



Department Of Statistics

Sri Venkateswara College

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StatMag

Promoting Statistics as a “Subject of Necessity”



Theme

Recent Developments of **Statistics & Data Analysis** in
Multidisciplinary Research

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About the Department Of Statistics

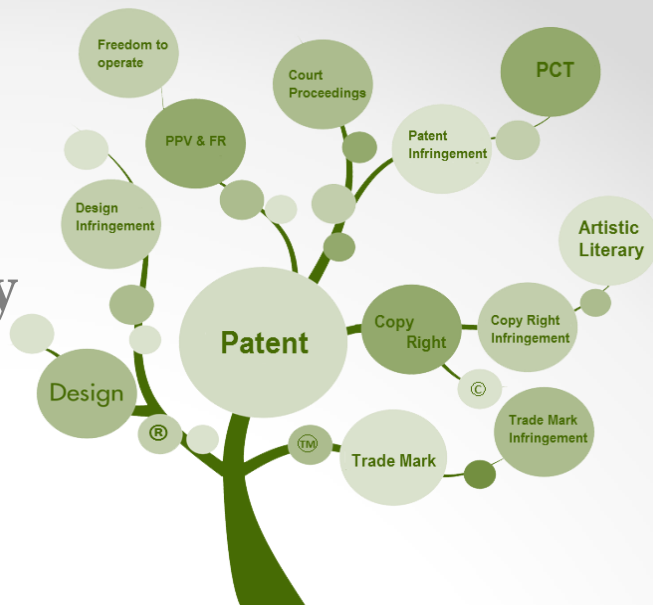
The Department of Statistics was established in 1977 and continually runs the undergraduate and postgraduate programmes in Statistics till date. Specializations in department are vast and include statistical science, social statistics, and official statistics and range from computational statistics and much more. The faculty contributes knowledge of statistical analysis and expertise from a variety of fields including design of experiments, sample survey, econometrics and others.

There is a good collection of books in the department with the latest titles in various areas of statistics. The computer laboratory with the latest computing systems and related equipment has been set up in the Department for the use of students and teachers.

Prof. Veena Budhraja

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Intellectual Property Rights In Higher Institutes In India



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Despite less innovation inputs, in the last decade, India has romped up the rank from 62nd to 46th among the 132 economies featured in Global Innovation Index (GII) 2021, and producing more innovation outputs. India ranks 1st among the 10 economies in Central and Southern Asia and 2nd among the 34 lower middle-income group economies in GII 2021. India, hold the record for over performing on innovation relative to their level of development for the 11th year in a row.

India ranked 40th among 53 global economies on the latest annual edition of the International Intellectual Property (IP) Index 2021. Since 2012, of the BRICS economies included India's score improved by 13.44% indicating the improved framework for IP-driven innovation and creativity. However, despite this positive progress, India lags in IP filings, occupying 25th rank among countries with a low resident patent applications count wherein approx. 59.2% IP filings are from non-resident applicants.

Economic Survey of India 2021-2022 reported patents filing rose 30% in the last five years while the number of patents granted during the same period almost tripled. The survey noted that 58,502 patents were filed and 28,391 patents were granted during 2020-21. Significant contributions have been made by Educational Institutes and Tech Companies with Research and Development (R&D) centres in India. For instance, the Indian Institute of Technology (IIT) Kanpur reported 107 new IP filings in 2021 taking its overall tally of IPRs to 810 and similarly, the Samsung Research Institute has filed 7500 patents globally from India, out of which 3500 were filed in India in the last 10 years. Though patents filed in India have grown considerably, the number is still a fraction of the 5.30 lakh patents granted in China and 3.52 lakh patents granted in the USA, according to the Economic Survey.

It is an undeniable fact that IP for a country is one of the basic grounds for economic growth and, it is not untouched with the massive competition globally. Therefore, it is vital that young researchers should realise their Intellectual Property Rights and manage IP in appropriate way for taking competitive advantage and superior performance in the present dynamic world.

Academic institutions of a country are the key creators of the well-educated skilled human resources including technocrats, researchers, mentors, inventors, policy makers etc who are the pillars of every sector, may it be Government sector or private sectors including research & development organisations, industries, institutions etc. Therefore, it is mandatory to create a favourable environment for promotion, protection and management of IP's created /invented in the educational institutions at the level of varsities and colleges. These institutions should utilize IP as a mechanism to disseminate knowledge for upliftment of economic sector.

Intellectual Property Rights (IPR) confer exclusive rights to the inventor/creator or his assignee to protect and fully utilize his invention/creation for a given period of time. IPR promotes healthy competition thus encourages industrial and economic development of a country. Intellectual property assets are vital link between the market, technology and business strategy.

India has a firm legislative, administrative and judicial framework to protect Intellectual Property Rights (IPRs). India's IPR regime is dynamic, robust and compliant with Trade Related Aspects of Intellectual Property Rights (TRIPS). TRIPS Agreement allows policy space to countries to evolve a regime that best suits its condition. Accordingly, India's IPR regime aims at meeting international standards while providing adequate incentive for innovations. Intellectual Property Legislations administered in India by Department for Promotion of Industry and Internal Trade (DPIIT), Govt. of India, are:

- The Patents Act, 1970
- The Trade Marks Act, 1999
- The Copyright Act, 1957
- The Geographical Indications of Goods (Registration & Protection) Act, 1999
- The Designs Act, 2000
- The Semiconductor Integrated Circuits Layout Design Act, 2000

In recent years India is taking great steps in boosting its intellectual property ecosystem. Government of India launched 'National IPR Policy' in 2016 that aimed to promote innovation and creativity in higher education institutes and also amongst entrepreneurs. National IPR Policy of 2016, was formulated with following objectives:

- Increasing IPR awareness
- Generating more IPRs
- Development of a legal and legislative framework
- Improving the administration and management
- Commercializing IPRs
- Human Capital Development
- Enforcement and adjudication of IPR schemes.

To gain global recognition of Indian education system, importance of innovation and research should be emphasised. In order to encourage greater participation of the educational institutions, that play a pivotal role in country's innovation, official fees payable by them for patent filing and prosecution is reduced by 80%, which came into effect on 21st September, 2021. The University Grant Commission (UGC) is also planning to include IPR as a part of academic curriculum in educational institutes. National IPR Policy envisions a comprehensive approach to transforming the quality and quantity of 'Research' in India. It is a guiding framework that aims at creating an education system that is oriented towards start-ups for students and faculties. Govt. of India has also launched many flagship programmes and schemes for protection & management of IPR of the start-ups, which includes fees reduction, facilitation for patent filings through their panellists patent agents and of course enhance IP awareness etc.

