New Applications for Quadratic Funding

Progress, barriers, & transcendence

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GitcoinDAO

@connoroday0
Let’s take a quick poll...

Who has heard of quadratic funding?
Who here actually understands it?
Who has funded a project in a QF program?
Who only did it because you thought you might get an airdrop in the future?
Emerging Web3 tooling will boost scalability and mechanism design tweaks can drive adoption in new communities.

QF has proven to be a powerful tool but primarily in niche communities and with limited new advancements. As adoption has grown, problems are becoming more apparent.

(TLDW)
(if you can’t miss happy hour)

(QF = gud)
(Scale = hard)
(Innovation + experimentation = transcendence)
WTF is QF?

(spoiler alert)
Why Quadratic Funding?

Quadratic Funding is the mathematically optimal way to fund *public* goods in a *democratic* community.

- **1:1 matching:** both get $100
- **QF matching:** Grant 1 gets $20, Grant 2 gets $180

![Diagram](diagram.png)

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A Flexible Design for Funding Public Goods

Vitalik Buterin  
Ethereum Foundation

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E. Glen Weyl  
Microsoft Research, glew@microsoft.com

We propose a design for philanthropic or publicly-funded seeding to allow (near) optimal provision of a decentralized, self-organizing ecosystem of public goods. The concept extends ideas from Quadratic Voting to a funding mechanism for endogenous community formation. Citizens make public goods contributions to projects of value to them. The amount received by the project is (proportional to) the square of the sum of the square roots of contributions received. Under the “standard model” this mechanism yields first best public goods provision. Variations can limit the cost, help protect against collusion and aid coordination. We discuss applications to campaign finance, and highlight directions for future analysis and experimentation.

*Key words:* public goods, free rider problem, mechanism design
Preferences of the many outweigh the preferences of the few

- **One dollar one vote** (dominated by capital)
- **Quadratic voting (funding)**
- **One person one vote** (dominated by people)

How much influence you purchase

How much you value a given public good
Quadratic Funding & Public Goods

Proposed as means to fund Public Goods
Use cases in practice have mainly focused on this (like Open Source Software)

QF has promising utility in more areas than what we traditionally think of as “public goods”
This classification system is expanding

<table>
<thead>
<tr>
<th>Excludable</th>
<th>Non-Excludable</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Rivalrous</strong></td>
<td></td>
</tr>
<tr>
<td>Private Goods</td>
<td>Common Goods</td>
</tr>
<tr>
<td>Food, clothes, cars, &amp; other consumer goods</td>
<td>Fish, timber, coal</td>
</tr>
<tr>
<td><strong>Non-Rivalrous</strong></td>
<td></td>
</tr>
<tr>
<td>Club Goods</td>
<td>Public goods</td>
</tr>
<tr>
<td>Cinemas, private parks, satellite TV</td>
<td>Clean air, open source software, privacy</td>
</tr>
</tbody>
</table>

what if we defined public goods not by their excludability but by the extent to which they produce positive externalities

Evil Gitcoin
@evil_gitcoin
Public bads funding | coordination disabler
Where we are today
$69,139,898 of Funding for Open Source Software

$69.1m in Results

Nice
Gitcoin Grants Growth

(GR1 / Jan 2019)

200 Contributions  $38k Raised

(GR14 / June 2022)

600k Contributions  $5mm Raised
September 07-22, 2022
Round starts at 3pm UTC

458K+ Number of Contributions
$4.3M+ Total Contributed
39.6K+ Number of Contributors
Ecosystem Rounds - Empowering communities to signal preferences

**ETH Infra** - $500K
People and projects supporting core Ethereum infrastructure

**polygon** - $100K
Projects building on and supporting the Polygon Network

**ENS** - $42K
Projects supporting the mission of ENS and ENS DAO

**Unlock** - $25K
Projects in support of the unlock community and protocol

**Protocol Labs** - $50K
Projects advancing the use of IPFS, FilCoin, and other PL ecosystem projects

**Subgraph Scholarships** - $50K
Open source projects developing or supporting subgraphs

**ZK Tech** - $145K
Projects advancing Zero Knowledge tools, libraries, protocols, and communities

**Open Gaming** - $100K
Projects building web3 gaming tools, infrastructure, and community

**celo** - $50K
Open source projects building in the Celo ecosystem

**AURORA** - $100K
Open source projects supporting the AURORA ecosystem

**Loot**
Projects advancing the Loot ecosystem, aka the Lootverse

**Web3 Social** - $50K
Projects advancing the Web3 Social Network movement
Cause Rounds - Breaking QF out of the Web3 Bubble

