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Criminal Psychology using Hypothesis Testing

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Abstract:
Criminal Psychology is a fact-finding field which involves the views, thoughts, actions and on behavioral aspects of a human. It mainly studies about intentions of the criminal and his way of seeing different aspects while he is involved in a crime. Interest in this area of research is growing dramatically from more than a decade. This field also involves a little bit of forensic psychology. Our major study revolves around the only fact that "why do humans commit crime?". This question always keeps buzzing in forensic anthropology to understand the basis and background behind such a behavior of people. We here analyze the environment the criminal is exposed to and based on certain parameters we derive patterns from the data that would help the police and other investigation agencies so that they can help the court of law during the proceeding sessions between the criminal and the law. The process of connecting an offender's actions to the crime scene to investigate traits of similar types of offenders makes criminal profiling possible. This makes it simple for law enforcement or other relevant agencies to identify and apprehend similar types of offenders simply by looking at the crime scene. Data science, particularly research methodologies and statistics, enables psychologists to delve extensively into pressing issues today. Psychologists must be able to perform laboratory or field studies to effectively drive change. This generates data to promote evidence-based methods that assist individuals in overcoming obstacles and living more comfortable and meaningful lives. However, data has far-reaching implications that go far beyond typical psychological uses.

Keyword: Null hypothesis, Alternative hypothesis

I. INTRODUCTION

The discovery that data could be used as a tool marked a turning point in human history. As a result, new data science discoveries affect everyone, rich and poor, old and young. From daily life to legal systems, the world is changing for everyone. Crimes have presented a threat to societal order and fostered unrest throughout history. As a result, every possible method for identifying and preventing crime should be investigated, and data science appears to be an excellent tool for this.----- Data science is defined as a "set of core concepts that enable and guide the methodical extraction of information and understanding from data." For many years, crime statistics have been considered. Data on a wide range of crimes has been collated and reported by some states and police departments. While data analytics is revolutionising everything from politics to commerce, criminal data may be used for much more than just numbers. Due to its effectiveness, data mining saves time and money for criminal investigators. Because computers can understand hundreds of instructions in seconds and are less prone to errors than human investigators, especially those who work long hours, they are a better choice. We cannot, however, replace all agents and criminals with machines. Computers are tools for collecting and analysing data, but criminalists and investigators must constantly check the process and evaluate the results. Information about criminal justice

is making an impact in a variety of ways. Such activities include response planning, crime prevention, criminal identification, and so on. "Many implementations contained more than one specific form of classification strategy in terms of employing classification techniques in criminal data mining," according to the ongoing initiatives on using data science to prevent crime. Data is the first piece of information required to obtain results. They support the company's decisions and initiatives. While solid evidence provides unequivocal proof, the opposite is also possible. Data more effectively reveals the underlying causes of problems. They depict what is happening in different systems and divisions. Saving data allows us to examine the effectiveness of solutions and, as a result, we recognise the need for long-term solution adjustments. Data improves productivity. If data gathering and analysis are both done efficiently, deficits are completed faster. Data analysts look for trends in criminal justice data that can help improve the system's quality and efficiency. Criminal Justice Data helps in response planning, crime prevention, criminal identification, predictive policing, improving community relations, and initiative evaluation.

II. LITERATURE SURVEY

Clustering analysis is a critical technique in data exploration for financial crime research. They are already utilised in anti-money laundering transaction monitoring and are offered by major solution providers such as NICE Actimize and Statistical Analysis Software (SAS). Clustering methods may readily be used to monitor financial markets, especially order books on exchanges or dark pools if they are accessible.

The outlier identification approach based on clustering has a potential application in dynamically monitoring markets or people. As a result, if an individual's characteristic deviates from its peer group (its cluster), it might be a warning indication. Clustering algorithms, on the other hand, confront two major challenges: the ability to cope with large amounts of data, as well as the speed of processing and the ability to give outputs fast. Big data clustering is widely employed in hierarchical approaches, although time is still a concern.

Dependent Means T-Test

The t test for dependent means is used to distinguish across populations when dealing with linked or dependent data. For example, to determine whether conducting surprise examinations increases students' knowledge. To measure this, we need to know the student's knowledge before and after the test.