As a good practice, educational institutes frame their institutional IP Policy to provide a simple and transparent framework. An institutional IP policy usually include rules for the management of IP resulting from researches, rules for dissemination of knowledge and transfer of IP as well as rules regarding collaborative and contract research along with other related issues.

In general, educational institutes should ensure that all stakeholders concerned, whether employees, visiting researchers, outside collaborators or students, are aware of the confidentiality issues related to their activities, along with the opportunities arising from their own and the institution's IP. Institutional IP policy should provide clear rules for them regarding disclosure and confidentiality, as well as model non-disclosure agreements. Educational and Research institutes often work in collaboration with business houses, Government or other institutions in order to exploit their research. Collaboration may take many forms, such as collaborative research between different universities/research institutes, or between universities/ research institutes and industry, contract research between universities/ research institutes and industry, or the free exchange and dissemination of knowledge and materials among universities/ research institutes. In such instances, they need to establish collaboration agreements that safeguard their rights to continue to use existing IP and to exploit the IP that arises from research.

Currently, only few institutes are effectively contributing for research and development in India. IITs are the top most institutes in filing IP applications. The new national IPR policy has shown some intent in improving the condition of IPR in India. Through the process of educating students at young age about IPR, we are going to improve the number of people getting interested in research and development in the future. Also, by providing financial support, the Government may take care of the aspect when due to limited finances students do not participate in such practices.



Recent Involvement Of Statistics & Data Analysis In Multidisciplinary Research

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Statistics, when we talk about, we start get panic or distraught by thinking about the mathematics formulas, equations, and complex data. But, Statistics is a part of every field of our life, knowingly or unknowingly we apply it to our daily life. Statistics help us understand our past, present and future. For instance, it can help us uncover trends based on data from the past and can be useful in predicting what may happen in the future.

The 21st century modern day world is often termed as the 'information age,' wherein we are constantly trying to make sense of the enormous information around us. However, information isn't as useful until it is gritted mathematically by using statistics. Importance of statistics is far-reaching and includes almost every possible domain. It holds a central position in almost every field. It's uses and importance can be seen in fields as diverse as agriculture, mathematics, healthcare, engineering, decision making, geography, sports, marketing, government, nursing, planning, banking, economics, education, medicine, business management, industry, physics, biology as well as educational research.

Some of the most vital applications of Statistics in our daily life are:

- The financial market is not complete without statistical data. For a layman, it is hard to understand the intricate scenario of share market and other financial sectors. It is easier to represent important data with the help of diagrams, charts, and other statistical tables.
- Pharmaceutical companies use statistical studies to determine efficiency and safety of drugs.
- Nowadays, Mobile Applications are also incomplete without statistical data. For example, booking a cab or keeping a count on number of calories burnt in a week.
- Economics largely depends upon statistics. In economics statistical methods are used for collecting and analysing the data. The relationship between supply and demands is also studied by statistical method. The imports and exports, the inflation rate etc. also require a good knowledge of statistics.

- News Channels use statistical data to make everything understandable for its viewers. Statistical data plays a strong part in this sector. Without that, it would be tough for the viewers to understand the significant perspectives of today's world.
- Stock market is one of the most important sectors where basic and technical analysis of the data is used to predict the future movement of the stocks.
- Weather forecasting is almost impossible to do without statistics. During weather forecast we notice that the forecasters talk about weather models, which are nothing but a computer based models built on a firm foundation of statistics.
- In Insurance, Statistics plays an important role in determining the insurance value of commodities from cars to houses etc.
- Statistics help us make predictions about something that can happen in the future. On the basis of what we encounter in our daily life we make predictions about the future. For example, exit polls are totally predicted on the basis of statistics.

Studying the field of statistics is crucial in modern society. It guides researchers for learning from data and navigating common problems that can lead you to incorrect conclusions. On the other hand, it is growing importance of decisions and opinions based on data. Statistics is an exciting field about the thrill of discovery, learning, and challenging your assumptions. It facilitates the creation of new knowledge.

Despite the many useful applications of statistics in our day to day life as highlighted earlier, people sometimes manipulate data or use hazy statistics to support and promote their propaganda, and this can create a deep long-lasting effect.

Many people get allured by these illustrated statistics; therefore, it is important for us to understand sophisticated statistics and the ethics of dealing with data. However, this does not take away from the humongous contribution that statistics made in the advancement of our modern-day world.

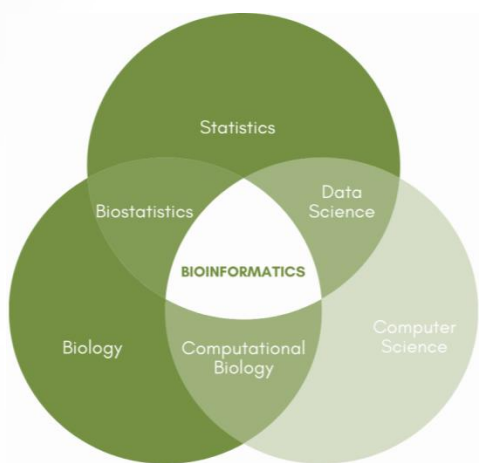
In the words of Bowley, “Knowledge of statistics is like knowledge of foreign language or of algebra; it may prove of use at any item under any circumstance.”

Statistical analysis is a procedure of performing various statistical operations. It is a kind of quantitative research, which seeks to quantify the data, and typically, applies some form of statistical analysis. It is an important research tool used by scientists, governments, businesses, and other organizations.

- To draw valid conclusions, statistical analysis requires careful planning from the very start of the research process. You need to specify your hypotheses and make decisions about your research design, sample size, and sampling procedure.
- After collecting data from your sample, you can organize and summarize the data using descriptive statistics. Then, you can use inferential statistics to formally test hypotheses and make estimates about the population. Finally, you can interpret and generalize your findings.

Data analysis is the process of cleaning, changing, and processing raw data, and extracting actionable, relevant information that helps businesses make informed decisions. The procedure helps reduce the risks inherent in decision-making by providing useful insights and statistics, often presented in charts, images, tables, and graphs.