Climate Solutions - $350K
Projects combating climate change

Decentralized Science - $500K
Support projects in decentralized science

Diversity, Equity, & Inclusion - $150K
Public goods projects Diversity, Equity, & Inclusion

Longevity - $500K
Decentralized projects sustaining longevity

Advocacy - $300K
Public goods projects advocating change in web3

Support for Ukraine - $700K
Humanitarian aid to the Ukrainian people
Hon. Member of Parliament for Tororo municipality & Representative of #climatechange in @Parliament_Ug plants #bamboo at the river banks in Tororo as he takes #ClimateAction to fight #climatecrisis @KagutaMuseveni @JanetMuseveni @GretaThunberg @RefiSpring @regensunite @GitcoinDAO
Geographic QF - Regional & Local Rounds

Oakland - $15K
Local round - Restorative Justice for Oakland Youth

The Hidden Genius Project
by oakcommunity
Last Update 1 week ago  RiskScore ™ 0.0000
Grants Round GR4 - Main, Oakland Local Chains:
$214 raised from 33 contributors
Est. Matching $915

Community Kitchens
by oakcommunity
Last Update 1 week ago  RiskScore ™ 0.0000
Grants Round GR4 - Main, Oakland Local Chains:
$167 raised from 11 contributors
Est. Matching $253

Greater China - $50K
Open source projects in the Greater China ecosystem

Downtown Stimulus Package
Transition capital for Boulder's small businesses

Deva the Devcon Unicorn
@EFDdevcon

Introducing a quadratic funding round during Devcon organized by the LatAm community to support local projects!

If you are a project in LatAm looking for funding, sign up today!

Brought to you by: @ETHColombia @ETHLatam @EthereumHN @clr.fund

ethcolombia.clr.fund
4:58 PM · Sep 26, 2022 · Twitter for iPhone
Growing pains

Section 3
This is what a sybil attack looks like..

Gaining influence, altering decisions
Subverting systems reputation

don't let it happen to you!
Mitigating Sybil Attacks & Fraud

Infinite game of Red Team vs. Blue team

Sybil Sybil Sybil

Sybil attacks are increasing with adoption
Airdrop farmers
Self donors
Collusion

Fraudulent Grants

Impersonations
Emulations

The solution? Identity!

GR15 Fraud Report

Squelching (Reactive Mitigation)

<table>
<thead>
<tr>
<th>Overall</th>
<th>GR11</th>
<th>GR12</th>
<th>GR13</th>
<th>GR14</th>
<th>GR15</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Sybil Donors Squelched</td>
<td>853</td>
<td>8100</td>
<td>2071</td>
<td>16073</td>
<td>9176</td>
</tr>
<tr>
<td>Total Donors</td>
<td>16597</td>
<td>27260</td>
<td>16651</td>
<td>44736</td>
<td>39758</td>
</tr>
<tr>
<td>% of total Donors Squelched</td>
<td>5.14%</td>
<td>29.71%</td>
<td>12.44%</td>
<td>35.93%</td>
<td>23.08%</td>
</tr>
<tr>
<td>Total Sybil Donations</td>
<td>29300</td>
<td>115000</td>
<td>23,951</td>
<td>167988</td>
<td>155683</td>
</tr>
<tr>
<td>Total Donations</td>
<td>441644</td>
<td>482293</td>
<td>306898</td>
<td>600869</td>
<td>465267</td>
</tr>
<tr>
<td>% of donations that are sybil</td>
<td>6.63%</td>
<td>23.84%</td>
<td>7.80%</td>
<td>27.96%</td>
<td>33.46%</td>
</tr>
<tr>
<td>$ Value of Sybil Donations</td>
<td>$710,139</td>
<td>$68,060</td>
<td>$337,143</td>
<td>$225,380</td>
<td></td>
</tr>
<tr>
<td>Total $ Value of all Donations</td>
<td>$1,620,800</td>
<td>$3,214,587</td>
<td>$1,462,659</td>
<td>$1,735,349</td>
<td>$1,306,724</td>
</tr>
<tr>
<td>% of total donation $ from sybil</td>
<td>0.00%</td>
<td>22.09%</td>
<td>4.65%</td>
<td>19.43%</td>
<td>17.25%</td>
</tr>
</tbody>
</table>
The plan?

