

Master of Science in Machine Learning and AI

(Program Curriculum)

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COURSE	MODULE NAME	SESSION	SESSION NAME				
PRE PREPARATORY CONTENT	INTRODUCTION TO PYTHON FOR DATA ANALYSIS	UNDERSTANDING UPGRAD CODING CONSOLE	INTRODUCTION UNDERSTANDING PRIMARY ACTIONS UNDERSTANDING STATUSES & IMPORTANT POINTERS				
		DATA STRUCTURES IN PYTHON	INTRODUCTION GETTING STARTED - INSTALLATION INTRODUCTION TO JUPYTER NOTEBOOK THE BASICS LISTS TUPLES DICTIONARIES SETS				
			CONTROL STRUCTURES & FUNCTIONS	IF-ELIF-ELSE LOOPS & CONDITIONAL STATEMENTS COMPREHENSIONS FUNCTIONS EXCEPTION HANDLING MAP, FILTER & REDUCE			
				PYTHON FOR DATA SCIENCE	INTRODUCTION TO NUMPY	INTRODUCTION NUMPY BASICS CREATING NUMPY ARRAYS STRUCTURE AND CONTENT OF ARRAYS SUBSET, SLICE, INDEX AND ITERATE THROUGH ARRAYS MULTIDIMENSIONAL ARRAYS PYTHON LISTS VS NUMPY ARRAYS	
					OPERATIONS ON NUMPY ARRAYS	INTRODUCTION BASIC OPERATIONS OPERATIONS ON ARRAYS BASIC LINEAR ALGEBRA OPERATIONS	
						INTRODUCTION TO PANDAS	INTRODUCTION PANDAS BASICS INDEXING AND SELECTING DATA MERGE AND APPEND GROUPING AND SUMMARIZING DATAFRAMES LAMBDA FUNCTION & PIVOT TABLES
							INTRODUCTION TO PANDAS
		GETTING AND CLEANING DATA	CLEANING DATASETS INTRODUCTION READING DELIMITED AND RELATIONAL DATABASES READING DATA FROM WEBSITES GETTING DATA FROM APIS READING DATA FROM PDF FILES				
			INTRODUCTION TO PANDAS		CLEANING DATASETS INTRODUCTION READING DELIMITED AND RELATIONAL DATABASES READING DATA FROM WEBSITES		
					MATH FOR MACHINE LEARNING	EIGENVALUES AND EIGENVECTORS	CALCULATING EIGENVALUES AND EIGENVECTORS EIGENDECOMPOSITION OF A MATRIX EIGENVECTORS: WHAT ARE THEY? DETERMINANTS
		LINEAR TRANSFORMATIONS AND MATRICES				INVERSE, RANK, COLUMN AND NULL SPACE LINEAR TRANSFORMATIONS MATRICES: THE BASICS MATRIX OPERATIONS SYSTEM OF LINEAR EQUATIONS	
			MULTIVARIABLE CALCULUS			CRITICAL POINTS, MAXIMA AND MINIMA DIFFERENTIATION FUNCTIONS AND DERIVATIVES FUNCTIONS: PRIMER MULTIVARIABLE FUNCTIONS TAYLOR SERIES AND LINEARISATION (OPTIONAL) THE HESSIAN THE JACOBIAN VECTOR-VALUED FUNCTIONS	
	VECTORS AND VECTOR SPACES					DOT PRODUCT - EXAMPLE APPLICATION INTRODUCTION TO LINEAR ALGEBRA SUMMARY VECTOR OPERATIONS - THE DOT PRODUCT VECTOR SPACES VECTORS: THE BASICS	
		DATA VISUALISATION IN PYTHON				BASICS OF VISUALISATION	COMPONENTS OF A PLOT DATA VISUALISATION TOOLKIT FUNCTIONALITIES OF PLOTS SUB-PLOTS
						PLOTING CATEGORICAL AND TIME-SERIES DATA	INTRODUCTION PLOTING AGGREGATE VALUES ACROSS CATEGORIES PLOTING DISTRIBUTIONS ACROSS CATEGORIES BIVARIATE DISTRIBUTIONS - PLOTING PAIRWISE RELATIONSHIPS VECTOR SPACES VECTORS: THE BASICS
	PLOTING DATA DISTRIBUTIONS			INTRODUCTION UNIVARIATE DISTRIBUTIONS UNIVARIATE DISTRIBUTIONS - RUG PLOTS			
			DATA ANALYSIS USING SQL	BASICS OF SQL			AN INTRODUCTION TO RDBMS AND SQL BASICS OF SQL DATA RETRIEVAL WITH SQL PATTERN MATCHING WITH WILDCARDS BASICS OF SORTING SESSION SUMMARY
				ADVANCED SQL		ORDER BY CLAUSE AGGREGATE FUNCTIONS GROUP BY CLAUSE HAVING CLAUSE NESTED QUERIES INNER JOIN MULTI JOIN OUTER JOIN SUMMARY	
	ADVANCED SQL					DATABASE DESIGN	INTRODUCTION DEFINING DATA WAREHOUSE STRUCTURE OF DATA WAREHOUSE OLAP VS. OLTP STAR SCHEMA HOW TO USE A STAR SCHEMA - A DEMONSTRATION DATA WAREHOUSE SCHEMA- INDUSTRY EXAMPLE
						UPDATING TABLE	INTRODUCTION ADDING AND DELETING COLUMNS CHANGING COLUMN NAME AND DATA TYPE CREATING TABLE FROM EXISTING TABLE CHANGING CONSTRAINTS (FOREIGN KEY) STRING MANIPULATION DATE MANIPULATION
							WINDOW FUNCTIONS
