Robhoot 1.0
The Deep Knowledge Network

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1 Summary

The Robhoot project aims to connect research and the public in a decentralized network to help taking informed decisions when solving complex social, environmental and technological problems. Current technologies for scientific inquiry and decision-making are highly fragmented and thus only increase robustness, reproducibility, open-access and the interactions with the public marginally. The goal of Robhoot is to propose a hybrid-technology to lay out the foundation for a open-science research ecosystem aiming to strengthen the robustness and reproducibility of science and the interactions with the public. Robhoot is not set out to deliver a finished deep knowledge network in the science ecosystem, but to provide a science-enabled technology in establishing a prototype proof-of-principle to connect decentralized and neutral-knowledge generation with knowledge-inspired societies.

2 The Science Ecosystem

The process of science requires multiple steps of information transfer among trusted/untrusted peers to build solid evidence-based knowledge in social, economical, natural and technological ecosystems. Solid evidence-based knowledge should be immutable and have a secure peer-to-peer architecture storing the open-source knowledge graphs derived from the research output. These steps are key to have fully reproducible open-access reports when taking informed decisions in complex societal, environmental and technological problems. However, public funded science is highly centralized (Günther, 2018; Inhaber, 1977), prone to errors ((Fang Casadevall, 2011)), difficult to reproduce (Hardwicke. et al., 2019)), and contains many biases (Ioannidis, 2005). These elements make the connection between the scientific process and open-access reporting for decision-making highly improbable. Despite many projects are aiming at making the science ecosystem less centralized and biased while increasing openness and reproducibility (refs) a science-enabled technological paradigm connecting open-science to knowledge-inspired societies is not currently in place.

Many studies in decentralized systems are producing an immense gain in detailed knowledge about scalability, security and decentralization trade-offs (refs; TON network; Fabric ledger OS network). Automation and AI technologies is the other angle from which many advances

Features	Science Ecosystem	Robhoot 1.0
Decentralization	No	Yes
Open-access	Mostly No	Yes
Immutability	No	Yes
Robustness	Mostly No	Yes
Reproducibility	Mostly No	Yes
Owner-Controlled assets	No	Yes

Table 1: *Robhoot 1.0 aims to be designed to resolve desirable properties of science: Robustness, Reproducibility, Decentralization, Open and Direct access to reporting by peers and not-peers*

are rapidly occurring (refs). Yet, while the existing technological paradigm is rapidly shifting towards science-based decentralization and automation technologies, end-to-end open-source research accounting for decentralized, neutral and automated knowledge-inspired technologies are missing. Rapid advances of automated research platforms facilitating data integration accounting for sections of the research cycle are currently under development[1] but open-source decentralized automated platforms accounting for the research cycle are still at a very incipient stage of development. While conceptual frameworks conceptualizing the required layers in many research fields are well established (Figure 1a), there is currently a lack of tools automating the knowledge graphs (Figure 1b) into deep process-based learning networks exploring its robustness (Figure 1c) and decentralization power (Figure 1d).

3 Robhoot Design Goals

Robhoot aims to build an automated knowledge network technology to connect knowledge-graphs to knowledge-inspired societies (Figure 1). Our final aim is to provide real-time open-access neutral data-rule-knowledge to gain informed decisions when solving complex social, environmental and technological problems.

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[1]This is by no means an exhaustive list but it gives an indication of the many projects currently in place: NakamotoT,BigQuery,Automated statistician,Modulos,Google AI,Iris,easeml
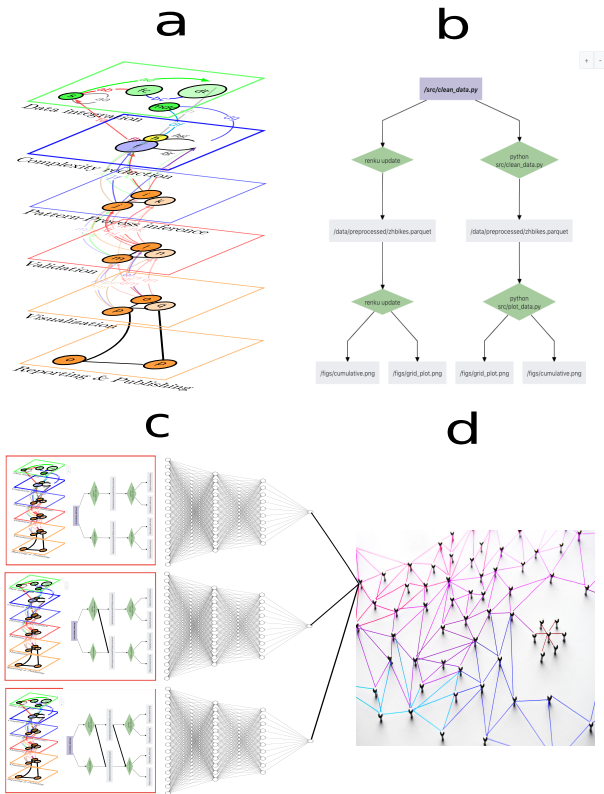
Figure 1: Deep knowledge-based ledger network technology. a) End-to-end research cycle from data integration (top) to reporting (bottom). b) The knowledge graph (KG) tracking one research path of a (i.e., Renku open-source code). c) Deep knowledge-based network automatically exploring a population of KGs to gain process-based understanding of the data. d) The ledger accounts for all the KGs in a distributed network of mutually trusting/untrusting peers with every peer maintaining the population of the KGs (i.e., decentralized P2P git network like Gitchain.) The overall objectives for the project are the following:

3.1 Deep learning networks

- Deploy an automated knowledge-based network technology accounting for end-to-end research in a lineage client-tracker to produce a population of Knowledge Graphs (KGs) (Figures 1a-b).
- Intralayer automation of data integration, inference, and validation (Figure 1a: top four layers).
- Intralayer automation of visualization and reporting generation (Figure 1a: bottom two layers).
- Deep inter-layer automation exploring novel neural biological networks algorithms with lineage client-tracker paths in the multilayer network (Figures 1a-c.)

