MODULE HANDBOOK

DATA MINING AND VISUALIZATION

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

ENDORSEMENT PAGE

	**MODULE HANDBOOK** **DATA MINING AND VISUALIZATION** **STATISTICS UNDERGRADUATE PROGRAM** **DEPARTMENT OF STATISTICS** **INSTITUT TEKNOLOGI SEPULUH NOPEMBER**

Proses *Process*	Penanggung Jawab *Person in Charge*			Tanggal *Date*
	Nama *Name*	Jabatan *Position*	Tanda tangan *Signature*	
Perumus *Preparation*	Dr. Santi Wulan Purnami, S.Si., M.Si.	Dosen Lecturer		March 28, 2019
Pemeriksa dan Pengendalian *Review and Control*	Dr. Santi Wulan Purnami, S.Si., M.Si.; Irhamah, M.Si., Ph.D.	Tim kurikulum Curriculum team		April 15, 2019
Persetujuan *Approval*	Prof. Nur Iriawan, M.Ikom, Phd.	Koordinator RMK Course Cluster Coordinator		July 17, 2019
Penetapan *Determination*	Dr. Kartika Fithriasari, M.Si	Kepala Departemen Head of Department		July 30, 2019

MODULE HANDBOOK
DATA MINING AND VISUALIZATION

Module name	DATA MINING AND VISUALIZATION	
Module level	Undergraduate	
Code	SS234522	
Course (if applicable)	DATA MINING AND VISUALIZATION	
Semester	5	
Person responsible for the module	Dr. Santi Wulan Purnami, S.Si., M.Si.	
Lecturer	Dr. Santi Wulan Purnami, S.Si., M.Si.; Dr. Kartika Fithriasari, M.Si; Irhamah, M.Si., Ph.D.	
Language	Bahasa Indonesia and English	
Relation to curriculum	Undergradute degree program, mandatory, 5th semester.	
Type of teaching, contact hours	Lectures, <50 students	
Workload	1. Lectures [L]: 2 x 50 = 100 minutes perweek. 2. Practicum [P]: 1x170=170 minutes per week. 3. Exercises and Assignments [EA] : 3 x 60 = 180 minutes (3 hours) perweek. 4. Independent learning [IL]: 3 x 60 = 180 minutes (3 hours) per week	
Credit points	3 credit points (SKS) Equivalent to 4.8 ECTS	
Requirements according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams.	
Mandatory prerequisites	Applied Multivariates Analysis	
Learning outcomes and their corresponding PLOs	CLO.1 Can explain the concept of data mining and its application in various fields CLO.2 Able to explain data mining procedures starting from pre-processing to presenting information CLO.3 Able to identify, formulate, and solve statistical problems using techniques in Data Mining CLO.4 Able to use computational techniques and modern computer equipment required in Data Mining CLO.5 Has knowledge of current and upcoming issues related to the Data Mining field CLO.6 Able to communicate effecticely and cooperate in an interdisciplinary team and multidisciplinary teams	 PLO-3 PLO-4 PLO-5

	CLO.7 Have professional responsibility and ethics CLO.8 Able to motivate oneself to think creatively and learn throughout life	PLO-6
Content	Data Mining and Visualization is one subject in the field of theory, which aims to master the basic concepts of mathematics to understand the theory of vectors, basic operations of Data Mining and Visualization, determinants, inverses, random vectors, systems of linear equations, vector spaces, values and eigenvectors. Besides that, students able to use this concept for processing random variables, formulating modeling and calculating univariate and multivariate calculations. To achieve this goal, the learning strategy used is discussion and practice both manually and with a computer program package.	
Assessment and its weight	Assignment(20%) Midterm Exam(25%) Final Project(30%) Practicum(25%)	
Media employed	LCD, whiteboard, websites (myITS Classroom), zoom	
Reading list	1. Witten, I.H., Data Mining: Practical Machine Learning Tools and Techniques, Second Edition, Elsevier, 2005. 2. Han,J., Kamber, M. and J. Pei, Data Mining: Concepts and Techniques. Morgan Kaufmann, 3rded. , 2011 3. Hastie, T., Tibshirani, R., Friedman, J., The Elements of Statistical Learning: Data Mining, Inference, and Prediction, Second Edition, Springer, 2009. 4. Tan, P.-N. , Steinbach, M. and Kumar, V., Introduction to Data Mining, Wiley, 2005 5. Nisbet, R. and Elder, J., Handbook of Statistical Analysis and Data Mining, Elsevier, 2009. 6. Duda, R. O., Hart, P. E., and Stork, D. G., Pattern Classification, 2ed., Wiley, Interscience, 2000 7. Larose, D.T., Data Mining Methods And Models, John Wiley & Sons, Inc., , 2006 8. James, G., Witten, D., Hastie, T., Tibshirani, R., An Introduction 9. to Statistical Learning with Application in R, Springer Inc., 2013	

	INSTITUT TEKNOLOGI SEPULUH NOPEMBER **FAKULTAS SAINS DAN ANALITIKA DATA** **PROGRAM STUDI SARJANA STATISTIKA** **DEPARTEMEN STATISTIKA**	**Kode Dokumen**

