Voting in Participatory Budgeting

Lodewijk Gelauff - www.bijv.org - lodewijk@stanford.edu

Deliberative Democracy Lab - deliberation.stanford.edu

Joint work with Ashish Goel's Crowdsourced Democracy Team

SCaLE 21x
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Background: My Research

Engaging residents in policy decisions, using online technology

- Structured conversations for an open-ended consultation at scale
  - Video-chat Deliberation platform self-moderating small groups
  - stanforddeliberate.org
- Participatory budgeting
  - Voting in participatory budgeting elections (cities etc)
  - PBstanford.org
- City budgeting feedback
  - More bespoke approaches - happy to discuss!
  - budget.pbstanford.org

Today

- Participatory Budgeting
  - Overview
  - Process
- Stanford Participatory Budgeting Platform
- Voting methods
  - Overview
  - Comparative research
- Other budget feedback processes
  - Clustering
- What else?

Democratic decision making

- Decaying trust in politics and politicians
- People want to be involved
  - Interest in local politics high?!
  - Beyond ‘politics’
- Transparency
- Accountability

Stanford Crowdsourced Democracy Team

Management Science and Engineering, Prof. Ashish Goel

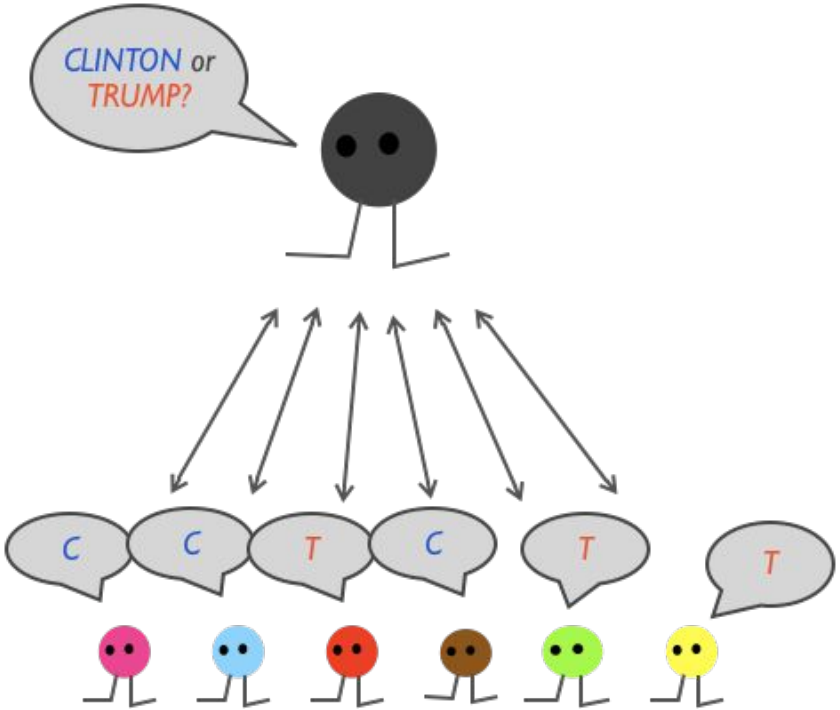
Improving societal decision making through online tools.
Scaling up participatory decision making in a fair and efficient way.

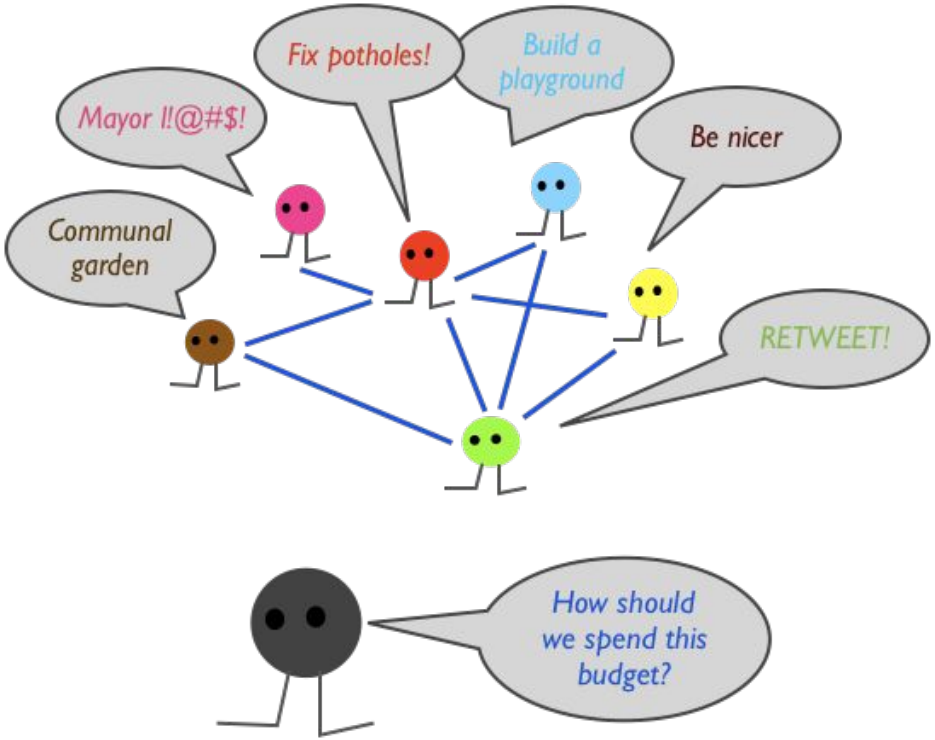
Focus on complex decisions: budgets, deliberations, negotiations

Theory and practice: designing, analyzing, implementing and comparing group decision algorithms

Collaborate with governments and NGO's: provide tools

Complex decisions





Participatory Budgeting

Gelauff, Lodewijk, and Ashish Goel. “Rank, Pack, or Approve: Voting Methods in Participatory Budgeting”, *Under review* (2024) ArXiv:2401.12423

Why PB?

Courtesy: David Lee

Fluid concept

So many definitions!

- First mention in late 1980s (e.g. Porto Alegre, Brazil)
- 11,000+ processes counted worldwide (PB World Atlas), 300+ in USA (PBP)
- Different definitions. In common: allocate budget across items (projects) with stakeholder participation.
- Often participation in both in development of projects and some voting phase

