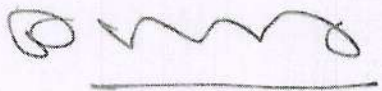# Vidya Jyothi Institute of Technology

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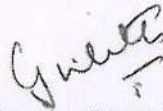
Amount Approved 78,440

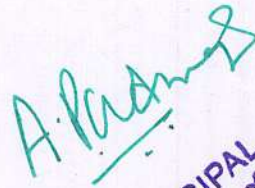Submitted for Approval and Sanction.

Encl: Renewal Proposal

Controller of Examinations   Academic Coordinator   DIRECTOR

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Pinnacle Nanotech India Pvt. Ltd. #11-8-237/4/204, C S Nilayam, Kranthi Nagar Colony, Saroornagar, Hyderabad-500035 info@pinnaclenanotech.com	Pro Invoice No.: HYD 18020	Dt:17/12/2018
Buyer: Vidya Jyothi Institute of Technology Aziz Nagar Gate, C.B. PostHyderabad–500 075 , Telangana, India	Buyers Order No & Date:	
	Terms of Delivery:	

Sr. No.	Description of Goods	Qty	Rate	Per	Amount
1	DrillBit Extreme Anti Plagiarism Software Unlimited pages and 500 number of uploads (1 Year Lic)	1	58,000	No.	58,000.00
	CGST@9 %				5,220.00
	SGST@9 %				5,220.00
	Total				**68,440.00**

Amount Chargeable (In Words): Sixty Eight Thousand Four Hundred and Forty Rupees Only

Company's CIN: U72200TG2009PTC065627
Company's GSTIN: 36AAFCP4375H1Z7
Company's PAN: AAFCP4375H
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For PINNACLE NANOTECH INDIA PVT LTD.

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Dept. Autonomous Lab Odem Branch

Item : Drill bit software

Purpose Projects plugarism checking tool

Certified that the equipment/material is received in good condition and is working as per specifications of the bill

HOD   K.r. Chalam
                Sr. AO   Incharge K.
                                  (Requisitioning Person)

Bill for Rs 68,440/-

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PNPL/Software/2019-20/119

To
The Principal
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Sub: Quotation for Anti – Plagiarism software

Part No.	PRODUCTS DECRIPTION	Qty	Unit Rate	Total Cost in Rs.
1	DrillBit Extreme Anti – Plagiarism software 500 project uploads and unlimited pages (1 year Lic)	1	58000	58,000.00
	GST @ 18%			10,440.00
	GRAND TOTAL			68,440.00

DrillBit Extreme

DrillBit Extreme- software can be more applicable for students, when student reports for a Project work usually **exceed 200 pages**, then DrillBit Extreme can be used. With few added attractive features it is quite powerful tool.

General Instructions:

- This Software checks similar data found from the web and dedicated database.
- The main purpose of this software is to detect the plagiarized data and hence make students avoid data theft from Internet.
- Plagiarism rules are often very strong in all countries. Institutions/universities should create awareness about plagiarism.
- This Anti-plagiarizer claims to be world's best software, because the algorithm implemented in this system basically follows
- Plagiarism rule in a confined manner. (Rule: Min. five consecutive words should be under Plagiarism).
- We hereby request students to write report in your own words.
- In the Similarity Reference section this software generates RGB coloring and it is for Presentation purpose only.
- Students may cross verify the data from the respective web links

Advantages of DrillBit plagiarism:

DrillBit is one of best solution for plagiarism originality check because it will consider Case sensitive and Erroneous words detection and follow plagiarism rules strictly and mail forwarding facility to student and project guide. DrillBit will generate originality check certificates for students and provide direct link to data sources.

