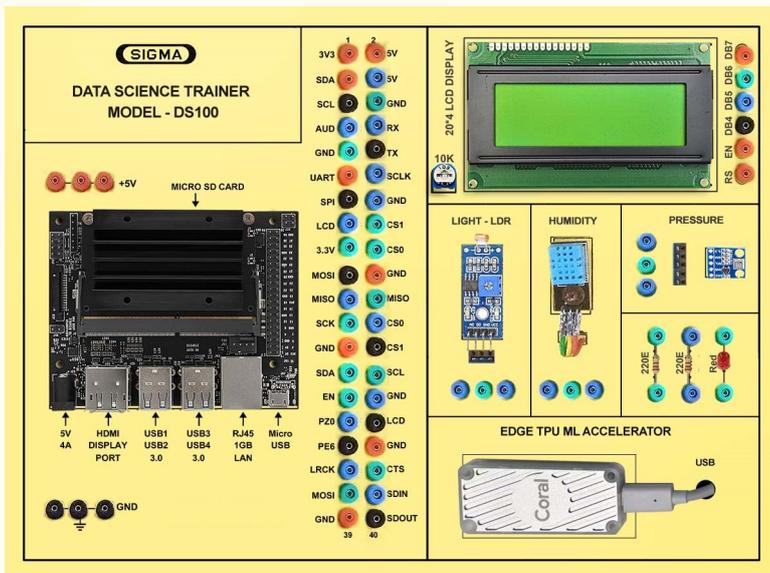




DATA SCIENCE TRAINER MODEL- DS100

This trainer has been designed with a view to provide practical and experimental knowledge of Data Science as used in Artificial Intelligence (AI) with hardware and software programming using Jetson Nano Micro controller, Google Colab and Jupyter Notebook.



**Hardware
Trainer**



**Software
OS, Drivers,
Codes**

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Dealer:-

SPECIFICATIONS

1. Microcontroller Board

1. A57 Microcontroller
2. CPU : Quad-core ARM A57 @ 1.43 GHz
3. OS : Linux
4. RAM : 4 GB 64-bit LPDDR4 25.6 GB/s
5. Ethernet Connectivity : Gigabit Ethernet
6. Wifi Connectivity : 802.11 b/g Wireless LAN Dual-Band 2.4/5.0 GHz, 3G
7. Bluetooth Connectivity : Bluetooth 5.0
8. USB Connectivity : USB 3.0 – 4 Nos. – Micro USB Port
9. Storage : microSD – 32 GB
10. Camera : 2 x MIPI CSI-2 DPHY lanes
11. Display : HDMI and Display port
12. Protocols : GPIO, I2C, I2S, SPI, UART
13. Power - 5V, 4A DC

2. Sensors:

1. Temperature and Humidity– DHT11
2. Ambient Light Sensor – LDR
3. Ambient Pressure Sensor – BMP180

3. Modules and Hardware:

1. 20 X 4 - LCD Display
2. LEDs and Resistors
3. 2 mm interconnection Sockets

4. AI GPU Accelerator

1. Google Edge TPU ML accelerator
2. 4 TOPS total peak performance
3. 2 TOPS per watt
4. USB 3.0 (USB 3.1 Gen 1) Type - C socket

5. Accessories:

- | | | |
|-----|--|-------------------|
| 1. | 2 mm interconnection Sockets | : On Board |
| 2. | 2 mm Banana Jumper Cable | : 20 Nos |
| 3. | 2mm Banana Jack to Single pin jumpers | : 2 Nos |
| 4. | USB to Micro USB Cable | : 2 Nos |
| 5. | Ethernet Cable | : 1 No |
| 6. | HDMI to HDMI Cable | : 1 No |
| 7. | HDMI to Micro HDMI Converter | : 1 No |
| 8. | VGA 15 pin Male to HDMI Converter | : 1 No |
| 9. | Power Supply Adaptor | : 5V, 4A DC |
| 10. | SD Memory Card with Codes for All Experiments | : 32 GB - 2 No |
| 11. | 16 GB Pen Drive | : 1No |
| | with Software, Library, Drivers, Codes, Soft Copy of Manual & Mobile App | |
| 12. | Printed Practical Manual | : 1 No |
| 13. | E-Books for AI Subject | : 10 Nos |
| 14. | Mp4 Video Class for AI Subjects | : 100 Nos |
| 15. | Power Supply | : 230V AC, 50 Hz |
| 16. | Operating Conditions | : 0-40 °C, 85% RH |
| 17. | Mains Cord | : 1 No – On Board |

6. Cabinet and PCB

The complete circuit diagram is screen printed on component side of the PCB with circuit and Parts at the same place. The PCB with components on front side is fitted in elegant wooden box having lock and key arrangement. The acrylic cover is fitted on PCB to safeguard parts. It works on 230 V AC Supply.