Involvement of Statistics in Biological Chemistry



Author

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Abstract

Statistics is one of the most imperative subjects whose knowledge and techniques are not just limited to it, but can be extrapolated to various seemingly unrelated fields of study as well. Although people appreciate how Statistics can be applied to everyday lives, it is quite uncommon that people rarely think and discuss, if not aware, about the numerous applications of Statistics in the field of Biology Chemistry.

In this article, an attempt is made to mention the vital role of Statistics in Biological Chemistry, its application, and its profound impact in the various fields of Biology.



Introduction

Every scientific breakthrough starts with an observation. Scientific research lies on reproducibility and cold, hard numbers. Therefore, it is not uncommon that scientists would be dealing with abundant data generated from their carefully thought experiments every day.

There is always a fallacy, at least in the minds of students, that the two fields, Biology and Statistics are really distant and would not converge, if not diametrically opposite. Thus, this article is meant to convey that despite being two seemingly distinct fields, there are a lot of applications of Statistics in the field of Biology that are currently being implemented in research to better understand Biology.

Starting off with the most basic example of the use of Statistical analysis in Biology. There is a lot of Biological data being generated from the wet lab experiments from which we have to draw out inferences. Once the experiment is performed, how can we be certain if the result is significant?

Let D be the data that we already have and θ be the unknown parameter. Thus, the prior distribution $f(\theta)$ will be given by

$$f(\theta|D) = \frac{1}{z} f(\theta) f(D|\theta)$$

Here, z is the normalizing constant

$$z = \int f(\theta) f(D|\theta) d\theta$$

Posterior $p(\theta|D)$:

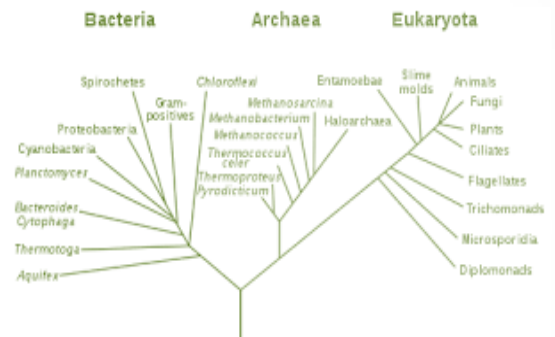
$$p(\theta|D) = \frac{P(D|\theta)P(\theta)}{P(D)}$$

Thus, to know whether the data is consistent with our proposed hypothesis, we have to determine which Statistical test we need to apply to the dataset. Depending on the type of data, whether it is categorical or numerical, we determine the test that can help us better understand our observed results.

In addition to this, we want to study the observation of some reactions over a particular duration of time. For instance, we want to study the action of a drug on its target over some time to know its therapeutic effect. This is a classic example of the application of time series analysis.

Phylogenetics, in simple terms, is the study of the evolutionary relationship of organisms.

In the 1990s, Bayesian phylogenetic methods substantially changed the way we analysed the genomic sequence data and phylogenetic. The Bayesian approach concatenates the prior probability of the tree with the data to give a posterior probability distribution on trees.



Thus, in Phylogenetics the Bayesian approach is widely popular and its use has been growing exponentially since 1990s.

These three examples were just a small portion (or sample) of the vast applications of Statistics in Biology and related fields. Every field of science relies on numbers. An experiment would yield data, but statistics can narrate the story. Thus, it is correctly said that Statistics is the grammar of Science.

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Statistical Techniques Transforming the Medical Industries

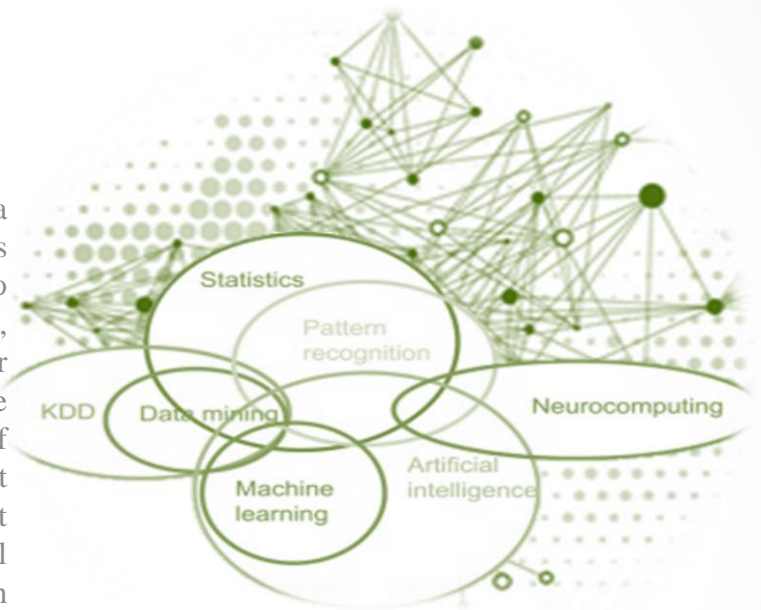
Author

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Abstract

The time of Big Data in medical will be a brilliant period for insights. Logical fields are changing from information poor to information rich and-across enterprises, science, and government-techniques for settling on choices are turning out to be more information driven as a lot of information is being gathered and put away. The information utilized for most populace wellbeing the board and clinical choice help applications is observational in nature and medical care.



Introduction

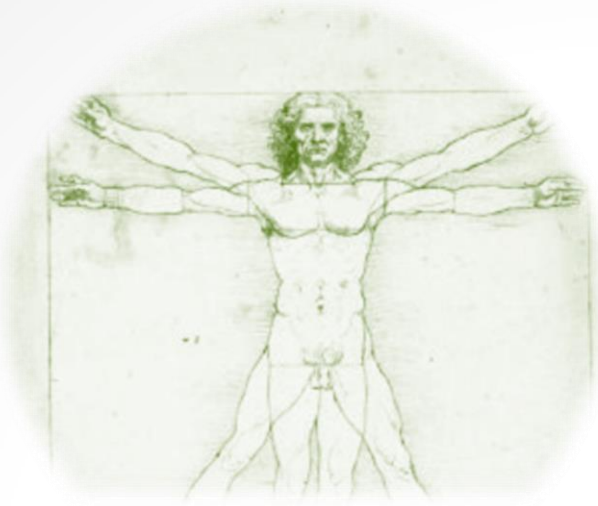
A multidisciplinary approach with an accentuation on insights and logical reasoning will be basic for outfitting and utilizing huge information in medical care, says another white paper from the American Statistical Association. Drawing nearer convoluted and uproarious clinical datasets with a numerical psyche can assist with reinforcing dynamic cycles while refining new advances and AI applications to focus on key bits of knowledge.

