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DATA ANALYTICS

Advance Course 2025

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COURSE CONTENT

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OF
INSTALLATIONS

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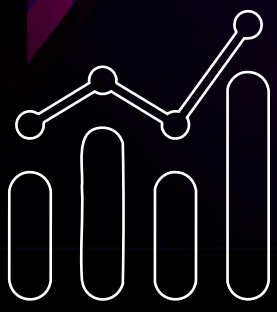
Fundamentals
&
Microsoft Excel



section 1: Introduction to Data Analytics

- What is data analytics?
- Basic concept of data analysis.
- Types of analytics (descriptive, diagnostic, predictive, prescriptive)
- Data analysis lifecycle

Section 2: Excel for Data Analysis

- Data entry, formatting, data creation, knowledge of each tab in ribbon.
- Sorting and Filtering, Custom List Creation, Creating, Editing, Saving and Printing Data.
- Difference Between Formatting and Conditional Formatting
- Functions and Formulas used in excel and advance excel
- Data cleaning: removing duplicates, fixing formats
- Charts and visualizations (bar, line, pie)
- Interview Questions and Assignments

Section 3: Descriptive Statistics in Excel

- Working with Hypertext Links, Hyperlink between two sheets

- Selection, by Define name, Use of Name Manager During Indirect
- Function & Vlookup Functions,hlookup,xlookup, index match and many more
- Mean, median, mode, standard deviation
- Frequency distributions
- Conditional formatting, Pivot tables, Macros & dashboards
- Interview Questions, Assignments and Projects for Live Implementation.

Section 4 : Pivot Table & Charts, Data Analysis and Reporting

- Pivot Table & Charts, Data Analysis and Reporting
- Pivot Table Report
- Tables Using advanced options of Pivot tables, Pivot charts,slicer
- Assignments

Section 5: Advance Data Analysis

- Use of What If Analysis, Use of Goal Seek,
- Data Tables, Use of Data Tables in Financial Analysis

- Importing Data from a Text File, Exporting Data, Converting Text to column
- assignments

section 6 : & Important Excel Features for Excel Expert

- Freezing of Panes, Freezing Top Row, Freezing First Column,
- Splitting of Windows, Flash Fill (New Add On feature)
- Paste Special, Timeline in Excel, Remove Duplicates, Go to Function Tab
- Advance Filtering Technique, Unique and duplicate data Filtering, Color Filtering

Section 7: Working with Charts in Excel & Dashboard Creation

- Creating a Chart, Importance of Charts, Visualization of Data through Charts
- Formatting the Chart, Elements of Charts, Advance Formatting in Charts
- Use of Data Labels, Adding Labels, Modification and Formatting of Data Labels
- Chart Type, Introduction of Column Charts, Line Charts, Pi Charts, Bar Charts etc.

- Mixed Charts, Doughnut Charts, etc
- Use of Excel Charts for PowerPoint Presentation & Excel Dashboards

Section 8: Using Functions & Formula For Creating Reports

- Concept of Functions AND Formula,
- TODAY, NOW, PI, RAND, ROW, COLUMN
- RANDBETWEEN, SUM, MIN, MAX, AVERAGE, PRODUCT, COUNT, COUNTA
- POWER, ABS, SQRT, CONCATENATE, find, replace.

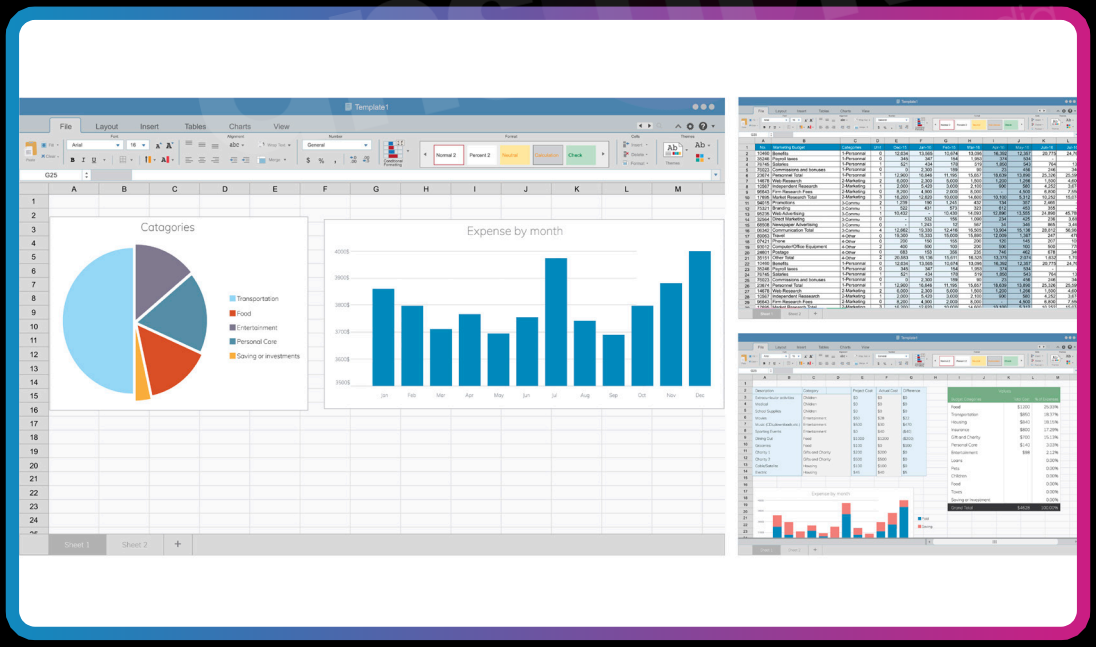
Section 9: Working on Date & Time Functions and Formulas

- DATE AND TIME FUNCTINS
- DAY, MONTH, YEAR, WEEKNUM, WEEKDAY, HOUR, MINUTE, SECOND
- Date if , Text, Workday, Calendar Creation
- Assignments

Section: 10 Dynamic Dashboard Creation by Using Advance Excel

- Dashboard Concept, Overview of all advanced excel functions
- Use of Form Control in Dashboard Creation,

- Checkbox Implementation in Dashboard,
- Use of Pivot, Charts & Slicer in Dashboard, Star Effect Dashboard
- many more others topic will be cover as per your job profile.

