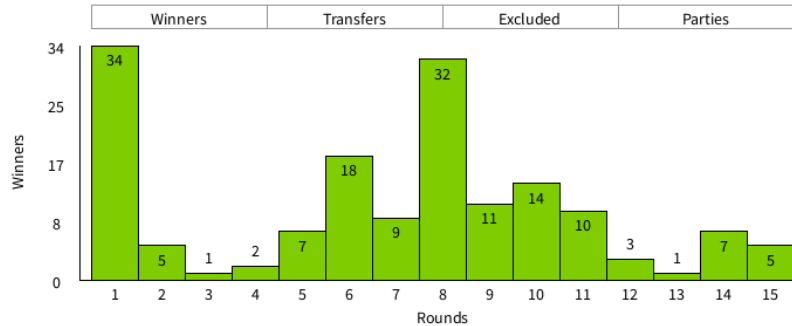
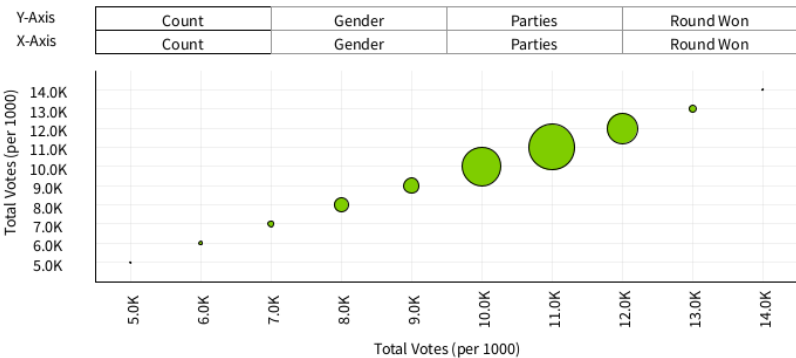


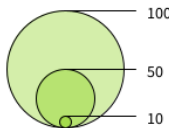
Round By Round Breakdown



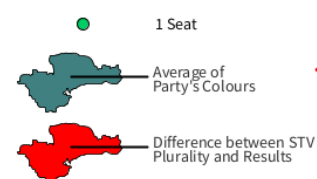
Attribute Vs. Attribute Scatter



Winner Bubble Legend



Constituency Map Legend

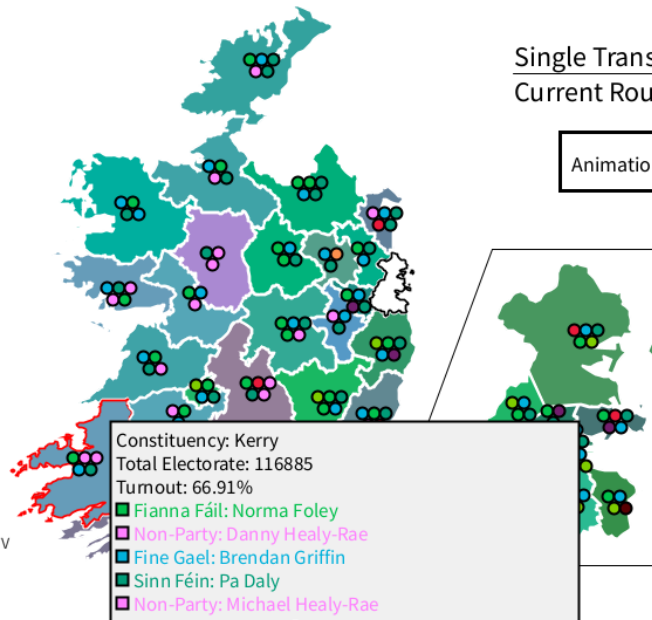


Plurality Toggle

Plurality Voting

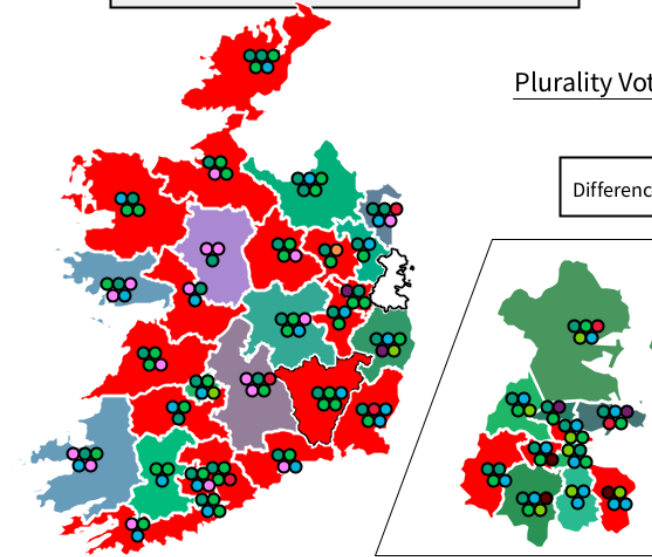
Single Transferable Vote
Current Round: 15

