Selecting Voting Locations for Fun and Profit

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Introduction

Manipulative attacks on elections are well-studied problems.

Only recently has geographic information been used (e.g., gerrymandering [Lewenberg et al., 2017]).

We consider how selecting *where* voters can cast their votes can be used to manipulate.

Motivation

The Guardian

Texas closes hundreds of polling sites, making it harder for minorities to vote

Guardian analysis finds that places where black and Latino population is growing by the largest numbers experienced the majority of closures and could benefit Republicans

MOTIVATION

Closed voting sites hit minority counties harder for busy midterm elections

Mark Nichols USA TODAY

Published 7:06 a.m. ET Oct. 30, 2018 | Updated 11:58 p.m. ET Oct. 30, 2018
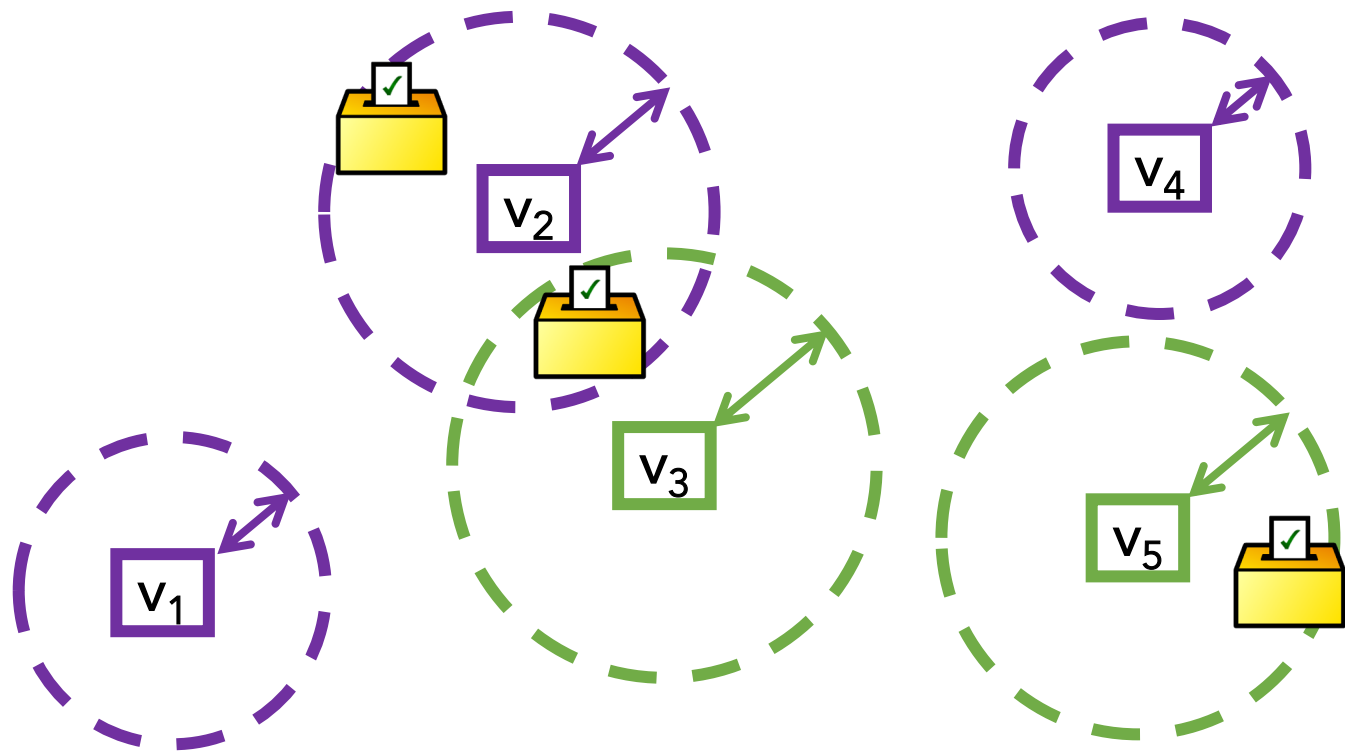
Geographic Elections

Voters and voting locations are distributed on a metric space.