Maximum of the research papers proof that information contact pretty much every part of our lives, from the manner in which we

execute trade on the web, to how we measure our wellness and wellbeing, to the manner in which specialists treat our diseases, to monetary choices that influence whole countries. Since one can undoubtedly be tricked by convoluted predispositions and examples emerging by some coincidence, and on the grounds that measurements have developed around making revelations from information, factual reasoning will be vital to Big Data challenges.

As medical services shift into an information driven industry and the sheer volume of accessible information increases

at an outstanding rate, information researchers and innovation engineers should find more proficient approaches to gathering, putting away, sorting, and introducing informational indexes. The white paper recognizes four key regions



medical services information researchers should address to achieve the targets of populace wellbeing the board and customized clinical consideration: causal derivation, inclination decrease, design mining, and model trade-offs.

- ❖ Epic Systems Pulls Ahead for Population Health Management Vendors
- ❖ Patient-Centered Medical Home May Improve Safety Net Care
- ❖ Utilizing Artificial Intelligence to Detect Anti-disease Immunity

Since the information utilized for most populace wellbeing the board and clinical choice help applications is observational in nature. Medical care associations should be mindful so as to get the genuine causal effect and relative viability of therapies or care as far as results, fulfilment, and cost might include the investigation of electronic clinical records, claims data sets, and quality reviews from thousands and ultimately.

Large information examination is additionally confounded by the regular predisposition innate in populace information, which might contain holes comparable to vital sub-populaces, and the need to adjust contending objectives like interpretability and precision.

Analysts have for quite some time been occupied with battling these difficulties in the general wellbeing field as well as in various different ventures, like money, business, the sociologies, and designing. As heads of interdisciplinary information sciences groups, they can give a significant assortment of information for creating foreseeing investigation calculations, concentrating on progressively huge and complex populace informational collections, and creating perception applications for carrying logical experiences to suppliers and opposite end clients.



The historical backdrop of measurements shows how analysts have occupied interdisciplinary examination and how that commitment progressed in the area of sciences, and gave new bits of knowledge. Multidisciplinary groups with each discipline having a lot to gain from different disciplines-will guarantee the best science is brought to bear, help to keep away from re-examination of existing procedures from the contributing information science teaches, and prod improvement of new hypotheses and approaches.



Statistics: A Gadget To Efficiency

Author

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Abstract

In layman language Statistics is the study of collection, organization, presentation, analysis, and interpretation of data. Anyone can see the importance of statistics in various fields. Nowadays, everything is based on data and its associated analysis techniques. Statistics allows us to understand any subject much more deeply. It opens a new perspective in our life. It provides us a way to make claims based on data, to make predictions and learn from the past.

Introduction

Today, the world demands efficiency and Statistics is the tool that can bring the efficiency needed in today's world. Let us first understand what Statistics is before understanding its importance and its role in various fields. People think that Statistics and big data analysis is a new discipline in sciences but the traces of statistics can be traced in history in some form back 2000 years ago. Statistics allows you to evaluate claims based on quantitative evidence and helps you differentiate between reasonable and dubious conclusions.

Statistics is not about numbers. It's about data and numbers. It is the context that makes a problem meaningful and something worth considering. As people say

“Without data, you are just another person with opinions”

Data is the most important thing in the world and to analyse data and to conclude results from data we use statistics. Statistical methods allow us to collect, describe, analyse and draw conclusions from data. So, one can conclude that Statistics is the scientific discipline that provides methods to help us make sense of data. The field of statistics allows us to make intelligent judgments and informed decisions in the presence of uncertainty and variation. Statistics uses numerical evidence to draw valid conclusions .



Anyone can see widespread use of statistical analysis in diverse fields such as business, medicine, agriculture, social sciences, natural sciences and engineering. I believe that statistics is the key to efficiency in various fields of research. A question is asked “Is work that cannot be done without involving statistics?” The answer is in many fields we can perform tasks without statistics but we are still using statistics as it allows us to do the same work in lesser time and with more efficiency. It systematized the effort of a researcher and leads them towards the goal. They help us to summarize results, draw conclusions, and predictions.

Moreover, statistical techniques are used in every invention and research to test their efficiency without launching them on a full scale. We can see the use of statistics in many other fields like engineering. It helps us to draw the best possible result from the collected data. Statistics is of utmost importance in online marketing where algorithms are designed for personalized marketing. Furthermore, political parties are also designing their campaign after a deep analysis of data collected from surveys. The statistic is also useful in weather forecasting. It is done after analysing weather from the past and studying current conditions collected from satellites. Much of economics also depends on statistics. Economists use statistics to collect information, analyse data, and test hypotheses. Relationships between supply and demand and imports and exports are found using statistical information. The same can be said for figuring out the inflation rate, the per capita income, and even the national income account. Many activities of the government run on statistics. Government designs their budgets are designed upon statistical data because it's the most accurate data available when estimating expected expenditures and revenue.



Statistics find a vital role in astronomy too. Can you imagine measuring the distance between two objects in space by physical means? No, it is not possible to measure distances like that so how are they measured. They are measured using statistical tools. Physics, chemistry, meteorology, sociology, communication, and even information technology all use statistics. For many of these categories, the use of statistics in that field involves collecting data, analysing it, coming up with a hypothesis, and testing that hypothesis.

So, we have seen what statistics and why it is important. We need to tell you that with the passing time the importance of statistics is increasing and there is a compilation of more and more data and we need more statisticians to interpret this data, to get an efficient result. Everyone must learn data analysis techniques as they find their application from research to business, from politics to sports. Statistics help us in predicting what might happen in the future and also to understand what has happened in the past. Finally, I have to say statistics is the key to what today's world demands, which is efficiency and now we must recognize statistics as a subject of necessity.