3.2 Distributed ledger network

- Deploy an end-to-end permissioned-permissionless distributed ledger technology to guarantee decentralization, open-access and security of the KGs populations in the science ecosystem (Figures 1c and 1d.)

- Distributed ledger implementation accounting for consensus algorithms and smart contracts among trusted-untrusted peer-to-peer interactions.
- Exploring consensus algorithms to minimize scalability-security-decentralization trade-offs when storing the KGs in the knowledge network.

3.3 DeepKlen 1.0

- Testnet for the interaction between consensus protocols and the scalability-security-decentralization trade-offs when committing the KGs to the distributed ledger.
- Mainnet to cryptographically link each population of KGs to previous KGs-ledger to create an historical KGs-ledger chain that goes back to the genesis ledger. The mainnet aims to connect database real-time open-access citizen data science to knowledge-inspired societies.

3.4 Robhoot 1.0

- Robhoot Open Network in Biodiversity Research to connect citizen open science to real-time open-access data-rule-knowledge to gain informed decisions when solving local and global environmental problems.
- Citizen open science for biodiversity datasets integration.

4 The multilayer nature of Robhoot

4.1 Data integration

4.2 Complexity reduction

4.3 Inference

4.4 Validation

4.5 Visualization

4.6 Reporting

5 Robhoot in Digital Ecosystems

5.1 Computing Power

5.2 Decentralization

5.3 Neural Networks

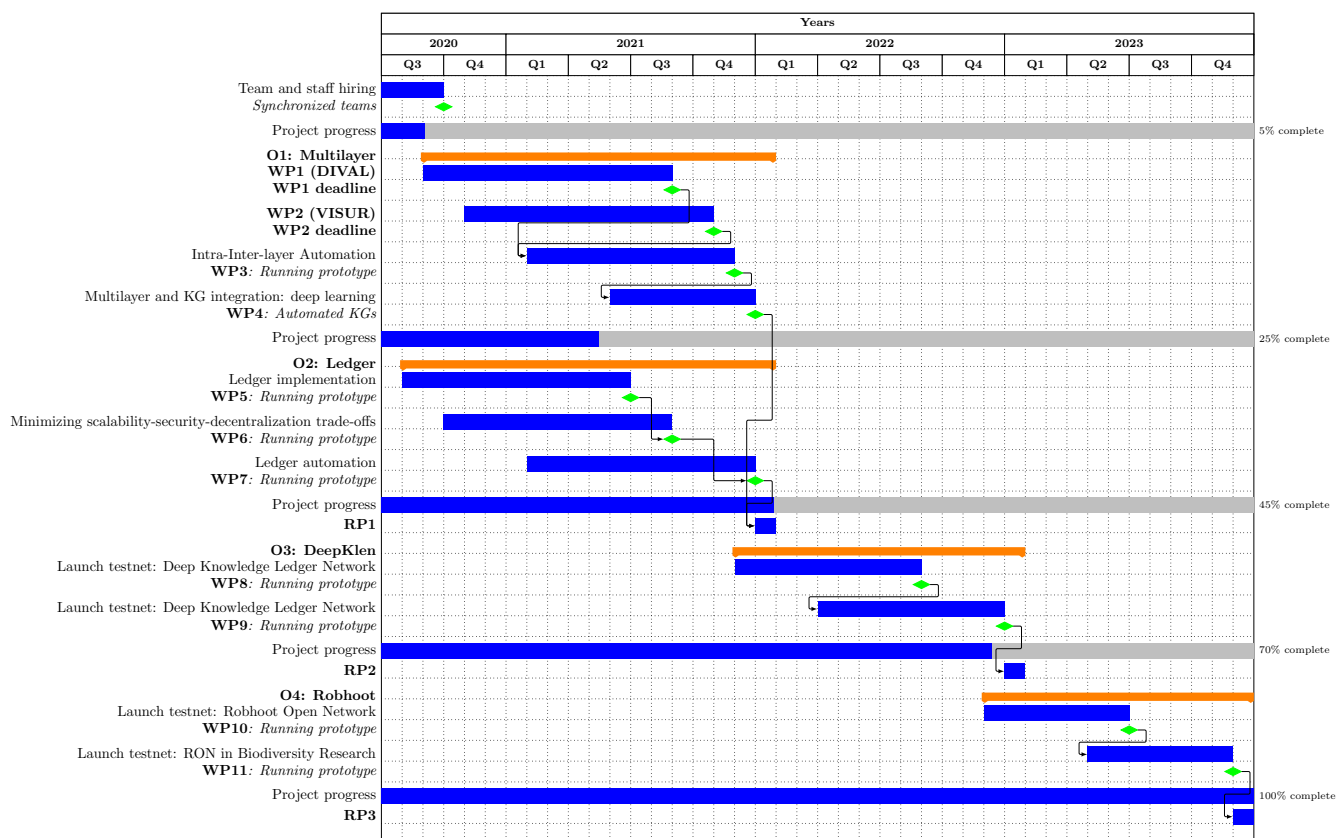# 6 How to contribute to Robhoot

7 The Robhoot roadmap

Figure 2: The Robhoot roadmap

8 Conclusion

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