Process

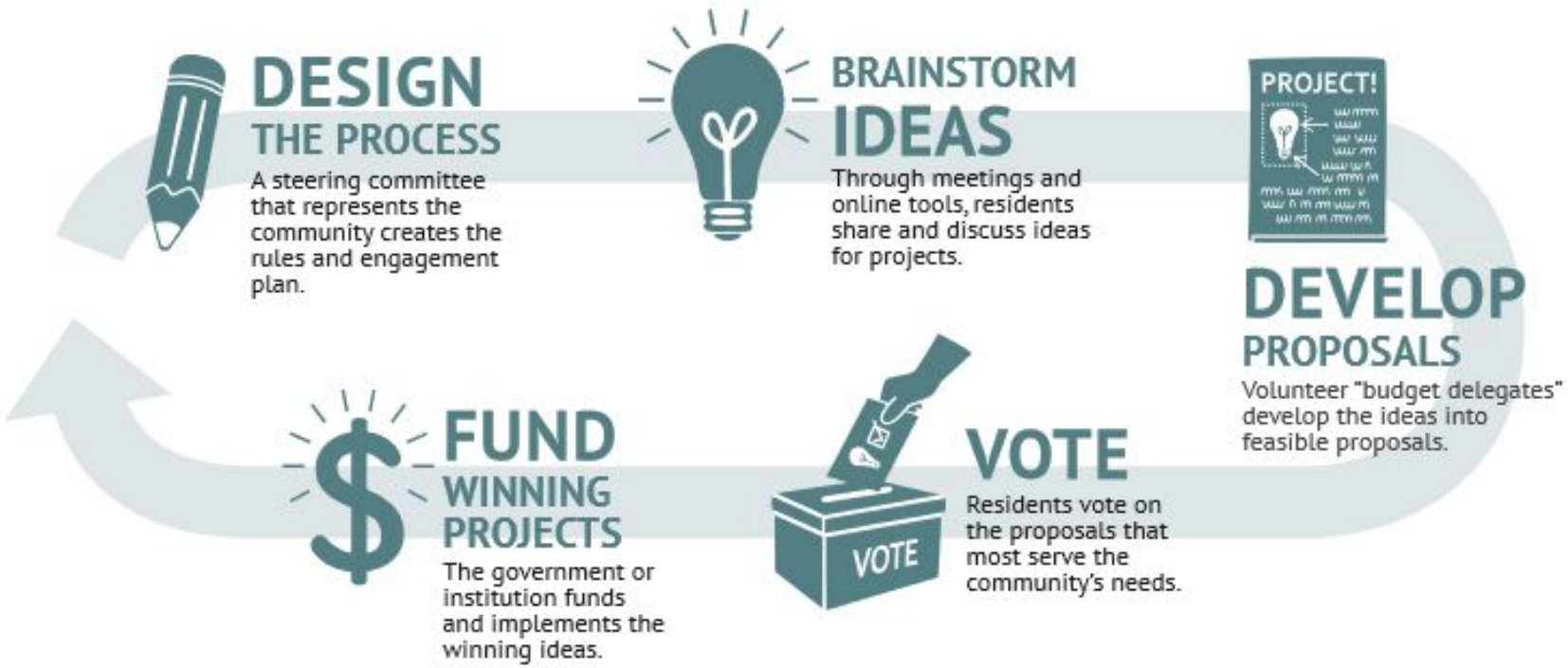


Image: Participatory Budgeting Project

BALLOT QUESTION NUMBER 2

How should the remaining portion of the 49th Ward menu money be allocated?

You may vote for up to FOUR (4) projects from the seven (7) projects below (select no more than four).

PROJECTS	COST
☐ 1. Park Benches Replace seven old benches at Loyola, Touhy, Pottawattomie Parks and add a new bench at Sherwin beach.	$40,000
☐ 2. New Streetlights on Greenview adjacent to Kilmer Elementary and Sullivan High Schools Replace the old residential streetlights on the 6600 and 6700 blocks of Greenview, from Albion to Pratt, with new, brighter streetlights.	$212,000
☐ 3. Water Feature at Langdon Park Install a new water feature at this park at Albion and Ravenswood to allow for fun play and cooling off in the hot summer months.	$150,000
☐ 4. Jarvis Countdown Crosswalk Install a countdown crosswalk sign at the northeast corner of Clark and Jarvis to help pedestrians cross Jarvis safely.	$20,000
☐ 5. Zócalo in Touhy Park (a "zocalo" is the public square of a Mexican city or town) Build a public plaza/stage at ground level in Touhy Park for cultural expression and community engagement.	$40,000
☐ 6. Pratt Bike Lane Extension Provide striped bike lanes on Pratt from Clark to Ridge. This will allow for an uninterrupted bike lane on Pratt from Sheridan to Kedzie.	$30,000
☐ 7. Park Community Bulletin Boards Install two bulletin boards at Pottawattomie and Touhy Parks to provide information on local events.	$14,000

PARTICIPATORY BUDGETING PB 49 WARD49.COM

A - City Roots Community Land Trust
City Roots wants to purchase property to build the community land trust in Rochester, which keeps land permanently affordable to the public and gives community members a voice in neighborhood development.
Total Budget: $50,000

B – Emergency Security Deposit Fund
Funding for this project will be used to provide emergency security deposit funding to families in need of assistance, administered through the Rochester Continuum of Care.
Total Budget: $50,000

C – Consumer Credit Counseling Services (CCCS)
CCCS is a local-nonprofit that has improved the financial wellness of Rochesterians since 1970. This funding will increase our capacity to provide 400 more 1:1 financial counseling sessions, enroll 25 low-income residents in long-term financial coaching, and enroll 25 youth in our financial education program.
Total Budget: $50,000

D – Feed People, Not Landfills: Flower City Pickers Food Recovery
The Flower City Pickers (FCP) Food Recovery Project will allow FCP to recover and distribute safe, nutritious, but formerly landfill-bound food to a network of 45+ food pantries, homeless shelters, soup kitchens, and local farms at no cost to the receiving agencies.
Total Budget: $ 30,000

E – Rochester Youth Education Summit
A Summit for Rochester City School District students with various speakers, workshops and panel discussions addressing many of the issues the youth in our city face on a daily basis: poverty, financial literacy, structural racism, trauma, career building. The Summit's aim would be to EDUCATE, ENGAGE & INSPIRE our most important gift - our children - toward personal and professional success.
Total Budget: $20,000

F – *RCSD School 16 Builds Community in the 19th Ward*
Guest specialists and faculty help students to strengthen character, learn, create, and perform. Students are celebrated in an Art and Music Festival
Total Budget: $19,654

G – The Esther Project
The Esther Project seeks to provide women and their children with transitional housing and support. This funding would allow the project to finish a house and begin using it as space for women to live and thrive!
Total Budget: $25,375

H – House of Mercy Next Steps Moving Company
The House of Mercy Next Step Properties Moving Company Project seeks to provide furnishings and moving services for individuals transitioning from homeless shelters to permanent housing. This funding would fund and staff a storage facility for furniture donations, along with pick-up and delivery of those items.
Total Budget: $50,000

I – Rochester Community Facebook Page
On any given day in Rochester, there are community events that are fun, informative, and free. A Facebook page dedicated to promoting these events in Rochester will make it easier for people to find out about these events. This Facebook page will increase attendance to these events and help build a sense of community in Rochester.
Total Budget: $10,000

J – North Star Shines
North Star Shines is a project that will involve youth in the development of skills that include public speaking and drama. It would increase ELA skills as well as the history of African Americans. The works of August Wilson, Frederick Douglass and others will be used to move this project.
Total Budget: $15,000

K – Supporting Community Gardens & Urban Farms in Rochester
Foodlink and Eat Smart New York seek funding to support community-based and entrepreneurial urban agriculture operations in Rochester. 6-10 existing operations will receive $2,000-$5,000 for materials & equipment, structures, land acquisition or participant support. Funded operations will also receive coaching, technical assistance and cooking & nutrition education.
Total Budget: $30,000

L – *Emergency Services Family Stabilization Network (ESFSN)*
Funding for this project would go to a network of agencies throughout Rochester and would be used to resolve the immediate needs of families for food, clothing, rent/mortgage assistance, transportation, etc.
Total Budget: $50,000

M – EMANCIPATION
The EMANCIPATION Project is designed to **free** our community of trauma caused by Domestic Violence, Sexual Abuse, Poverty and Racism. Funding will allow ALL of the community to share their experiences and heal through radio, outreach, church sermons, small groups, workshops, whichever the community is comfortable in sharing and healing.
Total Budget: $45,000

N – The Hangout Spot
"The Hangout Spot," a program of Marvelous Mind Academy, seeks to ***rectify*** all barriers to parents entering and staying in the workforce with an ***innovative*** childcare solution operable during B and C shifts. The Hangout Spot will be setup as a worker-owned coop and funding will allow The Hangout Spot to appropriately remodel a space and purchase quality play materials and child-safe furniture.
Total Budget: $50,000

O – 1st Mile Last Mile
Provide transportation (i.e. ride hailing or van pooling services) to assist those in need when public bus transportation is not enough.
Total Budget: $50,000

P – House of Mercy Emergency Housing Fund
The House of Mercy Emergency Housing Fund Project seeks to provide immediate funding to prevent homelessness or keep people in housing. This project would provide funding and improve coordination of funds with needs. It will also fund creating and managing a tracking system to follow clients' progress and improve allocation efficiencies.
Total Budget: $50,000

Q - *146(go)5*
Lead by local Artist Shawn Dunwoody, 146(go)5 will use neighborhood engaged public mural art and community clean up to generate social change, creative place-making, beauty, and positive attention to a historic area of Rochester, the 14605 zip code, also known as CONEA.
Total Budget: $50,000