EXPERIMENTS

A. Basic Experiments of to generate Data using Micro Controller

1. To understand micro SD Card Interface for Microcontroller
2. To understand that how to connect 20 x 4 LCD Display to Microcontroller
3. To understand Libraries and Algorithms used for Microcontroller
4. To determine Air Humidity & Temperature using DHT11 in Microcontroller
5. To measure Air Quality using Sensor MQ135 in Microcontroller
6. To measure Soil Moisture using Soil Moisture Sensor in Microcontroller

B. Practical Experiments

Understanding of Data Science is divided in following sections as below

1. Data Science Introduction
2. Languages used for Data Science
3. Mathematics used for Data Science
4. Data Structures, Capture and Collection, and Data Analysis
5. Data Visualization
6. Data Science Applications – Data Handling, Cleaning, Converting and Modeling
 - A. Artificial Intelligence - AI
 - B. Machine Learning – ML
 - C. Deep Learning – DL
 - D. Transfer Learning - TL
 - E. Natural Language Processing – NLP
 - F. Artificial Neural Networks - ANN
 - G. Data Science – DS
7. Database Servers – Data storing and using

1. **Data Science Introduction**

To understand Theory and Block Diagram of
Artificial Intelligence – AI,
Machine Learning - ML,
Deep Learning -DL,
Transfer Learning - TL
Natural Language Programing - NLP,
Artificial Neural Networks - ANN
Data Science – DS

1. To understand Programming Language used for DS
Python,
R Language
Go Language
Skala Language
2. To understand software and Environments used for DS :
 - a. Linux OS
 - b. Windows OS
 - c. Anaconda Navigator
 - d. Conda
 - e. Mini Conda
 - f. Jupyter Notebook
3. To understand Frame works used for DS :
 - a. TensorFlow
 - b. Keras
 - c. PyTorch and Torch
 - d. Torch Vision
 - e. Yolo
 - f. OpenCV
 - g. Computer Vision

4. To understand Libraries used for DS :
 - a. numpy
 - b. pandas
 - c. matplotlib
 - d. scikit-learn
 - e. seaborn
 - f. pycuda
 - g. cv2
 - h. plotly
 - I. torch
 - j. pytorch
 - k. TensorRt
 - l. dmlc XHBoost
 - m. CatBoost

5. To understand Mathematics used for DS :
 - a. Linear Algebra – Linear Equations, Matrixs, Vectors
 - b. Calculus – Differentiation, Integration, Gradient Descent,
 - c. Statistics – Population, Parameter, Sample, Variable, Probability

6. To understand Data Types used in for DS :
 - a. CSV
 - b. Images
 - c. Mp3
 - d. Mp4
 - e. Pdf
 - f. Structured data
 - g. Semi Structured data
 - h. Unstructured data
 - i. Binary Data

2. Languages and Software Environment Setup Installation Experiments

1. To install and configure Python
2. To install and configure R
3. To install and configure Jupyter Note Book
4. To install and Configure Google Colab
5. To install and Configure Linux OS
6. To install and Configure Windows OS
7. To install and Configure Anaconda Navigator
8. To install and Configure Conda
9. To install and Configure Mini Conda
10. To install and Configure PyCharm
11. To install and Configure Spyder

3. Mathematics used for DS:

1. To understand Linear Algebra Linear Equations, Matrixs, Vectors
2. To understand Calculus Differentiation, Integration, Gradient Descent,
3. To understand Statistics Population, Parameter, Sample, Variable, Probability

4. Data Structures, Capture and Collection and Data Analysis Experiments

A. Pandas Library

1. To install Pandas library
2. To download sample workbook for Pandas
3. To describing Data with Pandas
4. To selecting and viewing Data with Pandas
5. To manipulating Data with Pandas
6. To practice Pandas exercise with Assignments

B. Numpy Library

7. To install Numpy library
8. To download sample workbook for Numpy
9. To understand Numpy Data Types and Attributes
10. To creating Numpy Arrays
11. To exercise Numpy Random Seed
12. To Viewing Arrays and Matrices
13. To Manipulating Arrays
14. To exercise Standard Deviation and Variance
15. To exercise Reshape and Transpose
16. To understand Dot Product vs Element Wise
17. To exercise Numpy with Nut Butter Store Sales
18. To comparison Operators in Numpy
19. To Sorting Arrays
20. To turn images into Numpy Arrays
21. To exercise- Imposter Syndrome
22. To exercise Numpy with assignment
23. To view extra Numpy resources

5. Data Visualization Experiments

C. Matplotlib Library

1. To install Matplotlib and understand its functions and uses
2. To download sample workbook for Matplotlib
3. To Importing and using Matplotlib
4. To understand Anatomy of a Matplotlib Figure
5. To exercise Scatter Plot and Bar Plot using Matplotlib
6. To exercise Histograms and Subplots using Matplotlib
7. Plotting From Pandas Data Frames
8. Regular Expressions
9. Customizing your Plots
10. Saving and Sharing your Plots