Each voter has a distance-bound and casts their vote only if they are within this bound to a voting location.

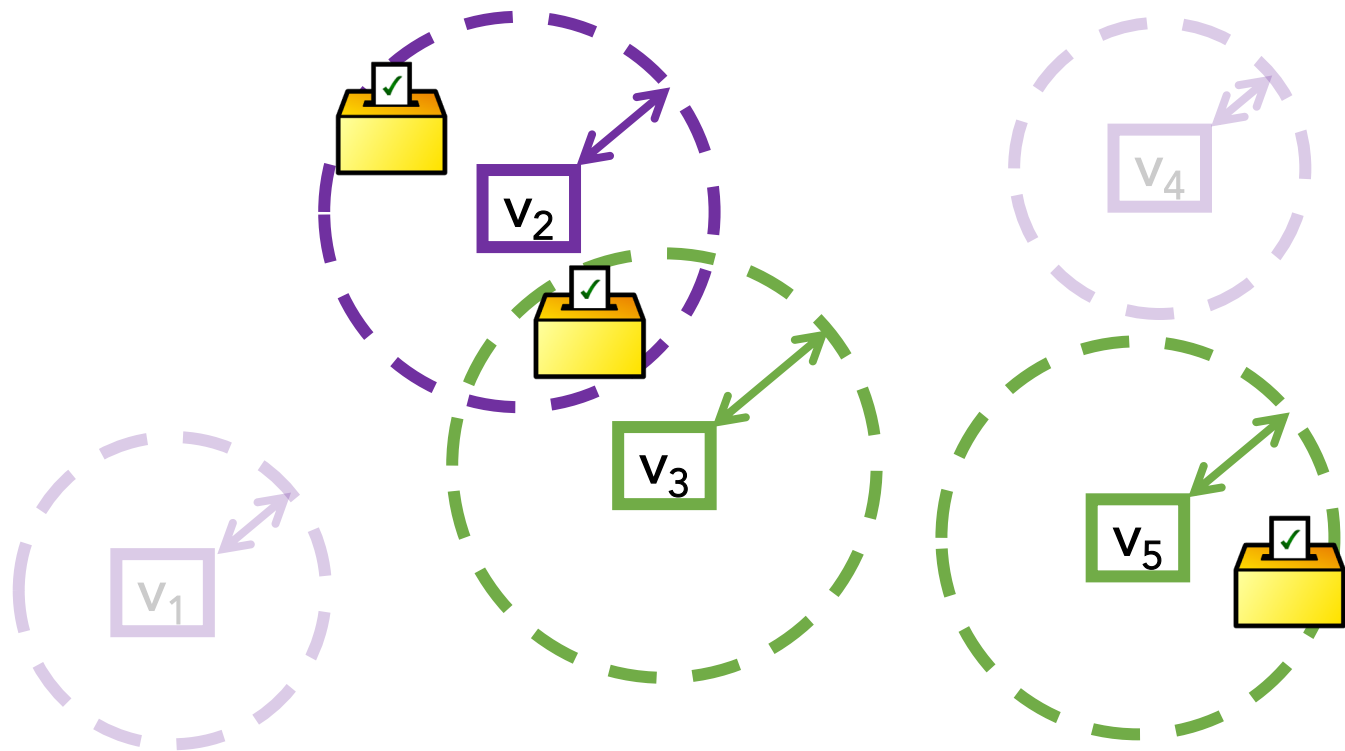Each voter has preferences over a given set of candidates.