R – *Free Bicycles for Work or School*
Funding would go to R Community Bikes to provide free bicycles for people to use to get to work or school.
Total Budget: $10,000

S – Growing Out of Poverty
Training, Deploying & Employing School Without Walls (SWW) Community Service Students to Support Community Gardening, Greening & Farm Projects Across the City of Rochester - Healthy Activity, Healthy Food & Healthy Neighborhoods
Building a Workforce for a Green Future...
Total Budget: $31,650

T – Tiny House Project
The Tiny House Project seeks to provide very low income individuals, particularly veterans, with affordable permanent housing. This funding would build a prototype house to advance the creation of a Tiny House community in Rochester.
Total Budget: $50,000

U – Concrete Rose Project
The Concrete Rose Project will connect high school students with career exploration, training, and employment opportunities, $23,000 of our funding specifically allocated to pay young people for training and project based work. Furthermore, we will establish a social-emotional skill development program for young men of color ages 10-12 y/o for the purpose of assisting the participating youth to make a smooth transition from boyhood to manhood.
Total Budget: $50,000

V – Homebuyer Prep /Credit Improvement
This project will provide free case management services, financial literacy courses, and credit building loans to people living in the city of Rochester that want to improve their credit and purchase a home. This project is a partnership with Visions Federal Credit Union and the Rochester Homeless Continuum of Care.
Total Budget: $50,000

VOTE HERE!

Please use this space to select your top 5 projects by writing the project letters in the box below. The 1st box is your 1st choice project.

1st	2nd	3rd	4th	5th

Why digital/online

- Young voters!
- Richer information for voters (optional data, audiovisual)
- Ease of voting
- If online: Reach out to new audiences through advertising
- Analysis: faster counting!

Photo: Sukolsak Sakshuwong

Participatory Budgeting

Some interesting tidbits from the academic literature:

- Analysis from New York suggests that engaging traditionally underrepresented groups increases their likelihood of voting in elections
- Engagement in budget exercises has been shown to improve understanding of budgetary issues
- Turnout is often low, and recruiting a representative cohort is not straight forward.

Organizing PB?

Lots of great documentation at:

- PBP: https://participatorybudgeting.org
- People Powered: https://peoplepowered.org

Or catch me after, and I'll be happy to chat or connect!

- lodewijk@stanford.edu

Online tools

Multiple online tools are available to organize one component or another.

- Collect ideas
- Online synchronous meetings
- Asynchronous collaboration to improve projects
- Pre-selection
- Voting
- Evaluation

Elicitation & aggregation

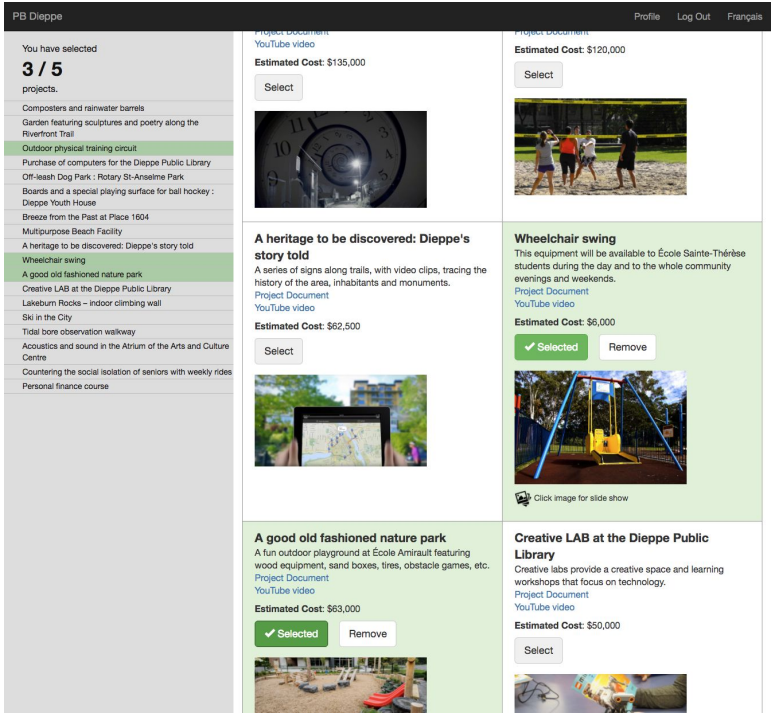
Voting method components:

- Elicitation
- (Consideration)
- Aggregation

PB Stanford

- Since 2012
- Primarily digital, but allows paper ballot
- Currently used in multiple cities, incl. Seattle, Chicago, Cambridge MA, Vallejo
- Multiple voting methods
- Flexible visualization
- Interested to help cities with targeting campaigns

https://github.com/StanfordCDT/pb



Overview

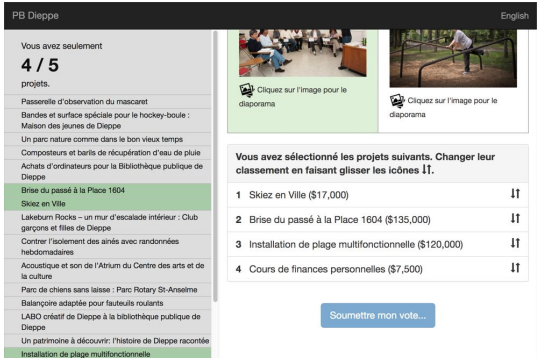
Stanford Participatory Budgeting Platform allows cities, municipalities, states and foundations and other organizations to run a participatory budgeting (PB) election in which people can vote on the budget. This project is made by the Stanford Crowdsourced

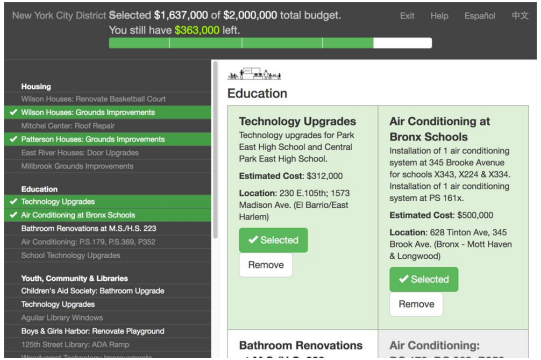
Stanford PB Platform

Settings determined by election organizer:

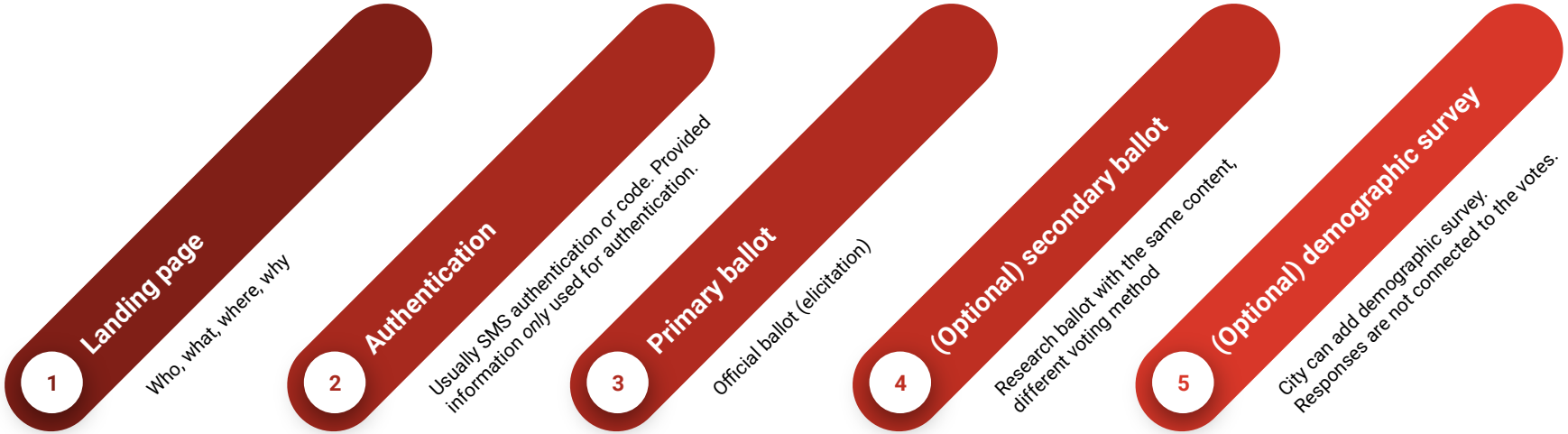
- Voting method: K-approval, K-ranking, knapsack, K-token
- Language
- Voter validation
- Voter registration
- Voting phases
- Available budget (B)
- Elicitation constraints (e.g. K)
- Project appearance
- Demographic survey