Get airdrop farmers to donate to @gitcoin grants while improving Sybil attack detection in order to accelerate the adoption of decentralized identity, convert degens to regens, and fund public goods without them meaning to.
Gitcoin Grants 1.0

Until now Gitcoin QF rounds have run on a centralized stack

Necessary to prevent fraud/Sybil attacks, but:
- High bandwidth requirements
- Centralized decision making
- Humans prone to error

The path towards decentralization includes:
- A permissionless protocol
- Resilient identity systems
- Community curation
- Self serve product features
New primitives and tooling

Decentralized identity
Without reliable identity systems, permissionless QF platforms will never work at scale

Gitcoin Passport - OSS dapp
💡 Privacy preservation → No PII in the passport
△ Decentralization → No centralized data storage (Ceramic Network)
💰 Gitcoin Trust Bonus Reader and Scorer
🛠 Open Source SDK; Integrate with your dApp

60,000 passports already created!
Sybil Resistance

quadratic funding
quadratic voting
Fair launches
UBI
one-person-one-vote DAOs
data collectives
Plural funding
New primitives and tooling

Incentivized community curation

Staking on identities, grants, reputation, can gamify protocol defense, penalize fraud and bad actors

Token Curated Registries

Popularized in 2017 (A.D.), TCRs are trusted lists maintained by communities via an incentivized voting game

Leverage the “Wisdom of the Crowd”

Aligns incentives among token holders

TCRs making a comeback?

Are TCRs back?

Confession time: I don't know what the following phrases are and have just been nodding my head whenever someone talks about them:

- Quant (as in the job)
- DeSci (found out earlier tonight)
- Gang Gang (I don't know if this is a phrase or verb or what)
- TCRs (irrelevant now?)
New flavors of QF
FUND THE RAINBOW.

TASTE THE RAINBOW.
QF in practice strays from the “pure” math

And that’s ok :)  

*Fixed matching pool and fixed time limit = matches scale based on saturation

- Trust verification & bonuses
- Matching caps
- Pairwise Bounding
- Overlapping rounds

What is optimal?

\[ v_i^p \left( \left( \sum_j \sqrt{c_j^p} \right)^2 - c_i^p \right) \]

\[ ^\text{^Sqrt 1 contribution^} \]

\[ ^\text{^Sum of all Sqrt^} \]

\[ \text{Yellow } = \text{ matching}^* \]

It's only real Quadratic Funding if it comes from the \([Vip((\sum j \sqrt{cpj})^2) - Cpi]\) region of France. Otherwise, it’s just sparkling coordination
Pairwise Bounding (& extensions)

A deterrent mechanism based on patterns between users to protect against Sybil attacks/collusion

Less correlated pool of donors = more matching
More correlated pool of donors = less matching

Plural pairwise QF: incorporating social distance to encourage outgroup collaboration with SBTs/DID
MACI - Privacy by Design

Minimal Anti-Collusion Infrastructure

MACI voting (or funding) is private, helping to avoid collusion and vote buying.

When applied to QF, MACI ensures users cannot prove how they donated.

Source - Release Announcement: MACI 1.0
Retroactive Public Goods Funding

Expert driven, proportional to past value generated

In practice, “whitelisted”, QV not QF

Providing OSS projects an exit incentivizes new initial funding sources

Exciting Gitcoin <> Optimism collab in the works!

Do you reward past work in regular QF rounds?
Dominance Assurance Contracts

Mitigating the free rider problem for public goods

**Assurance Contract** - if a threshold ($ raised or # of donors) is not met, donors are refunded

**Dominance Assurance Contract** - if threshold is not met, refunds include an additional bonus

A DAC could be structured so if it is funded, the project owner retains some profit. Win-win for donors: Public good gets funded, or they earn a profit (dominant strategy?)

*Kickback*

Incentivizing event attendance through crypto economics
Quadratic Voting

Do we need the F in of QF?

QV, the predecessor to QF, may better serve the needs of some communities

Needs strong Sybil protection or whitelists/permissions

More useful for single choice decisions

Lacks the QF benefit of raising additional funds via user contributions
What’s next?
Balancing the scales of scalability

Create a customizable, permissionless, multi-chain grants protocol with the newest Web3 features

Create a simple, user friendly grants platform to break QF out of the blockchain bubble
The Gitcoin Grants Protocol

Permissionless
Modular
Decentralized
= communities can rapidly test different public goods funding mechanisms
We envision... project owners using the Grants Hub to kickstart their project’s existence and then as a vehicle for growth hundreds of funding programs running at any time, designed and operated in a self-sovereign way by the communities they serve.
Choose your own adventure

**Monolith**

**Grants registry**
- Main Gitcoin Round
- Side Rounds

**Platform**
- Other grants platforms/protocols
  - CLR Fund
  - Retro PG
  - EF ESP

**Ecosystem**
- MACI QF
- Pairwise QF
- Retro Public Goods
- Conviction Voting
- Proof of Impact

**Governance**
- Ratify Round Params
- Sybil Prevention
- Grants Curation

**Gitcoin Grants Protocol**
- Governance
- Curation
- Ratify Round Params
- Sybil Prevention
- Grants Curation
Thank you!

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