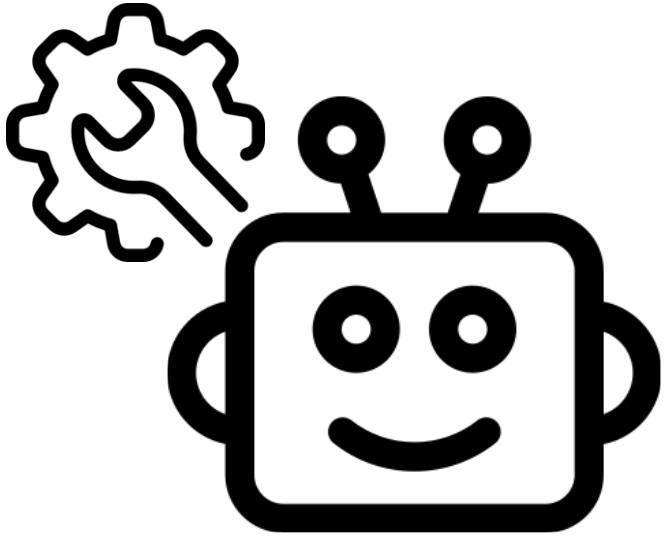
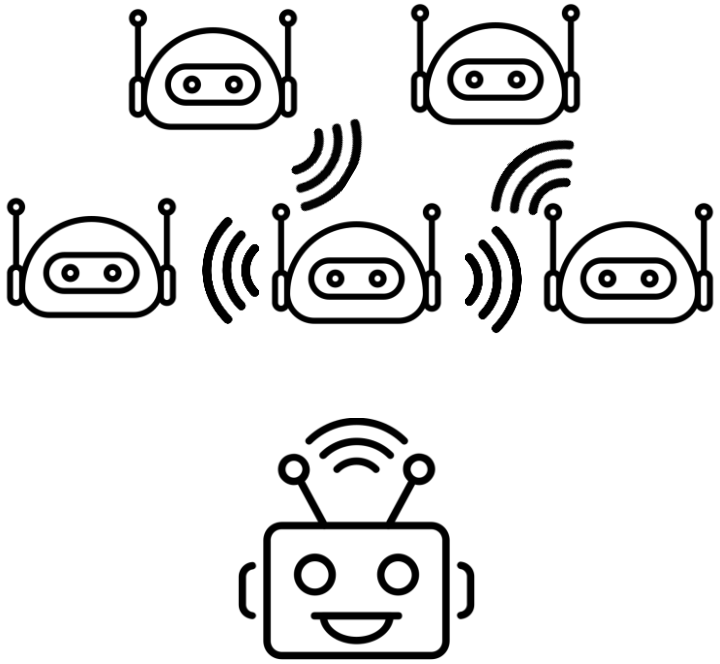


CHALLENGE 4: BOT DEFINITION AND CONFIGURATION

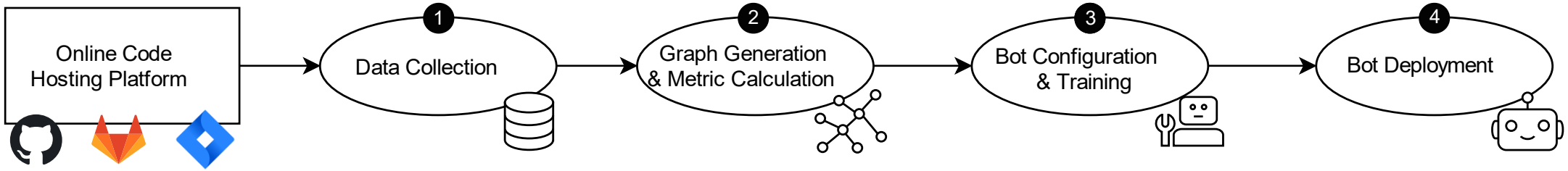
- We propose to define languages to build a smart bots infrastructure able to monitor OSS projects, define and enforce rules, and communicate with the user.





CONCLUSION/NEXT STEPS

- Proposal:



- Challenges:
  - Mining collaboration graphs
  - Graph-specific metrics
  - Graph ML methods
  - Bot definition and configuration

- Thank you!
- Questions?

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