As a result, all information gathered from this student is connected. This test is only used to sample means. The mean difference between scores (M1-M2) is determined, implying that the students chosen to originate from a population in which the test does not enhance knowledge (or from a population in which the exam does improve knowledge).

Independent Means T-Test

The t test for independent means is used to assess the difference between populations. For example, to determine whether or whether boys and girls at a school vary in some psychological characteristic. It is necessary to assess information from a distinct sample of men and women. If there is no overlap across groups, the means are deemed independent, just as a person cannot be both a male and a girl at the same time. This test is solely used for testing sample means.

Our hypothesis examines whether the average difference in scores (M1 - M2) indicates that our students originate from a population where there is no difference between males and girls, or whether they come from distinct populations.

It only takes one solid piece of evidence to debunk a hypothesis, but an infinite number to prove it accurate. The alternative hypothesis needs to be accepted if the null hypothesis is disproved. This is why, rather than demonstrating the alternative, both the judicial system and statistics focus on disproving or rejecting the null hypothesis. It's a lot less difficult. The defendant is found guilty if the jury rejects the assumption of innocence.

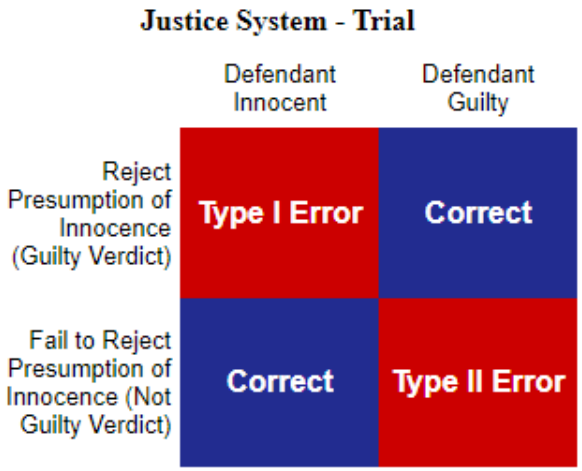
Type I errors: Neither the legal system nor statistical testing is without flaws. When a jury makes a mistake, an innocent person can end up in prison. Statisticians call this a type I error since they are so creative. It is considered a travesty by civilians.

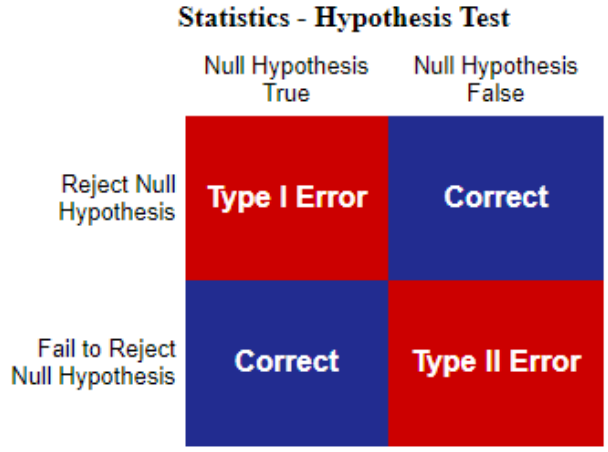
Failure to reject the assumption of innocence results in a not guilty verdict in the court system. This simply implies that the criteria for rejecting innocence were not met. It does not imply that the individual is truly innocent. To prove the hypothesis of innocence, an infinite quantity of evidence would be required.