Animation Toggle

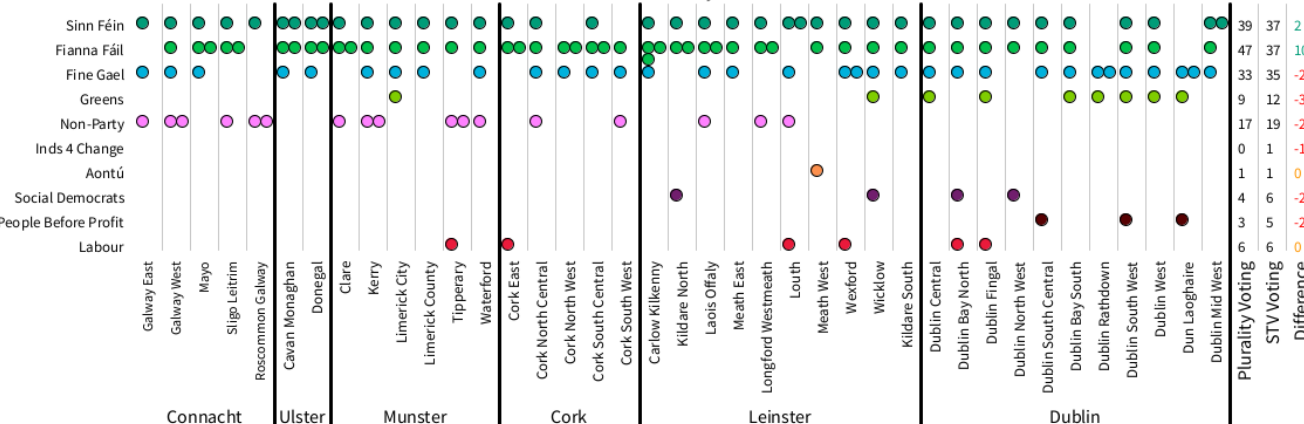


Plurality Voting

Difference Toggle



Constituency Breakdown



DECLARATION: I understand that this is an **individual** assessment and that collaboration is not permitted. I have read and I understand the plagiarism provisions in the General Regulations of the University Calendar for the current year, found at <http://www.tcd.ie/calendar>. I understand that by returning this declaration with my work, I am agreeing with the above statement.

Introduction, Background and Motivation:

For this visualisation assignment, I created an interactive dashboard with animations **to achieve the goal of facilitating an exploratory and explanatory round-by-round breakdown of Ireland's last by-election, as well as an investigation into the effect that plurality voting might have in Ireland**. This dashboard consists of five graphics, with 5 idioms, each highlighting a different aspect of the election process within Ireland or highlighting the difference that plurality voting might bring.

Proportional Representation by means of Single Transferable Vote (STV), is used in nearly all public elections in Ireland. It allows people to vote for whatever party they feel closely aligns with their values, without having to "waste" their vote on third party candidates who might not get elected. It involves electing by writing in order of preference. On the contrast Plurality voting, as used in America, only allows a person to vote for one single person. This can create fear of "wasting" your vote on smaller parties and as such pushes towards a two-party system.

Tools, Technologies, and Pre-processing:

Processing programming language was used for the entirety of this visualisation via the IntelliJ IDEA IDE. Boxy SVG [3] was used to edit the Ireland constituency map file used, from Wikipedia [4]. Python has been used to edit and merge two datasets, into a variety of different datasets for easier use.

