Core courses:

1.Statistics and Scientific Method;

The course gives a very broadly based introduction to statistics, covering: design of experiments; analysis of data; statistical modelling and inference. It emphasises the role of statistical thinking as an integral part of the scientific method, rather than presenting statistics as a collection of unrelated techniques. The ideas are motivated by discussion of specific examples from the biological and environmental sciences. Lab exercises use the R software environment.

2. Machine Learning Essentials;

The course would consist of preparatory lectures via youtube video (https://www.youtube.com/playlist?list=PL05umP7R6ij35ShKLDqccJSDntugY4FQT) and theoretical/practical sessions on classification/regression/unsupervised learning. Ideally the course would take 3 full days (can be extended if needed).

3. Methods from Control and Dynamical Systems;

Control Science, born during the age of the industrial revolution, has evolved into a bridge between technology, physical, biological and computer sciences, and mathematics. After a brief historical account we will highlight the multidisciplinary nature of the field by key concepts and methods that have enabled developments in the aforementioned sciences. Our focus will be on methods that pertain to stability, robustness and optimality in engineering, computational tasks, and physical processes.

4. Problem solving with Data Science;

The UN vision of the Data revolution whereby data science changes the world, is one which we are all active participants. However it is very easy to get lost in the abstract and miss the potential impact we could have on the world by using our skills to directly solve real world problems. This course will expose participants to skills and approaches which data-scientists use to contribute to real world problems, with a focus on highlighting the real-world impact of Data-Science to African development problems. Most importantly it will force participants to start with problems and data and consider what questions different data-science approaches can actually answer. This will attempt to put into perspective different types of knowledge and try to communicate the limits of data science as well as it's exciting potential.

5. Mathematical Foundations for Data Science;

This 10 hour minicourse held by Bubacarr Bah and Leon Bungert comprises tandem lectures on mathematical tools and their application in data science. The first lecture of each tandem reviews basic concepts from linear algebra, statistics, graphs, calculus, and optimization. The second one explains and analyzes mathematical models to solve prototypical data science tasks like clustering, semi-supervised learning, and high-dimensional optimization problems.

6. Optimisation for data science;

Design and analysis of stochastic gradient type algorithms for large scale optimisation problems with structure that typically arises in data science. Applications include the training of neural networks and optimisation problems with structured sparsity.