The Mathematics Of Voting And Elections A Hands On Approach Mathematical World

Scientific Essay from the year 2021 in the subject Mathematics - Statistics, grade: 7 (IB), language: English, abstract: The aim of this paper is to investigate to what extent different systems of voting can affect the results and the distribution of votes in single-winner elections. Moreover, during elections, there are always politicians who hold extreme beliefs and are either loved or hated by people and those who hold tempered beliefs but are tolerable by society. Consequently, the research also examines which of the two mentioned characteristics a candidate should have to increase the chances of winning by applying basic statistical measures such as mean or standard deviation. The subject is relevant because it allows us to get a mathematical insight into single-winner electoral systems and can show whether a particular system of voting is only a tool, or directly contributes to the results. The paper analyses 4 different methods of voting that are or were used in the world to elect a President or other representatives for single-member posts: Supplementary Vote (SV), Instant-runoff voting (IRV), Bucklin Voting, and Coombs' method. It is worth adding that these systems are ranked-choice systems, that is voters rank their candidates from the most favorable one to the one that in their opinion is completely not suitable to accede to a particular office. Ranked-choice systems were chosen because this paper does not investigate only who wins the election but also how the situation of candidates in other positions changes.

interest in a particular application, however, often depends on his or her general interest in the area in which the application is taking place. My experience at Union College has been that there is a real advantage in having students enter the course knowing that virtually all the applications will focus on a single discipline-in this case, political science. The level of presentation assumes no college-level mathematical or social science prerequisites. The philosophy underlying the approach we have taken in this book is based on the sense that we (mathematicians) have tended to make two errors in teaching nonscience students: we have overestimated their comfort with computational material, and we have underestimated their ability to handle conceptual material. Thus, while there is very little algebra (and certainly no calculus) in our presentation, we have included numerous logical arguments that students in the humanities and the social sciences will find accessible, but not trivial. The book contains five main topics: a m.odel of escalation, game theoretic models of international conflict, yes-no voting systems, political power, and social choice. The first part of the text is made up of a single chapter devoted to each topic. The second part of the text revisits each topic, again with a single chapter devoted to each. The organization of the book is based on pedagogical considerations, with the material becoming somewhat more sophisticated as one moves through the ten chapters. On the other hand, within any given chap ter there is little reliance on material from earlier chapters, except for those devoted to the same topic.

Math in Society is a survey of contemporary mathematical topics, appropriate for a college-level topics course for liberal arts major, or as a general quantitative reasoning course. This book is an open textbook; it can be read free online at http://www.opentextbookstore.com/mathinsociety/. Editable versions of the chapters are available as well.

This book presents a simple and logical potential electoral reform. Under this system, voters may vote for, or approve of, as many candidates as they like in multicandidate elections. Among the many benefits of approval voting are its propensity to elect the majority candidate, its relative invulnerability to insincere or strategic voting, and a probable increase in voter turnout.

Polling, Prediction, and Testing
Designing Better Voting and Fair-Division Procedures
Is Democracy Mathematically Obtainable?
Geometry of Voting
Advances in the Spatial Theory of Voting
Recent Advances in Voting Systems and Collective Choice

This book explains, in a straightforward way, the foundations upon which electoral techniques are based in order to shed new light on what we actually do when we vote. The intention is to highlight the fact that no matter how an electoral system has been designed, and regardless of the intentions of those who devised the system, there will be goals that are impossible to achieve but also opportunities for improving the situation in an informed way. While detailed descriptions of electoral systems are not provided, many references are made to current or past situations, both as examples and to underline particular problems and shortcomings. In addition, a new voting method that avoids the many paradoxes of voting theory is described in detail. While some knowledge of mathematics is required in order to gain the most from the book, every effort has been made to ensure that the subject matter is easily accessible for non-mathematicians, too. In short, this is a book for anyone who wants to understand the meaning of voting.
A mathematical look at why it is impossible to devise a completely unmanipulable voting system, first published in 2005.