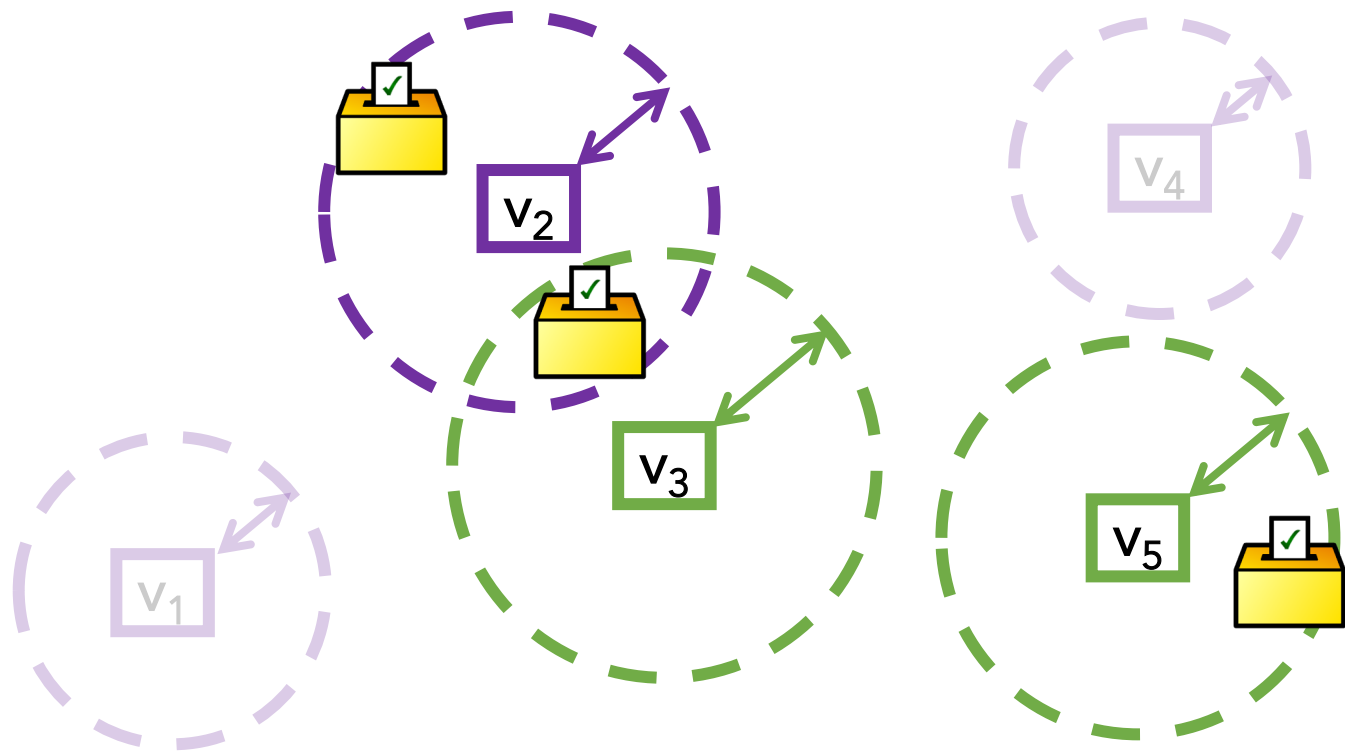# Example

Plurality election with candidates: {🍏, 🍇}

Example

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🍏 wins!

Polling Place Control

Voters and voting locations are distributed on a metric space. **Each voter has a distance it is willing to go to vote.**

For an election and a set of possible voting locations. Does there exist **a set of at least *k* voting locations**, such that a given candidate wins?