Description of dataset(s):

For the implementation of this assignment, I made use of two datasets, which I edited and combined. The first dataset is a round by round counting of each candidates' results, along with relevant characteristics about the candidate [1]:

ConstituencyName	Candidate	Result	CountNumber	Non-Transferable	OccurredOnCount	RequiredToReachQuota	RequiredTransfers	Votes	TotalVote	Constituency	CandidateId
Carlow-Kilkenny	AYLWARD BOBBY		1	0	0	4724	0	0	7550	161	161

The second dataset consists of the finalised results for each candidate, as well as some additional details [2]:

Constituency	Surname	Firstname	Gender	Id	PartyId	PartyAbbr	Count Number	Required	Required	Votes	Result	Candidate	Constituency	Constituency Airm
Carlow-Ki	AYLWARD	BOBBY	M		Fianna Fáil F.F.		10	2289	0	7550		161	1	Ceatharlach-Cill Chainnigh

Both datasets are of dataset type *table*, which consist of a series of rows or *Items* each with their own respective *Attributes*.

Combining these datasets, I created a listing of the following datatypes:

- **Constituency Name, Constituency Airm:** *Categorical / Field* – Location of the candidate's constituency within Ireland, as well as the Irish name equivalent.
- **Surname, First name, Candidate Id:** *Categorical* – Name of candidate along with their assigned identification number.
- **Result:** *Categorical*: Outcome of their candidacy, elected, excluded or non-elected.
- **Count Number:** *Quantitative*: Current round count that the respective row's candidate's results.
- **Transfers:** *Quantitative*: New vote awarded to candidates from now excluded candidates.
- **Total Votes:** *Quantitative*: Total votes, including first round votes and transfers, of that round for the candidate.
- **Gender Id:** *Categorical*: Gender of candidate, Male, Female or Other
- **Party Id, Party Abbreviation:** *Categorical*: Party candidate is with, or whether they are Independent.

Additional data not used or used to only calculate: Non-Transferable, Required to Reach Quota, Required to Save Deposit, Occurred on Count, Constituency Number.

Visual 1: Round-By-Round Breakdown:

Idiom:

- Standard Bar Chart – simple yet most effective way of highlighting importance of each round. Intuitive to user and doesn't overcomplicate what is simple to understand.
- Compound Bar Chart - like bar chart but has greater effect in highlighting which party dominates which round, and the influence this can have on STV vs Plurality voting. A regular

vertical bar chart here would put more focus on how important each round was, rather than which parties control which rounds.

Tasks:

- Associate: Link relationships between rounds and parties, and what the impact of multiple rounds can have on an election, and what parties benefit from multiple rounds.

Encodings:

- Position: For both charts, rounds are separated equally and ordered on the horizontal axis.
- Colour: Bar chart keeps the same colour, however the compound bar chart
- Size: Parties which win more seats each rounds take up a larger portion of space.

Reasoning: I wanted to keep these charts simple, so that I can easily highlight the task of showcasing which rounds are important, and for what parties. To accomplish this I choose three encodings that are the most familiar to most people, hence my choices of position, colour and size via bar charts.

Visual 2: Attribute Vs. Attribute Scatterplot:

Idiom: Scatterplot – perhaps the best graph to help us showcase or detect a relationship between attributes, with some level of interaction.

Tasks:

- Categorize, Cluster, Correlate – Try and determine the effect that different attributes can have on an election, and witness if there is a correlation between attributes.

Encodings:

- Position: For both axis', position has been used to separate labels, quantitative labels are separated linearly.
- Size: Points with more winners have a proportionally larger circle.

Reasoning: The same philosophy used for Visual 1 applies here, a simple encoding helps to explain a relationship rather than making things overly complex. Scatterplots are widely used to help explain relationships between attributes for their ability to visualise wide ranging attributes in a simple manner.

Visual 3: Constituency Breakdown:

Idiom: Novel Linear Scatterplot – flattened version of typical election results bubble chart which better suits in helping to showcase the urban-rural political divide for third-level parties. Interactive Toggle showcases which areas / parties are affected by plurality voting's since a large change in seat placement is clearly visible.

Tasks:

- Rank – Showcase which parties have more dominance, by taking up more space on the chart.
- Compare – Determine the difference in party make up between regions., via position.
- Compare – Determine which parties / areas have been effected by plurality voting, by contrasting the difference in colour.

Encodings:

- Position: Position is used to separate parties, but also constituencies. Constituencies are grouped by region, and further separated for the dense cities, Cork and Dublin. Position is
- Colour: Each seat is coloured the same as their party's colour, making the size of control a party has clearer, as it's equal to the amount of space they take up on the chart. Colour is also used to denote an increase, decrease or maintenance of seats in the totals section.
- Motion: Toggling between STV and Plurality causes the seat's position to change, resulting in a visual that allows us to see which areas / parties are effected the most plurality. More motion implies greater difference.