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SQL
INTRODUCTION
OF
INSTALLATIONS

Section 1: SQL Basics

- Data, Databases,
- overview about platform
- Sql, Advantages of SQL Server, uses, applications
- Real-time Usages, SQL versus Microsoft T-SQL [MSSQL]
- SQL Server and Installation, SQL Server - Career Options

Section 2: BASICS SQL & DATABASE Creations and Comands

- Insertions of data, Limit, Storage capacity
- Scanning and retrieving of data (Basic Level)
- Creating DB, Entitles(Tables)
- All about SELECT, WHERE, order by, group by
- Diff Data types in SQL, Select with simple and where conditions
- Filtering and sorting

Section 3: EXPORT AND IMPORT AND SCHEMA

- Update, Delete and Truncate, Drop, Removing Schema
- Tables and Databases
- DDL Commands, Creation, Transfer of Table
- Text Data types char and varchar, Nvarchar

Section 4: KEY CONCEPTS

- Data Integrity
- NULL, NOT NULL Property, PK, FK, CHECK , CK CONSTRAINTS, Default
- ER DIGRAMS
- Table Relation with Key,
- Different types of Views with Real time examples,

Section 5: SQL joins

- Define join, inner join, outer join, left and right join, full outer join and cross join
- REAL TIME EXAMPLES

- MERGE JOINS, DIFFRENCES WITH JOINS SMALL AND BIG TABLES

Section 6: GROUP BY AND T-SQL QUERIES

- Aggregation (SUM, AVG, COUNT, MAX, MIN)
- Group by all clauses
- Group BY Queries with Where Clause
- Difference between where and having clause and uses with real cases
- UNION AND UNION ALL, GROUPING Functions
- Assignments and interview question

Section 7: TSQL QUERIES

- Joining with two and three different tables
- Alias, where and on condition
- Group by and Sub-Queries, Date and Time Function
- String Functions, Trim, left, Right, Reverse, and Replace
- Complex Joining Tables in T-SQL; Using Joins with Sub Queries
- IF ( ) and CASE Statement, CASE study in Joins

- Is null, MERGE statement For all commands like DML
- Joins WHEN MATCHED & NOT MATCHED
- DML Operations MERGE Statement
- Row Number Generation in T-SQL

Section 8: transaction in TSQL

- Different Kinds of Transactions (ACID)
- Real Time Case Studies, Project and Interview Preparations

SECTION 9: Normal forms

- Normal Forms
- BCNF, 1NF, 2NF, 3NF, 4NF, Boyce-Codd Normal Form
- Functional Dependencies
- SQL Constraints

Section 10: Indexing In Databases And How to Manage Indexes

- Architectures of Databases
- Different kinds Files(.Ldf, .mdf)
- Different INDEXES: Clustered and Non-Clustered

- Online Indexes, Unique Indexes
- Statistics (Benefits, Creations, Updates, Management)
- Fragmentation, Rebuild of Indexes
- Online, Resume Option, interview questions

Section 11: project

- Real-world SQL project: e.g., Sales Database Analysis


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Power BI

Section1:

- Power BI Introduction, What is Power BI?
- Key Components:
    - Power BI Desktop
    - Power BI Service (Cloud)
    - Power BI Mobile
    - Types of Power BI Licenses
- Use Cases & Benefits
- Power BI Desktop (Power Query, Power Pivot, Power View)
- Power BI Report Server, Power BI Service, Power BI Mobile
- Flow of Work in Power BI / Power BI Architecture
- History of power bi
- PBI Desktop Installation, PBI Desktop & Service, Power BI Desktop Installation
- Datasets, Visualizations, Reports, Dashboards, Tiles
- Fields Pane, Visualizations pane, Ribbon, Views, Pages Tab, Canvas
- Overview of Power Query / Editor – ETL (Extract, Transform & Load Data)
- Importing Data from diff sources into Power BI or Query Editor

Section 2:

- Connecting to Data Sources
- Supported Data Sources (Excel, CSV, SQL, Web, etc.)
- Import vs. DirectQuery
- Loading data from Excel/CSV
- Data Preview & Selection

section 3: Data Transformation with Power Query

- Data Transformation, Benefits of Data Transformation
- Shape or Transform Data using Power Query
- The Ribbon (Home, Transform, Add Column, View Tabs)
- The Queries Pane, The Data View / Results Pane, The Query Settings Pane,
- Advanced Editor – Complete ETL Code
- Open Power Query Editor
- Rename columns
- Remove rows/columns
- Change data types
- Split/merge columns
- Handling missing values
- Apply & Close

Section 4: Data types and Different types Filters in Power Query

- Different Data types, to Change the Data types of a Column
- Filters in Power Query
- Auto Filter / Basic Filtering
- Filter a Column using Text Filters
- Filter a Column using Date Filters
- Filter a Column using Number Filters
- Filter Multiple Columns

Section 5: Inbuilt different Column Transformations

- Remove Columns / Remove Other Columns
- Name / Rename a Column
- Reorder Columns or Sort Columns
- Add Column / Custom Column
- Split Columns
- Merge Columns
- PIVOT, UNPIVOT Columns
- Transpose Columns

Section 6: In built Row Transformations

- Header Row or Use First Row as Headers
- Keep Top Rows, Keep Bottom Rows
- Keep Range of Rows
- Keep Duplicates, Keep Errors
- Remove Top Rows, Remove Bottom Rows, Remove Alternative Rows
- remove Duplicates, Remove Blank Rows, Remove Errors
- Group Rows / Group By