TWO PARTIES: VOTERS ON A LINE
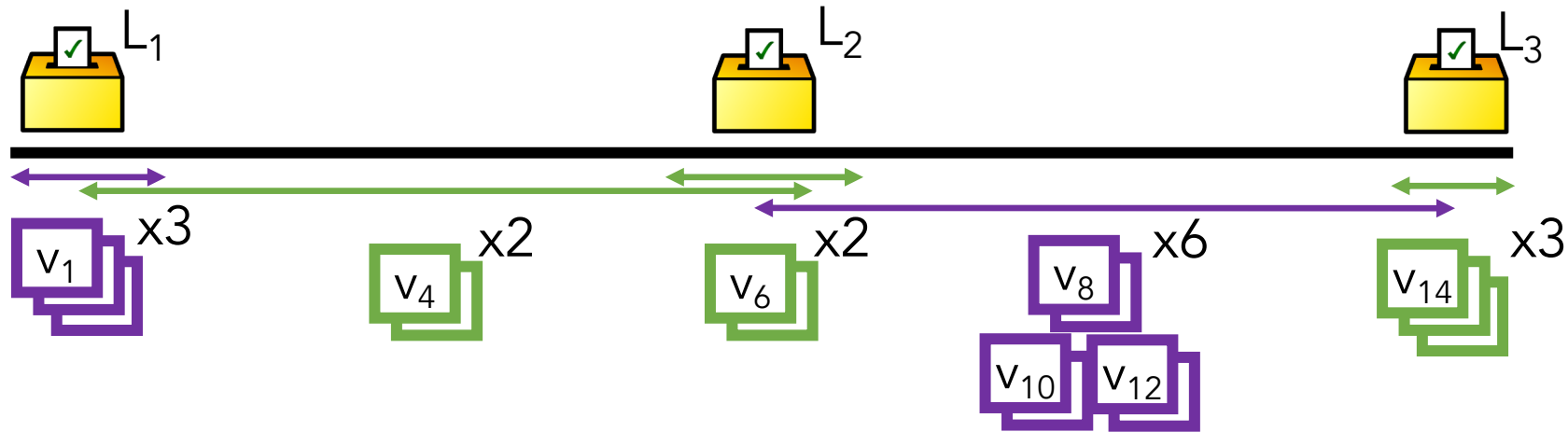
Select at least 2 polling places such that 🍏 wins?
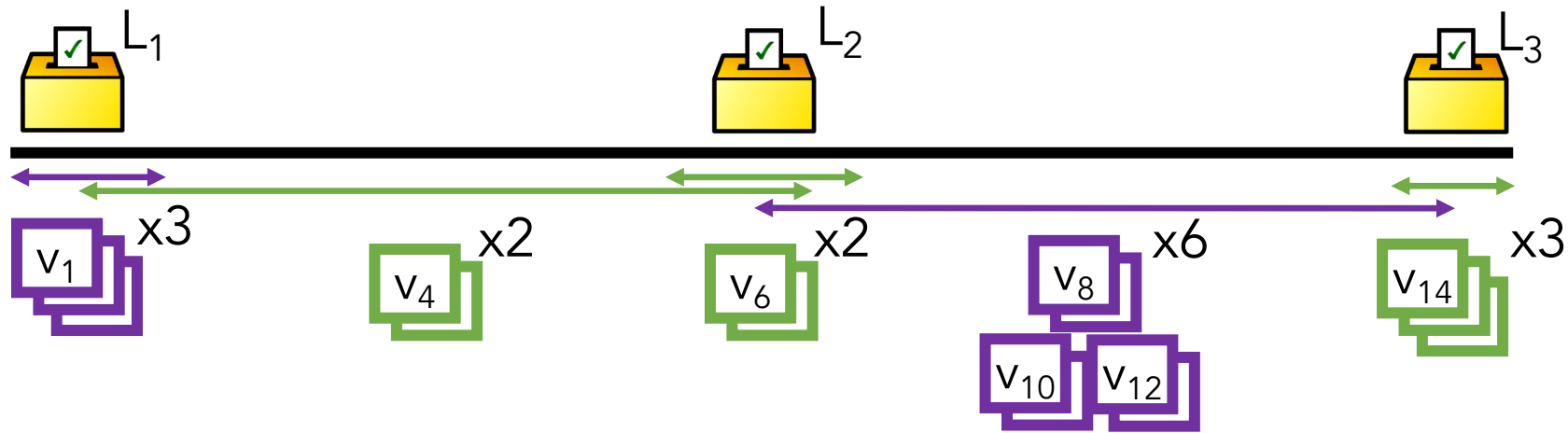
Greedy approach

Margin for 🍏, L_1: -1, L_2: -2, L_3: -3.