The Astronomical Growth: Using Statistics

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Abstract

Facts and figures have always been used as a supplement to solidify the particular proposed theories, the main purpose of using statistics is to effectively present the results while employing the correct analyses. We live in a world full of information, there are millions of opinions, facts, theories available on any given topic, most of this information is being preserved over the years mathematically by using statistics.

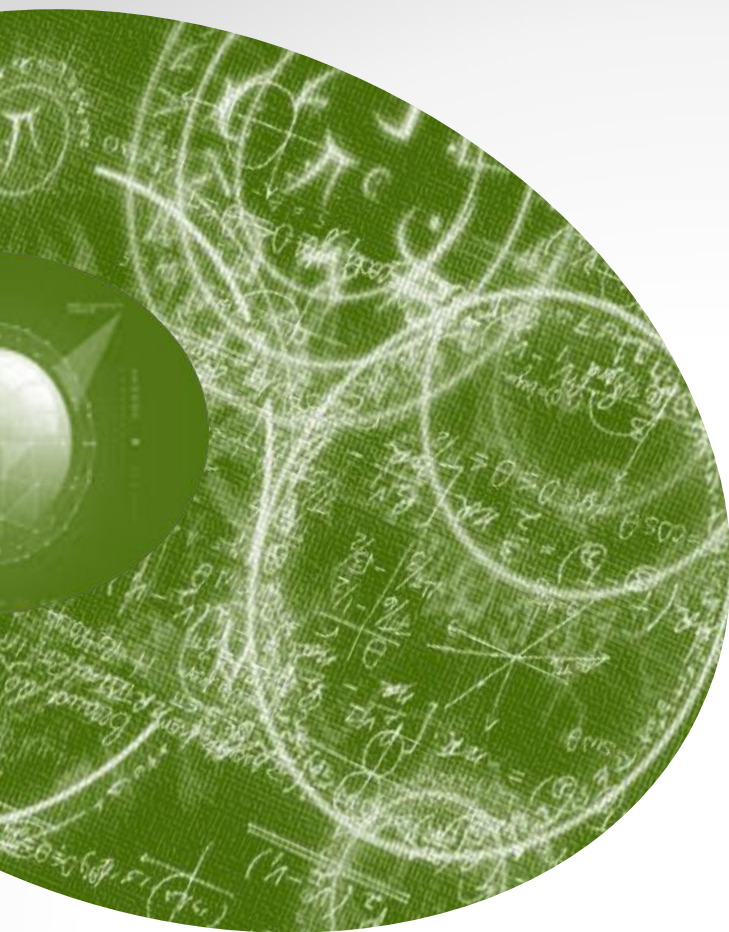
The aim of writing this article is to provide an introduction to statistical applications in astronomy for statisticians and highlights the hierarchical nature of many astronomy inference.

Introduction

In fact in our daily life, we make various predictions about the most random things. Such day to day based random predictions are the most raw form of statistics being used in our average day.

The list goes beyond pages and the facts go beyond the world, statistics modified the work progress and helped the various spheres to acknowledge the growth as well as fall. A correct method of analysis and observation can direct us to our desired results and make the most out of anything designated. Let's have a statistical approach and remember famous quote given by Albert Einstein "not everything that counts can be counted and not everything that can be counted ,counts."

The concept of census is another example of statistical progress over ages. Today the world runs on statistics, the finance, government, health care, social media all of these are using statistics in one form or another to complete their tasks. The entire range of information that the world has gathered so far is being used effectively and can be found anywhere because of the statistical tools used during organizing it.



Scientists have been working hard over the years to look for similar celestial objects that could possibly give us hope by providing the resources which are going to be exhausted on the earth soon enough. The exploration of space isn't that easy and takes a lot of patience as well as an organized method of keeping the data recorded. As space is known to be expanding endlessly there are too many variables, points and complexity which requires an updated learning of statistics. Using statistics for bifurcation of data and complexities, the work can get simpler and the research can be given a modified range for better results.

Astronomy has a long history of exploiting observational data to estimate parameters and quantify uncertainty in physical models. Problems in astronomy propelled the development of many statistical techniques, from classical least squares estimation to contemporary methods such as nested sampling.

Telescopes take images of the night sky and spectra represents the intensity of light in different wavelengths, providing considerably more information than can be directly inferred from image data. Astrostatisticians use a wide range of statistical methods to analyse these complex data sets. We now discuss several areas of statistical methodology with recent applications within astronomy.

Approaches commonly used in astronomy to solve measurement error models problem include the bivariate correlated errors and intrinsic scatter model and hierarchical Bayesian models. Use of Bayesian methodology has grown considerably in astronomy over the past three decades. Active areas of Bayesian research include hierarchical models, posterior samplers, and models for complex data types such as images and functions.

The process of turning data into scientific knowledge discovery typically requires the use of many statistical tools, often in innovative ways. Some of the most challenging statistical questions that arise in astronomy relate to how to merge these tools into a data analysis pipeline that permits valid statistical inferences while remaining computationally feasible.

Thus interdisciplinary collaborations of statisticians and astronomers will be essential for developing the new statistical methodology necessary for fully realizing the science potential.

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Importance Of Statistics In Medicine, Public Health And Biology

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“Data, Data, Data! I cannot make bricks without clay”

--Sherlock Holmes

It is hard to imagine any field of Science that does not rely on a thorough statistical analysis of data. The ability to fathom and draw inferences from raw data is what makes Statistics an imperative part of every scientist's work.

The field of Biology is no different when it comes to implementing various statistical tools and methods to make sense of data. Biostatistics is an emerging field that has a huge impact on everyday life. For instance, a biostatistician sheds light on crucial questions revolving around Health and Medicine like how effective a certain vaccine or drug is, the number of years a person is likely to live if he/she has contracted a particular disease, etc. In a data-rich world, we need people who can convert data into knowledge.

Whenever there is an outbreak of disease, there is a dire need for data and inferences as millions of lives are at stake. Statistically, we can probe the best, worst, and most probable scenarios that can happen in a particular geographical area that has diverse demographics. Depending on that, the authorities are able to make informed decisions that can save the lives of thousands or even millions of people.

Using statistical methods, public health officials and biostatisticians came up with two possible scenarios that can take place- Either taking precautionary steps to curb the spread of the virus, thereby giving time to the overburdened healthcare system to scale up and accommodate as many patients as possible, thus saving many lives or not taking any precautionary step and a wave of active cases swarm through the population, leading to a lot of casualties.