Section 7: Merge Queries / Join Queries

- Merge Queries, Merge Queries as New
- Left Outer (all from first, matching from second)
- Right Outer (all from second, matching from first)
- Full Outer (all rows from both)
- Inner (only matching rows)
- Left Anti (rows only in first)
- Right Anti (rows only in second
- Cartesian Join or Cross Joins

Section 8: Power BI Data Modeling

- Data Modeling Introduction
- Relationship, Need of Relationship
- Relationship Types / Cardinality in General

- One-to-One, One-to-Many (or Many-to-One), Many-to-Many
- AutoDetect the relationship, Create a new relationship,
- Make relationship active or inactive
- Delete a relationship
- Cross filter direction (Single, Both), Assume Referential Integrity

Section 9: DAX queries and DAX Functions Categories

- What is DAX, Calculated Column, Measures
- DAX Table and Column Name Syntax
- Creating Calculated Columns, Creating Measures
- Implicit Vs Explicit Measures
- Calculated Columns Vs Measures
- DAX Syntax & Operators, Types of Operators
- Arithmetic Operators, Comparison Operators, Text Concatenation Operator, logical operator
- Categories: Date and Time Functions
- Logical Functions
- Text Functions
- Math & Statistical Functions
- Filter Functions
- Time Intelligence Functions

Section 10: DAX Date & Time Functions

- YEAR, MONTH, DAY, WEEKDAY, WEEKNUM
- FORMAT (Text Function), Month Name, Weekday Name
- DATE, TODAY, NOW
- HOUR, MINUTE, SECOND, TIME, DATEDIFF, CALENDAR
- Creating Date Dimension Table

DAX Text Functions

- LEN, CONCATENATE (&)
- LEFT, RIGHT, MID
- UPPER, LOWER
- TRIM, SUBSTITUTE, BLANK

DAX Logical Functions

- IF
- True, False
- NOT, OR, IN, AND
- IF ERROR, SWITCH

DAX Math and Statistical Functions

- INT
- ROUND, ROUNDUP, ROUNDDOWN
- DIVIDE
- EVEN, ODD

- POWER, SIGN
- SQRT, FACT
- SUM, SUMX
- MIN, MINX
- MAX, MAXX
- COUNT, COUNTX
- AVERAGE, AVERAGEX
- COUNTROWS, COUNTBLANK

DAX Filter Functions

- CALCULATE
- ALL
- RELATED

Section 11: Report View / Power View

- Report View User Interface
- Fields Pane, Visualizations pane, Ribbon, Views, Pages Tab, Canvas
- Visual Interactions
- Interaction Type (Filter, Highlight, None)
- Visual Interactions Default Behavior, Changing the Interaction

Section 12: Filters in Power View

- Filter Types
- Visual Level Filters, Page Level Filters, Report Level Filters, Drill Through Filters
- Filter Sub Types, Basic Filtering, Advanced Filtering, Top N, Relative Date Filtering
- Numeric field filters, Text field filters, Date and Time field Filters

Section 13: Grouping, Binning & Sorting

- Grouping and Binning Introduction
- Using grouping, Creating Groups on Text Columns
- Using binning, Creating Bins on Number Column and Date Columns
- Sorting Data in Visuals

Section 14: Visualizing Trend Data

- Line and Area Charts
- Create and Format Line Chart, Area Chart, Stacked Area Chart
- Combo Charts
- Create & Format Line & Stacked Column Chart, Line & Clustered Column Chart
- Create and Format Ribbon Chart, Waterfall Chart, Funnel Chart

Section 15: KPI

- Create and Format Gauge Visual, KPI Visual
- Create and Format Card Visualization, Multi Row Card

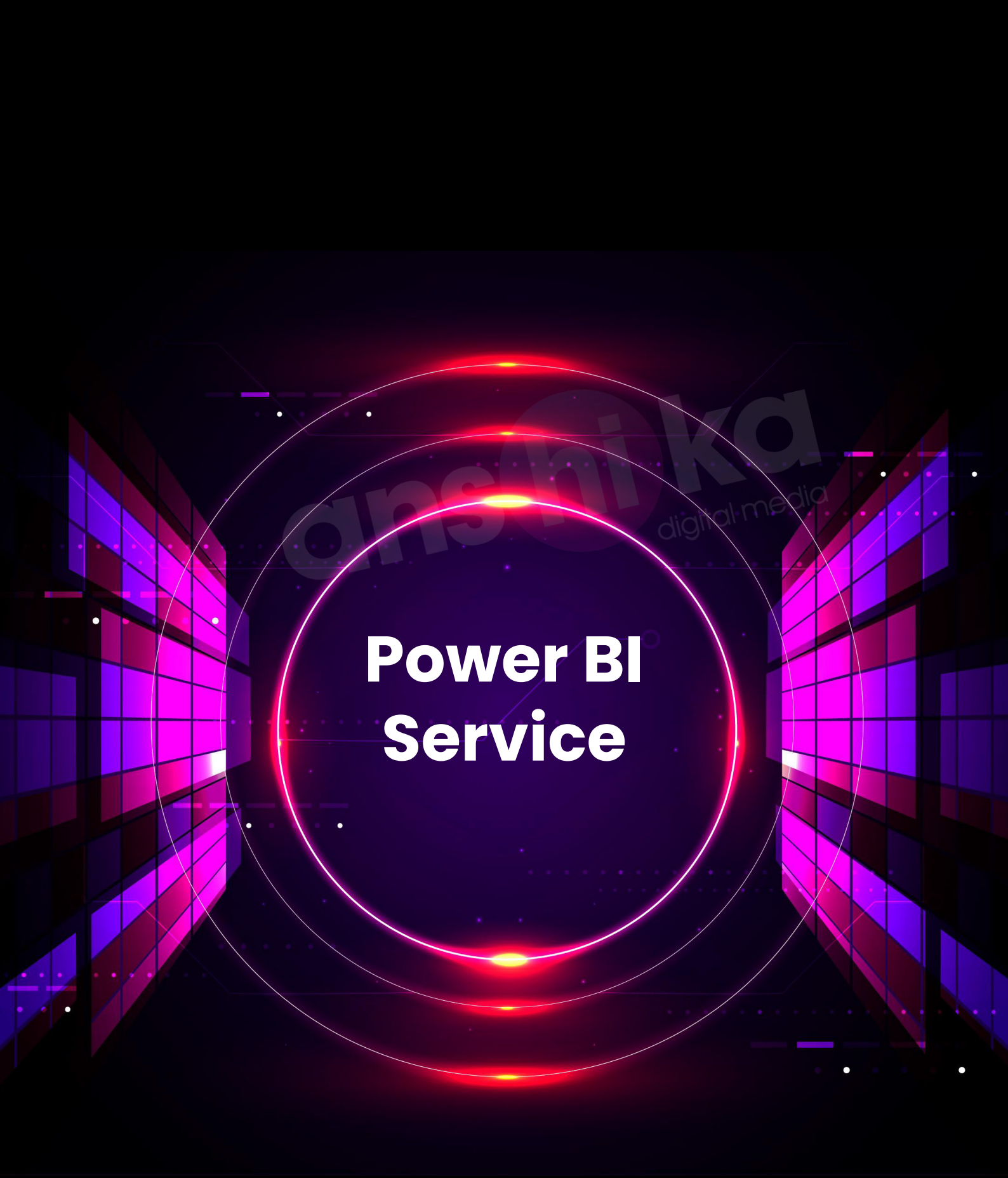
Section 16: Visualizing Tabular Data, Geographical