6A. Machine Learning Theory and processing Algorithms

1. To understand theory of Supervised Learning
 - a. Linear Regression
 - b. Logistic Regression
 - c. Gradient Descent
 - d. Decision Tree
 - e. Random Forest
 - f. Bagging & Boosting
 - g. K Nearest Neighbors – KNN
 - h. Bayesian Linear Regression
 - i. Non-Linear Regression
 - j. Support Vector Machine
2. To understand theory of Unsupervised Learning
 - a. K-Means
 - b. Hierarchical Clustering

6A. Machine Learning Data Science Experiments – Data Handling, Cleaning, Converting, Modeling

D. Scikit-learn Library

1. To install Scikit-learn library
2. To download sample workbook for Scikit-learn
3. To understand Scikit-learn Data Types and Attributes
4. To understand typical Scikit-learn workflow
5. To exercise Scikit-learn

1. Getting Your Data Ready : Splitting Your Data, Clean, Transform, Reduce
2. Getting Your Data Ready : Convert Data To Numbers, Feature Scaling
3. Getting Your Data Ready : Handling Missing Values With Pandas
4. Getting Your Data Ready : Handling Missing Values With Scikit-learn
5. Choosing the Right Model For Your Data - Regression
6. Data Decision Trees
7. Understand ML Algorithms
8. Choosing the Right Model For Your Data - Classification
9. Fitting a Model To The Data
10. Making predictions With Our Model - Regression
11. Evaluating a Machine Learning Model - Cross Validation
12. Evaluating a Classification Model - Accuracy
13. Evaluating a Classification Model - ROC Curve
14. Reading Extension : ROC Curve + AUC
15. Evaluating a Classification Model - Confusion Matrix
16. Evaluating a Classification Model - Classification Report
17. Evaluating a Regression Model - R2 Score
18. Evaluating a Regression Model - MAE
19. Evaluating a Regression Model – MSE

1. Machine Learning Model Evaluation
2. Evaluating a Model With Cross Validation and Scoring Parameter
3. Evaluating a Model With Scikit-learn Functions
4. Improving a Machine Learning Model
5. Tuning Hyperparameters
6. Metric Comparison Improvement
7. Correlation Analysis
8. Saving and Loading a Model
9. Putting it all Together
10. Scikit-Learn Practice
11. Exploring Our Data
12. Finding Patterns
13. Preparing our Data for Machine Learning
14. Choosing the Right Models
15. Experimenting With Machine Learning Models
16. Tuning Hyper parameters
17. Confusion Matrix Labels
18. Evaluating Our Model
19. Framework Setup
20. Exploring Our Data

21. Feature Engineering
22. Turning Data into Numbers
23. Filling Missing Numerical Values
24. Filling Missing Categorical Values
25. Fitting a Machine Learning Model
26. Splitting Data
27. Custom Evaluation Function
28. Reducing Data
29. Randomized SearchCV
30. Improving Hyperparameters
31. Preprocessing Our Data
32. Making Predictions
33. Feature Importance

6B. Deep Learning - DL - Data Science Experiments

E. TensorFlow Framework - Library

1. Starting Deep Learning project for unstructured data
2. Setting up with Google
3. Setting up Google Colab
4. Google Colab workspace
5. Uploading project data
6. Setting up our data
7. Importing TensorFlow
8. Using a GPU in a computer
9. Using GPU on Google Colab
10. Loading our data labels
11. Preparing the images
12. Turning data labels into numbers
13. Creating our own validation set
14. Preprocess images
15. Turning data into batches
16. Visualizing our data
17. Preparing our inputs and outputs
18. Building a deep learning model
19. Summarizing our model
20. Evaluating our model
21. Preventing Overfitting
22. Training your Deep Neural Network
23. Evaluating performance with tensorboard
24. Make and transform predictions
25. Transform predictions to text

26. Visualizing model predictions
27. Saving and loading a trained model
28. Training model on full dataset
29. Making predictions on test images
30. Submitting model to Kaggle
31. Finishing your Deep Learning Project

7. Database Servers – Data storing and using

A. RDBMS Servers –

SQL, MySQL, MangoDB, Oracle, Postgre SQL, Sybase, H2, Access, SQLite, Apache derby, HyperSQL, IBM DB2, Teradata, Hive,

B. Non RDBMS Servers -

redis, riak, Cassandra, CouchDb, Apache Hbase, HYPERTABLE CockroachDB, VoltDB, AWS S3, Kafka, NewSQL, storm, Kineses

1. To learn type of Data Base and Data Base Servers
2. Learn and experiment SQL Database Server
3. Learn and experiment Bigdata
4. Learn and experiment Hadoop
5. Learn and experiment HDFS
6. Learn and experiment MapReduce
7. Learn and experiment Apache Spark Database Server
8. Learn and experiment Apache Flink Database Server
9. Learn and experiment Kafka and Stream Processing
10. Learn and experiment Regression analysis - Linear Regression , Polynomial Regression
11. Learn and experiment Time series
12. Learn and experiment Data Lakes
13. Learn and experiment Data Warehouse
14. Learn and experiment Data Mining
15. Learn and experiment ETL Piping

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