Optional: research ballot





From the perspective of the voter



Decisions to make

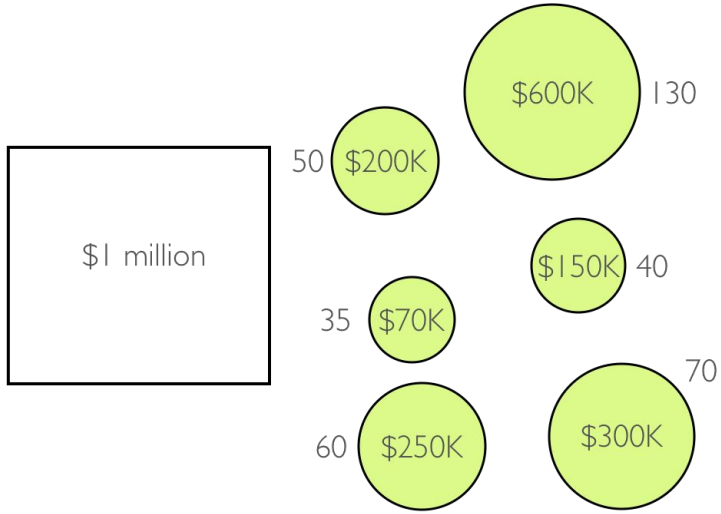
- Languages
- Authentication
- Ballot size
- How to access ballot
- Voting method
- Survey

Voting methods

Budget voting

Problem:

- Fixed budget
- Limited set of proposals
- Each project has an associated cost
- Each voter has a utility for each project
- Each project then has an average utility



We want to maximize the total utility and arrive at the best societal outcome.

Voting methods

Multiple ways to ask a question

- Approval voting
  - Select K projects
- Ranking
  - Select K projects, and rank them in order
- Knapsack/shopping cart
  - Select projects based on an allocated budget
- K-token
  - Distribute K tokens over the projects

Each method eventually arrives at an ‘aggregate’: which projects get funded

Approval voting

Select K projects from our proposals.

- Hard to consider trade-offs
  - Should we fix a pothole for $1,000 or build a fountain for $10,000?
- Odd incentives: approval voting is not strategy proof. There are scenarios where voting for something else than your preference gives you a better outcome.
- Aggregation is not straight forward

But: easy to implement on paper. Familiar.

Greensboro District 1 Español

City Council.

2. The information provided will help you familiarize yourself with the project proposals in your district for 2016. You may choose up to 5 projects.
3. Voting is open to all residents of Greensboro, ages 14 and up.

Submit My Vote...

You have selected

3 / 5

projects.

Safety & Environment

- ✔ Crosswalk Benbow Park
- Crosswalk at Vandalia Road and Randleman Road
- ✔ Pet Waste Basket Benbow Park

Parks & Recreation

- Weather Proof Stone Game Tables (Location being designated)
- ✔ Updated Equipment in Woodlea Acres Park
- Weather Proof Stone Game Table (Location being designated)
- Weather Proof Stone Game Tables (Location being designated)
- Shade Cloth Covers at Warnersville Pool

Special Projects

- Bus Application

Arts & Culture

- Bus Mural
- Playprint Glenwood Recreation Center

Streets, Sidewalks & Transportation

- Bus Shelter Glendale Road & Randleman Road
- Traffic Lane Randleman Road & Glendale Drive
- Bus Shelter Lake Field Drive & Vandalia Road

Safety & Environment

Crosswalk Benbow Park

This project's goal is to create a safe connection across a street connecting a park and residential housing at 1901 S. Benbow St.

Estimated Cost: $4,000

✔ Selected | Remove

Crosswalk at Vandalia Road and Randleman Road

This project focuses on the repair and creation of crosswalks in the W Vandalia Rd. and Randleman Rd. intersection. It is also recommended that crosswalk signals be added on each corner.

Estimated Cost: $20,000

Select

Pet Waste Basket Benbow Park

Install pet waste bag dispenser and trash receptacle at Benbow Park.

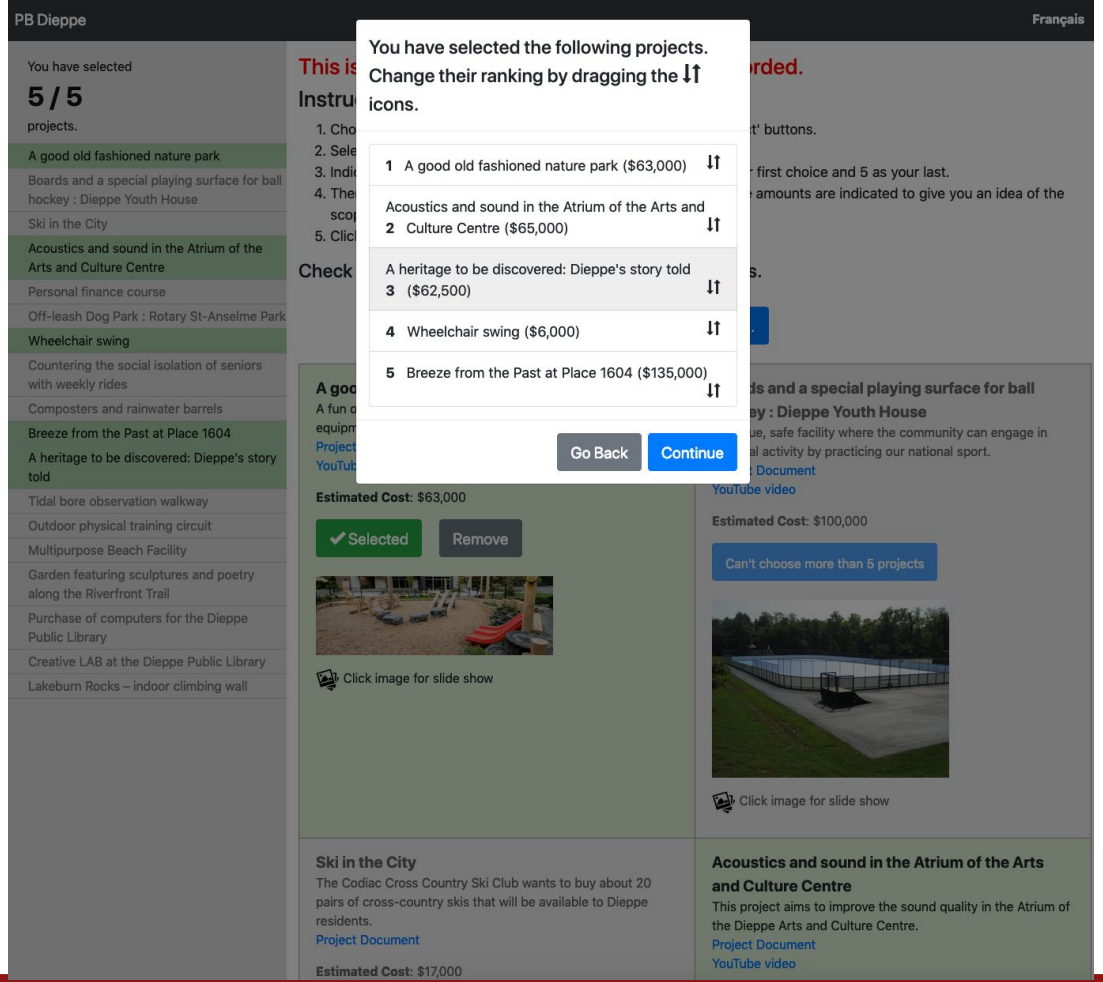
Estimated Cost: $300

✔ Selected | Remove

K-ranking

Select K projects, and then rank them in order of value for money.