- Create and Format Table Visual, Matrix Visualization
- Create and Format Map Visual, Filled Map Visual, Arc GIS Maps Visual
- Create and Format R Script Visual

Section 17: projects

Educational reports, analytical reports,dashboards

- Power BI Service Introduction, Power BI Cloud Architecture
- Creating Power BI Service Account, SIGN IN to Power BI Service Account
- Publishing & getting Reports to the Power BI service,
- My Workspace / App Workspaces Tabs
- DATASETS, WORKBOOKS, REPORTS, DASHBOARDS
- Working with Datasets, Creating Reports in Cloud using Published Datasets
- Power BI Datasets Live Connection using Desktop
- Working with Workbooks, working with Reports, Sharing Reports


Power BI
Service

Section 1: Dashboards

- Creating Dashboards
- Pin Visuals and Pin LIVE Report Pages to Dashboard
- Advantages of Dashboards
- Interacting with Dashboards
- Adding Tiles to Dashboards
- Web Content, Image, Text Box, Video
- Formatting Dashboard
- Sharing Dashboard

Section 2: Data Gateways

- Introduction to Data Gateways
- How Data Gateways work
- Connect to an on premise Data Source by using a Data Gateway
- Download Data Gateway
- Installing a Data Gateway
- Types of Gateways
- On-premises Data Gateway, On-premises Data Gateway (personal mode)
- Manage Data Gateway
- Add and Remove Administrators
- Add Data Source, Add or Remove Users to a Data Source

- Refresh On Premise Data
- Configuring Automatic Refresh using Schedules

Section 3: Collaboration in Power BI

- Introduction to App Workspaces
- Create an App Workspace
- Add Members to App Workspace to Collaborate

Section 4: Sharing Power BI Content using Apps and Content Packs

- Introduction to App
- Publish an App
- Update a Published App
- Manage Content in App
- Include in App, Exclude in App
- Sharing App
- Entire Organization, Specific individuals or group
- Unpublishing an App
- Content Pack Introduction
- Create Content Pack
- Sharing Content Packs
- Specific Groups, My Entire Organization
- Selecting the Content / Items to Publish or Share

Section 5: Row Level Security in Power BI

- Introduction to Row Level Security, Row Level Security with DAX
- Manage Roles, Creating Roles, Testing Roles
- Adding Members to Roles in Power BI Service
- Dynamic Row Level Security
- Creating Users Table and Adding to the Model
- Capturing users using UserName () or UserPrincipalName () DAX Functions
- Real Time Case Studies,Project and Interview Preparations

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Tableau

Tableau desktop

1. Introduction to Tableau

- What is Tableau?
- Tableau Product Suite:
  - Tableau Desktop
  - Tableau Server
  - Tableau Online
  - Tableau Public
  - Tableau Prep
- Tableau Interface Overview
- Installation and Setup
- Data Analytics vs. Business Intelligence

2. Connecting to Data

- Supported Data Sources
- Connecting to:
  - Excel
  - CSV
  - Databases (MySQL, SQL Server, Oracle, etc.)
  - Cloud Data (Google Sheets, Snowflake, etc.)
- Live vs. Extract Connections
- Data Source Page Overview
- Assignments

3. Data Preparation & Cleaning

- Data Interpreter
- Pivoting and Splitting Columns
- Renaming, Hiding, and Aliasing Fields

- Creating Extracts
- Joining Tables
- Data Blending
- Union vs. Join
- Using Tableau Prep (optional advanced)
- Assignments

4. Basic Visualizations

- Bar Chart
- Line Chart
- Pie Chart
- Text Table (Crosstab)
- Maps
- Tree Map
- Heat Map
- Highlight Table
- Scatter Plot
- assignments

5. Calculations in Tableau

- Basic Calculated Fields
- String, Number, and Date Functions
- Logical Statements (IF, CASE, IIF)
- Aggregations and Arithmetic
- Quick Table Calculations:
  - Running Total
  - Percent of Total

- Moving Average
- Rank

6. Advanced Calculations

- LOD Expressions (FIXED, INCLUDE, EXCLUDE)
- Nested Calculations
- Parameters and Dynamic Calculations
- Custom Aggregations
- Type Conversion Functions
- Level of Detail Use Cases
- Assignments

