

RENCANA PEMBELAJARAN SEMESTER

PROGRAM STUDI S2 SAINS DATA

FAKULTAS SAINS DAN MATEMATIKA Universitas Kristen Satya Wacana

Form						
Semester	Ganjil 2026/2027					
Mata Kuliah	BD003 MACHINE LEARNING					
Beban	3	SKS	T/A/P:	1/2/0	W/P:	Wajib
Dosen Pengampu	1. Dr. Suryasatriya Trihandaru, M.Sc.nat 2. Prof. Hanna Arini Parhusip, M.Sc.nat (Koordinator) 3. Dr. Bambang Susanto 4. Prof. Didit Budi Nugroho, S.Si., M.Si., D.Sc. Dosen Praktisi: Johanes Kurniawan, S.T., M.Si.D					

A. Program Learning Outcome / Capaian Pembelajaran Lulusan (CPL)

CPL01	Mampu menunjukkan sikap bertanggung jawab atas pekerjaan di bidang keahliannya secara mandiri.
CPL02	Menguasai konsep teoretis bidang pengetahuan dan keterampilan tertentu secara umum dan khusus untuk menyelesaikan masalah secara prosedural sesuai dengan lingkup pekerjaannya
CPL03	Mampu menganalisis kebutuhan perangkat lunak untuk menghasilkan spesifikasi yang tepat.
CPL04	Mampu merancang perangkat lunak yang sesuai dengan spesifikasi dan kebutuhan pengguna.
CPL05	Mampu mengimplementasikan perangkat lunak berdasarkan spesifikasi yang telah dirancang.
CPL06	Mampu berkomunikasi secara efektif, baik lisan maupun tulisan, dalam konteks profesional.
CPL07	Mampu bekerjasama dalam tim serta menunjukkan kemampuan kepemimpinan dalam konteks kerja kelompok.
CPL08	Mampu mengintegrasikan prinsip etika dan tanggung jawab sosial dalam pengambilan keputusan profesional.

B. Course Learning Outcome / Capaian Pembelajaran Mata Kuliah (CPMK)

CPMKBD00311	(CPL01) Mampu menunjukkan sikap bertanggung jawab, etika akademik, dan kemandirian dalam mempelajari, menerapkan, serta mengevaluasi konsep dan algoritma machine learning dalam penyelesaian permasalahan berbasis data.
CPMKBD00322	(CPL02) Menguasai konsep teoretis machine learning serta metode pembelajaran untuk pemodelan dan prediksi data.
CPMKBD00343	(CPL04) Mampu merancang sistem machine learning berdasarkan spesifikasi data dan kebutuhan pengguna.
CPMKBD00344	(CPL04) Mampu merancang pengembangan lanjutan sistem machine learning sesuai kebutuhan performa dan akurasi pengguna.

CPMKBD00355

(CPL05) Mampu mengimplementasikan metode machine learning ke dalam aplikasi sesuai spesifikasi fungsional dan kebutuhan pengguna.

C. Prerequisite/Corequisite Courses /Prasyarat Mata Kuliah

Code	Course Name

D. Description/Deskripsi

This course introduces the theoretical foundations and practical applications of Machine Learning (ML), covering: ML fundamentals and pipeline, data preprocessing and feature engineering, regression models, model evaluation, classical supervised learning algorithms (decision trees, ensemble methods, support vector machines, k-NN, Naive Bayes), unsupervised learning (clustering, dimensionality reduction), model selection and hyperparameter tuning, and machine learning model deployment.

Mata kuliah ini membahas konsep dasar dan penerapan Machine Learning (ML), meliputi: dasar dan pipeline ML, data preprocessing dan feature engineering, model regresi, evaluasi model, algoritma supervised learning klasik (decision tree, ensemble methods, support vector machine, k-NN, Naive Bayes), unsupervised learning (clustering, reduksi dimensi), pemilihan model dan hyperparameter tuning, serta deployment model machine learning.