It's hard to ignore Statistics given its vast applications. And the use of Statistics is only going to grow as more and more data is generated in the 21st century. All in all, without the use of Statistics, the pillars of Public Health, Medicine, and Biology would topple as clay (data) cannot magically become bricks (statistical models) in absence of Statistician.



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Statistical Techniques For Presenting COVID 19 Facts : An Overview

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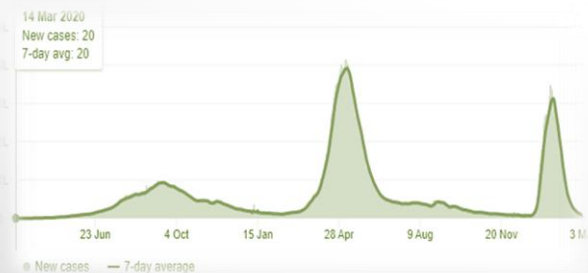
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Abstract

The onset of COVID 19 on December 31, 2019, statistics has been a key tool to convey the COVID data to a layman in terms of figures which are easily understandable. In the present article, an overview is given of how, descriptive statistics is applied to present the facts and figures of COVID 19 data. Statistics along with R Software is being used to measure the statistical measures such as mean, median, mode, standard deviation, global average and other applied over confirmed, recovered and death cases. Even models like the Poisson regression model and the generalised linear models are made use of to analyse the COVID 19 data. This article shows how statistics plays a crucial role in COVID 19 and its prediction. .

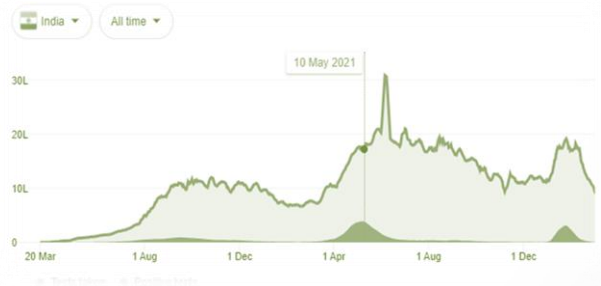
Introduction

As the line charts have been the most important form of data presentation as it is the easiest to understand yet effective in conveying the real data behind the figure.



Line Charts have been used to show the daily COVID cases across all countries and states and gives us a clear picture of how rapidly the cases are increasing or decreasing over time. The peak of the graph also shows the time at which the cases were at peak.

The chart for the test data describes how many tests were taken and how many of them were positive. This is represented by area under the lines, one for Total Tests taken and one for the total number of positive tests.



The Vaccination chart describes the cumulative data of people who have taken Dose I and Dose II of the Vaccine. Recently one more parameter was added which was of the number of Booster doses given.



This method is also being used to describe the number of cases in a specific region or a country. A circle is used to represent the quantity of data. One can clearly compare regions and see which region has more number of COVID-19 cases.



Statistics along with R Software is being used to measure the statistical measures such as mean, median, mode, standard deviation, global average and other applied over confirmed, recovered and death cases.

The various statistical measures used to describe COVID 19 related data.

Recovery Rate: Total number of people recovered from disease after the start of the epidemic divided by the total number of cases reported in the same time period.

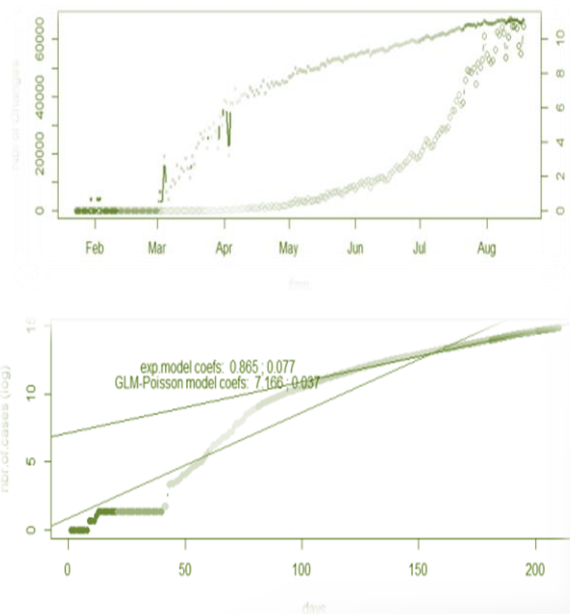
Case Fatality Rate: Total number of deaths reported divided by total number of COVID 19 cases in the same period.

R-Factor: It represents the reproduction rate of COVID 19 and indicates the disease's ability to spread. Higher the R-value more is the transmission of a disease.

Positivity Rate: Number of positive tests divided by total number of tests in the same period.

Some studies also shows that the plotting of two factors (Twitter and Google searches) and tweets about COVID 19 and its related keywords were showing the same trend. A strong and significant correlation between Google & Twitter activity and number of cases was also found.

The models like the Poisson regression model and the generalised linear models are made use of to analyse the COVID 19 data.



References

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Image Sources:

www.google.com and www.frontiersin.org

Impact Of COVID 19 On The Sales Of Two Wheelers In India

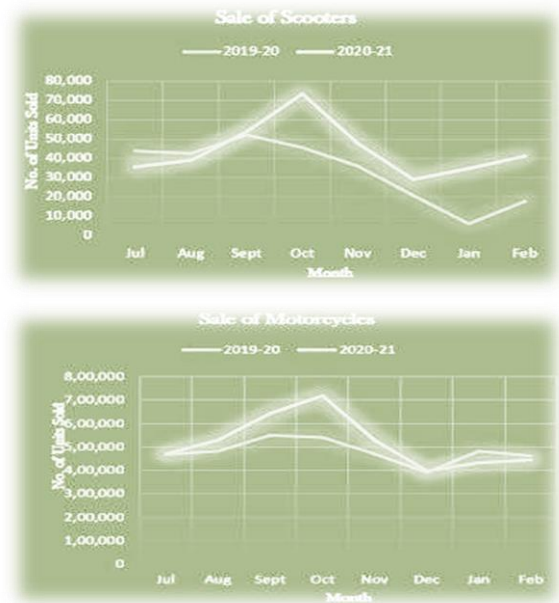
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The on-going global pandemic, caused by coronavirus is perhaps the most unprecedented event of our time. As of 21st April, 2021, India has reported nearly 15.6 million cases (2.16 million active) and 182.6 thousand deaths, making India the country with the second highest number of confirmed cases in the world after the USA. The global pandemic has severely affected the economic growth of the country. However, some industries have managed to perform well even in these times and the Two-wheeler industry is one of them. Combination of factors is at play here. On one hand, the travelling habits of people had to change because of concerns over following social distancing norms. Use of private modes of transport over public transport was bound to be preferred. In India, many corporates have recommended against employees using the same and have even provided for sanitised private transportation for essential employees. Also, since agriculture had been exempted from the lockdown, demand for two – wheelers in the rural segment has not taken a major hit.