- Trade-offs are still difficult
- Aggregation is not necessarily straight forward
  - Typically use Borda count to aggregate (more ‘points’ for a higher rank)
- Can also be paper alternative for knapsack voting


PB Dieppe
Français
You have selected
5 / 5
projects.
A good old fashioned nature park
Boards and a special playing surface for ball hockey : Dieppe Youth House
Ski in the City
Acoustics and sound in the Atrium of the Arts and Culture Centre
Personal finance course
Off-leash Dog Park : Rotary St-Anselme Park
Wheelchair swing
Countering the social isolation of seniors with weekly rides
Composters and rainwater barrels
Breeze from the Past at Place 1604
A heritage to be discovered: Dieppe's story told
Tidal bore observation walkway
Outdoor physical training circuit
Multipurpose Beach Facility
Garden featuring sculptures and poetry along the Riverfront Trail
Purchase of computers for the Dieppe Public Library
Creative LAB at the Dieppe Public Library
Lakeburn Rocks – indoor climbing wall
You have selected the following projects. Change their ranking by dragging the ⇅ icons.
1 A good old fashioned nature park ($63,000)
2 Acoustics and sound in the Atrium of the Arts and Culture Centre ($65,000)
3 A heritage to be discovered: Dieppe's story told ($62,500)
4 Wheelchair swing ($6,000)
5 Breeze from the Past at Place 1604 ($135,000)
Go Back
Continue
Estimated Cost: $63,000
Selected
Remove
Click image for slide show
Estimated Cost: $100,000
Can't choose more than 5 projects
Click image for slide show
Ski in the City
The Codiac Cross Country Ski Club wants to buy about 20 pairs of cross-country skis that will be available to Dieppe residents.
Project Document
Estimated Cost: $17,000
Acoustics and sound in the Atrium of the Arts and Culture Centre
This project aims to improve the sound quality in the Atrium of the Dieppe Arts and Culture Centre.
Project Document
YouTube video

Knapsack (shopping cart)

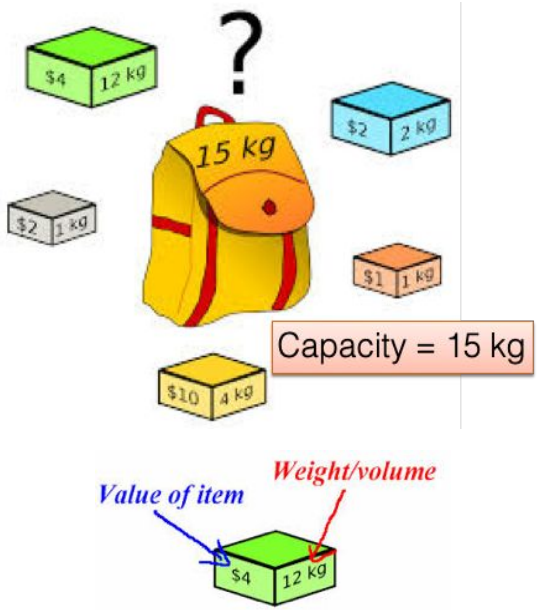
Hold voters to same constraints as the decision maker

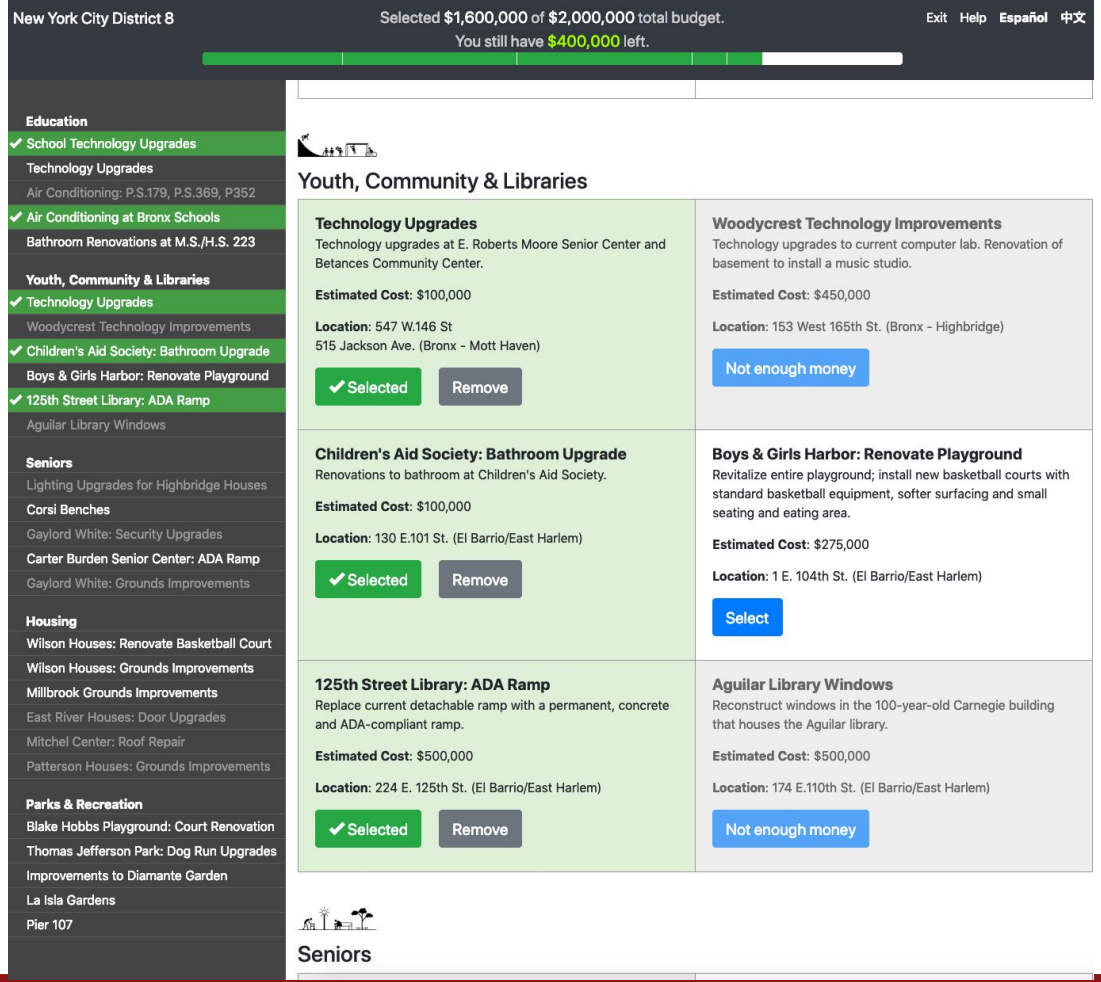
- Projects have a cost
- Total budget
- Vote for a subset

Knapsack problem. Projects are arranged by number of votes, and assigned until budget is exhausted.

