

# Workshop on Research Tools and Techniques

## Overview and Demonstration

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# Disclaimer

The views and opinions expressed in this presentation are my own.

They do not reflect the views, policies, or positions of my organization.

# Workshop on Research Tools and Techniques

- **Objective:** Familiarizing with various research methodologies and tool sets.
- **Types of Research:**
  - *Qualitative Research:* Focuses on understanding underlying reasons, opinions, and motivations through interviews, focus groups, and observation.
    - Understanding consumer behavior and preferences in marketing.
    - Exploring patient experiences in healthcare.
    - Analyzing cultural practices and social norms in anthropology and sociology.
  - *Quantitative Research:* Emphasizes measurable, numerical data, often using statistical and computational methods for analysis.
    - Measurement of the prevalence of diseases in epidemiology.
    - Analyzing financial trends and risks in economics.
    - Evaluation of educational outcomes and results of standardized tests.

# Research Tools for Electrical Engineering

- **MATLAB:** A high-level language and interactive environment for numerical computation, visualization, and programming.
- **Python:** A general-purpose programming language popular for scientific computing with libraries such as NumPy, SciPy, and pandas.
- **Proteus:** Software for microprocessor simulation, schematic capture, and printed circuit board (PCB) design.

# Popular Machine Learning Tools

- **Jupyter Notebook:** A web-based interactive computing platform that allows code, equations, and visualizations.
- **Google Colab:** A free cloud-based Jupyter notebook environment with GPU/TPU support.
- **Anaconda:** A distribution of Python and R for scientific computing.
- **Visual Studio Code:** A lightweight but powerful source code editor, supports Python, Jupyter notebooks, and more.
- **TensorFlow:** An open-source library developed by Google for deep learning and machine learning tasks.
- **PyTorch:** A popular deep learning framework developed by Facebook's AI Research lab.
- **Scikit-learn:** A Python module for machine learning built on top of SciPy.
- **Keras:** A high-level neural networks API running on top of TensorFlow or Theano.
- **OpenCV:** An open-source computer vision and machine learning software library.

# Data Collection Techniques and Tools

- **Sensors and IoT:** Physical devices that capture real-time data such as temperature, pressure, or biological signals.
- **Experimental Data:** Data gathered from controlled laboratory or field experiments.
- **Simulation Data:** Synthetic datasets generated by modeling physical processes or systems in software.

# Data Management Tools

- **Google Scholar:** A search engine for scholarly literature across many disciplines.
- **ResearchGate:** A social networking site for scientists and researchers to share papers and find collaborators.
- **Mendeley:** A reference manager and academic social network that helps organize research, collaborate, and discover.
- **Kaggle:** A platform for predictive modeling and analytics competitions, also hosts numerous datasets.

# Collaborative Research and Open-Source Tools

- **GitHub:** A web-based platform for version control using Git. Ideal for sharing and collaborating on code.



# Visualization Tools

- **Tableau:** Commercial software for advanced data analysis and interactive data visualization.
- **Python (Matplotlib, Seaborn):** Powerful libraries for creating static, animated, and interactive visualizations in Python.

# Formatting and Publishing

- **L<sup>A</sup>T<sub>E</sub>X (Overleaf)**: A high-quality typesetting system, widely used for technical and scientific documents.
- **Microsoft Word**: A word processing application, commonly used for manuscript drafting and formatting.

# Personal Journey

## Highlights:

- Chittagong, Bangladesh
- CUET EEE (2015–2019)
- MS in Information Sciences, University of Arkansas at Little Rock (2021–2023)
- From EEE to Information Sciences (2022)
- Data Analyst II, University of Arkansas for Medical Sciences (2023–Present)
- PhD (Part-time) in Biomedical Informatics (2024-2027(Expected))
- Why did I start PhD?

# Thank You!

Questions or comments?