7. Data Visualization Best Practices

- Choosing the Right Chart Type
- Color Theory in Dashboards
- Labeling and Tooltip Customization
- Using Shapes and Icons
- Design Principles: Simplicity, Consistency, and Clarity

8. Advanced Visualizations

- Dual Axis Charts
- Combo Charts
- Bullet Graphs
- Gantt Charts
- Funnel Charts
- Waterfall Charts
- Donut Charts
- Dynamic Maps with Filters

- Small Multiples (Trellis Charts)

9. Dashboard Design

- Creating Dashboards
- Actions:
  - Filter Actions
  - Highlight Actions
  - URL Actions
- Dashboard Layouts and Containers
- Mobile-Friendly Dashboards
- Interactivity and Navigation Buttons

11. Filters, Parameters, and Sets

- Quick Filters vs. Context Filters
- Cascading Filters
- Parameter Controls
- Using Parameters in Calculations
- Static vs. Dynamic Sets
- Combined Sets
- Bins and Groups

12. Maps in Tableau

- Geographic Mapping
- Custom Geocoding
- Filled vs. Symbol Maps
- Map Layers
- Map Options and Styling
- Custom Background Maps

13. Tableau Server & Online (Deployment)

- Publishing Workbooks and Dashboards
- Tableau Server Architecture
- Permissions and User Roles
- Scheduling Extract Refreshes
- Creating Subscriptions and Alerts
- Embedding Dashboards

14. Performance Optimization

- Extract vs. Live Connection Trade-offs
- Reducing Dashboard Load Time
- Using Performance Recording
- Optimization Tips for Filters and Calculations
- Indexing in Data Sources

15. Tableau Prep (Optional Advanced Topic)

- Tableau Prep Builder Interface
- Input, Clean, and Output Steps
- Data Flow Creation
- Aggregation and Grouping
- Writing Prep Flows to Tableau Server
- Interview prep

16. Real-World Projects and Case Studies

- Sales Dashboard
- HR Analytics Dashboard
- Finance KPI Dashboard
- Marketing Campaign Tracker
- Supply Chain or Inventory Dashboard
- Healthcare / Education / Government Use Cases

1. Introduction to Python

- What is Python?
- Uses, advantage, How to differ it from other language
- History and Features
- Installing Python (Windows/Mac/Linux)
- Writing and executing the first Python program
- Running Python:
  - Python Shell
  - Script Files (.py)
  - IDEs (VS Code, PyCharm, Jupyter, google colab etc.)

2: Python Basics

- Variables, keywords, and identifiers
- Data types (int, float, boolean,)
- Type casting and input/output operations
- Comments and code documentation
- Operators (arithmetic, comparison, logical, assignment, bitwise etc)
- Memory mapping variable

3: Control Flow

- Conditional statements (if, if-else, elif)
- Loops (for, while)
- Loop control statements (break, continue, pass)
- Nested loops and conditionals

4: Data Structures in Python

- **Strings**
  - String operations, slicing, formatting
  - String methods and immutability

- **Lists**
  - Creating, indexing, slicing
  - List methods and operations
  - Tuples
  - Tuple creation, access, immutability
- **Sets**
  - Set operations and methods
  - Dictionaries
  - Key-value pairs, methods, looping through dictionaries

5: Functions and Modules

- Defining and calling functions
- Function arguments: default, keyword, variable-length
- return statement
- Lambda functions
- Recursion
- Modules: built-in and user-defined
- Importing modules (import, from, as)
- math, random, datetime, etc

6: File Handling

- Opening and closing files
- Reading from and writing to files
- File modes (r, w, a, rb, wb)
- Working with text and binary files
- Using with for file operations

7: Exception Handling

- Types of errors and exceptions
- try, except, else, finally
- Raising exceptions
- Creating custom exceptions

8: Object-Oriented Programming (OOP) in Python

- Classes and objects
- __init__() constructor
- Instance and class variables
- Inheritance and method overriding
- Encapsulation and abstraction
- Polymorphism
- Magic methods (__str__, __len__, etc.)

9: Advanced Python Concepts

- List comprehensions
- Dictionary & set comprehensions
- Iterators and generators
- Decorators
- Closures
- Context managers

10: Working with Libraries and Packages

- What is data analysis?
- Why python for data analysis?
- Essential python libraries installation and setup


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NUMPY

1. Introduction to NumPy

- What is NumPy?
- Benefits of using NumPy over Python lists
- Installing NumPy (pip install numpy)
- Importing the NumPy library

2. NumPy Arrays

- Creating arrays using np.array()
- Difference between Python lists and NumPy arrays
- Array dimensions: 1D, 2D, 3D, and nD arrays
- Array attributes:
- ndim, shape, size, dtype, itemsize, nbytes

3. Array Creation Techniques

- Using built-in functions:
- np.zeros(), np.ones(), np.full()
- np.arange(), np.linspace()
- np.eye() (identity matrix), np.random.rand(), np.random.randint()
- Generating random data

4. Array Indexing and Slicing

- Accessing elements using indexing
- Slicing arrays (1D, 2D, and higher)
- Fancy indexing and boolean indexing
- Iterating through arrays

5. Array Operations

- Element-wise operations (addition, subtraction, multiplication, division)
- Broadcasting
- Vectorized operations vs. loops
- Aggregations:
  - sum(), mean(), std(), max(), min(), argmax(), argmin()
- Comparison and logical operations

6. Array Manipulation

- Reshaping arrays with .reshape()
- Flattening arrays with .flatten() and .ravel()
- Transposing arrays (.T)
- Concatenation and stacking (np.concatenate(), np.vstack(), np.hstack())
- Splitting arrays (np.split())

7. Working with Mathematical Functions

- Trigonometric, exponential, and logarithmic functions:
  - np.sin(), np.cos(), np.exp(), np.log(), etc.
- Rounding, floor, and ceil functions:
  - np.round(), np.floor(), np.ceil()