Either projects as a whole, or allow people to vote for partial projects

Mostly strategy proof and welfare maximizing under utility model




New York City District 8
Selected $1,600,000 of $2,000,000 total budget.
You still have $400,000 left.
Exit Help Español 中文
Education
School Technology Upgrades
Technology Upgrades
Air Conditioning: P.S.179, P.S.369, P352
Air Conditioning at Bronx Schools
Bathroom Renovations at M.S./H.S. 223
Youth, Community & Libraries
Technology Upgrades
Woodycrest Technology Improvements
Children's Aid Society: Bathroom Upgrade
Boys & Girls Harbor: Renovate Playground
125th Street Library: ADA Ramp
Aguilar Library Windows
Seniors
Lighting Upgrades for Highbridge Houses
Corsi Benches
Gaylord White: Security Upgrades
Carter Burden Senior Center: ADA Ramp
Gaylord White: Grounds Improvements
Housing
Wilson Houses: Renovate Basketball Court
Wilson Houses: Grounds Improvements
Millbrook Grounds Improvements
East River Houses: Door Upgrades
Mitchel Center: Roof Repair
Patterson Houses: Grounds Improvements
Parks & Recreation
Blake Hobbs Playground: Court Renovation
Thomas Jefferson Park: Dog Run Upgrades
Improvements to Diamante Garden
La Isla Gardens
Pier 107
Youth, Community & Libraries
Technology Upgrades
Technology upgrades at E. Roberts Moore Senior Center and Betances Community Center.
Estimated Cost: $100,000
Location: 547 W.146 St
515 Jackson Ave. (Bronx - Mott Haven)
Selected
Remove
Woodycrest Technology Improvements
Technology upgrades to current computer lab. Renovation of basement to install a music studio.
Estimated Cost: $450,000
Location: 153 West 165th St. (Bronx - Highbridge)
Not enough money
Children's Aid Society: Bathroom Upgrade
Renovations to bathroom at Children's Aid Society.
Estimated Cost: $100,000
Location: 130 E.101 St. (El Barrio/East Harlem)
Selected
Remove
Boys & Girls Harbor: Renovate Playground
Revitalize entire playground; install new basketball courts with standard basketball equipment, softer surfacing and small seating and eating area.
Estimated Cost: $275,000
Location: 1 E. 104th St. (El Barrio/East Harlem)
Select
125th Street Library: ADA Ramp
Replace current detachable ramp with a permanent, concrete and ADA-compliant ramp.
Estimated Cost: $500,000
Location: 224 E. 125th St. (El Barrio/East Harlem)
Selected
Remove
Aguilar Library Windows
Reconstruct windows in the 100-year-old Carnegie building that houses the Aguilar library.
Estimated Cost: $500,000
Location: 174 E.110th St. (El Barrio/East Harlem)
Not enough money
Seniors

K-token

Distribute K tokens over your favorite projects

- Allows voters to indicate weight of preferences
- Strategic behavior not always clear
- ‘Gateway’ to more complex implementations such as quadratic voting

Experimental only on our platform.

Aggregation

PB Stanford currently uses ‘greedy’ aggregation:

- add the votes for each project
- Rank in order of number of votes
- Choose the highest ranked projects
- Define tie-breaker and exhaustion rule
  - What to do if we run out of budget? Skip or partially allocate?

In theory, other aggregation methods are possible (e.g. Method of Equal Shares)

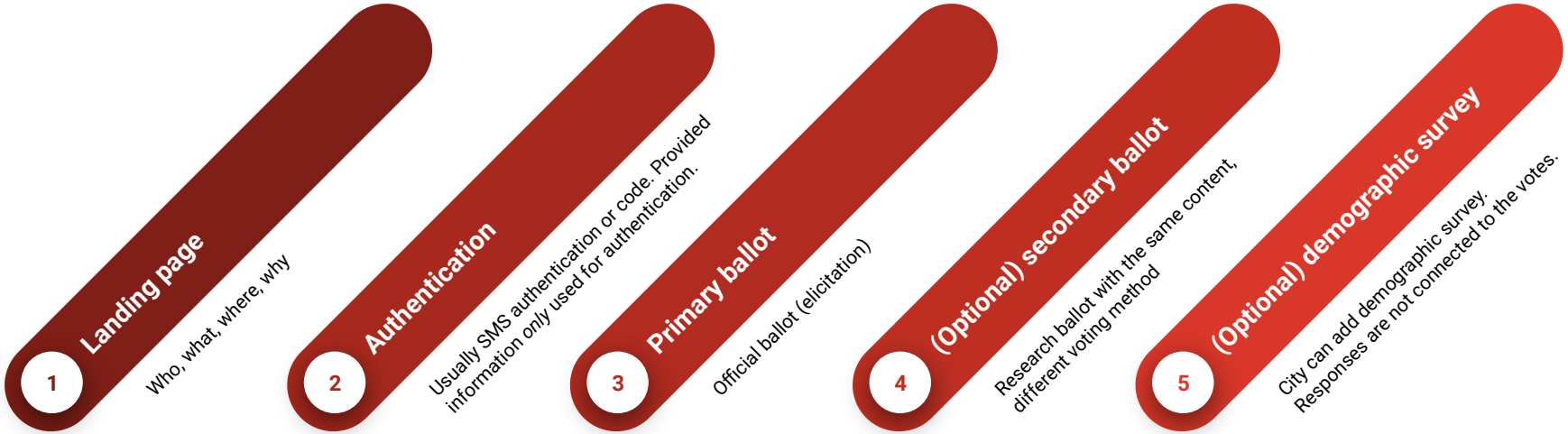
Research

Voting method findings

Gelauff, Lodewijk, and Ashish Goel. “Rank, Pack, or Approve: Voting Methods in Participatory Budgeting”, *Under review* (2024) ArXiv:2401.12423

Dataset: https://purl.stanford.edu/db709zg9088

From the perspective of the voter



Elicitation methods

- K-approval voting
  - Select up to *K* projects
- K-ranking voting
  - Select up to K projects and rank them
- Knapsack voting
  - Select projects subject to a budget constraint

Data set

Basic units in the data set (May 2023):

- Election
  - Budget, ballot length (n = 124)
- Voter
  - Authentication method, phase completion and time spent per phase, election ID (n = 125,000)
- Project
  - Cost, election ID (n = 1,500)
- Vote
  - Voter ID, project ID, allocated budget, rank, tokens

What elections?

To give a very quick overview:
124 primary, 38 secondary ballots

- 79 + 2 approval
- 32 + 18 knapsack
- 13 + 18 ranking

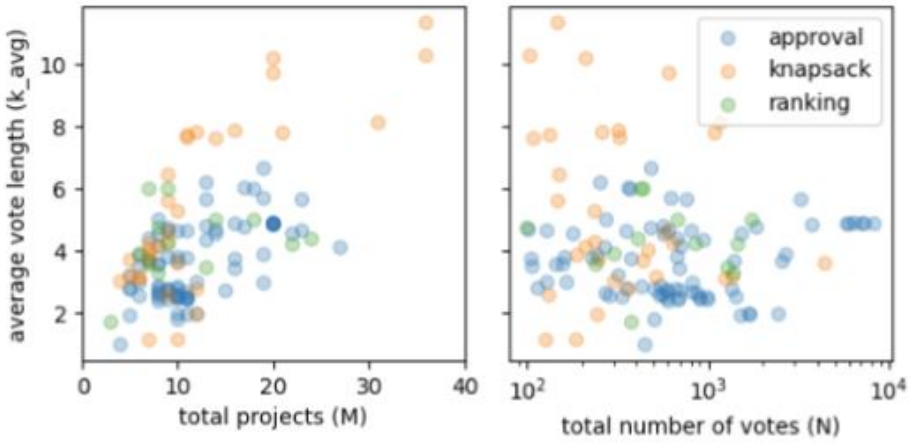


Figure 1: Elections in the dataset
(1 election out of range)

Why interesting?

Unique data set:

- Preference distributions per election
- Completion time and abandonment rate per ballot
- Vote pairs: same voter, same election, different voting method

This allows:

- Correlation of completion time and abandonment rate with ballot design
- Analyze effect of explicit elicitation constraints on individual preferences
- Analyze effect of implicit elicitation constraints on individual preferences
- Analyze effect of aggregation methods

Building blocks

- For each election we know median time spent (proxy for perceived complexity) and abandonment rate
  - Correlation between these statistics and different ballot design choices
- Ballot pairs from the same voter and election
  - Compare primary and secondary vote
- “Long” K-ranking votes
  - Infer what the knapsack/approval votes would have been
- Randomized Controlled Trial between voting methods
  - In some elections, secondary voting method was randomly assigned. We can compare those in aggregate.