Key Features & Benefits

DrillBit checks students report each line by comparing unlimited database as per plagiarism rule (five consecutive words should be under plagiarism) using algorithm. It will scan our own database and web pages. DrillBit can be used in the all applications because of its special features. 1. Case-sensitive check 2. Erroneous words Detection 3. Mail forwarding facility 4.Available in Regional Languages 5.Paper less concept

System Requirements:

- Microsoft Windows 7, Windows 10 etc
- Internet connection and 2GB RAM
- Internet Explorer Latest version, Chrome and Firefox.
- Javascript enabled

TERMS & CONDITIONS

1. Pricing is inclusive of GST @ 18%. TS GST No.: 36AAFCP4375H1Z7, 100% payment in advance.
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3. Quotation valid till 05th Dec 2019.
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Sincerely yours,

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Title: Data Wrangling using Python

Author Name:c_101

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3	1	IEEE 2018 IEEE International Conference on Intelligent Transportati, by Mena-Oreja, Jesus - 2018 Publication	<1
4	3	Design of artificial neural networks for short-term load forecasting. II. Multilayer feedforward networks for peak load and valley load forecasting IEEE Publication	<1

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Data Wrangling using Python

Siddhartha Ghosh, Kandula Neha, Y Praveen Kumar

Abstract: *The term Data Engineering did not get much popularity as the terminologies like Data Science or Data Analytics, mainly because the importance of this technique or concept is normally observed or experienced only during working with data or handling data or playing with data as a Data Scientist or Data Analyst. Though neither of these two, but as an academician and the urge to learn, while working with Python, this topic 'Data engineering' and one of its major sub topic or concept 'Data Wrangling' has drawn attention and this paper is a small step to explain the experience of handling data which uses Wrangling concept, using Python. So Data Wrangling, earlier referred to as Data Munging (when done by hand or manually), is the process of transforming and mapping data from one "raw" data form into another format with the intent of making it more appropriate and valuable for a variety of downstream purposes such as analytics. Data wrangling is the modern name used for data pre-processing rather Munging. The Python Library used for the research work shown here is called Pandas. Though the major Research Area is 'Application of Data Analytics on Academic Data using Python', this paper focuses on a small preliminary topic of the mentioned research work named Data wrangling using Python (Pandas Library).*

Index Terms: Data Engineering, Python, Data Wrangling

I. INTRODUCTION

This paper starts with an overview of Data Engineering. It will then explain about the use of Python Libraries for executing one of the most important Data Engineering Task – called Data Wrangling.

Data Engineering: Data Engineering is the fabrication and architecting the infrastructure for data (Data can be read as Big Data). It is the collecting and gathering of data, storing it for future, doing real time and batch processing on it and finally provide service to the Data Analyst/Scientist group for further process. Big Data tools are common names in Data Engineering field. The traditional Data Base concepts and Data Base Management Systems stand the fundamentals for Data engineering field.

So Data engineering is responsible for making the channel or streamline for the seamless movement of data from one instance to another. The data engineers who are into it take care of hardware and software requirement along with the IT and Data security and protection aissues. They also promise the fault tolerance in the system and monitor the server logs and administration of the data pipeline.

Data Engineering field includes handling and logging errors, monitoring the system, building human-fault-tolerant pipelines, understanding what is necessary to scale up, addressing continuous integration, knowledge of database

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administration, maintaining data cleaning, ensuring a deterministic pipeline and finally gives a strong base to the Data Analytics or Data Scientist group.

Few Data Engineering Techniques: Data Engineering Techniques can fall under numerous areas, such as

- ✓ File Formats
- ✓ Wrangling
- ✓ Ingestion Engines (e.g. Kafka, Kinesis)
- ✓ Stream processing (e.g. Spark, Flink)
- ✓ Storage engines (e.g. S3, HDFS, HBase, Kudu)
- ✓ Batch processing, batch SQL
- ✓ Data storage
- ✓ Cluster Management
- ✓ Transaction databases
- ✓ Web frameworks
- ✓ Data visualizations
- ✓ Machine Learning.

Data Engineering and Data Analytics: The Data Analytics or Data Science techniques cannot be applied on any kind of data set if the data is not in a proper format, data is not cleaned and data is not error free. So Data Engineers take the pain of representing data in a proper shape to a Data Analyst or Data Scientist.

Data wrangling: Broadly speaking, data wrangling is the process of reshaping, aggregating, separating, or otherwise transforming data from one format to a more useful one.

Clean and wrangle data into a usable state: Data engineers make sure the data the organization is using is clean, reliable, and prepped for whatever use cases may present them. Data engineers wrangle data into a state that can then have queries run against it by data scientists.

