



**INSTITUT TEKNOLOGI SEPULUH NOPEMBER
FACULTY OF SCIENCE AND DATA ANALYTICS
DEPARTMENT OF STATISTICS
STATISTICS UNDERGRADUATE PROGRAM**

Course	Course Name	:	Statistical Machine Learning
	Course Code	:	SS234526
	Credit	:	3 SKS
	Semester	:	V

COURSE DESCRIPTION

The Machine Learning (SML) course equips students to master the latest developing methods and algorithms that are used to make computers capable of learning and behaving intelligently. This lecture will discuss theory and practice for the latest methods and algorithms with topics including unsupervised learning and supervised learning methods/algorithms for regression, classification, and time series forecasting.

PROGRAM LEARNING OUTCOME

- PLO-2 Able to study and utilize science and technology in order to apply it to the field of Statistics, and be able to make appropriate decisions from the results of their own work or group work in the form of final project reports or other forms of learning activities whose output is equivalent to the Final Project through logical, critical thinking, systematic and innovative
- PLO-7 Able to use modern computing devices to solve statistical problems.
- PLO-8 Able to use computational techniques to solve statistical problems.
- PLO-9 Able to apply statistical methods to analyze theoretical and real problems
- PLO-10 Able to apply business, industrial, economic, social, health or environmental statistical methods to real problems

COURSE LEARNING OUTCOME

- CLO.1 Understand and able to explain the concept of supervised and unsupervised in machine learning and its application in various fields.
- CLO.2 Able to identify, formulate, and solve statistical problems using machine learning.
- CLO.3 Able to apply computing techniques and to use modern computer tools/software used in machine learning for clustering
- CLO.4 Able to apply computational techniques and to use modern computer tools/software used in machine learning for predictions of regression and classification.
- CLO.5 Able to use computational techniques and modern computer devices needed to solve Operations Management problems
- CLO.6 Able to write a written report of the analysis obtained from project.

MAIN SUBJECT

1. The concept of Machine Learning on supervised and unsupervised learning problems
2. Data pre-processing and features selection
3. Clustering method
4. The practice of applying clustering methods to data

5. Artificial Neural Network (ANN)
6. Implement ANN using software and coding on data
7. Building ANN architecture for regression
8. Implementing ANN using software and coding on data
9. Application of ML for classification predictions on real data
10. Work on projects and write reports
11. Building an ML model for time series forecasting and Evaluation of forecasting model performance

PREREQUISITE

Applied Multivariate Analysis

REFERENCES

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3. Limin Fu, 1994, Neural Network in Computer Intelligence, McGraw Hill
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5. Hastie, T., Tibshirani, R., and Friedman, J., 2017, The Elements of Statistical Learning: Data Mining, Inference, and Prediction, Second Edition, Springer New York
6. James, G., Witten, D., Hastie, T., and Tibshirani, R., 2014, An Introduction to Statistical Learning (with Application in R), Springer.
7. Cristianini, N and Shawe-Taylor, J., 2000, An Introduction to Support Vector Machines and Other Kernel-based Learning Methods, 1st Edition, Cambridge University Press.
8. Goodfellow, I., Yoshua, B., and Courville, A., 2016. Deep Learning.
9. Haerdle, W.K., Prastyo, D.D., Hafner, C.M. (2014). "Support vector machines with evolutionary model selection for default prediction." In: Racine, J., Su, L., Ullah, A. (eds.). The Oxford Handbook of Applied Nonparametric and Semiparametric Econometrics and Statistics, pp. 346–373. Oxford University Press, New York.
10. Berry, M., Mohamed, A., Yap, B. (eds). 2020. Supervised and Unsupervised Learning for Data Science. Springer.