					USER DEFINED FUNCTIONS AND STORED PROCEDURES		
				QUERY OPTIMISATION		INTRODUCTION OPTIMISATION IN SELECT CLAUSE OPTIMISATION IN WHERE CLAUSE OPTIMISATION IN GROUP BY AND ORDER BY OPTIMISATION IN JOINS OPTIMISATION IN WINDOW FUNCTION	

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COURSE	MODULE NAME	SESSION	SESSION NAME
STATISTICS ESSENTIAL	ANALYTICS PROBLEM SOLVING	THE CRISP-DM FRAMEWORK	INTRODUCTION
			DEFINE THE BUSINESS PROBLEM - BUSINESS UNDERSTANDING
			OWNING AN IPL TEAM - BUSINESS UNDERSTANDING
			PREPARING DATA FOR ANALYSIS
			THE HEART OF DATA ANALYSIS: MODELLING
			MODEL EVALUATION AND DEPLOYMENT
	INVESTMENT ASSIGNMENT	INVESTMENT ASSIGNMENT	INTRODUCTION
			DOWNLOADS
			CHECKPOINTS - PART 1
			CHECKPOINTS - PART 2
			EVALUATION RUBRIC
			FINAL SUBMISSION
	INFERENTIAL STATISTICS	BASICS OF PROBABILITY	INTRODUCTION: INFERENCE STATISTICS
			INTRODUCTION: BASICS OF PROBABILITY
			RANDOM VARIABLES
			PROBABILITY DISTRIBUTIONS - I
			PROBABILITY DISTRIBUTIONS - II
			EXPECTED VALUE - I
			EXPECTED VALUE - II
			PRACTICE QUESTIONS
		DISCRETE PROBABILITY DISTRIBUTIONS	INTRODUCTION: DISCRETE PROBABILITY DISTRIBUTIONS
			PROBABILITY WITHOUT EXPERIMENT - I
			PROBABILITY WITHOUT EXPERIMENT - II
			BINOMIAL DISTRIBUTION
			CUMULATIVE PROBABILITY
			PRACTICE QUESTIONS
		CONTINUOUS PROBABILITY DISTRIBUTIONS	INTRODUCTION: CONTINUOUS PROBABILITY DISTRIBUTIONS
			PROBABILITY DENSITY FUNCTIONS - I
			PROBABILITY DENSITY FUNCTIONS - II
			NORMAL DISTRIBUTION
			STANDARD NORMAL DISTRIBUTION
			PRACTICE QUESTIONS
		CENTRAL LIMIT THEOREM	INTRODUCTION: CENTRAL LIMIT THEOREM
			SAMPLES
			SAMPLING DISTRIBUTIONS
			PROPERTIES OF SAMPLING DISTRIBUTIONS
			SAMPLING DISTRIBUTIONS
			CENTRAL LIMIT THEOREM
			PRACTICE QUESTIONS - PART I
			ESTIMATING MEAN USING CLT
			CONFIDENCE INTERVAL - EXAMPLE
			PRACTICE QUESTIONS - PART II
	HYPOTHESIS TESTING	CONCEPTS OF HYPOTHESIS TESTING - I	INTRODUCTION
			UNDERSTANDING HYPOTHESIS TESTING
			NULL AND ALTERNATE HYPOTHESES
			MAKING A DECISION
			CRITICAL VALUE METHOD
			CRITICAL VALUE METHOD - EXAMPLES
		CONCEPTS OF HYPOTHESIS TESTING - II	INTRODUCTION
			P-VALUE METHOD
			P-VALUE METHOD - EXAMPLES
			TYPES OF ERRORS
		INDUSTRY DEMONSTRATION OF HYPOTHESIS TESTING	INTRODUCTION
			T DISTRIBUTION
			TWO-SAMPLE MEAN TEST
			TWO-SAMPLE PROPORTION TEST
			A/B TESTING DEMONSTRATION
			INDUSTRY RELEVANCE
			HYPOTHESIS TESTING IN PYTHON
		HYPOTHESIS TESTING - ADDITIONAL RESOURCES	INTRODUCTION
			Z-TEST
			T-TEST
			CHI-SQUARE TEST
			P-VALUE APPROACH
			F-TEST
	EXPLORATORY DATA ANALYSIS	DATA SOURCING	INTRODUCTION TO EDA
			INTRODUCTION
			PUBLIC AND PRIVATE DATA
			PRIVATE DATA
			PUBLIC DATA
			PUBLIC DATA EXERCISE
		DATA CLEANING	INTRODUCTION
			FIXING ROWS AND COLUMNS
			MISSING VALUES
			STANDARDISING VALUES
			INVALID VALUES
			FILTERING DATA
		UNIVARIATE ANALYSIS	INTRODUCTION
			DATA DESCRIPTION
			UNORDERED CATEGORICAL VARIABLES - UNIVARIATE ANALYSIS
			ORDERED CATEGORICAL VARIABLES - UNIVARIATE ANALYSIS
			QUANTITATIVE VARIABLES - UNIVARIATE ANALYSIS
			QUANTITATIVE VARIABLES - SUMMARY METRICS
		SEGMENTED UNIVARIATE	INTRODUCTION
			INTRODUCTION TO SEGMENTED UNIVARIATE ANALYSIS
			BASIS OF SEGMENTATION
			QUICK WAY OF SEGMENTATION
			COMPARISON OF AVERAGES
			COMPARISON OF OTHER METRICS
		BIVARIATE ANALYSIS	INTRODUCTION
			BIVARIATE ANALYSIS ON CONTINUOUS VARIABLES
			BUSINESS PROBLEMS INVOLVING CORRELATION
			PRACTICE QUESTIONS
		DERIVED METRICS	BIVARIATE ANALYSIS ON CATEGORICAL VARIABLES
			INTRODUCTION
			WHAT ARE DERIVED METRICS?
