

# Teaching Machine Learning with R in Nigeria: Challenges and Prospects

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Contributed talk presented at



**With the Theme:** Ethical and Societal Challenges of Machine Learning  
**Online, November 7-11, 2022**



# Outline

- What I Do
- Introduction
- Why Open Source Software? Why R?
- Machine Learning with R
- Challenges for Teaching Machine Learning using R in Nigeria
- Prospects
- Conclusion

# What I Do

- Regional Coordinator, Northern Nigeria LISA 2020 Network
- Coordinator, NSUK-LISA Stat Lab, Nasarawa State University, Keffi
- Chair, International Association of Statistical Computing (IASC) African Members Group
- Coordinator, Nasarawa State R User Group
- Co-Founder, FOUND-LEAS-IN-NIGERIA an NGO that support Girls and Women in Data Science

# Introduction

The field of Data science and machine learning is young in Nigeria as most universities, colleges and polytechnics do not offer Data science at undergraduate level. This means potentials data scientist comes from statistics, mathematics and computer science fields. One of the major challenges will have seen from experience of teaching machine learning with statistical computing (such as R) is that students and learners in Nigeria lack basic skills in statistical computing using R.

Question: Why Open  
Source Software?

Question: Why R?

# Some Software



## Academic EViews 13 Enterprise Edition (New Single User License)

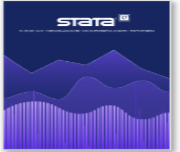
Cost: \$650



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# Introduction to R

R is a system for statistical analyses and graphics created by Ihaka & Gentleman (1996). R is both a software and a language considered as a dialect of the S language created by the AT&T Bell laboratories and is freely distributed under the terms of the GNU General Public License .

R is a language and environment for statistical computing and graphics, provides a wide variety of statistical methods (time series analysis, linear and nonlinear modeling, classical statistical tests, and so on) Machine learning and graphical techniques, and is highly extensible.



## Advantages of R

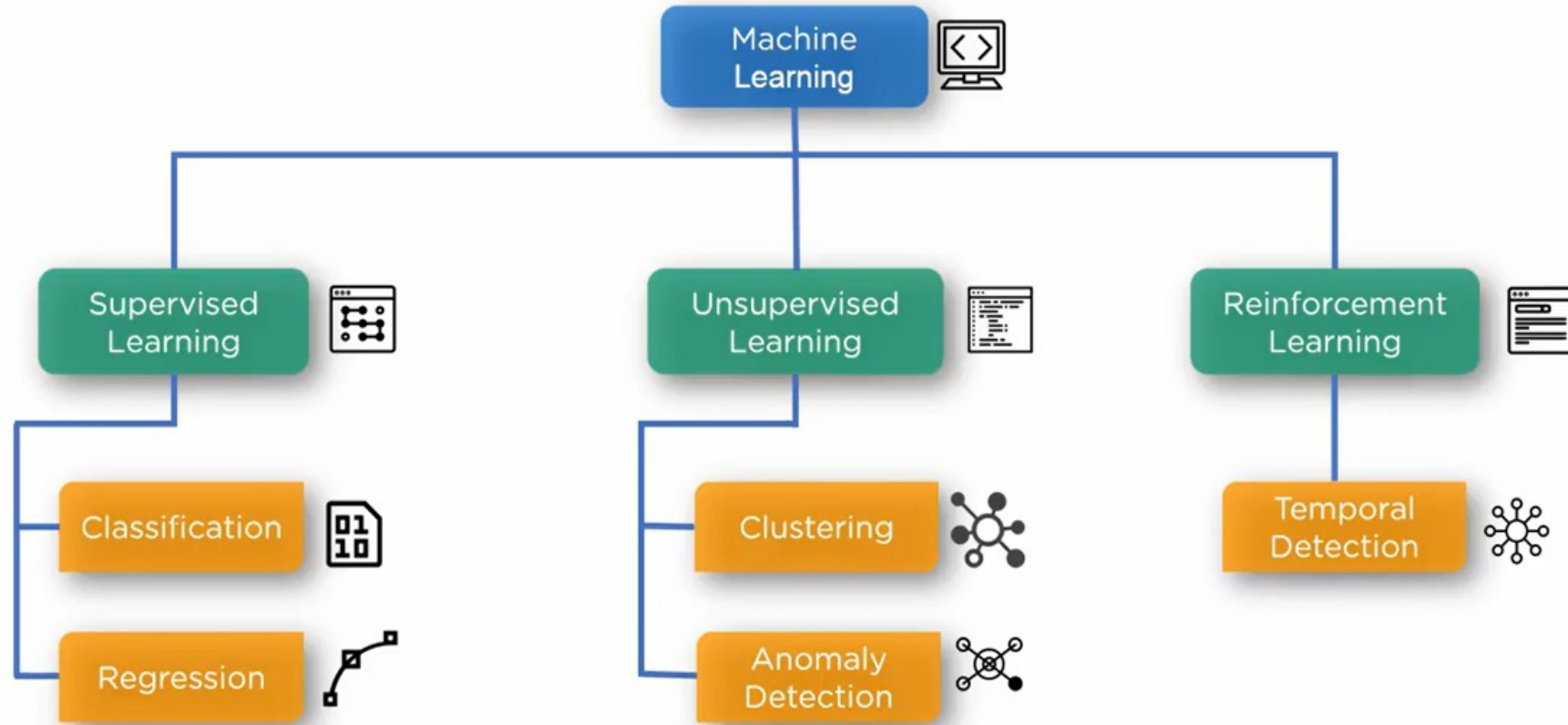
According to Paradis, (2005), the major advantages of R are