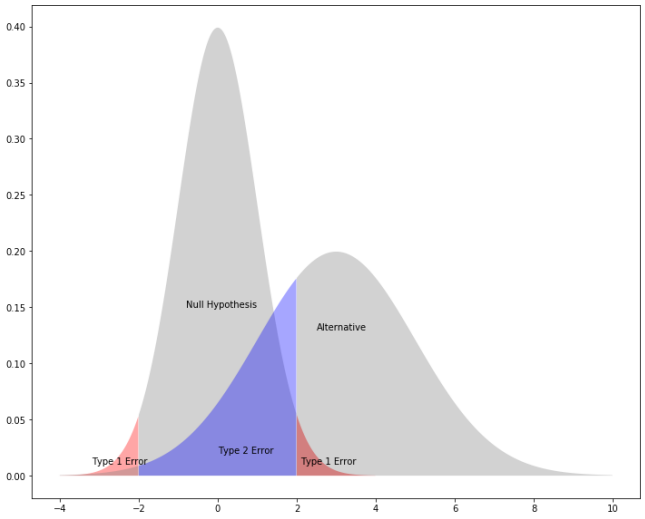
Type II errors: Sometimes persons who are guilty are released. Type II error is a term coined by statisticians to describe this error. Type II errors are unpleasant to Americans, but not as frightening as type I errors. When a type I error occurs, not only is an innocent person imprisoned, but the guilty person is also released. A type I error in a trial is, in some ways, twice as terrible as a kind II error. Without a doubt, the American justice system places a premium on avoiding type I errors. However, this emphasis on avoiding type I mistakes does not apply to all statistical hypothesis testing scenarios.

The type II mistake is deemed worse than the type I error in statistical hypothesis testing used for quality control in manufacturing. The null hypothesis here is that the product meets the customer's requirements. A batch of merchandise cannot be sold to a client if the null hypothesis is rejected. Rejecting a good batch by mistake—a type I error—is costly, but not as costly as failing to reject a defective batch of product and shipping it to a customer—a type II error. This might result in the customer being lost and the company's reputation being tarnished.

The figure below is the pictorial representation of statistical hypothesis testing and justice analogy in the court room.







III. METHODOLOGY

A. EXISTING SYSTEM

Statistical techniques have traditionally been used to model crime occurrences, and while these approaches are beneficial, they have difficulty incorporating enormous volumes of highly detailed individual-level data and behavioral variables. For crime or intelligence analysis, specialized databases can be constructed. Data mining is used to study and model the criminal behavior of violent crimes. Data mining enables better decision-making and analysis, which can be applied to the massive amount of data that all agencies are currently dealing with. Data mining techniques improve both the speed and the depth of analysis. Analysts can completely analyze a situation with the help of crucial morsels of knowledge.

Criminology is the scientific study of crime and criminal behavior, as well as the process of identifying crime characteristics. It is one of the most important domains in which data mining techniques can provide significant results. A wide examination of illegal activities demonstrates that all criminal action follows a set of universal principles. For profiling criminal behavior, a micro simulation model can be created by connecting general principles with individual characteristics. These principles are continuous; however, how they emerge for each individual varies depending on personality, criminal activity, external influences, and individual characteristics. Using data mining techniques, this research elaborates on the criminal behavior analysis of criminals.

B. PROPOSED SYSTEM

Data is collected and analysed in statistical hypothesis testing. Then you must evaluate whether we had "enough" evidence to invalidate the basic premise - "innocence" is assumed at the outset. You should have determined on the standard of proof required to reject the initial assumption before making this decision. The phrase "beyond a reasonable doubt" is used in criminal prosecutions.

A lower standard known as "preponderance of evidence" is applied in civil proceedings. You decide whether the defendant is guilty or not guilty based on that defined and pre-determined a priori standard. We compare our p-value to a significance level in statistics, which is typically 5%. We reject the null hypothesis if our p-value is smaller than. The choice of significance level is similar to the difference in evidence standards between criminal and civil trials - in all cases, everyone should know the criteria for rejecting the original premise before any data is "analysed." After someone is found guilty, there is the issue of punishment, which is based on the "magnitude" of the crime's impact. statistics, this is equivalent to estimating the extent of differences and making decisions about whether or not the differences are practical. The sentence will be light if the crime is established beyond a reasonable doubt but it is a minor offence. The sentence will be more dramatic if the proof is equal and the crime is more terrible.