			TYPES OF DERIVED METRICS: TYPE DRIVEN METRICS
			TYPES OF DERIVED METRICS: BUSINESS DRIVEN METRICS
			PRACTICE QUESTIONS
			TYPES OF DERIVED METRICS: DATA DRIVEN METRICS
	GROUP PROJECT	LENDING CLUB CASE STUDY	LENDING CLUB CREDIT DEFAULT ANALYSIS USING EDA CONCEPTS

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COURSE	MODULE NAME	SESSION	SESSION NAME
MACHINE LEARNING - 1	LINEAR REGRESSION	INTRODUCTION TO SIMPLE LINEAR REGRESSION	INTRODUCTION TO MACHINE LEARNING
			REGRESSION LINE
			BEST FIT LINE
			STRENGTH OF SIMPLE LINEAR REGRESSION
		SIMPLE LINEAR REGRESSION IN PYTHON	INTRODUCTION
			ASSUMPTIONS OF SIMPLE LINEAR REGRESSION
			READING AND UNDERSTANDING THE DATA
			HYPOTHESIS TESTING IN LINEAR REGRESSION
			BUILDING A LINEAR MODEL
			RESIDUAL ANALYSIS AND PREDICTIONS
			LINEAR REGRESSION USING SKLEARN
		MULTIPLE LINEAR REGRESSION	INTRODUCTION
			MOTIVATION: WHEN ONE VARIABLE ISN'T ENOUGH
			MOVING FROM SLR TO MLR: NEW CONSIDERATIONS
			MULTICOLLINEARITY
			DEALING WITH CATEGORICAL VARIABLES
			MODEL ASSESSMENT AND COMPARISON
		MULTIPLE LINEAR REGRESSION IN PYTHON	FEATURE SELECTION
			INTRODUCTION
			DATA UNDERSTANDING AND PREPARATION
			INITIAL STEPS
			BUILDING THE MODEL
			RESIDUAL ANALYSIS AND PREDICTIONS
	LINEAR REGRESSION ASSIGNMENT	ASSIGNMENT- LINEAR REGRESSION	VARIABLE SELECTION USING RFE
			SUMMARY
			INTRODUCTION
			LINEAR REGRESSION: REVISION
		INDUSTRY RELEVANCE OF LINEAR REGRESSION	PREDICTION VS PROJECTION
			EXPLORATORY DATA ANALYSIS IN LINEAR REGRESSION
			MEDIA COMPANY CASE STUDY
			MODEL BUILDING
			ASSESSING THE MODEL
			INTERPRETING THE RESULTS
	LOGISTIC REGRESSION		PROBLEM STATEMENT - PART I
			PROBLEM STATEMENT - PART II
			EVALUATION RUBRIC
			FINAL SUBMISSION
			INTRODUCTION: UNIVARIATE LOGISTIC REGRESSION
			BINARY CLASSIFICATION
			SIGMOID CURVE
			FINDING THE BEST FIT SIGMOID CURVE
			SUMMARY
		MULTIVARIATE LOGISTIC REGRESSION - MODEL BUILDING	INTRODUCTION
			MULTIVARIATE LOGISTIC REGRESSION - TELECOM CHURN EXAMPLE
			DATA CLEANING AND PREPARATION
			BUILDING YOUR FIRST MODEL
			FEATURE ELIMINATION USING RFE
			CONFUSION MATRIX AND ACCURACY
		MULTIVARIATE LOGISTIC REGRESSION - MODEL EVALUATION	MANUAL FEATURE ELIMINATION
			INTRODUCTION
			METRICS BEYOND ACCURACY: SENSITIVITY & SPECIFICITY
			FINDING THE OPTIMAL THRESHOLD USING ROC CURVE
			METRICS BEYOND ACCURACY: PRECISION & RECALL
			MAKING PREDICTIONS
		LOGISTIC REGRESSION - INDUSTRY APPLICATIONS - PART I	INTRODUCTION
			GETTING FAMILIAR WITH LOGISTIC REGRESSION IN THE INDUSTRY
			NUANCES OF LOGISTIC REGRESSION - SAMPLE SELECTION, SEGMENTATION, AND VARIABLE TRANSFORMATION
			INTRODUCTION
		LOGISTIC REGRESSION:INDUSTRY APPLICATIONS - PART II	COMMONLY FACED CHALLENGES IN IMPLEMENTATION OF LOGISTIC REGRESSION
			MODEL EVALUATION (A SECOND LOOK)
			MODEL VALIDATION AND IMPORTANCE OF STABILITY
			TRACKING OF MODEL PERFORMANCE OVER TIME
	NAIVE BAYES	BAYES THEOREM AND ITS BUILDING BLOCKS	INTRODUCTION: NAIVE BAYES
			CONDITIONAL PROBABILITY AND ITS INTUITION
			BAYES' THEOREM
		NAIVE BAYES FOR CATEGORICAL DATA	INTRODUCTION
			NAIVE BAYES -WITH ONE FEATURE
			CONDITIONAL INDEPENDENCE IN NAIVE BAYES
		NAIVE BAYES FOR TEXT CLASSIFICATION	DECIPHERING NAIVE BAYES
			INTRODUCTION - NAIVE BAYES FOR TEXT CLASSIFICATION
			DOCUMENT CLASSIFIER - PRE PROCESSING STEPS
			DOCUMENT CLASSIFIER - WORKED OUT EXAMPLE
			LAPLACE SMOOTHING
			QUICK INTRODUCTION TO BERNOULLI NAIVE BAYES
	MODEL SELECTION	PRINCIPLES OF MODEL SELECTION	PYTHON LAB - EDUCATION OR CINEMA ?