This textbook contains a rigorous exposition of the mathematical foundations of two of the most important topics in politics and economics: voting and apportionment, at the level of upper undergraduate and beginning graduate students. It stands out among comparable books by providing, in one volume, an extensive and mathematically rigorous treatment of these two topics. The text's three chapters cover social choice, yes-no voting, and apportionment, respectively, and can be covered in any order, allowing teachers ample flexibility. Each chapter begins with an elementary introduction and several examples to motivate the concepts and to gradually lead to more advanced material. Landmark theorems are presented with detailed and streamlined proofs; those requiring more complex proofs, such as Arrow's theorems on dictatorship, Gibbard's theorem on oligarchy, and Gärdenfors' theorem on manipulation, are broken down into propositions and lemmas in order to make them easier to grasp. Simple and intuitive notations are emphasized over non-standard, overly complicated symbols. Additionally, each chapter ends with exercises that vary from computational to "prove or disprove" types. The Mathematics of Voting and Apportionment will be particularly well-suited for a course in the mathematics of voting and apportionment for upper-level undergraduate and beginning graduate students in economics, political science, or philosophy, or for an elective course for math majors. In addition, this book will be a suitable read for to any curious mathematician looking for an exposition to these unpublicized mathematical applications. No political science prerequisites are needed. Mathematical prerequisites (included in the book) are minimal: elementary concepts in combinatorics, graph theory, order relations, and the harmonic and geometric means. What is needed most is the level of maturity that enables the student to think logically, derive results from axioms and hypotheses, and intuitively grasp logical notions such as "contrapositive" and "counterexample."

This book deals with how uncertainty can be dealt with in models of voting procedures. Using the recent U.S. presidential elections as an example, it demonstrates the extremely large variation in voter opinions that would have resulted in the same observed outcome. Another case discussed to some extent is the vote in German Bundestag that resulted in the transfer of government and parliament from Bonn to Berlin. Also this vote as well as the 2001 British parliamentary elections exhibit a high degree of procedure dependence of outcomes. It turns out that differences in voting outcomes can be explained by differences in the description of consensus states and ways in measuring preferences distances.
Voting, Compensation, and Division
The Mathematics of Elections and Voting
The Mathematics of Voting
Basic Geometry of Voting
The Mathematics of Voting and Elections
The Mathematics of Voting and Apportionment

Mathematics of Social Choice is a fun and accessible book that looks at the choices made by groups of people with different preferences, needs, and interests. Divided into three parts, the text first examines voting methods for selecting or ranking candidates. A brief second pa wherein an indivisible item must be assigned to one of several people who are equally entitled to ownership of the item, with monetary compensation paid to the others. The third part discusses the problem of sharing a divisible resource among several people. Mathematics of S undergraduates studying mathematics and students whose only mathematical background is elementary algebra. More advanced material can be skipped without any loss of continuity. The book can also serve as an easy introduction to topics such as the Gibbard-Satterthwaite fair division for readers with more mathematical background.

In this book, different quantitative approaches to the study of electoral systems have been developed: game-theoretic, decision-theoretic, statistical, probabilistic, combinatorial, geometric, and optimization ones. All the authors are prominent scholars from these disciplines. Quan powerful tool to detect inconsistencies or poor performance in actual systems. Applications to concrete settings such as EU, American Congress, regional, and committee voting are discussed.

The likelihood of observing Condorcet's Paradox is known to be very low for elections with a small number of candidates if voters' preferences on candidates reflect any significant degree of a number of different measures of mutual coherence. This reinforces the intuitive notio should become less likely as voters' preferences become more mutually coherent. Similar analysis is used here to indicate that this notion is valid for most, but not all, other voting paradoxes. This study also focuses on the Condorcet Criterion, which states that the pairwise ma as the election winner, if one exists. Representations for the Condorcet Efficiency of the most common voting rules are obtained here as a function of various measures of the degree of mutual coherence of voters' preferences. An analysis of the Condorcet Efficiency represent support for using Borda Rule.

The author takes the general reader on a tour of the mathematical puzzles and paradoxes inherent in voting systems, such as the Alabama Paradox, in which an increase in the number of seats in the Congress could actually lead to a reduced number of representatives for a sta which demonstrates that the winner of elections featuring more than two candidates does not necessarily reflect majority preferences. Szpiro takes a roughly chronological approach to the topic, traveling from ancient Greece to the present and, in addition to offering explanati conundrums of elections and voting, also offers biographical details on the mathematicians and other thinkers who thought about them, including Plato, Pliny the Younger, Pierre Simon Laplace, Thomas Jefferson, John von Neumann, and Kenneth Arrow.