On the other hand, several people have been victims of retrenchments during the pandemic and a multitude have faced salary cuts despite being employed in the formal sector, thus limiting their buying capacity. Moreover, a good number of companies and businesses have moved a lot of their activities and operations to the virtual mode and working from home would mean that an investment in two wheelers may not be viewed as necessary at this point in time.

Line Charts of Sales of Scooter and Motorcycle in Hero MotoCorp (Apr, May, June have not been shown due to partial/complete lockdown). Clearly, the overall trend is an increase in demand in both cases.



Overall, there has been a demand revival for two wheelers in India. Sadly though, the data released by SIAM on 12th April, 2021 suggests that the domestic wholesale of two wheelers has suffered a double digit decline of 13.19% year-on-year despite volume growth of 0.17%, 13.37% and 24.29% in September, December and March quarters respectively during FY21 (Source: ET Auto). This can be explained by the complete nationwide lockdown spread in the months of April and May (when the sales was zero) and the series of regional lockdowns imposed in severely affected states.

Lies, Damned Lies And Statistics

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Numbers often shape the way we view the world. Facts, figures and percentages tell us which medicines to take, the status of the economy and even suggest which candidate we should vote for in the next election. Be it a useful invention or the absolute truth, hardly anyone would doubt the trustworthiness of Mathematics as a subject. Why then, are phrases like “Lies, damned lies and statistics” and “Torture numbers, and they’ll confess to anything” used, to suggest foul-play concerning numbers?

Let us start by looking at some Statistical paradoxes. In a top school, researchers attempted to study the correlation between diligence and academic results. For convenience, they divided the attributes into hardworking/lazy and good result/poor result respectively. A rational mind would predict that the two attributes are positively associated, since the more hardworking the student, the better should be the result. However, the researchers found an anomaly, the attributes surprisingly came out to be negatively associated! Does this suggest that lazy people score better on tests? Sadly, the answer is no. This unexpected outcome of the experiment is caused by the fact that the researchers went to a top school to conduct their study. Here, the number of students who are both lazy and score poorly on tests would be negligible, since such students wouldn’t have been admitted into the school in the first place. This missing piece from our sample space is what skews our outcome. If the research was conducted in a sample with a good representation of all segments, the result would be exactly what one should expect.

This is an example of Berkson’s Paradox, which is a counterintuitive result found in problems of conditional probability. Another dangerous paradox is the Simpson’s Paradox, in which a trend appears in several different groups of data but disappears/reverses when these groups are combined. Here, just like in Berkson’s Paradox, the contradictory outcomes arise due to another lurking variable.

Paradoxes aren’t the only instances of this interesting foul-play. Consider the coincidences in our everyday lives. The last time Paul met an old friend in a new city, he thought, “Wow, what are the odds?” The odds are, actually, better than Paul considers them to be. As the number of cities he travels to increases, so does the chance of him meeting an acquaintance there. However, he would only remember that one time when he did meet his friend, since not meeting a friend in a new city is not worth noticing. If someone wishes to argue that the odds are, in fact, very less since they personally haven’t met an old friend in a new city as yet, Paul has probably travelled to more cities than them.

These are situations where numbers and chances seem to fool us. But sometimes, we make the numbers lie for us, by truncating/manipulating axes and overlapping graphs plotted on different scales. Though this might not be wrong mathematically, the person manipulating these graphs (and also those interpreting them) knows exactly what they’re doing. Nevertheless, if we look closely at these cases of misleading numbers, it becomes obvious that it is not the numbers that are trying to mislead us. It was us, who forgot to take a homogeneous sample, ignored the presence of a lurking variable, mixed correlation with causality, forgot to look at the axis or simply put, failed to be observant.

Statistics of

Crypto-Currency

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Technology, nowadays, remains ahead of anything and everything, and is growing rapidly. Several domains of life have inculcated technology within them. Money is nowhere behind in this. Online buying and selling of goods can be done by exchanging crypto-currencies which is a form of online payment. Crypto-currency works using a decentralized technology called block chain. Once you make a transaction, it is updated in the block chain on thousands of computers across the world. It is expected that by the end of 2024, the corporate sector would be investing \$20 billion per year on block chain technical services, which reflects the increasing wide usage of these services. These currencies are traded primarily with a motive of making profits. Like Bitcoin, there are around more than 6700 digital currencies which are used for trading publicly. This type of technology could be used in easing the work of businesses, bank transactions, etc. The primary thing that you need to start trading with crypto-currencies is having a “wallet” account, wallet being an online app.

BITCOIN

The “Bitcoin” crypto-currency was invented in 2009. The identity of the people or the person who created this digital currency is still anonymous. Bitcoin is merely a success in the field of cryptography. It is the biggest crypto by market capitalization. Bitcoins are accessible to everyone and everything,

which brings in the concept and wide usage of Internet of Things (IOTs). Bitcoin was a big success in 2020, even though there was a severe pandemic going on.

Number of addresses holding 1+ coins even reached an ATH in 2020. But still some people do not consider buying it. Why? One of the reasons could be the currency being a volatile one.

Comparison among the various crypto-currencies is important for traders as they get to know how a currency would behave and how it would influence the market prices. Moreover, the public must be aware too about the alternatives of the investment they are interested in. Some other cryptos present in today’s world include Litecoin, Ethereum, Stellar, Bitcoin Cash and many more. The supply of a currency usually influences its demand in the market..

Crypto-currency in India is rapidly growing and becoming a mainstream investment element for many, especially for the millennial. Although it is completely legitimate to buy and sell cryptos in India, yet there is no guarantee on the safety of this investment. A research shows that there is some percentage increase in the youth investors of India since 2020, when the lockdown was imposed. Even the Bitcoin “Wallet” app surpassed more than 25 million installations since 2015. This shows that more people in India are stepping up to enter the world of trading in crypto-currencies.