			PYTHON LAB - SMS SPAM HAM CLASSIFIER : BERNOULLI
			PYTHON LAB - SMS SPAM HAM CLASSIFIER : MULTINOMIAL
			COMPREHENSION - NAIVE BAYES FOR TEXT CLASSIFICATION
		MODEL EVALUATION	INTRODUCTION
			INTRODUCTION TO MODEL SELECTION
			MODEL AND LEARNING ALGORITHM
			SIMPLICITY, COMPLEXITY AND OVERFITTING
			BIAS-VARIANCE TRADEOFF
			COMPREHENSION - BIAS VARIANCE TRADEOFF
			COMPREHENSION - BIAS VARIANCE TRADEOFF
			REGULARIZATION
			INTRODUCTION
			REGULARIZATION AND HYPERPARAMETERS
			MODEL EVALUATION AND CROSS VALIDATION
			MODEL EVALUATION: PYTHON DEMONSTRATION
			CROSS-VALIDATION: MOTIVATION
			CROSS-VALIDATION: PYTHON DEMONSTRATION
			CROSS-VALIDATION: HYPERPARAMETER TUNING

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MACHINE LEARNING - II	ADVANCED REGRESSION	GENERALIZED LINEAR REGRESSION	INTRODUCTION GENERALIZED REGRESSION GENERALIZED REGRESSION FRAMEWORK-I GENERALIZED REGRESSION FRAMEWORK-II SYSTEMS OF LINEAR EQUATIONS GENERALIZED REGRESSION FRAMEWORK-III GENERALIZED REGRESSION IN PYTHON
		REGULARIZED REGRESSION	INTRODUCTION REGULARIZED REGRESSION RIDGE AND LASSO REGRESSION RIDGE AND LASSO REGRESSION IN PYTHON MODEL SELECTION CRITERI FEATURE SELECTION COMPREHENSION - MODEL SELECTION PARAMETERS COMPREHENSION: FEATURES' SUBSET SELECTION - BEST SUBSET SELECTION COMPREHENSION: FEATURES' SUBSET SELECTION - STEPWISE SELECTION OPTIONAL ASSIGNMENT
	SUPPORT VECTOR MACHINE (OPTIONAL)	SVM - MAXIMAL MARGIN CLASSIFIER	INTRODUCTION INTRODUCTION TO SVM CONCEPT OF A HYPERPLANE IN 2D CONCEPT OF A HYPERPLANE IN 3D MAXIMAL MARGIN CLASSIFIER
		SVM - SOFT MARGIN CLASSIFIER	INTRODUCTION THE SOFT MARGIN CLASSIFIER THE SLACK VARIABLE COMPREHENSION-1: NOTION OF SLACK VARIABLES COST OF MISCLASSIFICATION SVM PYTHON-LAB
		KERNELS	INTRODUCTION INTRODUCTION TO KERNELS MAPPING NONLINEAR DATA TO LINEAR DATA FEATURE TRANSFORMATION THE KERNEL TRICK PYTHON LAB - KERNELS SHINY APP - TYPES OF KERNELS CHOOSING A KERNEL FUNCTION LETTER RECOGNITION USING SVM
	TREE MODELS	INTRODUCTION TO DECISION TREES	INTRODUCTION INTRODUCTION TO DECISION TREES INTERPRETING A DECISION TREE COMPREHENSION - DECISION TREE CLASSIFICATION IN PYTHON REGRESSION WITH DECISION TREES
		ALGORITHMS FOR DECISION TREE CONSTRUCTION	INTRODUCTION CONCEPT OF HOMOGENEITY GINI INDEX ENTROPY AND INFORMATION GAIN COMPREHENSION - INFORMATION GAIN SPLITTING BY R-SQUARED
		TRUNCATION AND PRUNING	INTRODUCTION ADVANTAGES AND DISADVANTAGES TREE TRUNCATION TREE PRUNING BUILDING DECISION TREES IN PYTHON CHOOSING TREE HYPERPARAMETERS IN PYTHON COMPREHENSION - HYPERPARAMETERS
		RANDOM FORESTS	INTRODUCTION ENSEMBLES COMPREHENSION - ENSEMBLES CREATING A RANDOM FOREST COMPREHENSION - OOB (OUT-OF-BAG) ERROR RANDOM FORESTS LAB
		BAYES THEOREM AND ITS BUILDING BLOCKS	INTRODUCTION: NAIVE BAYES CONDITIONAL PROBABILITY AND ITS INTUITION BAYES' THEOREM
		NAIVE BAYES FOR CATEGORICAL DATA	INTRODUCTION NAIVE BAYES - WITH ONE FEATURE CONDITIONAL INDEPENDENCE IN NAIVE BAYES DECIPHERING NAIVE BAYES
		NAIVE BAYES FOR TEXT CLASSIFICATION	INTRODUCTION - NAIVE BAYES FOR TEXT CLASSIFICATION DOCUMENT CLASSIFIER - PRE PROCESSING STEPS DOCUMENT CLASSIFIER - WORKED OUT EXAMPLE LAPLACE SMOOTHING QUICK INTRODUCTION TO BERNOULLI NAIVE BAYES PYTHON LAB - EDUCATION OR CINEMA ? PYTHON LAB - SMS SPAM HAM CLASSIFIER : BERNOULLI PYTHON LAB - SMS SPAM HAM CLASSIFIER : MULTINOMIAL COMPREHENSION - NAIVE BAYES FOR TEXT CLASSIFICATION
	BOOSTING	INTRODUCTION TO BOOSTING AND ADABOOST	INTRODUCTION TO BOOSTING WEAK LEARNERS ADABOOST ALGORITHM ADABOOST DISTRIBUTION AND PARAMETER CALCULATION ADABOOST LAB
		GRADIENT BOOSTING	UNDERSTANDING GRADIENT BOOSTING GRADIENT IN GRADIENT BOOSTING GRADIENT BOOSTING ALGORITHM XGBOOST KAGGLE PRACTICE EXERCISE
	UNSUPERVISED LEARNING: CLUSTERING	INTRODUCTION TO CLUSTERING	INTRODUCTION UNDERSTANDING CLUSTERING PRACTICAL EXAMPLE OF CLUSTERING - CUSTOMER SEGMENTATION
		K MEANS CLUSTERING	INTRODUCTION STEPS OF THE ALGORITHM K MEANS ALGORITHM K MEANS AS COORDINATE DESCENT VISUALISING THE K MEANS ALGORITHM PRACTICAL CONSIDERATION IN K MEANS ALGORITHM CLUSTER TENDENCY