- R has many functions and packages for statistical analyses and graphics
- R language allows the user to program loops to successively analyze several data sets,
- It is possible in R to combine in a single program different statistical functions to perform more complex analysis.

# Machine Learning with R

Machine learning is a collection of algorithms that generate insight from data. That insight might be used by humans or other machines to make a decision.

# Machine Learning Algorithms



# Some R packages for Machine learning

- **caret**
- e1071
- Kernlab
- Mlr
- glmnet
- gbm
- tree
- CORElearn
- mboost
- mltools
- plyr
- data.table
- rpart
- rpart.plot
- nueralnet
- knn
- Cluster
- randomforest

# Teaching Machine Learning with TEAM-R Framework

TEAM-R stands for

T-Teach (seminar, webinar, workshop and short course etc)



# NASARAWA STATE UNIVERSITY, KEFFI

NSUK-LISA, Nigeria was created 31<sup>st</sup> January 2018 as the 9<sup>th</sup> member of the LISA 2020 Network. Coordinated by Dr. M. O. Adenomon.



## Statistical Consulting and Collaborative Practices in North Central Nigeria

- Students learn the Theory and Empirical Analysis using Mentorship and Statistical computing (MINITAB, R, STATA etc.)
- We teach short courses e.g. Statistics in Physical Sciences with R and Statistical Methods with MINITAB
- We rapidly improve skills with practical experience (practice on own laptop)





**Impacts:** Total students Trained, Collaboration, Publications and Awards

Collaboration		Papers published in Web of Science and Scopus Journals	Awards	Total students trained
Within the University	Outside the University			
10	3	3	2 Grants for Capacity Building 1 Best paper presentation Award	140


## TEAM Frame

- Teach
- Explanation with Real life
- Attitudinal Influence
- Mentorship



**International Association for Statistical Computing**  
African Members Group




**Presents**

## 2<sup>nd</sup> Physical Symposium on Applied Statistics with R Syntax


**About the Course**

This 2-day fully practical training aims at providing an overview of applications of R programming language in Applied Statistics to cover a broad selection of key challenges in and methodologies for working with real-life datasets. Topics to be covered are extensively detailed. Real life applications with industrial illustrations would be given to enhance participants' understanding. Participants will surely acquire a working knowledge of R syntax through hands-on projects and case studies.