A Mathematics Course for Political and Social Research
A Mathematician Looks at Voting
Protecting American Democracy
What does Voting Mean and How can it be Improved?
Social Choice and the Mathematics of Manipulation
Mathematics to the Rescue of Democracy

This volume brings together eight original essays designed to provide an overview of developments in spatial voting theory in the past ten years. The topics covered are: spatial competition with possible entry by new candidates; the "heresthetical" manipulation of vote outcomes; candidates with policy preferences; experimental testing of spatial models; probabilistic voting on alternatives with predictive power; elections with more than two candidates under different election systems; and agenda-setting behavior in voting. Leading scholars in these areas summarize the major results of their own and other's work, providing self-contained discussions that will apprise readers of important recent advances.

During the 2016 presidential election, America's election infrastructure was targeted by actors sponsored by the Russian government. Securing the Vote: Protecting American Democracy examines the challenges arising out of the 2016 federal election, assesses current technology and standards for voting, and recommends steps that the federal government, state and local governments, election administrators, and vendors of voting technology should take to improve the security of election infrastructure. In doing so, the report provides a vision of voting that is more secure, accessible, reliable, and verifiable.

Voters today often desert a preferred candidate for a more viable second choice to avoid wasting their vote. Likewise, parties to a dispute often find themselves unable to agree on a fair division of contested goods. In Mathematics and Democracy, Steven Brams, a leading authority in the use of mathematics to design decision-making processes, shows how social-choice and game theory could make political and social institutions more democratic. Using mathematical analysis, he develops rigorous new procedures that enable voters to better express themselves and that allow disputants to divide goods more fairly. One of the procedures that Brams proposes is "approval voting," which allows voters to vote for as many candidates as they like or consider acceptable. There is no ranking, and the candidate with the most votes wins. The voter no longer has to consider whether a vote for a preferred but less popular candidate might be wasted. In the same vein, Brams puts forward new, more equitable procedures for resolving disputes over divisible and indivisible goods.

The Mathematics of Elections and VotingSpringer
Understanding Elections through Statistics
Math in Society
America Votes!
Mathematics and Politics
Strategy, Voting, Power, and Proof
Securing the Vote

The Mathematics of Voting and Elections: A Hands-On Approach, Second Edition, is an inquiry-based approach to the mathematics of politics and social choice. The aim of the book is to give readers who might not normally choose to engage with mathematics recreationally the chance to discover some interesting mathematical ideas from within a familiar context, and to see the applicability of mathematics to real-world situations. Through this process, readers should improve their critical thinking and problem solving skills, as well as broaden their views of what mathematics really is and how it can be used in unexpected ways. The book was written specifically for non-mathematical audiences and requires virtually no mathematical prerequisites beyond basic arithmetic. At the same time, the questions included are designed to challenge both mathematical and non-mathematical audiences alike. More than giving the right answers, this book asks the right questions. The book is fun to read, with examples that are not just thought-provoking, but also entertaining. It is written in a style that is casual without being condescending. But the discovery-based approach of the book also forces readers to play an active role in their learning, which should lead to a sense of ownership of the main ideas in the book. And while the book provides answers to some of the important questions in the field of mathematical voting theory, it also leads readers to discover new questions and ways to approach them. In addition to making small improvements in all the chapters, this second edition contains several new chapters. Of particular interest might be Chapter 12 which covers a host of topics related to gerrymandering.

A careful analysis of the abstract properties that different procedures satisfy; e.g. envy-freeness and efficiency.

It is because mathematics is often misunderstood, it is commonly believed it has nothing to say about politics. The high school experience with mathematics, for so many the lasting impression of the subject, suggests that mathematics is the study of numbers, operations, formulas, and manipulations of symbols. Those believing this is the extent of mathematics might conclude mathematics has no relevance to politics. This book counters this impression. The second edition of this popular book focuses on mathematical reasoning about politics. In the search for ideal ways to make certain kinds of decisions, a lot of wasted effort can be averted if mathematics can determine that finding such an ideal is actually impossible in the first place. In the first three parts of this book, we address the following three political questions: (1) Is there a good way to choose winners of elections? (2) Is there a good way to apportion congressional seats? (3) Is there a good way to make decisions in situations of conflict and uncertainty? In the fourth and final part of this book, we examine the Electoral College system that is used in the United States to select a president. There we bring together ideas that are introduced in each of the three earlier parts of the book.