		EXECUTING K MEANS IN PYTHON	INTRODUCTION DATA PREPARATION MAKING THE CLUSTERS LET'S HAVE SOME FUN OTHER BEHAVIOURAL SEGMENTATION TYPES
		HIERARCHICAL CLUSTERING	INTRODUCTION HIERARCHICAL CLUSTERING ALGORITHM INTERPRETING THE DENDROGRAM TYPES OF LINKAGES CUTTING THE DENDROGRAM & ANALYZING THE CLUSTERS INDUSTRY INSIGHTS LET'S HAVE SOME FUN
		OTHER FORMS OF CLUSTERING	INTRODUCTION K-MODE CLUSTERING K-MODE IN PYTHON K-PROTOTYPE IN PYTHON DB SCAN CLUSTERING GAUSSIAN MIXTURE MODEL
		PRINCIPAL COMPONENT ANALYSIS	INTRODUCTION THE WHY'S AND WHAT'S OF PCA BUILDING BLOCKS OF PCA ILLUSTRATION - FINDING PRINCIPAL COMPONENTS COMPREHENSION - CALCULATING THE PRINCIPAL COMPONENTS SINGULAR VALUE DECOMPOSITION SVD EXAMPLE - IMAGE COMPRESSION
		PRINCIPAL COMPONENT ANALYSIS	INTRODUCTION PCA: PYTHON IMPLEMENTATION PRACTICAL CONSIDERATIONS AND ALTERNATIVES OPTIONAL ASSIGNMENT (MNIST DATASET) COMPREHENSION: PCA, SVD AND EIGENVECTORS
	UNSUPERVISED LEARNING: PRINCIPAL COMPONENT ANALYSIS	TELECOM CHURN CASE STUDY	PROBLEM STATEMENT EVALUATION RUBRIC SUBMISSION

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COURSE	MODULE NAME	SESSION	SESSION NAME
NLP	LEXICAL PROCESSING	INTRODUCTION TO NLP	NLP: AREAS OF APPLICATION
			UNDERSTANDING TEXT
			TEXT ENCODING
		BASIC LEXICAL PROCESSING	REGULAR EXPRESSIONS: QUANTIFIERS, REGULAR EXPRESSIONS, ANCHORS, WILDCARDS,COMMONLY USED RE FUNCTIONS,GROUPING,USE CASES
			GREEDY VERSUS NON-GREEDY SEARCH
			WORD FREQUENCIES AND STOP WORDS
			TOKENISATION
			BAG-OF-WORDS REPRESENTATION
			STEMMING AND LEMMATIZATION
			TF-IDF REPRESENTATION
		ADVANCED LEXICAL PROCESSING	BUILDING A SPAM DETECTOR
			CANONICALISATION
			PHONETIC HASHING
			EDIT DISTANCE
			SPELL CORRECTOR
			POINTWISE MUTUAL INFORMATION
	SYNTACTIC PROCESSING	INTRODUCTION TO SYNTACTIC PROCESSING	THE WHAT AND WHY OF SYNTACTIC PROCESSING
			PARSING
			PARTS-OF-SPEECH
			DIFERENT APPROACHES TO POS TAGGING
			LEXICON AND RULE-BASED POS TAGGING
			STOCHASTIC PARSING
			THE VITERBI HEURISTIC
			MARKOV CHAIN AND HMM
			EXPLANATION PROBLEM
			LEARNING HMM MODEL PARAMETERS
			HMM AND THE VITERBI ALGORITHM: PSEUDOCODE AND PYTHON IMPLEMENTATION
			DEEP LEARNING BASED POS TAGGERS
		PARSING	WHY SHALLOW PARSING IS NOT SUFFICIENT
			CONSTITUENCY GRAMMARS
			TOP-DOWN PARSING
			BOTTOM-UP PARSING
			PROBABILISTIC CFG
		INFORMATION EXTRACTION	DEPENDENCY PARSING
			UNDERSTANDING THE ATIS DATA
			INFORMATION EXTRACTION
			POS TAGGING
			RULE-BASED MODELS
			PROBABILISTIC MODELS FOR ENTITY RECOGNITION
			NAIVE BAYES CLASSIFIER FOR NER
			DECISION TREE CLASSIFIERS FOR NER
		CONDITIONAL RANDOM FIELDS	HMM AND IOB LABELLING
			CRFS - ANOTHER PROBABILISTIC APPROACH
			CRF MODEL ARCHITECTURE
			TRAINING A CRF MODEL
			PREDICTING USING CRF
			PYTHON IMPLEMENTATION OF CRF
	SYNTACTIC PROCESSING -ASSIGNMENT	ASSIGNMENT - SYNTACTIC ANALYSIS	PROBLEM STATEMENT
			EVALUATION RUBRIC
			FINAL SUBMISSION
	SEMANTIC PROCESSING	INTRODUCTION TO SEMANTIC PROCESSING	CONCEPTS AND TERMS
			ENTITY AND ENTITY TYPES
			ARITY AND REIFICATION
			SCHEMA
			SEMANTIC ASSOCIATIONS
			DATABASES - WORDNET AND CONCEPTNET
			WORD SENSE DISAMBIGUATION - NAIVE BAYES, LESK ALGORITHM
			LESK ALGORITHM IMPLEMENTATION
		DISTRIBUTIONAL SEMANTICS	OCCURRENCE MATRIX
			CO-OCCURRENCE MATRIX
			WORD VECTORS
			WORD EMBEDDINGS
			LATENT SEMANTIC ANALYSIS (LSA)
			WORD2VEC AND GLOVE IN PYTHON
			BASICS OF TOPIC MODELLING WITH ESA
			INTRODUCTION TO PROBABILISTIC LATENT SEMANTICS ANALYSIS (PLSA)
		TOPIC MODELLING	THE OUTPUT OF A TOPIC MODEL
			DEFINING A TOPIC
			MATRIX FACTORISATION BASED TOPIC MODELLING
			PROBABILISTIC MODEL
			PROBABILISTIC LATENT SEMANTIC ANALYSIS (PLSA)
			EXPECTATION MAXIMIZATION IN PLSA
			COMPREHENSION - MULTINOMIAL DISTRIBUTION IN TOPIC MODELLING
			LATENT DIRICHLET ALLOCATION (LDA)
		SOCIAL MEDIA OPINION MINING - SEMANTIC PROCESSING CASE STUDY	LDA - AN EXTENSION OF PLSA