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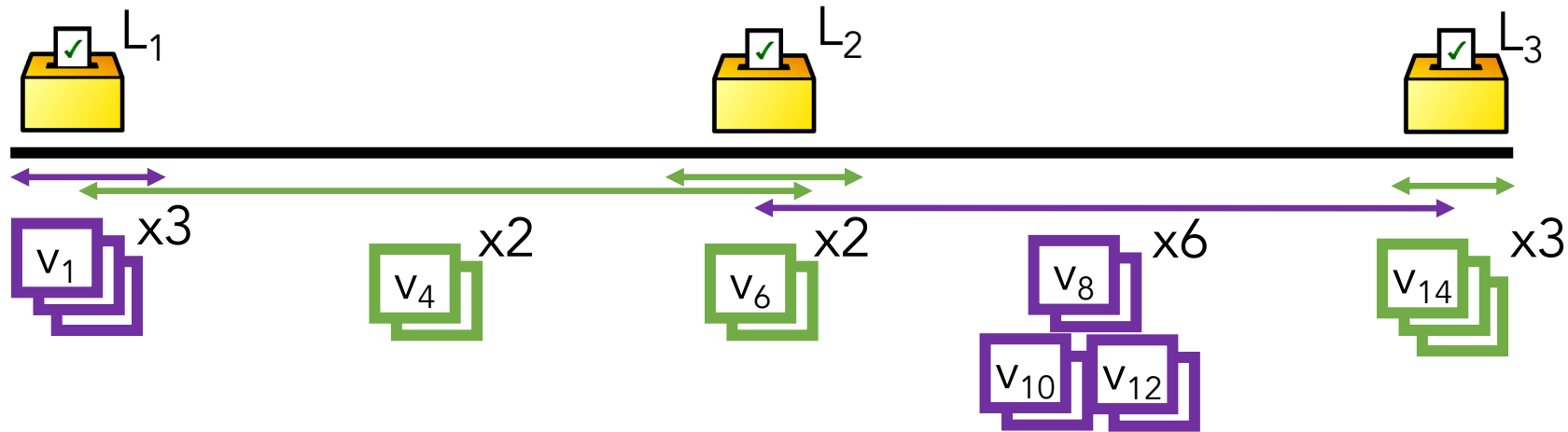Select at least 2 polling places such that 🍏 wins?

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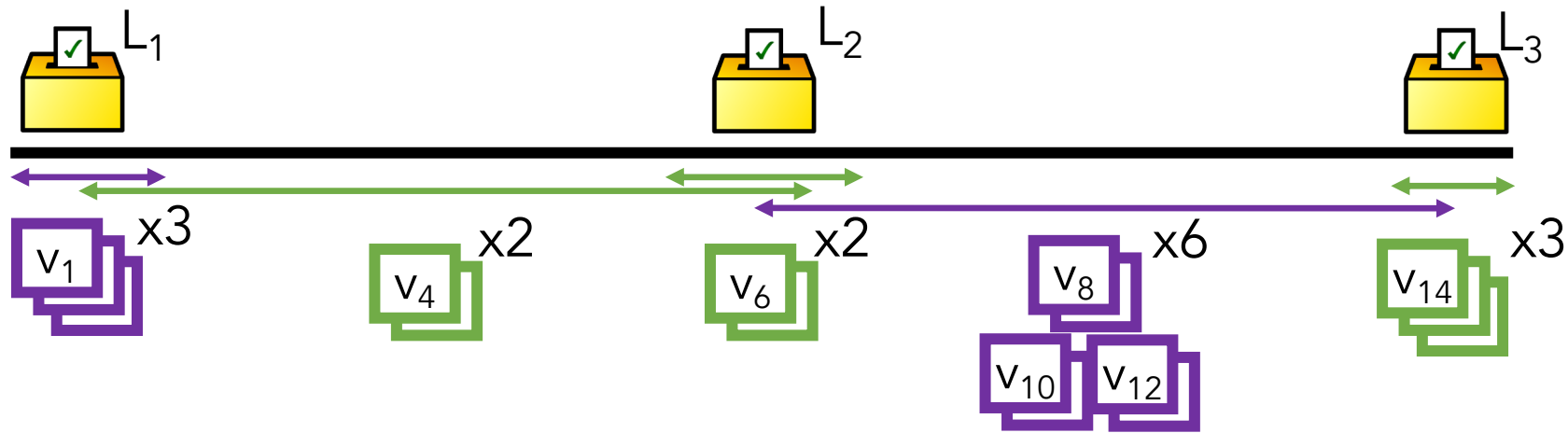

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~~Greedy approach~~ In P using dynamic programming