Elections are random events. From individuals deciding whether to vote, to people deciding for whom to vote, to election authorities deciding what to count, the outcomes of competitive democratic elections are rarely known until election day...or beyond. Understanding Elections through Statistics: Polling, Prediction, and Testing explores this random phenomenon from two points of view: predicting the election outcome using opinion polls and testing the election outcome using government-reported data. Written for those with only a brief introduction to statistics, this book takes you on a statistical journey from how polls are taken to how they can—and should—be used to estimate current popular opinion. Once an understanding of the election process is built, we turn toward testing elections for evidence of unfairness. While holding elections has become the de facto proof of government legitimacy, those electoral processes may hide a dirty little secret of the government illicitly ensuring a favorable election outcome. This book includes these features designed to make your statistical journey more enjoyable: Vignettes of elections, including maps, to provide concrete bases for the material In-chapter cues to help one avoid the heavy math—or to focus on it End-of-chapter problems designed to review and extend that which was covered in the chapter Many opportunities to turn the power of the R statistical environment to the enclosed election data files, as well as to those you find interesting From these features, it is clear the audience for this book is quite diverse. This text provides mathematics for those interested in mathematics, but also offers detours for those who just want a good read and a deeper understanding of elections. Author Ole J. Forsberg holds PhDs in both political science and statistics. He currently teaches mathematics and statistics in the Department of Mathematics at Knox College in Galesburg, IL.

Is Democracy Fair?
The Condorcet Efficiency of Voting Rules
The Mathematics of Ranked-Choice Single-Winner Voting Systems. Can Different Systems of Voting Affect the Results?
Why Elections Aren't Fair (and What We Can Do About It)
Numbers Rule
Fair Division

Have you ever voted on something? You might have voted for pizza for dinner, which movie to watch or who should go first in a game. If you have ever voted, you know how important it is to have a voice in making decisions that are part of your life. The people who created this country knew that too and took many risks to create a country where they could speak freely about what they wanted. The battle for voting rights was a long one--with some people being allowed to vote long before others. Read about who made the decisions and who had to fight for the same rights. Seeing how hard African Americans, Native Americans, and women fought to have the right to vote reminds everyone that voting is part of what created this country and what will help it keep growing and changing today and in the future.

Offers a critical assessment of fundamental flaws in the American electoral system, looking at how a minor "spoiler" candidate can affect the election by taking enough votes away from the most popular candidate to tip the election to another, and proposes a simple but fair solution designed to transform the electoral system.

Over two centuries of theory and practical experience have taught us that election and decision procedures do not behave as expected. Instead, we now know that when different tallying methods are applied to the same ballots, radically different outcomes can emerge, that most procedures can select the candidate, the voters view as being inferior, and that some commonly used methods have the disturbing anomaly that a winning candidate can lose after receiving added support. A geometric theory is developed to remove much of the mystery of three-candidate voting procedures. In this manner, the spectrum of election outcomes from all positional methods can be compared, new flaws with widely accepted concepts (such as the "Condorcet winner") are identified, and extensions to standard results (e.g. Black's single-peakedness) are obtained. Many of these results are based on the "profile coordinates" introduced here, which makes it possible to "see" the set of all possible voters' preferences leading to specified election outcomes. Thus, it now is possible to visually compare the likelihood of various conclusions. Also, geometry is applied to apportionment methods to uncover new explanations why such methods can create troubling problems.