			USE LDA TO GENERATE A CORPUS
			PARAMETER ESTIMATION USING GIBBS SAMPLING
			LDA IN PYTHON
	BUILDING CHATBOTS WITH RASA	BUILDING CHATBOTS WITH RASA	THE PROBLEM STATEMENT
			PROJECT PIPELINE
			PYTHON CODE
			BUILDING CHATBOTS WITH RASA
			INSTALLATION GUIDE - RASA
			NATURAL LANGUAGE UNDERSTANDING (NLU)
			TRAINING THE NLU MODEL
			DIALOGUE-FLOW MANAGEMENT
			CREATING CONVERSATIONAL STORIES & DEFINING ACTIONS
			TRAINING THE DIALOGUE MANAGEMENT MODEL
	NLP COURSE PROJECT - BUILDING A CHATBOT	NLP COURSE PROJECT - BUILDING A CHATBOT	INTERACTIVE LEARNING
			CHATBOT DEPLOYMENT
			ML AND AI IN BUSINESS
			PROBLEM STATEMENT
			EVALUATION RUBRIC
			FINAL SUBMISSION

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COURSE	MODULE NAME	SESSION	SESSION NAME
DL	INTRODUCTION TO NEURAL NETWORKS	STRUCTURE OF NEURAL NETWORKS	NEURAL NETWORKS - INSPIRATION FROM THE HUMAN BRAIN
			INTRODUCTION TO PERCEPTRON
			BINARY CLASSIFICATION USING PERCEPTRON
			PERCEPTRONS - TRAINING
			MULTICLASS CLASSIFICATION USING PERCEPTRONS
			WORKING OF A NEURON
			INPUTS AND OUTPUTS OF A NEURAL NETWORK
			PARAMETERS AND HYPERPARAMETERS OF NEURAL NETWORKS
		FEED FORWARD IN NEURAL NETWORKS	ACTIVATION FUNCTIONS
			FLOW OF INFORMATION IN NEURAL NETWORKS - BETWEEN 2 LAYERS
			INFORMATION FLOW - IMAGE RECOGNITION
			COMPREHENSION - COUNT OF PIXELS
			LEARNING THE DIMENSIONS WEIGHT MATRICES
			FEEDFORWARD ALGORITHM
			VECTORIZED FEEDFORWARD IMPLEMENTATION
			UNDERSTANDING VECTORIZED FEEDFORWARD IMPLEMENTATION
	SYNTACTIC PROCESSING	BACKPROPAGATION IN NEURAL NETWORKS	WHAT DOES TRAINING A NETWORK MEAN?
			COMPLEXITY OF THE LOSS FUNCTION
			COMPREHENSION - TRAINING A NEURAL NETWORK
			UPDATING THE WEIGHTS AND BIASES
			SIGMOID BACKPROPAGATION
			BATCH IN BACKPROPAGATION
		MODIFICATIONS TO NEURAL NETWORKS	TRAINING IN BATCHES
			REGULARIZATION
			DROPOUTS
			BATCH NORMALIZATION
		HYPERPARAMETER TUNING IN NEURAL NETWORKS	INTRODUCTION TO KERAS
			LOSS FUNCTION
			MINIBATCH GRADIENT DESCENT
			GRADIENT DESCENT
			MOMENTUM BASED METHODS
	NEURAL NETWORKS - ASSIGNMENT	INFORMATION EXTRACTION	DROPOUTS -THE BAYESIAN APPROACH
			VANISHING AND EXPLODING GRADIENTS
			INITIALIZATIONS
	CONVOLUTIONAL NEURAL NETWORKS -INDUSTRY APPLICATIONS	BUILDING CNNs WITH PYTHON AND KERAS	UNDERSTANDING THE ATIS DATA
			INFORMATION EXTRACTION
			POS TAGGING
			APPLICATIONS OF CNNs
			UNDERSTANDING THE VISUAL SYSTEM OF MAMMALS
			INTRODUCTION TO CNNs
			READING DIGITAL IMAGES
			VIDEO ANALYSIS
			UNDERSTANDING CONVOLUTIONS
			STRIDE AND PADDING
		ASSIGNMENT - SYNTACTIC ANALYSIS	IMPORTANT FORMULAS
			WEIGHTS OF A CNN
			FEATURE MAPS
			POOLING
			PUTTING THE COMPONENTS TOGETHER
			BUILDING CNNs IN KERAS - MNIST
		INTRODUCTION TO SEMANTIC PROCESSING	COMPREHENSION - VGG16 ARCHITECTURE
			CIFAR-10 CLASSIFICATION WITH PYTHON
			OVERVIEW OF CNN ARCHITECTURES
			ALEXNET AND VGGNET
			GOOGLENET
			RESIDUAL NET
		STYLE TRANSFER AND OBJECT DETECTION	INTRODUCTION TO TRANSFER LEARNING
			USE CASES OF TRANSFER LEARNING
			TRANSFER LEARNING WITH PRE-TRAINED CNNs
			PRACTICAL IMPLEMENTATION OF TRANSFER LEARNING
			TRANSFER LEARNING IN PYTHON
			AN ANALYSIS OF DEEP LEARNING MODELS
		INDUSTRY DEMO:USING CNNs WITH FLOWERS IMAGES	INTRODUCTION TO STYLE TRANSFER
			STYLE LOSS AND THE GRAM MATRIX
			LOSS FUNCTION
			STYLE TRANSFER NOTEBOOK
			OBJECT DETECTION
			EXAMINING THE FLOWERS DATASET
		INDUSTRY DEMO:USING CNNs WITH X-RAY IMAGES	DATA PREPROCESSING: SHAPE, SIZE AND FORM
			DATA PREPROCESSING: NORMALISATION
			DATA PREPROCESSING: AUGMENTATION
			DATA PREPROCESSING: PRACTICE EXERCISE SOLUTIONS
			RESNET: ORIGINAL ARCHITECTURE AND IMPROVEMENTS
			BUILDING THE NETWORK
	RECURRENT NEURAL NETWORKS	WHAT MAKES ANEURAL NETWORK RECURRENT?	ABLATION EXPERIMENTS
			HYPERPARAMETER TUNING
			TRAINING AND EVALUATING THE MODEL
			EXAMINING X-RAY IMAGES
			CXR DATA PREPROCESSING - AUGMENTATION
			CXR: NETWORK BUILDING
		VARIANTS OF RNNs	CXR: FINAL RUN
			WHAT ARE SEQUENCES?