E. Learning Stage/Tahap Pembelajaran

We ek	Final Ability	Material	Methods	Dura tion	Indicators	Assesment
1	<i>Have broad knowledge of Machine Learning fundamentals and the ML pipeline.</i> Memiliki pengetahuan luas tentang dasar-dasar Machine Learning dan pipeline ML.	Introduction to Machine Learning: Types & Pipeline	Presentation Discussion Demonstration Practicum	150'	Provides information about ML fundamentals and the ML pipeline; Discussion	Discussion
2	<i>Master data preprocessing and feature engineering techniques for ML.</i> Menguasai teknik data preprocessing dan feature engineering untuk ML.	Data Preprocessing & Feature Engineering	Presentation Discussion Demonstration Practicum	150'	Obtain information about data preprocessing and feature engineering; Discussion and Practicum	Discussion
3	<i>Master regression models: linear regression and logistic regression.</i> Menguasai model regresi: regresi linear dan regresi logistik.	Regression: Linear & Logistic Regression	Presentation Discussion Demonstration Practicum	150'	Obtain information about linear and logistic regression; Discussion and Practicum	Discussion

4	<i>Master model evaluation concepts: bias-variance trade-off, cross-validation, and evaluation metrics.</i> Menguasai konsep evaluasi model: bias-variance trade-off, cross-validation, dan metrik evaluasi.	Model Evaluation: Bias-Variance, Cross-Validation & Metrics	Presentation Discussion Demonstration Practicum	150'	Obtain information about model evaluation methods; Discussion and Practicum	Task: Submit a practicum report.
5	<i>Master practical work related to ML fundamentals, preprocessing, and regression models.</i> Menguasai praktikum terkait dasar-dasar ML, preprocessing, dan model regresi.	Practicum/Case Study related to Meeting 1-4	Presentation Discussion Demonstration Practicum	150'	Carrying out practicum and tutorials related to Meeting 1 to Meeting 4	Practical Assignment /Report - CPMK2 (20%)
6	<i>Master decision tree algorithms and ensemble methods (Random Forest, Boosting).</i> Menguasai algoritma decision tree dan ensemble methods (Random Forest, Boosting).	Decision Trees & Ensemble Methods	Presentation Discussion Demonstration Practicum	150'	Obtain information about decision trees and ensemble methods; Discussion and Practicum	Discussion
7	<i>Master Support Vector Machine (SVM) for classification and regression.</i> Menguasai Support Vector Machine (SVM) untuk klasifikasi dan regresi.	Support Vector Machines (SVM)	Presentation Discussion Demonstration Practicum	150'	Obtain information about SVM; Discussion and Practicum	Discussion
8	<i>Master k-Nearest Neighbors (k-NN) and Naive Bayes algorithms.</i> Menguasai algoritma k-Nearest Neighbors (k-NN) dan Naive Bayes.	k-Nearest Neighbors & Naive Bayes	Presentation Discussion Demonstration Practicum	150'	Obtain information about k-NN and Naive Bayes; Discussion and Practicum	Task: Submit a practicum report.
9	<i>Master practical work related to classical supervised learning algorithms.</i> Menguasai praktikum terkait algoritma supervised learning klasik.	Practicum/Case Study related to Meeting 6-8	Presentation Discussion Demonstration Practicum	150'	Carrying out practicum and tutorials related to Meeting 6 to Meeting 8	Practical Assignment /Report - CPMK3 (20%)
10	<i>Master unsupervised learning: clustering (K-Means, Hierarchical Clustering).</i> Menguasai unsupervised learning: clustering (K-Means, Hierarchical Clustering).	Unsupervised Learning: Clustering (K-Means & Hierarchical)	Presentation Discussion Demonstration Practicum	150'	Obtain information about clustering methods; Discussion and Practicum	Discussion
11	<i>Master dimensionality reduction techniques (PCA and feature selection).</i>	Dimensionality Reduction (PCA & Feature Selection)	Presentation Discussion Demonstration	150'	Obtain information about dimensionality	Discussion