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Two Parties: Voters on the Plane

NP-completeness result on the plane is shown by a reduction from Cubic Planar Vertex Cover [Garey and Johnson, 1977].
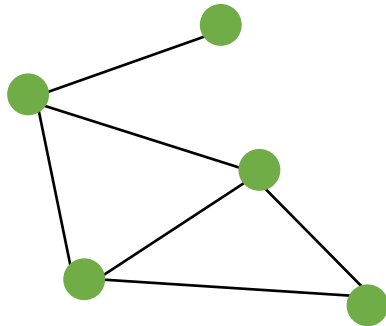
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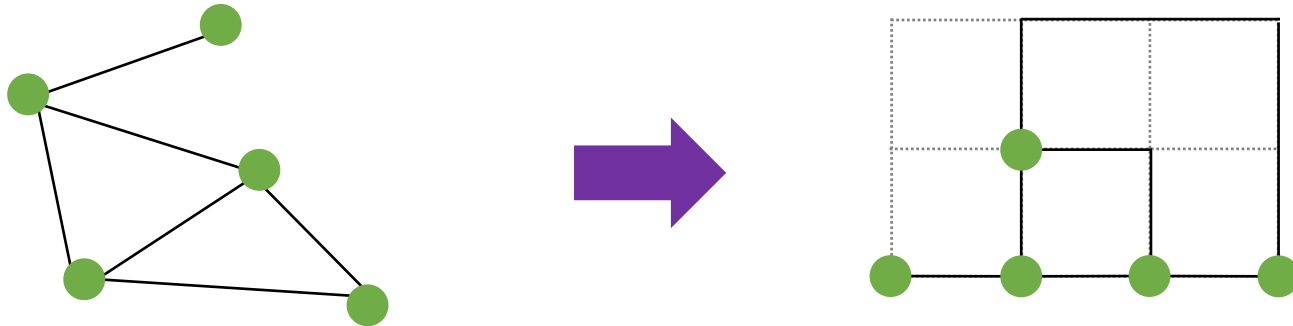
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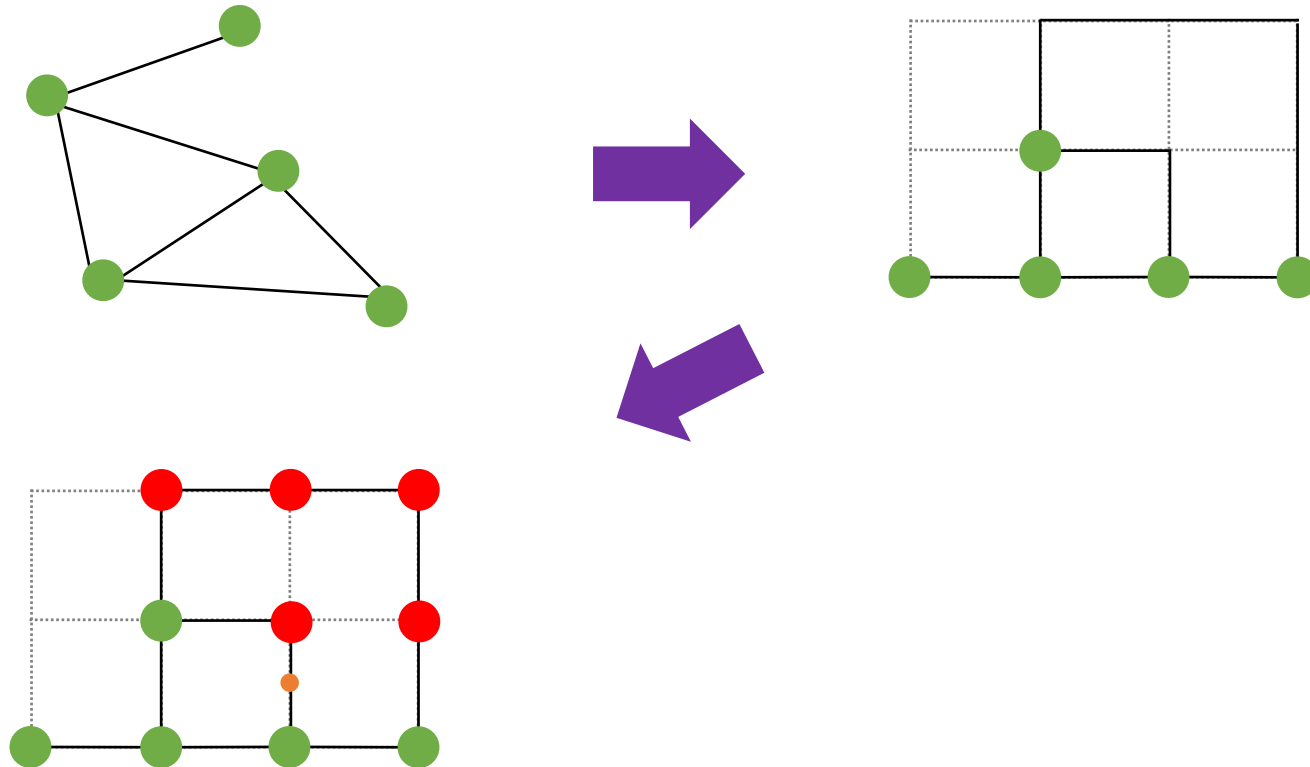
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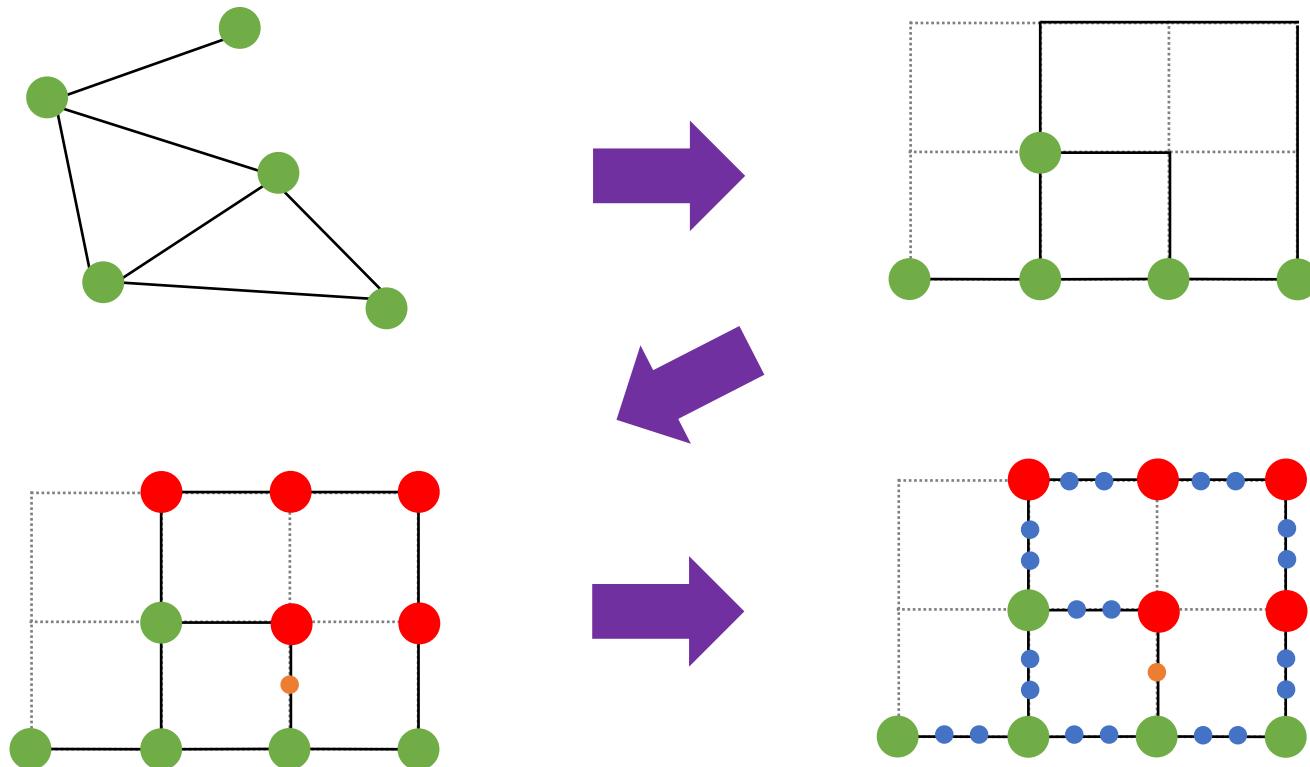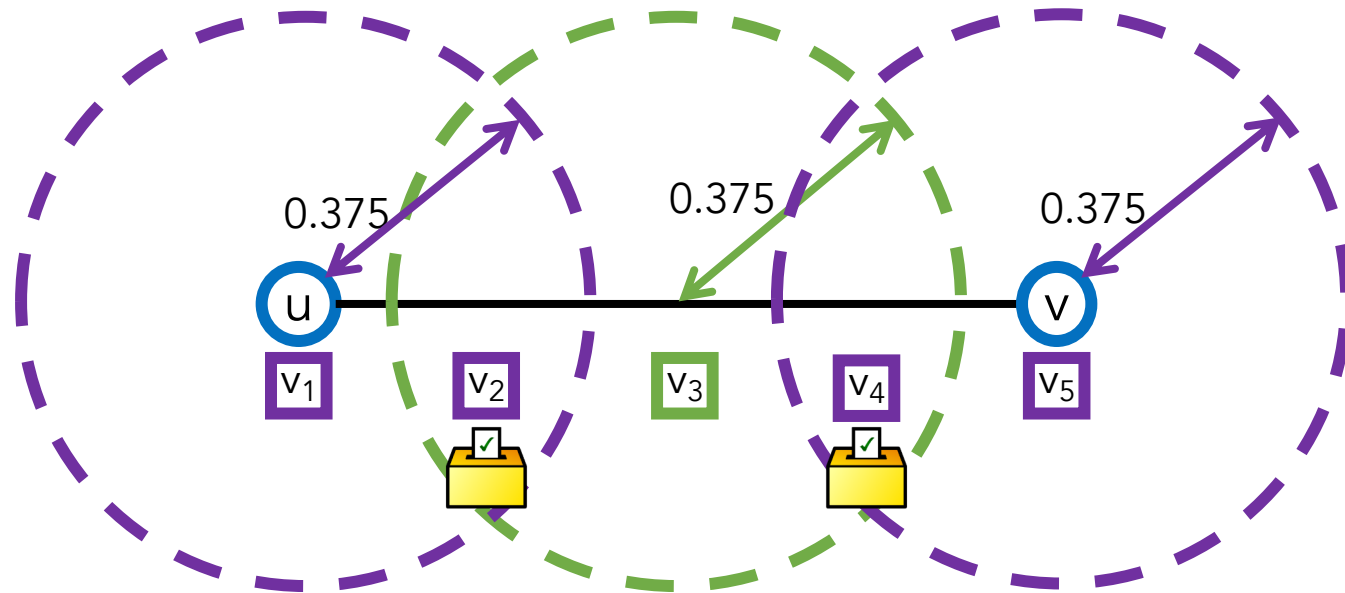
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Two Parties: Voters on the Plane

For each edge we construct:

Add an additional polling place > 1.5 from the constructed graph with k voters for 🍏.

Ask if there exists a way to select at least #edges + 1 polling places such that 🍏 wins.

Two Parties: Results

In P on the line using dynamic programming.

NP-complete on the plane even when voters can vote at most at 3 locations with same distance-bound.

In P on the plane for some natural restrictions (e.g., vote at most at 1 location).

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Also holds for destructive cases

Multi-Party: Results

For more than two candidates, even on the line, polling place control for plurality is NP-complete.

Moreover, the optimization version of this problem is inapproximable within any constant factor.

Other control actions

Attempting to change winner by changing voters' distance-bound.

In P for plurality by adapting the result for priced adding/deleting voter control [Miasko and Faliszewski, 2016].

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Possible application: Buses?

What's next?

Complexity of polling place control where voters can vote at most at two locations.

Experimental study of our polling place control problem.

New models that include geographic information.

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Thank you!