Data wrangling is about taking a messy or unrefined source of data and turning it into something useful. Once may begin by seeking out raw data sources and determining their value: How good are they as data sets? How relevant are they towards the goal? Is there a better source? Once one has parsed and cleaned the data so that the data sets are usable, he can utilize tools and methods (like Python scripts) to analyze them and present the findings in a report. This allows one to take data no one would bother looking at and make it both clear and actionable. Data wrangling is a significant problem when working with big data, especially if one has not been trained to do it, or he doesn't have the right tools to clean and validate data in an effective and efficient way. A good data engineer can anticipate the questions a data scientist is trying to understand and make their life easier by creating a usable data product.

The working environment

This research work uses the following tools for experiencing Data Wrangling steps.

- Python 3.5
- Anaconda3
- Jupyter Notebook

- Pandas Library

Anaconda3 : Anaconda is a free and open-source distribution of the Python and R programming languages for scientific computing (data science, machine learning applications, large-scale data processing, predictive analytics, etc.), that aims to simplify package management and deployment. Anaconda is a platform created for Data Scientists and Machine Learning Practitioners. Directly from the platform and without involving DevOps, data scientists can develop and deploy AI and machine learning models rapidly into production. Anaconda provides the tools needed to easily:

- Collect data from files, databases, and data lakes
- Manage environments with Conda (all package dependencies are taken care of at the time of download)
- Share, collaborate on, and reproduce projects
- Deploy projects into production with the single click of a button

Fig : Anaconda Navigator

Anaconda creates an integrated, end-to-end data experience. This research work uses one important tool mentioned above called Jupyter Notebook.

Jupyter Notebook : Source - https://jupyter.org/

The Jupyter Notebook is an open-source web application that allows you to create and share documents that contain live code, equations, visualizations and narrative text. Uses include: data cleaning and transformation, numerical simulation, statistical modelling, data visualization, machine learning, and much more. This comes as a packaged item with Anaconda. Once the latest version of Anaconda is installed there's no need for Jupyter Notebook. On launching the Jupyter Notebook the web browser looks like below.
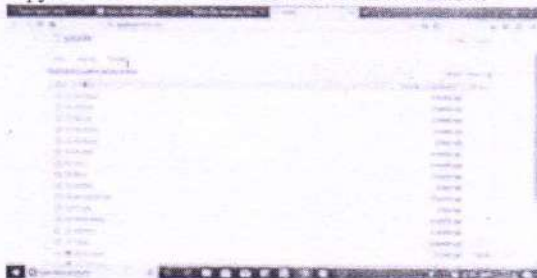

Fig: Jupyter Notebook through a Web Browser

The Notebook has support for over 40 programming languages, including Python, R, Julia, and Scala.

On choosing a new work environment for Python3 the screen looks like next fig.
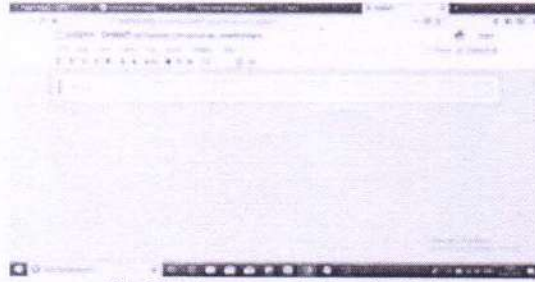

Fig: The Jupyter work Area for Python

One need to write his/her code in the in [ ]: portion.

About Pandas in Python : Python is a great language for working on data analysis; primarily because of the fantastic ecosystem of data-centric Python packages. Pandas is one of those packages, which imports and analyzes data much easier. Pandas build on packages like NumPy and MatPlotLib to give a single, convenient place to work on most of data analysis and visualization.

Pandas Library features:

- ✓ DataFrame object for data manipulation with integrated indexing.
- ✓ Tools for reading and writing data between in-memory data structures and different file formats.
- ✓ Data alignment and integrated handling of missing data.
- ✓ Reshaping and pivoting of data sets.
- ✓ Label-based slicing, fancy indexing, and sub setting of large data sets.
- ✓ Data structure column insertion and deletion.
- ✓ Group by engine allowing split-apply-combine operations on data sets.
- ✓ Data set merging and joining.
- ✓ Hierarchical axis indexing to work with high-dimensional data in a lower-dimensional data structure.
- ✓ Time series-functionality: Date range generation [4] and frequency conversion, moving window statistics, moving window linear regressions, date shifting and lagging.
- ✓ Provides data filtration.

