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| **Course Code:** |  |
| **Course:** | **Machine Learning** |
| **School** | **Computer Science University of Gambia** |
| **Term** | **3** |
| **Level** | **PostGrad** |
| **Locations** | **Banjul** |
| **Units** | **3** |

**Course Description**

This course is designed to introduce the key concepts involved in building and application of contemporary deep learning techniques. The course has been developed consulting from well known courses available in top US universities. It starts with the definition of learning and make student understand the key learning principals. Then starting from perceptron and logistic regression learning, ANNs, training and validation aspects of ANNs, CNNs, GANs, RNNs, LSTM and Transformers are covered. The purpose is to present the full range of Deep learning models and their applications. The foundational ideas are taught so that students understand and interpret future developments in this rapid moving field.

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| Week 1 | What is learning, the principals of learning, Perceptron learning, Intro of different realms of learning  Practical work: Fundamentals of Python Programming |
| Week 2 | Multiple linear Regression (MLR)  Practical work: Handling data in Python (Pandas) 1 and Implementing MLR |
| Week 3 | Logistic regression, Multinomial logistic regression (MLG)  Practical work: Handling data in Python (Pandas) 2 |
| Week 4 | From M LG to Neural Networks (NNs), Multi-layer NNs, Concepts of Deep NNs  Practical work: Implementing ANNs in Python |
| Week 5 | Understanding training of NNs, Gradient descent, Stochastic Gradient descent,  Practical work: Handling data in Python (Pandas) |
| Week 6 | Overfitting, Validation, Stratification, Measuring Performance of trained models |
| Week 7 | Understanding Filters, Convolutions, Pooling,building Layers of convolutions,  Understanding Convolutional NNs (CNNs)  Practical work: Object Classification using CNNS in Python |
| Week 8 | Exam |
| Week 9 | Training CNNs for Object Classification, Famous CNN based models, Object Detection Frameworks, |
| Week 10 | Overfeat paper with understanding of image pyramids, Receptive field, Problem of multiple detectors |
| Week11 | Concepts of Generative Adversarial Networks (GANs)  Practical work: Implementation of GANs in Python (Pandas) using MNIST fashion dataset |
| Week 12 | Understanding Sequence Models, Recurrent Neural Networks with Applications in Natural language Processing (NLP) |
| Week 13 | NLP, word Embeddings, GRUs, LSTM |
| Week 14 | Transformers and their Applications |
| Week 15 | Exams |