8. Random Module in NumPy

- Random number generation:
  - np.random.rand(), np.random.randn()
  - np.random.randint(), np.random.choice()

- Setting seed values with np.random.seed()
- Shuffling arrays

9. Handling Missing or Invalid Data

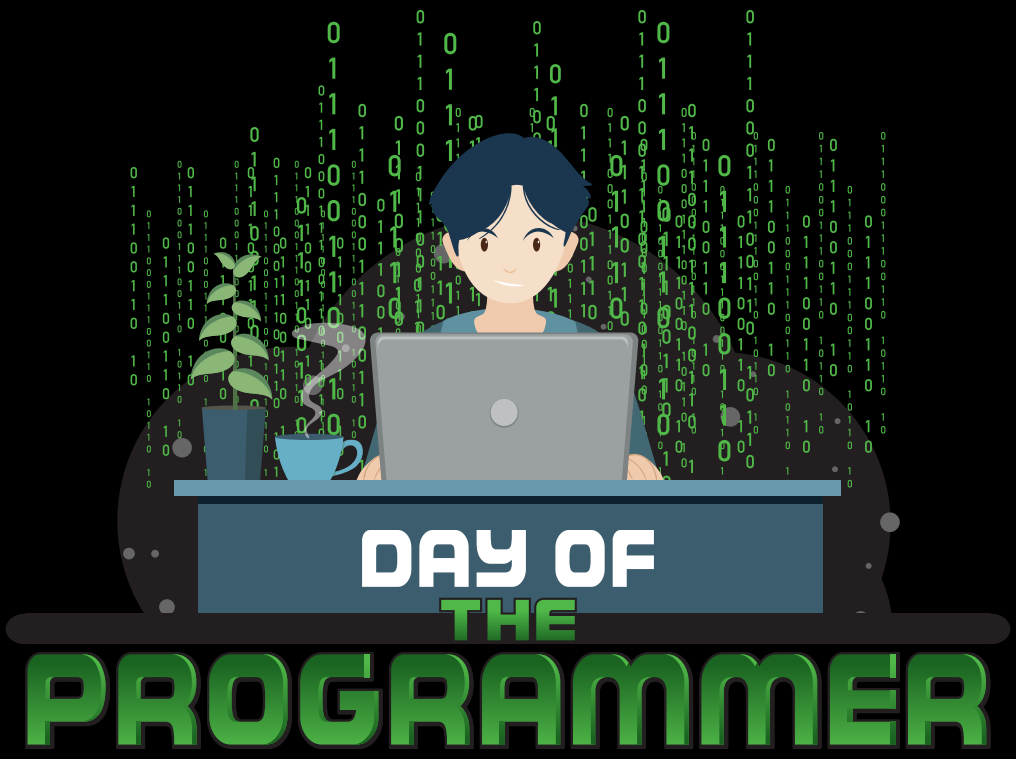
- Representing missing values with np.nan or np.inf
- Checking for missing data (np.isnan(), np.isinf())
- Filtering and cleaning data

10. Performance and Efficiency

- Time comparison between NumPy arrays and Python lists
- Memory usage optimization with data types

11. File Input/Output with NumPy

- Reading from and writing to files:




Pandas

1. Introduction to Pandas

- What is Pandas and why is it used?
- Key data structures:
  - Series – 1D labeled array
  - DataFrame – 2D labeled data table
- Installing and importing Pandas
  - pip install pandas
  - import pandas as pd

2. Creating Pandas Data Structures

- Creating Series from lists, dictionaries, and arrays
- Creating DataFrames from:
  - Dictionaries
  - Lists of dictionaries
  - NumPy arrays
  - CSV/Excel files

3. Reading and Writing Data

- Reading data from:
  - CSV: pd.read_csv()
  - Excel: pd.read_excel()
  - JSON: pd.read_json()
  - SQL databases: pd.read_sql()
- Writing data to:
  - CSV: df.to_csv()
  - Excel: df.to_excel()

4. Data Inspection and Exploration

- Viewing data:
  - head(), tail(), info(), describe()

- Getting data types with dtypes
- Checking null values with isnull(), notnull()
- Summary statistics for numerical data

5. Data Selection and Indexing

- Selecting columns and rows using:
  - Bracket notation (df['column'])
  - .loc[] – label-based indexing
  - .iloc[] – integer-based indexing
- Slicing and filtering data
- Conditional selection

6. Data Cleaning and Preparation

- Handling missing values:
  - Filling: fillna()
  - Dropping: dropna()
- Replacing values: replace()
- Renaming columns: rename()
- Changing data types: astype()
- Removing duplicates: drop_duplicates()
- String operations with .str accessor

7. Data Manipulation

- Adding, updating, and deleting columns
- Sorting data:
  - sort_values(), sort_index()

- Resetting and setting index
- Applying functions:
  - apply(), map(), applymap()
- Lambda functions in Pandas

8. Grouping and Aggregation

- Grouping data using groupby()
- Aggregating data:
  - sum(), mean(), count(), agg()
- Multi-level grouping

9. Merging and Joining DataFrames

- Concatenation: pd.concat()
- Merging: pd.merge()
- Joining: df.join()
- Inner, outer, left, and right joins

10. Pivot Tables and Crosstabs

- Creating pivot tables: pivot_table()
- Generating frequency tables with crosstab()

11. Time Series with Pandas

- Working with date and time data
- Converting strings to datetime: pd.to_datetime()
- Indexing and resampling time-series data
- Date/time extraction (day, month, year, weekday)

12. Data Visualization (Intro)

- Plotting with .plot() (built on Matplotlib)
- Basic charts: line, bar, histogram, box, etc.