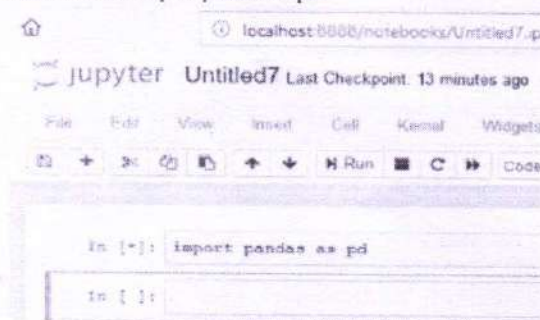The pandas is brought into action with a command on Jupyter Notebook as: import pandas as pd.

Fig: Launching Pandas on Jupyter Notebook

The Wrangling work using Pandas

Data wrangling involves processing the data in various

formats like - merging, grouping, concatenating etc. for the purpose of analysing or getting them ready to be used with another set of data. Python has built-in features to apply these wrangling methods to various data sets to achieve the analytical goal. In this part of the paper few examples describing these methods will be looked into.

Data Sets and format: The Data Sets used here is mainly to mimic the academic data. The format used here is called CSV – Comma Separated Values. Anyone can make the same data sets using Microsoft Excel or Notepad and then saving the data set as .csv file. If Excel is used one shouldn't forget to close all sheets (other than one data sheet) before saving as .csv. Here a datasetfeb2019.csv is used which can be used in academic organization showing some result of a class. The file location path must be used to access the file.

Now on Jupyter Notebook NumPy library is also used for accessing data.

Fig: A portion of dataset on Jupyter Notebook

The command used to load the dataset mentioned above is –

```
import numpy as np
import pandas as pd
df =
pd.read_csv("E:/Pandas2019/data/datasetfeb2019.csv")
```

Boolean Indexing: How are the values of a column filtered based on conditions from another set of columns? For instance, to find the value of a list of all females who scored above 500 means pass.

Python Code : df.loc[(df["Gender"]=="Female") & (df["TotalScore"]>=500), ["Name", "Status" , "TotalScore"]]

Out[12]:

	Name	Status	TotalScore
0	Abhinandita	Pass	538.0
3	Sreeja	Pass	620.0
4	Neha	Pass	611.0
7	Shikha	Pass	610.0
8	Ballari	Pass	603.0
10	Krithika	Pass	522.0
13	Aruna	Pass	578.0

Fig: Outcome of the above mentioned Python Code

Apply Function: It is one of the commonly used functions for playing with data and creating new variables. Apply

returns some value after passing each row/column of a data frame with some function. The function can be both default or user-defined. For instance, here it can be used to find the #missing values in each row and column.

```
#Create a new function:
def num_missing(x):
    return sum(x.isnull())
#Applying per column:
print ("Missing values per column")
print (df.apply(num_missing, axis=0))
#axis=0 defines that function is to be applied on each column
#Applying per row:
print ("\nMissing values per row:")
print (df.apply(num_missing, axis=1).head())
#axis=1 defines that function is to be applied on each row
```



```
Missing values per column
Name          0
Gender        0
TotalScore    1
Status        0
Promoted      0
Class         0
dtype: int64

Missing values per row:
0    0
1    0
2    0
3    0
4    0
```

Fig: Outcome of Finding Missing Values

		TotalScore
Gender Status		
Female	Fail	490.000000
	Pass	583.142857
Male	Fail	395.000000
	Pass	441.200000

Fig: A Pivot Table after Execution

Pivot Table: Pandas can be used to create MS Excel style pivot tables. For instance, in this case, a key column is "Total Score" which has missing values. We can impute it using mean amount of each 'Gender' and 'Status' group. The mean 'TotalScoret' of each group can be determined as:

```
#Determine pivot table
impute_grps = df.pivot_table(values=["TotalScore"], index=["Gender","Status"], aggfunc=np.mean)
print (impute_grps)
```