			WHAT MAKES THE NETWORK RECURRENT
			ARCHITECTURE OF AN RNN
	NEURAL NETWORKS PROJECT - GESTURE RECOGNITION	DEEP LEARNING COURSE PROJECT - GESTURE RECOGNITION	FEEDING SEQUENCES TO RNNs
			COMPREHENSION: RNN ARCHITECTURE
			TYPES OF RNNs
			TRAINING RNNs
			VANISHING AND EXPLODING GRADIENTS IN RNNs
			BIDIRECTIONAL RNNs
			LONG, SHORT-TERM MEMORY NETWORKS
			CHARACTERISTICS OF AN LSTM CELL
			STRUCTURE OF AN LSTM CELL
			LSTM NETWORK: FEEDFORWARD EQUATIONS
			GRUS AND OTHER VARIANTS
			POS TAGGING USING RNN
			GENERATING C CODE
			RNNs IN PYTHON
			PROBLEM STATEMENT
			TWO ARCHITECTURES: 3D CONVS AND CNN-RNN STACK
			UNDERSTANDING GENERATORS
			STARTER CODE WALKTHROUGH
			EVALUATION RUBRIC
			FINAL SUBMISSION

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COURSE	MODULE NAME	SESSION	SESSION NAME
REINFORCEMENT LEARNING	CLASSICAL REINFORCEMENT LEARNING	MARKOV DECISION PROCESS	INTRODUCTION
			WHAT IS REINFORCEMENT LEARNING?
			AGENT-ENVIRONMENT INTERACTION
			STATE VECTORS
			OBJECTIVE OF RL AGENT
			ACTIONS & POLICY
			EXPLORATION VS EXPLOITATION
			MARKOV STATE
			MARKOV DECISION PROCESS (MDP)
			VALUE FUNCTION
			OPTIMAL POLICY
			MODEL OF THE ENVIRONMENT
			RL VS SUPERVISED LEARNING
		FUNDAMENTAL EQUATIONS IN RL	INVENTORY MANAGEMENT (MDP)
			INTRODUCTION
			RL EQUATIONS - STATE VALUE FUNCTION
			RL EQUATIONS - ACTION VALUE FUNCTION
			UNDERSTANDING THE RL EQUATIONS
		BELLMAN EQUATIONS OF OPTIMALITY	
		POLICY IMPROVEMENT	
		MODEL-BASED METHOD - DYNAMIC PROGRAMMING	INTRODUCTION
			DYNAMIC PROGRAMMING
			POLICY ITERATION - ALGORITHM
			POLICY EVALUATION - PREDICTION
			POLICY IMPROVEMENT - CONTROL
			POLICY ITERATION - GRIDWORLD
			VALUE ITERATION
			GENERALISED POLICY ITERATION (GPI)
			AD PLACEMENT OPTIMIZATION (DEMO)
			MODEL-FREE METHODS
		INTUITION BEHIND MONTE-CARLO METHODS	
		MONTE-CARLO PREDICTION & DEMO	
		MONTE-CARLO CONTROL	
		OFF POLICY	
		TEMPORAL DIFFERENCE	
		Q-LEARNING WITH PSEUDOCODE	
		CLIFF WALKING DEMO	
		AD PLACEMENT OPTIMIZATION DEMO -Q LEARNING	
		OPENAI GYM -TAXI V2	
		INVENTORY MANAGEMENT DEMO	
	PROBLEM STATEMENT		
	MDP CODE		
	Q-LEARNING CODE		
	RESULTS		
	ASSIGNMENT -CLASSICAL REINFORCEMENT LEARNING	ASSIGNMENT - TIC-TAC-TOE	PROBLEM STATEMENT
			EVALUATION RUBRIC
			FINAL SUBMISSION
	DEEP REINFORCEMENT LEARNING	ARCHITECTURES OF DEEP Q LEARNING	INTRODUCTION
ARCHITECTURES OF DEEP Q NETWORK			
DQN ARCHITECTURE II - VISUALISATION			
DQN DEMO - CARTPOLE ENVIRONMENT			
DOUBLE DQN - A DQN VARIATION			
DEEP Q LEARNING		INTRODUCTION	
		WHY DEEP REINFORCEMENT LEARNING?	
		PARAMETERISED REPRESENTATION	
		GENERALIZABILITY IN DEEP RL	
		DEEP Q LEARNING	
		TRAINING IN DEEP REINFORCEMENT LEARNING	
		REPLAY BUFFER	
		GENERATE DATA FOR TRAINING	
		TARGET IN DQN	
		WHEN TO STOP TRAINING?	
		ATARI GAME	
POLICY GRADIENT METHODS		INTRODUCTION	
		INTRODUCTION TO POLICY GRADIENT METHODS	
		THE INTUITION OF POLICY-BASED METHODS	
		COMPARING DQN AND POLICY-BASED METHODS	
		PATH PROBABILITY	
		OBJECTIVE FUNCTION	
		GRADIENT OF THE OBJECTIVE FUNCTION	
		THE UPDATE RULE	
		STEP-BY-STEP UPDATE	
		ACTOR-CRITIC METHODS	INTRODUCTION
THE NEED FOR ACTOR-CRITIC METHODS			
ADDRESSING THE PROBLEM OF VARIANCE			
JUSTIFICATION FOR ADDING THE BASELINE			
REDUCING VARIANCE USING THE BASELINE			
APPROPRIATE CHOICE OF THE BASELINE			
POLICY GRADIENT (REINFORCE)			
ACTOR-CRITIC METHODS: TRAINING			
TRAINING PROCESS: SUMMARY			
ILLUSTRATION: DEFINING THE STATE SPACE			
REINFORCEMENT LEARNING PROJECT	REINFORCEMENT LEARNING PROJECT	PROBLEM STATEMENT	
		EVALUATION RUBRIC	
		FINAL SUBMISSION	

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COURSE	MODULE NAME	SESSION	SESSION NAME
CAPSTONE	DEPLOYMENT	DEPLOYMENT	INTRODUCTION
			UNDERSTANDING THE ML PIPELINE
			CONVERT YOUR JUPYTER NOTEBOOK TO A PRODUCTION LEVEL CODE
			LEARN ABOUT CI/CD PIPELINES
			CREATE AN APPLICATION FOR YOUR MODEL
			DEPLOY YOUR MODEL TO A PAAS
			INTRODUCTION TO DOCKER
			LEARN HOW TO DOCKERIZE YOUR MODEL APP
	CAPSTONE	DEPLOYMENT	INTRODUCTION
			PROBLEM STATEMENT
			RUBRICS
			FINAL SUBMISSION

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COURSE	MODULE NAME	SESSION	SESSION NAME
RESEARCH METHODOLOGY	INTRODUCTION TO RESEARCH AND RESEARCH PROCESS	INTRODUCTION TO RESEARCH	WHAT IS RESEARCH?
			SIGNIFICANCE OF RESEARCH
			OBJECTIVES OF RESEARCH
			ORIGINALITY IN RESEARCH
			SCIENTIFIC & SOCIAL RESEARCH
			DATA, INFORMATION AND KNOWLEDGE
		RESEARCH CHARACTERISTICS AND PROCESS	CHARACTERISTICS OF RESEARCH
			IMPORTANCE OF A GOOD RESEARCH QUESTION
			RESEARCH PROPOSAL STRUCTURE
	RESEARCH DESIGN	RESEARCH METHODS AND METHODOLOGY	TYPES OF RESEARCH
			RESEARCH DESIGN
			RESEARCH METHOD
			QUALITATIVE RESEARCH
			QUANTITATIVE RESEARCH
			QUALITATIVE VERSUS QUANTITATIVE RESEARCH
			PYRAMID OF EVIDENCE
		SAMPLING	SAMPLE AND SAMPLING ERROR
			HYPOTHESIS TESTING
			TOOLS TO VALIDATE HYPOTHESIS
	LITERATURE REVIEWING	FORMULATING A RESEARCH PROBLEM	RESEARCH PROCESS
			STEPS IN FORMULATING THE RESEARCH QUESTION
			CHARACTERISTICS OF A RESEARCH QUESTION
			ASPECTS OF A RESEARCH PROPOSAL
		SOURCES FOR LITERATURE REVIEW	IMPORTANCE OF LITERATURE REVIEW
			RESOURCES FOR RESEARCH
			IDENTIFYING CREDIBLE RESOURCES
		LITERATURE REVIEW PROCESS	FINDING RESOURCES FOR RESEARCH
			CARRYING OUT A RESEARCH SURVEY
			READING A RESEARCH PAPER
	RESEARCH PROJECT MANAGEMENT	RESEARCH PROJECT MANAGEMENT	REVIEWING A RESEARCH PAPER
			DEMONSTRATION: FORMULATING A PROBLEM STATEMENT
			SOLVING THE PROBLEM STATEMENT
		LIFE CYCLE OF A DATA SCIENCE PROJECT	RESEARCH PROJECT MANAGEMENT
			INITIATION
			PROJECT PLANNING
			EXECUTION
			TRACKING AND CONTROL
		LIFE CYCLE OF A DATA SCIENCE PROJECT	EXAMPLE-PROJECT PLANING
			CLOSURE
			THE CRISP-DM FRAMEWORK
	REPORT WRITING AND PRESENTATION	DISSERTATION AND REPORT WRITING	BUSINESS UNDERSTANDING
			DATA UNDERSTANDING
			DATA PREPARATION
			MODEL BUILDING
	DEEP REINFORCEMENT LEARNING	ETHICS IN RESEARCH I	MODEL EVALUATION
			MODEL DEPLOYMENT
		ETHICS IN RESEARCH II	THESIS REPORT STRUCTURE
			DEFENDING THE THESIS
			CITATION PROCESS
			CITATION METHODS AND RULES
		COPYRIGHTS AND INTELLECTUAL PROPERTY	CITING DIFFERENT RESOURCES
			ETHICS - MILGRAM EXPERIMENT
		COPYRIGHTS AND INTELLECTUAL PROPERTY	IMPORTANCE OF INFORMATION
			LJMU CODE OF CONDUCT
			PENALTIES
			PROFESSIONAL ETHICS
	DEEP REINFORCEMENT LEARNING	ETHICS IN RESEARCH I	ETHICAL APPROVAL IN LJMU
			MANAGING RESEARCH DATA
		ETHICS IN RESEARCH II	RESEARCH CLAIMS
			PROFESSIONAL STANDARDS
			INTELLECTUAL PROPERTY
			CONFLICT OF INTEREST
		COPYRIGHTS AND INTELLECTUAL PROPERTY	COLLABORATION IN RESEARCH
			COPYRIGHTS
		COPYRIGHTS AND INTELLECTUAL PROPERTY	CLAIMING COPYRIGHTS
			INFRINGEMENT
			PLAGIARISM
			FAIR USE OF INTELLECTUAL PROPERTY