There are a few key components of the testing process to keep in mind when interpreting statistical hypothesis test findings. When someone is declared "not guilty," it does not mean they are "innocent," but rather that there was insufficient evidence to convict them "beyond a reasonable doubt." The fact that there was insufficient evidence to reject the null hypothesis does not mean that the true means are equal; rather, it means that there was insufficient evidence to determine that they are not. There are a number of reasons why we might not be able to reject the null hypothesis, but the most prevalent is because our sample size was too small, which is connected to having insufficient evidence.

IV. ANALYSIS AND RESULTS

Statistical significance the level of significance at which the null hypothesis is accepted or rejected. Because it is impossible to accept or reject a hypothesis with 100% accuracy, we choose a level of significance that is usually 5%.

This is usually expressed by alpha, which is usually 0.05 or 5%, indicating that your output should be 95% certain in producing comparable results in each sample.

To perform t-test

First calculating mean, variance, and standard deviation of selected 2 columns.

After calculating t0(rejection region) and t values. If t is less than t0 we reject the null hypothesis or vice versa.

CASE1:

Though there are several perspectives on rape and related crimes, these studies are separated and require a holistic integration to dive further into the causes and repercussions of rape. Based on root cause analysis, the current study attempts to not only combine multiple viewpoints, but also to envision a new lens of inquiry and multidimensional explanation for the rape occurrence. Using psychological theories, the study examined and described the behavior of the victim, demonstrators, and criminals engaged in a recent gang rape in India on December 16, 2012. It has also offered recommendations for reducing rape in order to eradicate it from the country.

H0(NULL HYPOTHESIS)-All victim rape cases are not reported.

H1(ALTERNATIVE HYPOTHESIS)-All victims report their rape cases.

Conclusion for case 1:
The rejection region is t < -1.646
t: -0.011

Because t is not in the rejection region, you fail to reject the null hypothesis. You are unable to reject the null hypothesis because t is outside of the rejection region.. (Fail to reject)
For an effective Interpretation There is not enough evidence at the 10% or even less than 5% the level of significance to support the H0 is more compared to H1.

CASE 2:
The use of excessive police authority may be referred to as police ruthlessness or police brutality. Although a precise description of this heinous conduct has yet to be provided. The problem of police brutality has been in India from the beginning of policing, and with the advent of Covid-19, there has been a significant increase in such cases of police ferocity. As a result, it is critical to analyses the laws and resolutions that govern the police, as well as why the judiciary has become incapable of putting a stop to this illegal policing culture. This page focuses on the laws and precedents pertaining to police brutality, as well as those instances of police brutality that are still unsolved or unresolved.

H0(NULL HYPOTHESIS)-All policemen registered under violation of human rights are convicted.

H1(ALTERNATIVE HYPOTHESIS)-All policemen registered under violation of human rights are not convicted.

Conclusion for case 2:

The rejection region is t < -1.645
t: 34.074

Because t is in the rejection region, you do not fail to reject the null hypothesis. (Fail to reject)

For an effective Interpretation There is enough evidence at the 10% or even less than 5% that the level of significance to support the H1 is more compared to H0.

V. CONCLUSION

Given the wide range of crimes and perpetrators, this is not surprising. Various theories emphasize various causation aspects, including biology, psychology, unconscious conflict, and social learning, to mention a few. It's still unclear if biological elements have a role in antisocial conduct, but even if they do, most studies agree that the environment in which children are raised could either promote or inhibit any inborn criminal predisposition The study of criminal behavior has developed into a vital field that may help courts

and law enforcement organizations work better and fight crime and offenders more successfully. In India, criminal psychology is still in its infancy. More finances and suitable infrastructure are needed from the government so that students and academics are drawn to criminal psychology and more research and experimentation may be conducted to improve outcomes. The primary anchor of empirical research and the rapidly growing practice of evidence-based crime is hypothesis testing. However, both empirical research and hypothesis testing have limitations. The empirical method of study cannot eliminate uncertainty. The permissible magnitudes of type I and type II errors are determined in advance and are crucial when calculating sample size. Another thing to keep in mind is that hypothesis testing and statistical tests cannot 'prove' or 'disprove' anything. We can only reject or reject the null hypothesis and accept the alternative hypothesis by default. We accept the null hypothesis by default if we fail to reject it.

VI REFERENCES

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