Amazingly, the complexities of voting theory can be explained and resolved with comfortable geometry. A geometry which unifies such seemingly disparate topics as manipulation, monotonicity, and even the apportionment issues of the US Supreme Court. Although directed mainly toward students and others wishing to learn about voting, experts will discover here many previously unpublished results. As an example, a new profile decomposition quickly resolves the age-old controversies of Condorcet and Borda, demonstrates that the rankings of pairwise and other methods differ because they rely on different information, casts serious doubt on the reliability of a Condorcet winner as a standard for the field, makes the famous Arrow's Theorem predictable, and simplifies the construction of examples.
The Mathematics of Politics, Second Edition
Voters and Voting
Strategy, Voting, Power and Proof
An Introduction
Mathematics and Democracy
Voting Procedures under Uncertainty

Cover; Contents; Acknowledgments; INTRODUCTION: Voting as an Ethical Issue; CHAPTER ONE: Arguments for a Duty to Vote; CHAPTER TWO: Civic Virtue without Politics; CHAPTER THREE: Wrongful Voting; CHAPTER FOUR: Deference and Abstention; CHAPTER FIVE: For the Common Good; CHAPTER SIX: Buying and Selling Votes; CHAPTER SEVEN: How Well Do Voters Behave?; AFTERWORD TO THE PAPERBACK EDITION: How to Vote Well; Notes; References; Index. - Nothing is more integral to democracy than voting. Most people believe that every citizen has the civic duty or moral obligation to vote, that any sincere vote is morally acceptable, and that buying, selling, or trading votes is inherently wrong. In this provocative book, Jason Brennan challenges our fundamental assumptions about voting, revealing why it is not a duty for most citizens--in fact, he argues, many people owe it to the rest of us not to vote. Bad choices at the polls can result in unjust laws, needless wars, and calamitous economic policies. Brennan shows why voters have duties to.

An accessible textbook that provides an overview of the historical origins and development of voting theory, this guide explores theories of voting and electoral behaviour at a level

suitable for college students.
This illuminating and instructive survey demonstrates both the insights and the pitfalls that result from applying game theoretic models to the analysis of problems in political science. Using real-life examples, it shows how game theory can explain and elucidate complex political situations, from warfare to presidential vetoes. 1975 edition. 24 figures.
The Mathematics of Voting and Elections: A Hands-on Approach will help you discover answers to these and many other questions. Easily accessible to anyone interested in the subject, the book requires virtually no prior mathematical experience beyond basic arithmetic, and includes numerous examples and discussions regarding actual elections from politics and popular culture.
Gaming the Vote
Game Theory and Politics
Making Democracy Fair: The mathematics of voting and apportionment