By the End of This Module, You Will Be Able To:

- Load, explore, clean, and analyze structured data efficiently
- Handle real-world data with missing values and messy formats
- Merge and reshape large datasets for analysis
- Perform group-based aggregation and reporting
- Prepare data for machine learning or dashboards

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Matplotlib & Seaborn:

1. Introduction to Matplotlib

- What is Matplotlib and why use it?
- Installing and importing:
  - pip install matplotlib
  - import matplotlib.pyplot as plt

2. Basic Plotting

- Creating basic plots:
  - Line chart: plt.plot()
  - Bar chart: plt.bar()
  - Histogram: plt.hist()
  - Scatter plot: plt.scatter()
- Displaying plots: plt.show()

3. Customizing Plots

- Adding titles, labels, and legends:
  - plt.title(), plt.xlabel(), plt.ylabel()
- Adding gridlines
- Changing line styles, colors, and markers
- Controlling figure size and resolution

4. Working with Subplots

- Creating multiple plots in one figure using plt.subplot()
- plt.subplots() for advanced layouts
- Adjusting spacing with plt.tight_layout()

5. Saving Plots

- Exporting figures to files:
  - plt.savefig('filename.png', dpi=300)

Section 2: Seaborn

1. Introduction to Seaborn

- What is Seaborn and how it enhances Matplotlib
- Importing Seaborn:
  - import seaborn as sns
- Built-in datasets: sns.get_dataset_names(), sns.load_dataset()

2. Basic Plots in Seaborn

- sns.lineplot() – Line charts
- sns.barplot() – Aggregated bar charts
- sns.countplot() – Frequency of categories
- sns.histplot() – Histograms
- sns.boxplot() – Distribution with statistics
- sns.violinplot() – Distribution with KDE
- sns.scatterplot() – Scatter plots
- sns.stripplot() and swarmplot() – Categorical scatter plots

3. Advanced Visualizations

- sns.pairplot() – Plotting pairwise relationships
- sns.heatmap() – Correlation matrix and heat maps
- sns.jointplot() – Scatter + histogram or KDE

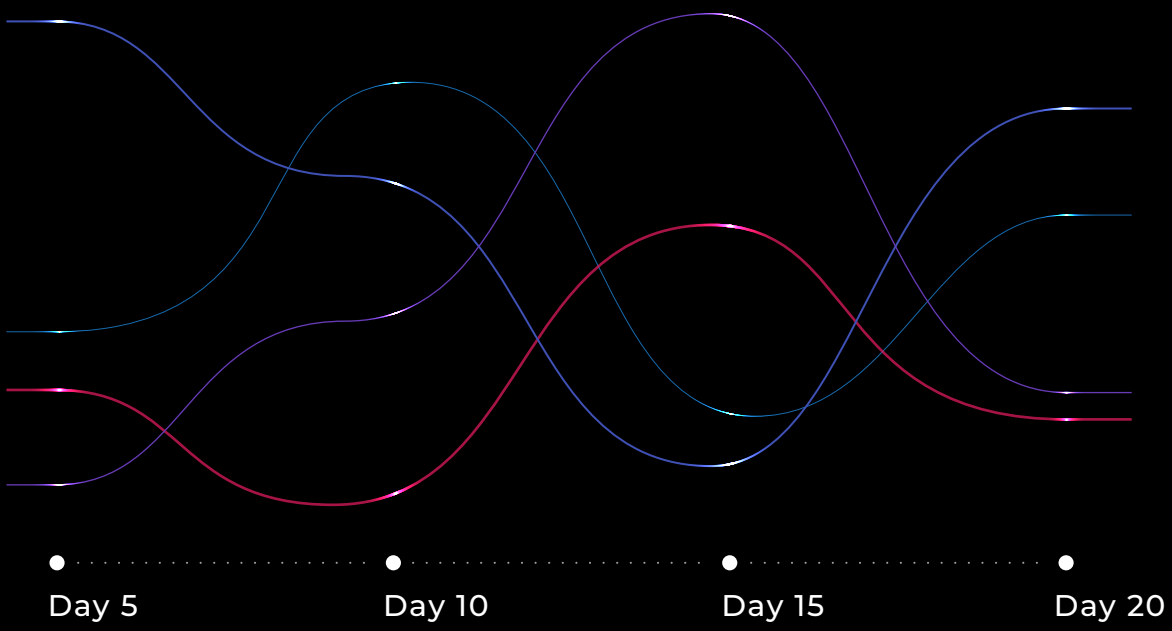
- sns.catplot() – Categorical plots with facets