Selected conclusions (1)

- Inferring knapsack votes from sufficiently long K-ranking ballots is a valid approximation.
  - Was claimed previously, we now have empirical evidence that it works
  - Useful when no digital interface is available
- Voters tend to select more expensive projects under K-approval vs Knapsack
  - This is mostly due to the less expensive projects on their vote
  - Both in aggregate and individually
  - Both explicit (budget awareness) and implicit (the method) constraints contribute
  - Corroborate and expand on initial findings from Goel et al. (2019)

Selected conclusions (2)

- Ballot complexity is positively correlated with median time spent by voters but no significant correlation is found with abandonment rate
  - Caveats: low turnout, self-selection, complexity within reason etc.
- Using the knapsack ballot does correlate with higher median time and abandonment rate, inconclusive causality
  - Avg abandonment rate of the primary ballot is around 5.4%.
  - Coefficient in multiple regression: -0.001 (app), 0.043 (knap), 0.014 (rank)
  - Controlled trial with secondary ballots suggests lower abandonment rate for knapsack vs ranking

Ongoing next steps

- Compare ‘greedy’ aggregation to Method of Equal Shares
  - Average and individual utility
  - Average project cost
- More data
- Token voting
  - Consistency with ranking?
- Opportunity: more about ballot design? Optimal K?

Budget Feedback Process

Gelauff, Lodewijk, and Ashish Goel. “Opinion Change or Differential Turnout: Changing Opinions on the Austin Police Department in a Budget Feedback Process”, *Under review* (2024) ArXiv:2310.11643

Gelauff, Lodewijk, and Ashish Goel. “Opinion Change or Differential Turnout: Austin’s Budget Feedback Exercise and the Police Department.” In Proceeding of the Second Conference on Equity and Access in Algorithms, Mechanisms, and Optimization (EAAMO ’22), 2022. DOI: 10.1145/3551624.3555295

City Budgeting Feedback
Austin, TX
Opinion Change or Differential Turnout

Based on:
Gelauff, L.L. and A. Goel, *Opinion Change or Differential Turnout: Austin's Budget Feedback Exercise and the Police Department*. In Proceedings of EAAMO '22: Equity and Access in Algorithms, Mechanisms, and Optimization (2022)

Budget feedback surveys

Constructive feedback on city budget proposals

More bespoke - many variables

Some examples: https://budget.pbstanford.org

- Balancing the budget between departments
- Menu of budget interventions to combine

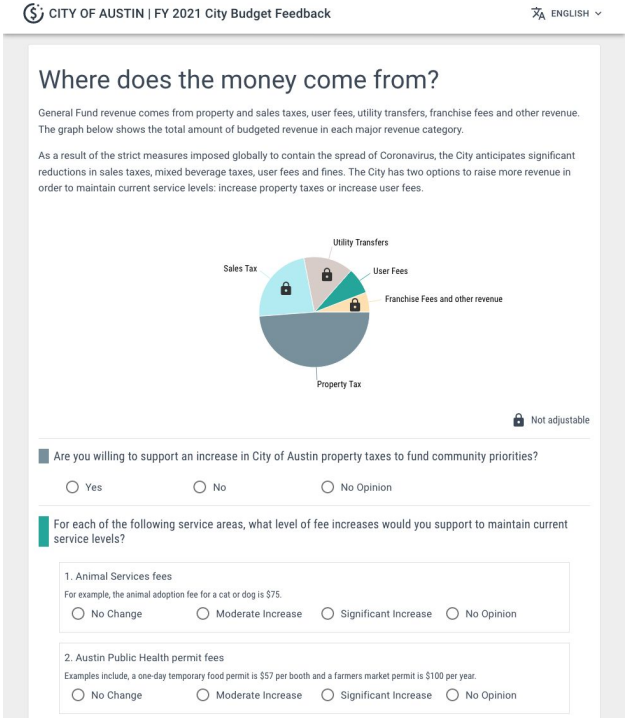
Let voters make the hard decisions individually, and come with a constructive counter proposal.

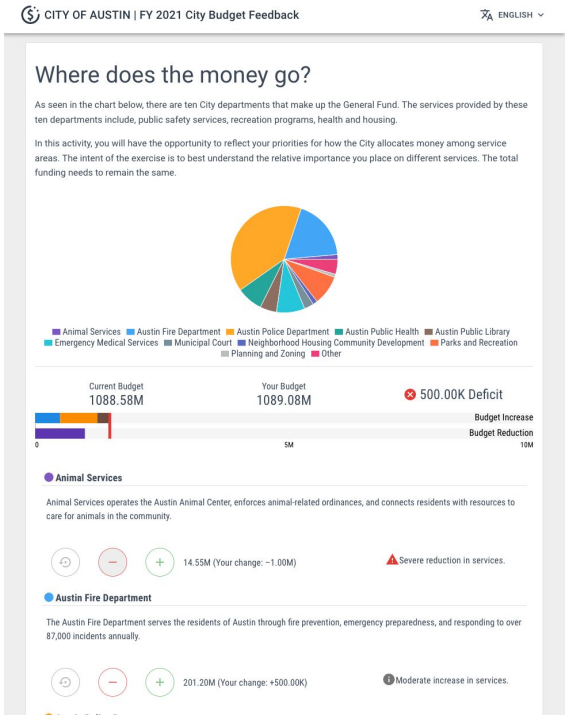
Austin 2020 budgeting exercise

Setting: Budget feedback survey, City of Austin

Revenue: level of support per category

Expenditures: redistribute budget across departments



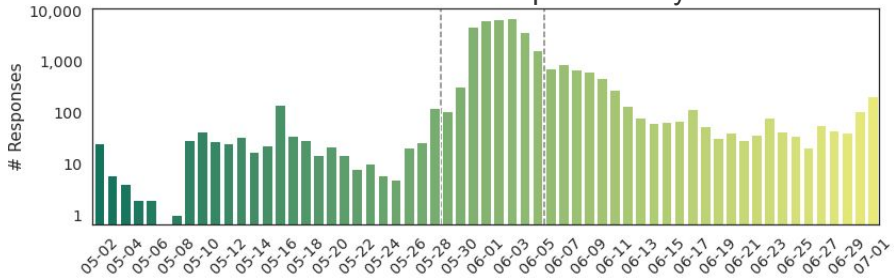


L. Gelauff and A. Goel, “Opinion Change or Differential Turnout: Austin's Budget Feedback Exercise and the Police Department” in EAAMO '22

Austin 2020 budgeting exercise

- Police budget divisive issue
- Tumultuous year
- Murder of George Floyd in the middle of survey
- After exogenous shock, daily responses increased a lot

Protests in Minneapolis in May 2020



L. Gelauff and A. Goel, “Opinion Change or Differential Turnout: Austin's Budget Feedback Exercise and the Police Department” in EAAMO '22

 Photo credit: Fibonacci Blue on Flickr (CC BY) [Gelauff and Goel, 2022]

Austin: exogenous shock

After the exogenous shock in 2020:

- Respondents skew younger and more likely to rent their home than ACS
- Surprisingly little shift in racial/ethnic demographics
- 93% support to decrease Police budget (from 43%)
- Lower support for increasing service fees
- Changes bounce back somewhat in segment 3

Not immediately clear if the shift in opinion is because of differential turnout or opinion change

We show that there is at least some opinion change

Table 6. Age distribution

Age Group	2018 ACS	2020 seg 1	2020 seg 2	2020 seg 3	2021
18-	0.197	-	0.016	0.014	
18-24	0.105	0.034	0.304	0.167	0.052
25-34	0.227	0.283	0.457	0.431	0.292
35-44	0.156	0.246	0.155	0.223	0.266
45-54	0.119	0.198	0.044	0.087	0.177
55-64	0.103	0.14	0.017	0.048	0.106
65+	0.094	0.098	0.008	0.030	0.107