**Facilitators**



**Timothy A. OGUNLEYE**  
Executive Director, Tim-R Programming Consult, Nigeria  
(Secretary-General, IASC African Members Group)



**Monday O. ADENOMON, PhD**  
Senior Lecturer, Nasarawa State University, Nigeria  
(The Chair, IASC African Members Group)

**Course Outline**

- Elements of Applied Statistics such as calculating quantiles (and quartiles) of a dataset, merging a quantile, converting data to a matrix, testing the mean of a sample (t test), forming a confidence interval for a mean, testing a confidence interval for a proportion, testing a sample proportion, forming a confidence interval for a proportion, testing for normality, comparing the means of two samples, testing a correlation for significance, etc.
- Data Graphics and Visualization (Infographic) such as Bar Chart, Pie Chart, Contingency Frequency Table (Ogives), Comparative Relative Frequency Graph, Dot Chart, Box Plot, Histogram, Line Plot, Scatter Plot, etc.

**Who should attend?**

- Students of Statistics, Mathematics, Engineering, Economics, etc
- Monitoring and Evaluation (M&E) Officers, Policy-makers, and NGO Staff
- Researchers, Lecturers, Statisticians, Econometricians, Actuarial Scientists
- Data Scientists, Data Engineers, Data Analyst, Economic Planners, etc

**Date:** April 7th – 8th, 2021 **Time:** 10:00AM-05:00PM  
**Venue:** Ologunsoye Oyinlola Auditorium, Osun State University, Osogbo

**REGISTRATION IS FREE!**



# INTERNATIONAL ASSOCIATION FOR STATISTICAL COMPUTING

**AFRICAN MEMBERS' GROUP**

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**Panelist/ Co-organizer:**



**MONDAY O. ADENOMON, PH.D**  
DEPARTMENT OF STATISTICS, NASARAWA STATE UNIVERSITY, KEFFI, NIGERIA



**TIMOTHY A. OGUNLEYE**  
DEPARTMENT OF STATISTICS, OSUN STATE UNIVERSITY, OSOGBO, NIGERIA



**ANTHONY EKPO, PH.D**  
UNIVERSITY OF AGRICULTURE, MAKURDI, NIGERIA

**REGISTRATION LINK:**  
[https://us06web.zoom.us/join/register/WN\\_gQ4bFSc9Tww0Pt\\_XzB6-iQ](https://us06web.zoom.us/join/register/WN_gQ4bFSc9Tww0Pt_XzB6-iQ)

**DATE:** FRIDAY, 30TH SEPTEMBER, 2022  
**TIME:** 3:00PM - 4:30PM WAT  
**DURATION:** 90 MINUTES **VENUE:** ONLINE








Machine Learning for Forecasting Financial Sector Data in Nigeria. Workshop Organized by the Nigerian Statistical Association (NSA), 26<sup>th</sup>-27<sup>th</sup> September 2022



E-Examples with Real world data,  
A-Attitudinal influence,  
M-Mentoring and  
R-Relationship

# Challenges

- Problem of integrating Machine Learning activities into the Tertiary education curriculum.
- Lack of basic skills in using R language and other languages
- Few or No university in Nigeria running B.Sc in Data Science