Crosstab: This function is used to get an initial "feel" (view) of the data. Here, we can validate some basic hypothesis. For instance, in this case, "TotalScore" is expected to affect the "Status" significantly. This can be tested using cross-tabulation as shown below:

pd.crosstab(df["TotalScore"],df["Status"],margins=True)

Out[22]:

TotalScore	Status Fail	Pass	All
0.0	0	1	1
345.0	1	0	1
445.0	1	0	1
490.0	1	0	1
508.0	0	1	1
522.0	0	1	1
530.0	0	1	1
540.0	0	1	1
558.0	0	1	1
578.0	0	1	1
600.0	0	1	1
603.0	0	1	1
610.0	0	1	1
611.0	0	1	1
620.0	0	1	1
All	3	12	15

Now we will merge existing data frame df with N2

Sorting DataFrames: Pandas allow easy sorting based on multiple columns. This can be done as:

To get the sorted values for required fields and to have the first 10 rows we can write -

data_sorted = df.sort_values(['Name','TotalScore], ascending=False)
data_sorted[['Name','Status']].head(10)

Out[39]:

	Name	Status
1	Vijay	Pass
12	Swetha	Fail
14	Sunil	Fail
9	Sudhakar	Pass
3	Sreeja	Pass
5	Siddhartha	Fail
7	Shilpa	Pass
2	Sanjay	Pass
15	Ramu	Pass
6	Praveen	Pass

Fig: Data after Sorting

Iterating over rows of a dataframe: It is not a frequently used operation. Still, one doesn't want to get stuck, right? At times one may need to iterate through all rows using a loop. For instance, one common problem we face is the incorrect treatment of variables in Python. This generally happens when:

- ✓ Nominal variables with numeric categories are treated as numerical.
- ✓ Numeric variables with characters entered in one of the rows (due to a data error) are considered categorical.

So it's generally a good idea to manually define the column types. If we check the data types of all columns:

Finding Current Data Types:

In [39]: df.dtypes

Out[39]:
Name	object
Gender	object
TotalScore	float64
Status	object
Promoted	object

A good way to tackle such issues is to create a dot csv (.csv) file with column names and types. This way, we can make a common function to read the file and assign column data types.

There are many more steps and techniques in Data Wrangling. This paper discusses most of the common methods which are mandatory for the people who will work in the field of data Science or Data Analytics using Python.

Conclusion

This paper was an initiative to share the preliminary steps of research experiences while working with Data Sets, Data Science and different Techniques. The paper is kept simple and small thinking that this can be used as preliminary steps for those thousands of learners and researchers who want to work in the field of Data Science and Machine Learning. A good time is spent by every individual, just thinking, where to start and what tools to use. This research work is an eye opener for me and while working with Pandas I could enjoy the modern ways of Analysing Data, mainly here, Wrangling data.

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DECISION TREE BASED ALGORITHM FOR REMOVAL OF DIFFERENT PROBABILITY SALT