The Ethics of Voting
Mathematics of Social Choice
This detailed snapshot of America's voting and electoral practices, problems, and most current issues addresses a variety of fundamental areas concerning election law from a federal perspective, with coverage of such topics as voter protection, voting tec disenfranchisement, and the Voting Rights Act. Original.
Scientific Essay from the year 2021 in the subject Mathematics - Statistics, grade: 7 (IB), , language: English, abstract: The aim of this paper is to investigate to what extent different systems of voting can affect the results and the distribution of votes in elections, there are always politicians who hold extreme beliefs and are either loved or hated by people and those who hold tempered beliefs but are tolerable by society. Consequently, the research also examines which of the two mentioned characteristics chances of winning by applying basic statistical measures such as mean or standard deviation. The subject is relevant because it allows us to get a mathematical insight into single-winner electoral systems and can show whether a particular system of vot the results. The paper analyses 4 different methods of voting that are or were used in the world to elect a President or other representatives for single-member posts: Supplementary Vote (SV), Instant-runoff voting (IRV), Bucklin Voting, and Coombs' meth are ranked-choice systems, that is voters rank their candidates from the most favorable one to the one that in their opinion is completely not suitable to accede to a particular office. Ranked-choice systems were chosen because this paper does not invest the situation of candidates in other positions changes.
Political science and sociology increasingly rely on mathematical modeling and sophisticated data analysis, and many graduate programs in these fields now require students to take a "math camp" or a semester-long or yearlong course to acquire the necess written for mathematics or economics majors, and fail to convey to students of political science and sociology the reasons for learning often-abstract mathematical concepts. A Mathematics Course for Political and Social Research fills this gap, providing be sciences and a handy reference for seasoned researchers. The book begins with the fundamental building blocks of mathematics and basic algebra, then goes on to cover essential subjects such as calculus in one and more than one variable, including optim implicit functions; linear algebra, including Markov chains and eigenvectors; and probability. It describes the intermediate steps most other textbooks leave out, features numerous exercises throughout, and grounds all concepts by illustrating their use and i sociology. Uniquely designed and ideal for students and researchers in political science and sociology Uses practical examples from political science and sociology Features "Why Do I Care?" sections that explain why concepts are useful Includes numerous ex manual (available only to professors, email david.siegel at duke.edu, subject line "Solution Set") Selected solutions available online to students
What does the 2000 U.S. presidential election have in common with selecting a textbook for a calculus course in your department? Was Ralph Nader's influence on the election of George W. Bush greater than the now-famous chads? In Chaotic Elections!, D placing them in the larger context of voting systems in general. His analysis shows that the fundamental problems with the 2000 presidential election are not with the courts, recounts, or defective ballots, but are caused by the very way Americans vote f mathematics can help to identify and characterize a disturbingly large number of paradoxical situations that result from the choice of a voting procedure. Moreover, rather than being able to dismiss them as anomalies, the likelihood of a dubious election re consequences indicate that election outcomes--whether for president, the site of the next Olympics, the chair of a university department, or a prize winner--can differ from what the voters really wanted. They show that by using an inadequate voting proc To add to the difficulties, it turns out that the mathematical structures of voting admit several strategic opportunities, which are described. Finally, mathematics also helps identify positive results: By using mathematical symmetries, we can identify what t might mean and obtain a unique voting method that satisfies these conditions. Saari's book should be required reading for anyone who wants to understand not only what happened in the presidential election of 2000, but also how we can avoid similar pro is making a choice using a voting procedure. Reading this book requires little more than high school mathematics and an interest in how the apparently simple situation of voting can lead to surprising paradoxes.
An Introduction to the Math of Voting Methods
From Cake-Cutting to Dispute Resolution
A History of Voting Rights
The Mathematics of Voting and Elections: A Hands-On Approach
Voting Paradoxes and Group Coherence
Chaotic Elections!

As a text for an undergraduate mathematics course for nonmajors, Mathematics and Politics requires no prerequisites in either area while the underlying philosophy involves minimizing algebraic computations and focusing instead on some conceptual aspects of mathematics in the context of important real-world questions in political science. Five major topics are covered including a model of escalation, game theoretic models of international conflict, yes-no voting systems, political power, and social choice. Each topic is discussed in an introductory chapter and revisited in more depth in a later chapter. This new edition has added co-author, Allison Pacelli, and two new chapters on "Fairness" and "More Fairness." The examples and the exercises have been updated and enhanced throughout. Reviews from first edition: This book is well written and has much math of interest. While it is pitched at a non-math audience there is material here that will be new and interesting to the readers... -Sigact News For mathematicians, Taylor's book shows how the social sciences make use of mathematical thinking, in the form of axiomatic systems, and offers a chance to teach this kind of thinking to our students. -The College Mathematics Journal The writing is crisp and the sense of excitement about learning mathematics is seductive. The political conflict examples are well thought out and clear. -Michael C. Munger
This title takes an in-depth look at the mathematics in the context of voting and electoral systems, with focus on simple ballots, complex elections, fairness, approval voting, ties, fair and unfair voting, and manipulation techniques. The exposition opens with a sketch of the mathematics behind the various methods used in conducting elections. The reader is lead to a comprehensive picture of the theoretical background of mathematics and elections through an analysis of Condorcet's Principle and Arrow's Theorem of conditions in electoral fairness. Further detailed discussion of various related topics include: methods of manipulating the outcome of an election, amendments, and voting on small committees. In recent years, electoral theory has been introduced into lower-level mathematics courses, as a way to illustrate the role of mathematics in our everyday life. Few books have studied voting and elections from a more formal mathematical viewpoint. This text will be useful to those who teach lower level courses or special topics courses and aims to inspire students to understand the more advanced mathematics of the topic. The exercises in this text are ideal for upper undergraduate and early graduate students, as well as those with a keen interest in the mathematics behind voting and elections.
A Guide to Modern Election Law and Voting Rights
A Hands-on Approach
The Vexing Mathematics of Democracy, from Plato to the Present
Approval Voting