	Menguasai teknik reduksi dimensi (PCA dan feature selection).		Practicum		reduction; Discussion and Practicum	
12	<i>Master model selection, hyperparameter tuning, and regularization techniques.</i> Menguasai pemilihan model, hyperparameter tuning, dan teknik regularisasi.	Model Selection, Hyperparameter Tuning & Regularization	Presentation Discussion Demonstration Practicum	150'	Obtain information about model selection and hyperparameter tuning; Discussion and Practicum	Discussion
13	<i>Master the basics of machine learning model deployment and MLOps.</i> Menguasai dasar-dasar deployment model machine learning dan MLOps.	ML Model Deployment & MLOps Basics	Presentation Discussion Demonstration Practicum	150'	Obtain information about ML deployment and MLOps; Discussion and Practicum	Task: Submit a practicum report.
14	<i>Master practical work related to unsupervised learning, model tuning, and deployment.</i> Menguasai praktikum terkait unsupervised learning, tuning model, dan deployment.	Practicum/Case Study related to Meeting 10-13	Presentation Discussion Demonstration Practicum	150'	Carrying out practicum and tutorials related to Meeting 10 to Meeting 13	Practical Assignment /Report - CPMK4 (20%)
15	<i>Able to implement a machine learning method into an applied system.</i> Mampu mengimplementasikan metode machine learning ke dalam sistem aplikasi.	PROJECT WORK	Project Work	150'	Design, build, and implement an ML-based project	Final Project Work - CPMK5 (20%)
16	<i>Able to present and defend the machine learning-based project.</i> Mampu mempresentasikan dan mempertanggungjawabkan proyek berbasis machine learning.	PROJECT PRESENTATION	Presentation Discussion	150'	Presenting the machine learning-based project	Project Presentation - CPMK1 (20%)

Note/Catatan untuk Tabel E.

Abbreviation	Description
CPL	Capaian Pembelajaran Lulusan / Program Learning Outcome
CPMK	Capaian Pembelajaran Mata Kuliah / Course Learning Outcome
ML	Machine Learning
SVM	Support Vector Machine
k-NN	k-Nearest Neighbors
PCA	Principal Component Analysis
MLOps	Machine Learning Operations

F. Learning Media and Tools

Python (scikit-learn, pandas, NumPy), Jupyter Notebook/Google Colab, Computer, Flearn (Online Learning Media), WAG and Google Meet/Zoom.

G. Student Learning Experience/Portfolio

Students gain experience in building end-to-end machine learning pipelines, applying and comparing classical ML algorithms, tuning and evaluating model performance, and deploying a machine learning-based application as a final project.

Mahasiswa memperoleh pengalaman dalam membangun pipeline machine learning secara end-to-end, menerapkan dan membandingkan algoritma ML klasik, melakukan tuning dan evaluasi performa model, serta men-deploy aplikasi berbasis machine learning sebagai proyek akhir.

H. References

1. [Hastie, T., Tibshirani, R., & Friedman, J. \(2009\). The Elements of Statistical Learning: Data Mining, Inference, and Prediction \(2nd ed.\). Springer.](#)
2. [Geron, A. \(2022\). Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow \(3rd ed.\). O'Reilly Media.](#)
3. [Pedregosa, F., et al. \(2011\). Scikit-learn: Machine Learning in Python. Journal of Machine Learning Research, 12, 2825-2830.](#)
4. [Breiman, L. \(2001\). Random Forests. Machine Learning, 45\(1\), 5-32.](#)
5. [Cortes, C., & Vapnik, V. \(1995\). Support-Vector Networks. Machine Learning, 20\(3\), 273-297.](#)

I. Authorization

Pengembang	Tanggal	Koordinator	Kaprodi
Dr. Suryasatriya Trihandaru, M.Sc.nat	8 Agustus 2026	Prof. Hanna Arini Parhusip, M.Sc.nat	Prof. Hanna Arini Parhusip, M.Sc.nat