By

Shirisha.N, Vasanth.K

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3	10	www.mathworks.com **Internet Data**	<1
4	1	Bharathiar University Article published in - www.inflibnet.com **Publication**	<1
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DECISION TREE BASED ALGORITHM FOR REMOVAL OF DIFFERENT PROBABILITY SALT AND PEP PER NOISE IN IMAGES 1Shirisha.N, 2Vasanth.K 1PG Scholar, 2Professor, Vidya Jyothi Institute of technolog y, Aziz Nagar, Hyderabad, Telengana, India Abstract: A Decision tree based algorithm for the removal of equal and unequal probability salt and pepper noise in images is proposed. The algorithm aims to address one solutio n for different salt and pepper noise models. The proposed algorithm operates on an image using fixed 3*3 win dow. The decision tree based algorithm classifies pixel into noisy or not based on the decision and replaces it w ith mean of neighbours or unsymmetrical trimmed median or unsymmetrical trimmed midpoint. The algorithm e xhibit excellent noise elimination capability at high noise densities in terms of quantitative and qualitative persp ective. The algorithm was found to exhibit good noise removal characteristics for three noise models. Key words : Salt and pepper noise, impulse noise, unequal probability, decision based algorithm I .INTRODUCTION: In t he process of image acquisition and transmission over the channel, the images are frequently corrupted by way of impulse noise. Impulse noise is of two types. Fixed valued impulse noise and Random valued impulse noise. T he fixed valued impulse noise is also referred to as Salt and Pepper noise. That holds '0' (pepper) and '255' (sa lt) known as salt and pepper noise. Another type of impulse noise is random-valued impulse noise. This influenc es the corruptive values inside the variety [0, 255]. This is called the dynamic range of the image. There have b een more studies that have been finished in image evaluation. The first step in any image processing is that we convey some pre-processing procedures to know whether the picture is original or corrupted with noise. Estimat ing the noise density in an image could be very crucial and additionally a bit difficult because we do now not, i n most cases, do now not know the supply of noise (additionally type of noise). The estimation and filtering of noise (salt & pepper) is one of the critical pre-processing steps within the image processing method. There are many filtering algorithms that we can use for filtering the noise, had been proposed in the past few years. The handiest one available is the Median clear out, one of the consultant filtering algorithms. In recent years, many versions of the median filter having been proposed. Linear filters can dispose of the salt and pepper noise, but it blurs the image. Hence non-linear filters are used for noise elimination. Subhojit Sarker et al [1], Used Non-loc mean filter for recuperation and Salt and Pepper Noise removal. The algorithm removes noise at increasing v ariance as much as 0.7. Algorithm consumes greater computation time. Vijayan [2] used Modified Decision base d unsymmetrical trimmed median filter (DBUTMF) for removing of Salt and Pepper Noise. The algorithm work s well at 10% to 90% noise density and takes less computation time because of using shear sorting algorithm. A ldunucci et al [3] used Adaptive median filter for eliminating salt and pepper noise and recuperation of Image. Advantages of this filter are High exceptional, edge-retaining, and recuperation. The Disadvantage in this algorit hm is High computational price. Firas Ajil Jassim [4] introduced IQR filter is used for salt and pepper noise re moval and edge protection, which fits effectively however it fails at growing window size and high noise densiti es. Elmustafa et al [5] proposed one-of-a-kind median filters have been used and given their overall performanc e at specific characteristics of the image. Nair et al [6] gave an Improved Decision –Based Algorithm for Impul se Noise Removal, In these images, noisy pixels are changed with the mean or median of neighborhood pixel. Veerakumar et al [7] gave an Approach to minimize very high-density salt and pepper noise through Trimmed