Reasoning: I wanted to make a typical bubble election chart but I felt it wouldn't be enough to highlight the urban-rural divide, nor the greater difference caused by plurality voting. This linear chart can make things much clearer, and the toggle aspect allows us to see quickly flick back and forth to see the difference plurality has on parties.

Visual 4 + 5: STV Vs. Plurality Heatmap:

Idiom: Field / Heat Map – There's perhaps no better map than a field map to visualise the results of an election. We get a wider idea of the election results, can see which areas vote for which parties, where plurality voting makes a difference in graph 5, along with many other attributes. User can hover over

constituencies to get result details (winners, turnout, etc) or toggle animation to see a play out of round-by-round results, showcasing the effect multiple rounds has on voting.

Tasks:

- Identify – whether plurality voting would make a difference in Irish elections.
- Compare – what areas / parties would be effected by plurality voting.
- Associate - would plurality voting cause a two-party system in Ireland. Does it lead to more seats for already larger parties, and less seats for smaller parties.

Encoding:

- Colour – used to identify where parties win in constituencies, areas. Used to highlight constituencies that would result in a different result with plurality voting. Parties which hold a majority will be more visible, so a two-party system will stand out in elections.
- Texture – a red outline is used for constituencies with different plurality votes compared to STV. This helps distinguish the scale that plurality voting can effect results.
- Motion – Both graphs have an interactive element, but graph 4 uses animation to display a round by round animation of different results. This motion displays to the user the effect that multiple rounds can have on the result of an election.

Reasoning: The purpose of this graph is to signal to the user what effect multiple rounds has on elections and signal the difference plurality voting can have. Colour is one of the most familiar features to a human, and its inclusion in this graph serves a dual purpose, of showcasing the dominant parties in a constituency, as well as highlighting differences. Its effect is immediate, and something that the other encoding couldn't help to replicate. Texture has a similar effect to a less degree. Motion is best at showcasing effect overtime for a unique chart such as this.

Visualisation Novelty:

Even though there is a limited number of encoding channels used in this dashboard, we still witness a high level of complexity and novelty within this visualisation. Our first two charts, remain simple by showcase to us the effect that round-by-round voting has on elections, how certain parties are influential during certain rounds, and what attributes can contribute to an election win, such as votes, gender, party, etc.

Our third chart is a simple yet effective way of visualising the difference between election results, leading parties, urban-rural party divide, and the effect that plurality voting can have across the political system. It's a simple chart to understand but personally it's one I have never seen used as of yet, hence I believe it to be novel. Our fourth / fifth chart is a field map which tells us the result of an election for each constituency, the candidates won, their party, the turnout, the total electorate and the average election results. The final chart indicates the areas where plurality voting would effect an election, and what parties would benefit from plurality voting, encoded in the colour of the constituency.

Personally, I consider it impressive that the chart can display so many things, with such complexity, yet remain simple, with few encodings. In essence, my charts are simple, yet unique, and still manage to visualise a complex array of items in one A4 page size dashboard. Colour and position are the main encodings, and once again, while simple, result in ease of engagement.

This visualisation also meets all requirements, namely, multiple facets have been used, each with their own idiom creating a dashboard of different dynamic/animated views, with some visuals within combining several encoding channels. Users can interact with and manipulate these graphics.

Strengths:

- Accomplishes the goal of determining round by round impact of election, as well as impact of plurality voting, and it's pull towards a two-party system. Highlights this fact in multiple different ways across the charts.
- Explains a variety of different complex attributes into manageable bite-size charts. Interactive dashboard allows for exploration into dataset, and to provide further prove for goal.
- Novel visualisation which as of writing this report, I cannot find another example of.

Weaknesses:

