**STATISTICAL FUNCTIONS IN COMPUTER SCIENCE**

Name of the Student

Institution

Course

Instructor

Date,

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**ABSTRACT**

The field of statistics addresses all facets of data. In order to efficiently create the findings, statistical expertise aids in selecting the best data collection technique and using those samples in the appropriate analysis procedure. To put it briefly, statistics is an essential procedure that aids in decision-making based on facts. It is very important in processes like data mining and decision-making, among many others.

**ROLES OF STATISTICS IN COMPUTER SCIENCE**

Statistics refers to a variety of methods and approaches for evaluating, interpreting, presenting, and making decisions based on data are referred to as statistics. It includes a range of techniques for condensing, describing, and drawing conclusions from data gathered via experiments or observations. Statistics are essential for comprehending and making decisions, whether you're examining the average height of a population, examining stock market patterns, or assessing the efficacy of a novel medication.

But statistics is important, and there are many different statistical branches and kinds of procedures. Among these is descriptive statistics, which condenses and converts unstructured data into information with meaning. Standard deviation, mean, and median are common metrics. Smith, S. A., and Jaffoe-Djan, J. B. (2019). Descriptive statistics, for instance, can assist you in comprehending the central tendency and variability of exam scores, assuming you have a dataset of those scores.   
Using sample data, inferential statistics enables the user to infer and draw inferences about populations. This group includes methods such as regression analysis, confidence intervals, and hypothesis testing. Probability theory which addresses randomness and uncertainty. It is essential for comprehending occurrences and formulating forecasts. J. M. Shaughnessy (2006). In computer science, ideas like random variables, Bayes' theorem, and conditional probability are crucial.   
Models for regression analysis use input features to predict outcomes. Regression analysis using polynomial, logistic, and linear models are common. Applications for these models can be found in fields such as data mining and machine learning.

Theory Testing determines if data discrepancies that are noticed are statistically significant.

It's essential for deriving inferences about populations and making judgments based on sample data.   
Bayesian methods, which integrate known information with empirical data. It helps with making decisions in the face of uncertainty. Applications for it include medical diagnosis, recommendation systems, and spam filtering.

Multivariate analysis examines the connections between several variables. Examples include factor analysis, canonical correlation, and principal component analysis (PCA). These techniques aid in dimensionality reduction and the discovery of hidden patterns in data.   
Time series analysis uses longitudinally recorded observations. Modeling temporal patterns is done using methods like exponential smoothing and autoregressive integrated moving average (ARIMA).   
Network traffic analysis, weather forecasting, and stock market prediction are a few examples of applications.   
Bootstrapping is one example of a resampling method that uses repeated sampling from the available data to estimate statistical parameters. When analytical solutions are difficult or unavailable, they can be helpful.   
Non-parametric techniques that estimate underlying functions from data points include local regression and kernel density estimation. They find use in density estimation and noise reduction of noisy data; Gramacki, A. (2018).

Inspired by the structure of the human brain, Artificial Neural Networks (ANN) represent complicated interactions using statistical learning. A subset of artificial neural networks called deep learning has transformed domains such as natural language processing and picture recognition.   
GAMs, or generalized additive models, are a kind of linear regression that takes into account non-linear correlations between response variables and predictors. They are helpful in the modeling of intricate data patterns.   
Nonetheless, statistics are fundamental to computer science. Among them are;   
Data analysis: Computer scientists can better understand complex information by using statistics to analyze and interpret vast amounts of data. I. Dey (2003)   
Machine learning: Computers may learn from data and make predictions or judgments by using machine learning algorithms, which are mathematically supported by statistics.   
Performance evaluation: The effectiveness of various computer methods and systems can be measured and contrasted using statistics.   
Data mining in statistics plays a crucial role in spotting patterns and trends in big datasets.   
Reliability analysis and testing are two methods that utilize statistics to evaluate the dependability and quality of hardware and software systems. J. Tian (2005).   
Designing and analyzing trials to evaluate the efficiency and performance of computer systems and algorithms is made easier with the use of statistics.   
Risk assessment: In computer systems, including cyber security and network security, statistics are used to evaluate and quantify risk.

Optimization: Statistics offers methods for streamlining computer programs and systems, including scheduling procedures and allocating resources.  
Making decisions: In computer science, statistics plays a crucial role in decision-making processes such system design, resource allocation, and performance enhancement.   
Predictive modeling is a useful technique in computer science applications that uses statistics to create models that can forecast behavior or future events based on past data.   
Despite all of these functions, the following issues with statistics have been observed:   
Intricacy The complexity of computer systems and software is rising, which makes it harder to design and build them. This intricacy may result in errors, security flaws, and other issues. Scalability: Systems frequently need to scale in order to meet rising demand as they become bigger and more complicated. This can be difficult since scaling frequently necessitates considerable modifications to the system's architecture and design. Goodenough, J. B., and C. B. Weinstock (2006).   
Security: As sensitive data is processed and stored more and more on computer systems and software, security has grown to be a top priority. To stop data breaches, cyber-attacks, and other security concerns, researchers and developers must seek to uncover and resolve any vulnerabilities.  
Privacy: With worries about data misuse and potential privacy violations, the gathering, storing, and processing of personal data has grown in importance in recent years. In order to guarantee that systems and software are created with privacy in mind, researchers and developers must collaborate.   
Interoperability: The capacity of software and systems to function together without difficulty is becoming more and more crucial as they get more complicated. To achieve interoperability across many systems, standards and protocols must be developed.   
Ethical considerations: With increased power come greater potential social effects from computer systems and software. Researchers and developers need to think about the moral ramifications of their work, such as bias, equity, and social impact.   
In order to overcome the aforementioned obstacles, users have done a variety of things, including using appropriate tools, learning the fundamentals of programming, upgrading their knowledge and skills, and employing trustworthy and pertinent data.

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