# Data Science in Nigeria

## DATA SCIENCE-RELATED COURSES IN NIGERIAN UNIVERSITIES

S/No	University	Department	Program	Areas of Specialization	Visit Program Link
1	Covenant University	Computer & Information Science	MSc. Computer Science	Artificial Intelligence, Data Mining, Machine Learning, Mobile Computing	<a href="http://bit.ly/3oRkc7c">bit.ly/3oRkc7c</a>
2	African University of Science & Technology		MSc.	Geoinformatics and GIS	<a href="http://t.ly/wFYZ">t.ly/wFYZ</a>
3	University of Nigeria, Nsukka	Computer Science	MSc.	Software Engineering, Artificial Intelligence	<a href="http://t.ly/e5uM">t.ly/e5uM</a>
4	Nnamdi Azikwe University, Awka	Computer Science	MSc.	Artificial Intelligence	<a href="http://bit.ly/3mualNj">bit.ly/3mualNj</a>
5	University of Port Harcourt	Computer Science	Ph.D	Artificial Intelligence, Database Systems	<a href="http://bit.ly/3oVU2jC">bit.ly/3oVU2jC</a>
6	University of Uyo	Computer Science	Ph.D	Computational Intelligence	<a href="https://uniuyo.edu.ng/faculty-of-science/computer-science/#">https://uniuyo.edu.ng/faculty-of-science/computer-science/#</a>
7	Babcock University	Computer Science	MSc.	Data Analytics and Business Intelligence	<a href="http://t.ly/fMHU">t.ly/fMHU</a>
8	Lead City University	Computer Science	MSc. Computer Science	Computational Intelligence	<a href="http://t.ly/L4Zh">t.ly/L4Zh</a>
9	Igbinedion University Okada		MSc. Computer Science & Information Technology	Artificial Intelligence & Expert System	<a href="http://bit.ly/3ahBsOU">bit.ly/3ahBsOU</a>
10	Nile University	Computer Science	MSc. Computer Science	Artificial Intelligence, Database Systems	<a href="http://t.ly/mD36">t.ly/mD36</a>
11	NOUN	Sciences	B.Sc. Data Management	Data management	<a href="http://bit.ly/2NgPoj8">http://bit.ly/2NgPoj8</a>
12	Nasarawa State Uni. Keffi		M.Sc. Data Science and Technology (MDST)	Data Science and Technology	<a href="https://bit.ly/2NqcpA7">https://bit.ly/2NqcpA7</a>
13	American University of Nigeria		Data Science and Analytics (MSc)	Data Science and Analytics	<a href="http://bit.ly/2M6vQx8">http://bit.ly/2M6vQx8</a>
14	University of Ibadan		M.C.S, MPhil and PhD in Computer Sci.	Data Mining	<a href="http://bit.ly/3uj8xSe">bit.ly/3uj8xSe</a>

**Source:**  
<https://datalab.com.ng/universities-offering-data-science-in-nigeria/>

# Prospects

Application of machine learning is needed in the following areas:

- Fraud detection
- Electoral processes (2023 General Election in Nigeria)
- Agriculture
- Climate Change
- Security Problems in Nigeria
- Medicine
- Education and Research

# Conclusion

There is need to integrate Data science components across all courses of study in the Nigeria tertiary education since data science is multi-disciplinary in nature.

Undergraduate programme in Data Science be run in Nigeria tertiary institution in order to achieve the prospects of Machine learning, Big Data and AI in Nigeria

# Further Readings

- Adenomon, M. O. (2022): Statistical Consulting and Collaboration Practices: The Experience of NSUK-LISA Stat Lab. In Awe, O. O.; Love, K. & Vance, E. A. (Eds): Promoting Statistical Practice and Collaboration in Developing Countries, Pp. 131-138. DOI:10.1201/9781003261148-13
- Adenomon, M. O. (2022): Teaching and Learning Statistics in Nigeria with the Aid of Computing and Survey data sets from International Organizations. In Awe, O. O.; Love, K. & Vance, E. A. (Eds): Promoting Statistical Practice and Collaboration in Developing Countries, Pp. 371-382. DOI:10.1201/9781003261148-32
- Mary C. Tucker, Stacy T. Shaw, Ji Y. Son & James W. Stigler (2022): Teaching Statistics and Data Analysis with R, Journal of Statistics and Data Science Education, DOI: 10.1080/26939169.2022.2089410

**THANK**

**YOU**