Therefore, though the future is always uncertain, even in the case of investing in crypto-currencies, people must first consider the pros and cons, analyse the scenario and then take further actions. At the end, the crypto prices are all set by how much people invest in them. Moreover, it’s never too late to invest in anything that seems worth it!

S-I-R

Model For COVID 19

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The S-I-R model was created by W. O. Kermack and A. G. McKendrick in 1927. In this type of model we assume that our population is divided into 3 categories:

S—Represents the individuals not yet infected with the disease at time t , or Susceptible to the disease of the population.

I— Represents the individuals who have been infected with the disease and are capable of spreading the disease to those in the susceptible category.

R—Represents the individuals of the population who have been infected and Then removed from the disease, either due to immunization or due to Death.

In order to simplify the real world phenomenon for our mathematical model we make some assumptions

Assumption I: The epidemic is sufficiently small-so it doesn't last long and out population remains constant

Assumption II: We assume that the rate in increase of infected people is directly proportional to the contact between susceptible and infective and this occurs at a constant rate

Assumption III: There is a constant rate (could be death rate, recovery rate etc.)

Based on these 3 assumptions we made the following equations

For susceptible:

$$\frac{dS}{dt} = -rIS$$

where r is the rate of contact between susceptible and infective.

For infective:

$$\frac{dI}{dt} = rIS - aI$$

where $\frac{dI}{dt}$ represents the rate of change of infective over time. It will grow as susceptible are moving to become infected.

For Removed:

$$\frac{dR}{dt} = aI$$

Let us assume that initially

$$\begin{aligned} S &= S_0 \\ I &= I_0 \\ R &= 0 \end{aligned}$$

By our first assumption we can say that

$$\frac{d(S + I + R)}{dt} = 0$$

On solving

$$S + I + R = S_0 + I_0$$

Now the question arise will the disease spread? On solving above equations, one may get the answer of the question

$$\frac{dI}{dt} < Ia(R_0 - 1)$$

where R_0 is the basic reproductive number or basic reproductive ratio which tells us that we will have a pandemic if

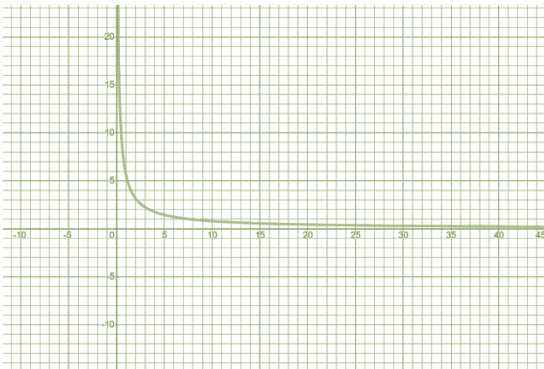
$$R_0 = \frac{RS_0}{a} > 1$$

R_0 represents the number of secondary infections in the population by one initial primary infection

What will the maximum number of infected people at a given time? One may also get the reply of this question also on solving the above equation

$$I_{max} = I_0 + S_0 - \frac{1}{q} \{1 + \ln(qS_0)\}$$

where I_{max} represent the maximum number of infected people at a given time. Drawing the graph of the above function, taking 'q' on x-axis



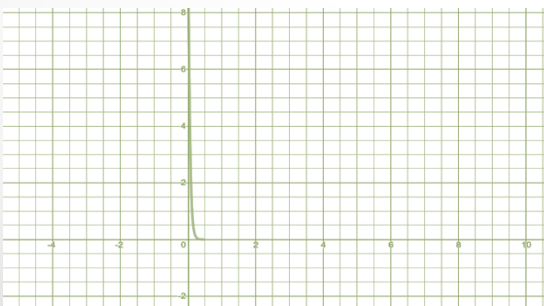
This tells us that greater the value of x smaller will be the value of $F(x)$. For COVID 19 the value of q is high which is bad as this will mean that the value of the term

$$\frac{1}{q} \{1 + \ln(qS_0)\}$$

will be small and hence majority of the population will be infected at a given time. Now

$$0 + S_{end} \frac{1}{q} \ln S_{end} = I_0 + S_0 - \frac{1}{q} \{\ln S_0\}$$

This will give how many people will catch the disease.



The graph implies that as the value of q (contact ratio) increases the value of S_{end} decreases. Hence,

$$R_{end} = I_0 + S_0 - \text{Small Quantity}$$

This implies that majority of the population will catch the disease.

- On the basis of the model that was created has successfully answered the common questions. According to our model the disease will spread quite rapidly as the value of the contact ratio i.e. 'q' is very high Since the value of 'q' is very high our model has predicted that a vast majority of the population will be infected at a given time Lastly, the model has also predicted that almost the entire population will catch the disease. But the model that we have made has some defects like user have to assumed that the rate of spread, death rate, rate of recovery etc. are all constant whereas in the real world this is not the case. User also have to assumed that the total population i.e. S+I+R must be a constant which is not possible. She/he have assumed the contact ratio to be a constant and have not accounted for what will happen if it changes because it can change at any point of time, it can become very high if we don't practice social distancing or take necessary precautions or it can become very low if we take the necessary precautions.

Glimpses Of The Department

DEPARTMENT OF STATISTICS
SRI VENKATESWARA COLLEGE
 presents
SIMULATION'20

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|---|---|---|
| DAY 1 - 13th February Football Auction 12 PM Picturesque 12 PM Couch Potato 1 PM Beg borrow steal 2 PM | Media Partners DE DU VIBES | CHIEF GUEST Dr. S.N. Dwivedi Professor of Biostatistics AIIMS, New Delhi |
| DAY 2 - 14th February Machine Learning 10:30 AM Game of Mimes 12 PM Hustle Bustle 12:30 PM Baker Street 2 PM | Gifting Partner Iced Tea Partner Drinks Partner | CONTACT Tanushmita - 977615648 Rajahalli - 977307534 Suchana - 8240422009 |



THE STATISTICS DEPARTMENT
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SIMULATION'19
 7th and 8th March 2019

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Tirumala Tīrupati Devasthanams

“Jñānam vijñāna sahitam”

Self realization through realized knowledge

“Satyāt na pramadityam”

Do not deviate from truth

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University of Delhi