Global Mean, Used median and Trimmed global mean for noise elimination. J.Jenifer et al [8], studied different De-noising Techniques Eliminating Impulse noise and Artifacts, Comparisons between special styles of filters. Alias et al [9] removed Salt and pepper noise via the use of Improved Decision-Based Algorithm and replaced the corrupted pixels with median and Midpoint. Selvi and Sukumar [10] used a Model to estimate the salt and pepper noise density level on the grayscale image. This algorithm gave the relation between entropy and noise density. Fareed and Khader [13], proposed an algorithm for salt and pepper noise removal using adoptive and selective mean filter. HosseinKhani et al[14], introduced a filter to remove noise in medical images. VijayKumar et al[15], gave a Switching median Filter for the Removal of Salt and Pepper Noise in Images is proposed. All the algorithm proposed over the years had targeted to remove fixed valued salt and pepper noise of equal probability. Many algorithms had failed to remove noise at high noise densities or creates few artifacts. In the proposed work a decision-based algorithm is used for the elimination of both equal & unequal probability salt and pepper noise. Hence a suitable algorithm has to be designed to remove salt and pepper noise without inducing artifacts. Section 2 deals with the noise model. Section 3 deals with the proposed algorithm. Section 4 offers with simulation and discussions. Section 5 concludes the work. II . NOISE MODEL Noise degrades most of the part of image information. Image degradation is a major problem in image processing. Image distorted due to various of noise such as Gaussian noise, Poisson noise, Speckle noise and Salt and Pepper. The paper propose an algorithm for three different noise model whose probability of occurrence was found to be equal and unequal. The various noise model used in the paper is given below. NOISE MODEL 1: In noise model1 Salt and pepper noise with the equal noise probability are taken into consideration. If [0, 255] denote the dynamic range of y', i.e., zero <= P_{ij} <= 255 for all (i,j), then they are denoted by Salt-and-pepper noise. The gray level of y at the pixel region (i j) is illustrated in equation 1. Y_{ij}= 0 with probability p; P_{ij} with probability 1-p-q; 255 with probability q; (1) Where s = p + q denotes the salt-and-pepper noise level [11]. NOISE MODEL 2: In noise model2 Salt and pepper noise with unequal noise probability are taken into consideration. Where white pixels are greater than black pixels: For the Noise Model 2, it's similar to equal probability Noise Model 1, except that each pixel might be corrupted via the greater quantity of "salt" noise than "pepper" noise with unequal probabilities. Let P1 and P2 be the probability of incidence of salt and pepper respectively. Y_{ij}= P1 for X=0; 1-P for X=P_{ij}; P2 for X=255; (2) Where X is the noise density P=P1+P2 and P1P2 where P1 >P2[12]. NOISE MODEL 3: In noise model3 Salt and pepper noise with unequal noise possibility are taken into consideration with more black pixels than white pixels. For Noise Model three, it's far just like Noise Model 2, might be corrupted via a greater number of "Pepper" noise than "salt" noise with unequal probabilities. Let P1 and P2 be the probability of the occurrence of salt (255) and pepper (zero) respectively. Y_{ij}= P1 for X=0; 1-P for X=P_{ij}; P2 for X=255; (3) Where X is the noise density P=P1+P2 and P1P2 where P2 >P1 [12]. III. PROPOSED ALGORITHM: The proposed algorithm is also called as Decision tree based algorithm for removal of salt and pepper noise. The proposed algorithm is elaborated as follows. Step1: Read the noisy image. Step2: Choose a 3*3 window. Step3: Arrange the data in increasing order in an array. Step4: Perform unsymmetrical trimming of the input array and find the median and midpoint of the input array. Step5: Check the processed pixel is noisy or not, if the pixel hold 0 or 255 it is considered noisy. Step6: If noisy pixels are present inside the image then check for noisy neighbors. Step7: Case (1): If the range of noisy pixels is more than three, the noisy pixels are changed with the unsymmetrical trimmed midpoin