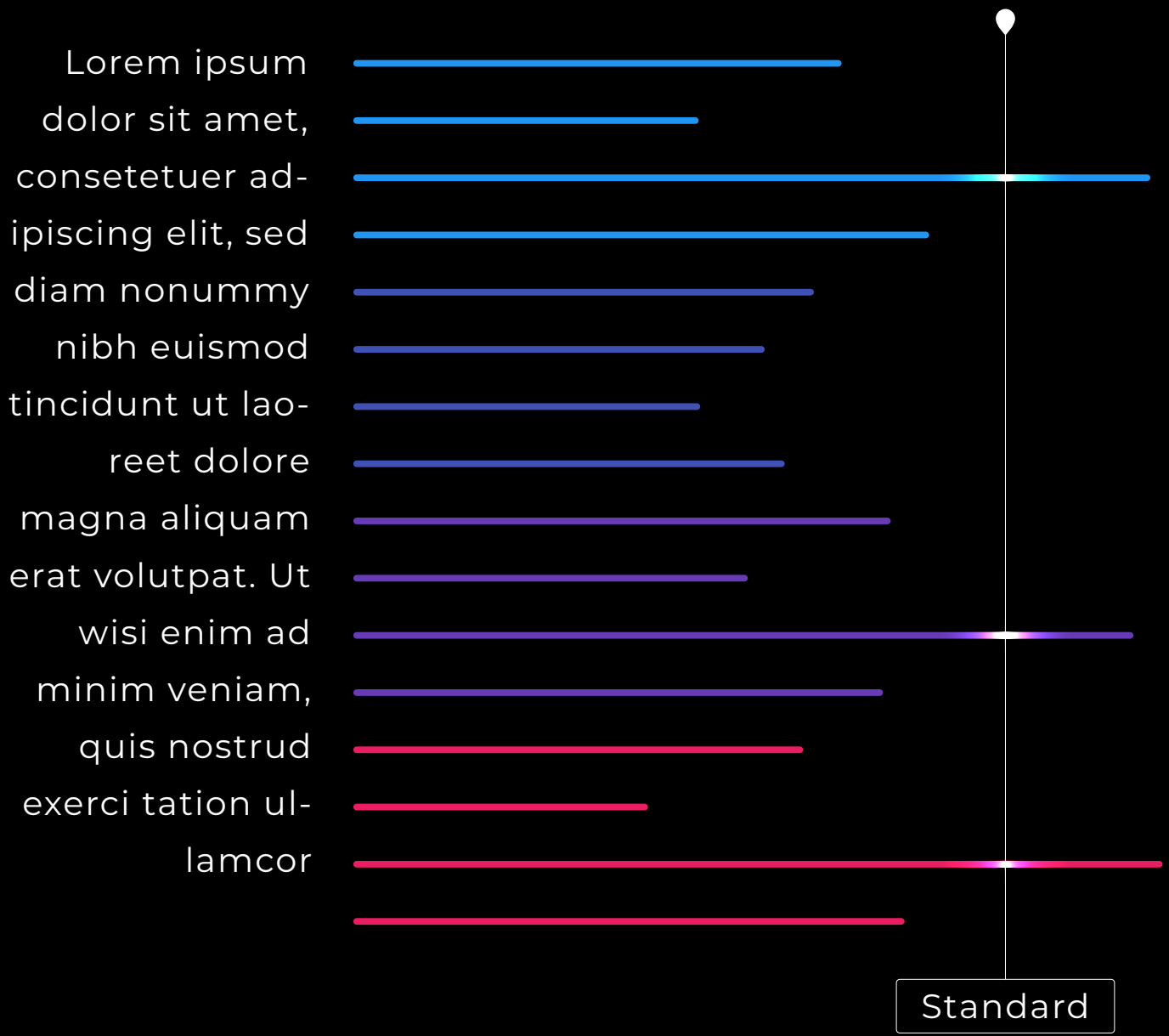
4. Customizing Seaborn Plots

- Themes and styles:
  - sns.set_style(), sns.set_context()
- Changing color palettes:
  - sns.color_palette(), palette='Set2', etc.
- Annotations and fine-tuning aesthetics

5. Combining Seaborn with Matplotlib

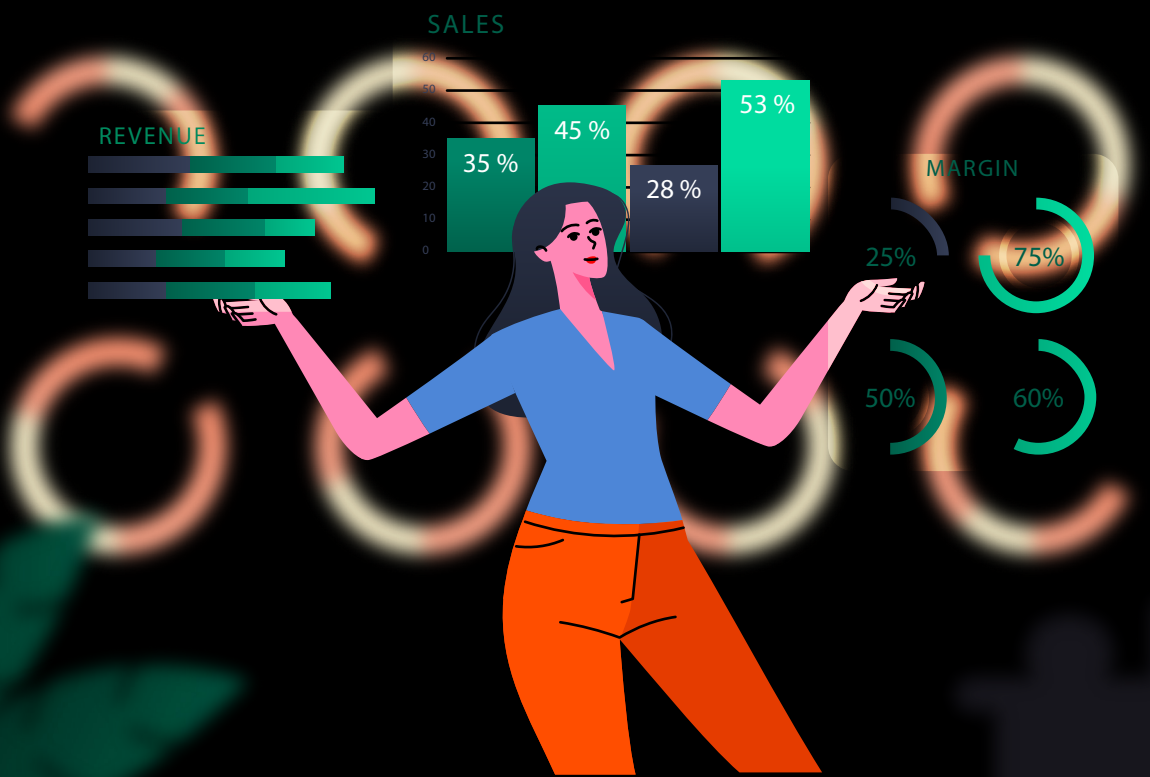
- Customizing Seaborn plots using matplotlib.pyplot functions
- Using plt.figure() for layout control





By the End of This Module, You Will Be Able To

- Create professional-quality visualizations from scratch
- Choose the right chart type for the data and objective
- Customize and style plots for reports, dashboards, or presentations
- Use Seaborn to perform **Visual EDA (Exploratory Data Analysis)**
- Save and share your visualizations in various formats



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