Table 17. Support for any Increase of Budget by time segment

Department	2020 seg 1	2020 seg 2	2020 seg 3
Animal Services	0.197	0.557	0.493
Austin Fire Department	0.260	0.446	0.404
Austin Police Department	0.229	0.027	0.059
Austin Public Health	0.537	0.899	0.850
Austin Public Library	0.284	0.702	0.605
Emergency Medical Services	0.399	0.743	0.674
Municipal Court	0.097	0.370	0.332
NHCD	0.392	0.828	0.792
Other	0.120	0.337	0.327
Parks and Recreation	0.366	0.661	0.613
Planning and Zoning	0.104	0.301	0.281

[Gelauff and Goel, 2022]

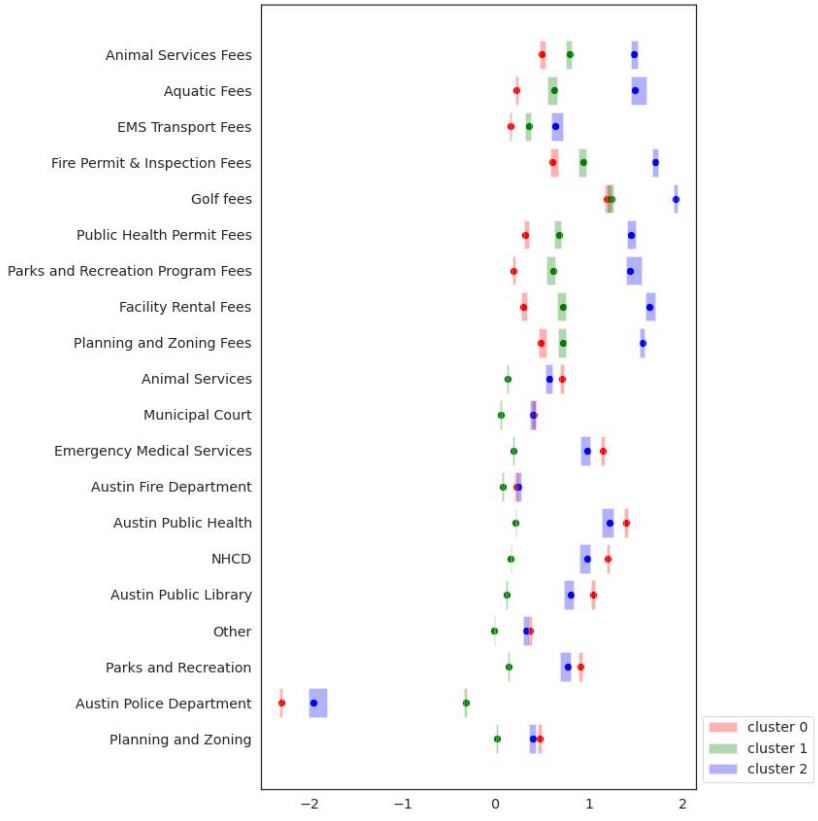
Austin: clusters

We identified 3 robust and well-defined (k-means) clusters:

- Robust
  - Centroids robust to resampling and reclustering
  - 98.6% (2020) and 96.7% (2021) avg accuracy
- Meaningful
  - Decrease police, no revenue change
  - Less/no decrease police, some revenue increase
  - Decrease police, increased revenue

More meaningful than analysis along demographic lines.

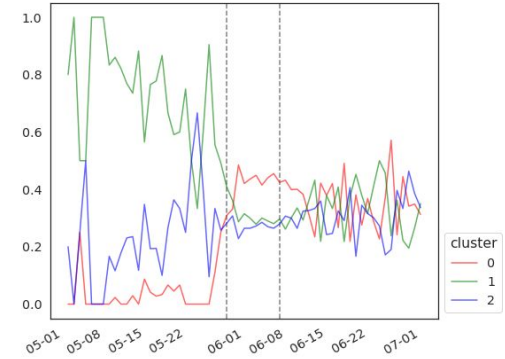
Cluster centroids, 95% confidence intervals after resampling (98.6% accuracy)

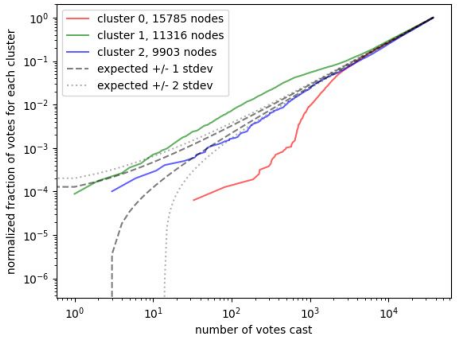


Austin: clusters

We observe a strong shift in clustering around the exogenous shock. Cluster 0 barely existed before, suggesting that there was an actual change in opinion rather than turnout.

2021 data confirms that these clusters were meaningful and that there was likely a lasting shift.





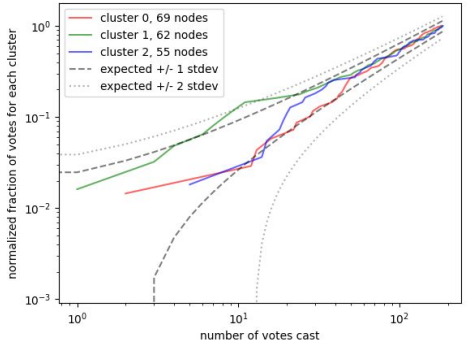
[Gelauff and Goel, 2022]

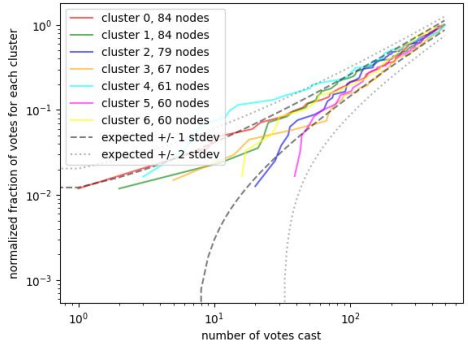
Comparison with PB clusters

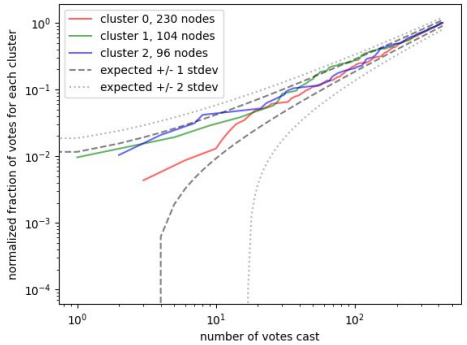
Comparison: 4 PB elections

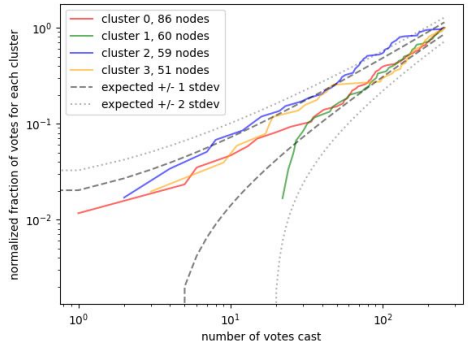
Less volatile than Austin

Shows scalability of the method









Austin: clusters

Clustering multi-dimensional data proved here a useful tool to understand what exactly happened in a way that demographic analysis could not provide.

Available without any demographic data about respondents.

- 2021 survey and follow-up survey confirmed that clusters capture persistent opinions
- No reason to believe there will always be meaningful clusters
- No reason to assume 3 is always the ‘right’ number

Big picture

- Ballot complexity correlated with median voting time
  - Not correlated with abandonment rate!
- Knapsack effect
  - Implicit constraints
  - Explicit constraints
  - Especially relevant for the ‘lower cost projects’
  - Election specific effect?!
- Clustering
  - Useful to understand how opinions correlate
  - Turnout effects over time

More

Always happy to chat about

- Collaborations
- Implementations
- Data sharing

lodewijk@stanford.edu

More

More about PB: participatorybudgeting.org & peoplepowered.org

Stanford PB Platform: pbstanford.org & github.com/StanfordCDT/pb

City Budget Feedback Exercises: budget.pbstanford.org

lodewijk@stanford.edu & www.bijv.org

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