t. Case (2): If the range of noisy pixels is less than 3, the noisy pixels are changed with the median. Case (3): If the processed pixel is noisy and some of the neighbors are noisy then replace with local mean. Case (4): If the processed pixel is noisy and all of the neighbors are noisy then replace with global mean. The process is repeated for rest of the images. IV. SIMULATION RESULTS AND DISCUSSIONS: The proposed algorithm is evaluated using Mat lab R2015a based totally on quantitative measure PSNR, Mean Square Error (MSE), Image Enhancement Factor (IEF), and Structural Similarity Index Metric (SSIM) are PSNR= 20 log 10 (255) (4) MSE= ij [()2×] (5) Where r refers to Original image, n gives the corrupted image x is denotes restored image, M x N is the scale of Processed image. (6) C2) y2 x2(C1) y2 x2(C2)xy (2 C1)y x(2 = y)SSIM(x, Where x is the average of x, y is the average of y, x is the Standard deviation of x, y is the Standard deviation of y. C1= (K1L)2, C2= (K2L)2 two variables to stabilize the division with vulnerable denominator; L the dynamic range of the pixel values (for an 8 bit image it takes from 0 to 255), K1=0.01 and K2=0.03 via default. MSE is referred to as Mean square error. Matlab R2015a is used for simulations. The computer used is having specifications Intl (R) Core (TM)i3-5005U CPU, 2GHz speed, 4GB RAM and 64-bit operating system. The experiments were performed using images corrupted by fixed valued impulse noise by adding 10% of it for every execution from 10% to 90%. The unequal probability noises were created using photo shop depending on the size of image pixel count and noise model. Table 1: Comparisons between various algorithms with Decision tree in terms of PSNR of Synthetic image Table 2: Comparisons between various algorithms with Decision tree in terms of MSE of Synthetic image Gray.tiff(PSNR) ND SMF AMF DT(PA) 10 39.12 7.53 24.00 20 31.21 10.86 24.01 30 28.79 12.47 24.01 40 26.51 12.96 24.02 50 22.88 12.91 23.99 60 18.02 12.17 23.99 70 13.42 10.72 24.00 80 9.57 8.60 23.92 90 6.73 6.43 18.80 Gray.tiff(MSE) ND SMF AMF DT(PA) 10 7.950 1.1465 258.74 20 49.17 5.3264 258.07 30 85.89 3.6780 257.94 40 145.11 3.2858 257.67 50 334.87 3.3238 259.13 60 1.0226 3.9379 259.42 70 2.95 40 5.5076 258.69 80 7.1719 8.9747 263.15 90 1.3718 1.4773 855.71 Table 3: Comparisons between various algorithms with Decision tree in terms of SSIM of Synthetic image Table 4: Comparisons between various algorithms with Decision tree in terms of IEF of Synthetic image a) Original b) Corrupted c) Restored SMF d) Restored AMF e) Restored DT(PA) Figure 1: Comparisons between SMF &AMF with Decision Tree of Lena image of 10% -90% noise Gray.tiff(SSIM) ND SMF AMF DT(PA) 10 0.98 0.05 0.92 20 0.95 0.07 0.92 30 0.91 0.24 0.9 40 0.85 0.58 0.89 50 0.63 0.53 0.87 60 0.24 0.25 0.84 70 0.04 0.07 0.80 80 0.007 0.04 0.75 90 0.001 0.04 0.63 Gray.tiff(IEF) ND SMF AMF DT(PA) 10 277.46 0.185 8.64 20 91.06 0.79 17.12 30 77.69 1.80 25.41 40 61.20 2.75 34.55 50 37.07 3.37 42.86 60 12.98 3.48 51.12 70 5.25 2.86 60.08 80 2.48 1.98 67.47 90 1.44 1.35 23.35 a) Original b) Corrupted c) Restored SMF d)Restored AMF e)Restored DT(PA) Figure 2: Comparisons between SMF &AMF with Decision Tree of Synthetic image of 10% -90% noises From the noise model 1, Table 1 shows the quantitative results of the proposed algorithm in the form of PSNR, When in comparison to SMF and AMF the proposed decision tree based algorithm putting off noise efficiently. From Table 2 it is illustrated that the proposed algorithm gives less error possibility results in the form of MSE. From Table 3 proposed algorithm offers excellent preservation of structure in the form of SSIM, and from Table 4 it is proved that the proposed algorithm gives quantitative results in the form of IEF of Synthetic image. From Table 1, Table 2, Table 3 and Table 4 it is illustrated that the proposed algorithm offers qualitative effects within the form of PSNR, MSE, SSIM, and IEF. Figure 1 is the qualitative evaluation of the proposed algorithm when noise density from 10% t

o 90% of the Lena image when as compared with SMF and AMF. Figure 2 is the qualitative analysis of the proposed algorithm while noise from 10% to 90% of the Synthetic image when as compared with SMF and AMF. From the above figures, Figure 3 is having greater white pixels, which having noise densities from 10% to 90% and qualitative restored pixels after noise removal by the usage of Decision Tree-based algorithm. From the noise model 3, Figure 4 is having greater black pixels, which having noise densities from 10% to 90% and given qualitative restored images after noise removal. The replacement of noisy pixel was done using mean of 4 neighbors, unsymmetrical trimmed median and unsymmetrical trimmed midpoint. These values operate only on non noisy pixels and these values were found to lie between mean and median. Hence Decision based approach in replacing a suitable pixel for the corrupted pixel using the above statistics is the main reason for good result even at high noise densities. Figure 3 greater white pixels Figure 4 Greater black pixels V.CONCLUSION: The proposed algorithm is examined in Matlab R015a, by giving noise densities from 10% to 90% noise. This paper offers with a unique algorithm that eliminates equal and unequal probability salt and pepper noise in images are proposed. The algorithm suggests excellent results in the elimination of high-density salt and pepper noise in gray scale images. The quantitative and qualitative effects of the proposed algorithm had been found good. The proposed algorithm is Decision tree based algorithm. This algorithm also showed good result in removal of equal and unequal probability salt and pepper noise. Hence an algorithm for the elimination of 3 salt and pepper noise models is proposed.

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