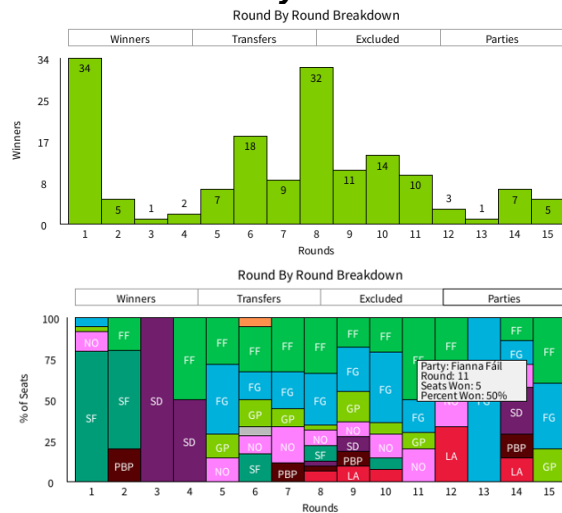
- Colouring the constituency based on the average of the winner's colours. This doesn't work as a linear gradient, doesn't allow for fine grain detail and is impossible to create a legend for.
- Lack of additional encoding in chart 1 (the regular vertical bar charts) and chart 2. Both these charts have only position or size as an encoding characteristic. Further data types could have been encoded in this chart.

References:

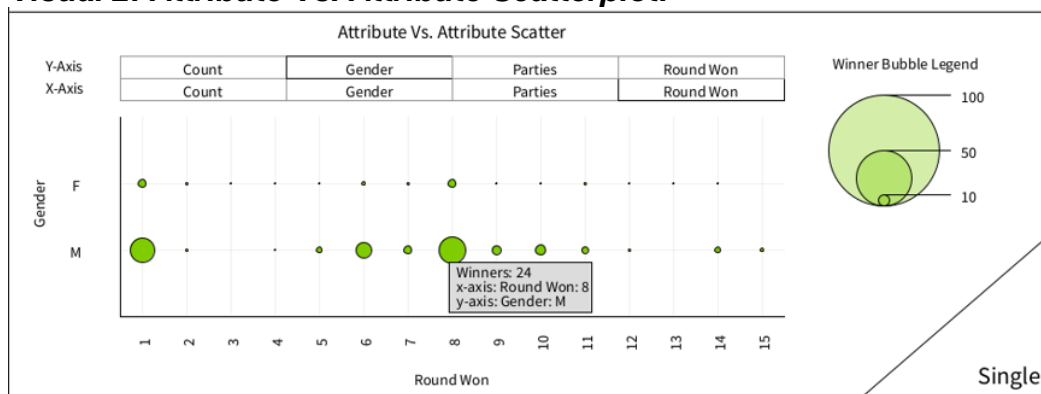
- [1] General Election 2020 Count details, Round by Round: <https://data.gov.ie/dataset/general-election-2020-count-details>
- [2] Candidate Details for General Election 2020, Final results: <https://data.gov.ie/dataset/candidate-details-for-general-election-2020>
- [3] Boxy SVG: <https://boxy-svg.com/>
- [4] Wikipedia, Ireland Constituency SVG file: https://en.wikipedia.org/wiki/D%C3%A1il_constituencies
- [5] Inspiration for Visualisation: American 2022 election chart: <https://about.bgov.com/brief/balance-of-power-republican-majority-in-the-house/>

Appendix:

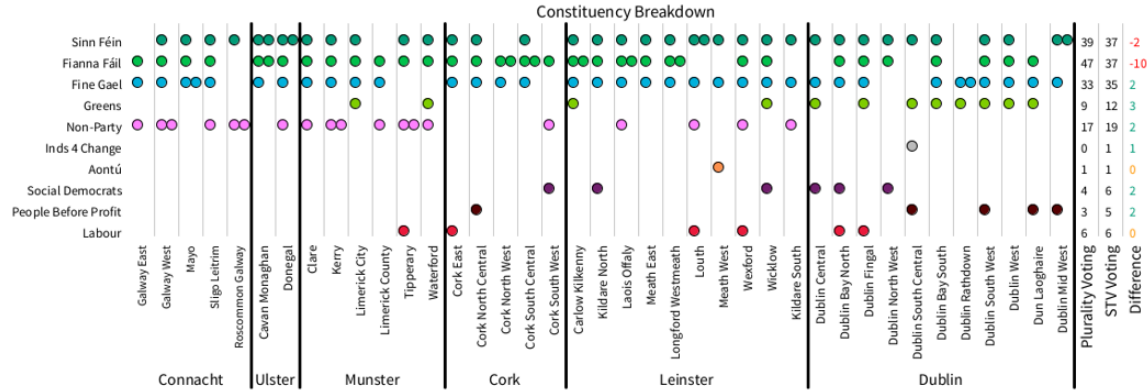
Visual 1: Round-By-Round Breakdown:



Visual 2: Attribute Vs. Attribute Scatterplot:



Visual 3: Constituency Breakdown:



Visual 4: Constituency Breakdown:

