MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
(A constituent unit of MAHE, Manipal)

ACADEMIC SECTION

TIMETABLE: JAN-JUNE 2023 **DEPT. OF DATA SCIENCE AND COMPUTER APPLICATIONS**

Faculty: **Mr. Nirmal Kumar Nigam (NKN)** Lecture Hall: Effective from: 30-01-2023

	08.00 - 09.00	09.00 - 10.00	10.00 - 10.30	10.30 - 11.30	11.30 - 12.30	12.30 - 01.00	01.00 - 02.00	02.00 - 03.00	03.00 - 03.30	03.30 - 04.30	04.30 - 05.30
MON		ML						<----ML LAB(Batch A1)(NKN/SSS)--->			
TUE	<----ML LAB(Batch B1)(NKN/SSS)--->							DCN			ML
WED					DCN			<----ML LAB(Batch B2)(NKN/SSS)--->			
THU								ML			
FRI		DCN			ML			<----ML LAB(Batch A2)(NKN/SSS)--->			
SAT											DCN*

WORKLOAD

DSE 2254	MACHINE LEARNING	4*2 = 8
DSE 2262	MACHINE LEARNING LAB	12*1 = 12
DSE 2258	DATA COMMUNICATIONS AND NETWORKS	3*2 = 6
	Total	26 units

Head of the Department

DSE 2254 MACHINE LEARNING [3 1 0 4]

Machine Learning Basics: Types of Machine Learning, Supervised vs. Unsupervised Learning, Parametric vs. non-parametric models., **Instance Based learning** – k-nearest neighbors, **Simple Regression Models**: Linear, Logistic, Cost functions, Gradient Descent, Batch Gradient Descent, Overfitting, Model Selection, No free lunch theorem, bias/variance trade-off, union and Chernoff bounds, VC dimensions. **Bayesian Models:** Bayesian concept learning, Bayesian Decision Theory, Naïve Bayesian, Laplacian Correction, Bayesian Belief Networks. **Tree Models:** information theory, decision tree induction, tuning tree size, ID3,C4.5, CHAID, Decision Stump. **Support Vector Machines**: kernel functions,. **Regression Models**: Ridge and Lasso Regression, GLM and the exponential Family. Bagging algorithm, Random Forests, Grid search and randomized grid search, Partial dependence plots. **Ensembling and Boosting Algorithms**: Concept of weak learners, Adaptive Boosting, Extreme Gradient Boosting (XGBoost). **Artificial Neural Networks**: Perceptron, Back propagation, Hopfield Network. **Curse of Dimensionality**: Factor Analysis, Principal Component Analysis (PCA), Difference between PCAs and Latent Factors,

References:

1. K. Murphy, *Machine Learning: A Probabilistic Perspective*, MIT Press, 2012.
2. G. James, D. Witten, T Hastie, R Tibshirani, *An introduction to statistical learning with applications in R*, Springer, 2013.
3. J. Han, M. Kamber, J. Pei, *Data Mining concepts and techniques*, (2e), Morgan Kaufmann-Elsevier, 2011.
4. T. Hastie, R. Tibshirani, J. Friedman, *The Elements of Statistical Learning*, (2e), Springer, 2009.
5. T. M. Mitchell, *Machine Learning*, (Indian Edition), MacGraw Hill, 2017.
6. C. Bishop, *Neural Networks for Pattern Recognition*, Oxford University Press, 2019

DSE 2258 DATA COMMUNICATION AND NETWORKS [3 0 0 3]

Basic concepts of computer networks, Layered architecture and comparison between ISO/OSI, TCP/IP layered models. Significance of Datalink layer and protocols. Network layer functionalities, classful, classless IP addressing, address allocation and role of forwarding module in forwarding the packet using routing table. Roles played by IP, ARP, RARP, ICMP & IGMP protocols in network layer. Inter-domain and intra-domain routing algorithms for routing tables. Importance of transport layer in achieving process-to-process communication. Insight of connection oriented protocol TCP and connectionless protocol UDP. Features of TCP in achieving flow control, error control and congestion control. Requirement of different timers in TCP. Drawbacks of IPv4 addressing and new IP addressing scheme IPv6. Migrating from IPv4 to IPv6. Introduction to application layer, a client/server application program and a case study. Client-server application program-Dynamic Host Configuration Protocol (DHCP).

References:

1. Behrouz A. Forouzan, *TCP/IP Protocol Suite*, 4th Edition, Tata McGraw Hill, 2010.
2. Tannenbaum, A.S, *Computer Networks*, 5th Edition, Prentice Hall of India EE Edition, 2011.
3. Behrouz A. Forouzan, *Data Communications and Networking*, 5th Edition, Tata McGraw Hill, 2013.
4. Leon Garcia and Widjala, *Communication Networks*, 5th Edition, Tata McGraw Hill, 2017.

DSE 2262 MACHINE LEARNING LAB [0 0 3 1]

Tutorial on tools for Machine Learning. Python suggested. Experiments with datasets to be defined in lab manual to perform preprocessing and deploy classifiers such as Bayesian, Decision Trees, Support Vector Machines, k-nearest neighbor, Regression Models. Classification accuracy measures, improving classifier performance through ensembling, boosting etc.

References:

1. Hans Peter Langtangen, *Python Scripting for Computational Science*, (3e), Springer Publishers, 2014
2. Naomi R. Ceder, *The Quick Python Book*, (2e), Manning Publications Co., 2010
3. Wesley J. Chun, *Core Python Applications Programming*, (3e), Prentice Hall Publishers, 2012
4. G. James, D. Witten, T Hastie, R Tibshirani, *An introduction to statistical learning with applications in R*, Springer, 2013.