RENCANA PEMBELAJARAN SEMESTER
SEMESTER LEARNING PLAN

MATA KULIAH (MK)/ *Course*	**KODE/** *Code*	**Rumpun MK/** *Course Group*	**BOBOT (sks) /** *Weight (Credit)*		**SEMESTER/** *Semester)*	**Tgl Penyusunan/** *Drafting Date*
Data Mining dan Visualisasi *Data Mining and Visualization*	SS234522	Lab Computational Statistics	**3**		V	24 Feb 2024

OTORISASI	**Pengembang RPS/** *RPS Developer*	**Koordinator RMK/** *Course Group Coordinator*	**Ketua PRODI/** *Head of Department*
	Dr. Kartika Fithriasari, M.Si Dr. Irhamah, M.Si Dr. Santi Wulan Purnami, M.Si	Prof. ***Nur Iriawan***, M.Ikom, Ph.D	Dr. Kartika Fithriasari, M.Si

Capaian Pembelajaran (CP)/ *Learning Achievement*	**CPL-PRODI yang dibebankan pada MK** *PLO*	
	CPL-3	Mampu mengelola pembelajaran diri sendiri, dan mengembangkan diri sebagai pribadi pembelajar sepanjang hayat untuk bersaing di tingkat nasional, maupun internasional, dalam rangka berkontribusi nyata untuk menyelesaikan masalah dengan mengimplementasikan teknologi informasi dan komunikasi dan memperhatikan prinsip keberlanjutan serta memahami kewirausahaan berbasis teknologi ***Able to manage one's own learning, and develop oneself as a lifelong learner to compete at national and international levels, in order to make a real contribution to solving problems by implementing information and communication technology and paying attention to the principles of sustainability and understanding technology-based entrepreneurship***
	CPL-4	Mampu menerapkan sains dan matemarika untuk mendukung pemahaman metode statistika ***Able to apply science and mathematics to support the understanding of statistical methods***

	CPL-5	Mampu menerapkan teori statistika pada metode statistika ***Able to apply statistical theory to statistical methods***
	CPL-6	Mampu merancang, mengumpulkan, dan melakukan manajemene data dengan metodologi yang tepat ***Able to design, collect, and perform data management with the right metodology***
	Capaian Pembelajaran Mata Kuliah (CPMK) ***CLO***	
	CPMK.1 Dapat menjelaskan konsep data mining dan penerapannya dalam berbagai bidang CPMK.2 Mampu menjelaskan prosedur data mining mulai dari pra-pemrosesan hingga penyajian informasi CPMK.3 Mampu mengidentifikasi, memformulasikan, dan menyelesaikan permasalahan statistik dengan menggunakan teknik-teknik dalam Data Mining CPMK.4 Mampu menggunakan teknik komputasi dan peralatan komputer modern yang diperlukan dalam Data Mining CPMK.5 Memiliki pengetahuan tentang isu-isu terkini dan yang akan datang yang berkaitan dengan bidang Data Mining CPMK.6 Mampu berkomunikasi secara efektif dan bekerja sama dalam tim interdisipliner maupun multidisipliner CPMK.7 Memiliki tanggung jawab dan etika profesional CPMK.8 Mampu memotivasi diri sendiri untuk berpikir kreatif dan belajar sepanjang hayat ***CLO.1 Can explain the concept of data mining and its application in various fields*** ***CLO.2 Able to explain data mining procedures starting from pre-processing to presenting information*** ***CLO.3 Able to identify, formulate, and solve statistical problems using techniques in Data Mining*** ***CLO.4 Able to use computational techniques and modern computer equipment required in Data Mining*** ***CLO.5 Has knowledge of current and upcoming issues related to the Data Mining field*** ***CLO.6 Able to communicate effecticely and cooperate in an interdisciplinary team and multidisciplinary teams*** ***CLO.7 Have professional responsibility and ethics*** ***CLO.8 Able to motivate oneself to think creatively and learn throughout life***	
		Matrik CPL – CPMK

	CPL-3	CPL-4	CPL-5	CPL-6
CPMK-1	v			
CPMK-2	v			
CPMK-3	v			
CPMK-4	v			
CPMK-5		v		
CPMK-6			v	

		CPMK-7				v
		CPMK-8				v
Deskripsi Singkat MK ***Course Description***	Data Mining dan Visualisasi merupakan salah satu mata kuliah keahlian yang merupakan bagian dari bidang kajian dalam rumpun mata kuliah statistik komputasi. Tujuan dari mata kuliah Data Mining dan Visualisasi adalah mahasiswa mampu menggali, meringkas dan menganalisis informasi yang terkandung dalam suatu large data menggunakan metode-metode berbasis computational statistics. Melalui mata kuliah ini diharapkan mahasiswa akan memiliki pengalaman belajar untuk berfikir secara kritis dan mampu memberikan keputusan yang tepat tentang teknik-teknik Data Mining yang sesuai pada suatu permasalahan dan penyelesaiannya serta mampu mengkomuni-kasikan baik secara lisan maupun tulisan. Strategi pembelajaran yang digunakan adalah diskusi dan latihan serta tugas (project). ***Data Mining and Visualization is one subject in the field of theory, which aims to master the basic concepts of mathematics to understand the theory of vectors, basic operations of Data Mining and Visualization, determinants, inverses, random vectors, systems of linear equations, vector spaces, values and eigenvectors. Besides that, students able to use this concept for processing random variables, formulating modeling and calculating univariate and multivariate calculations. To achieve this goal, the learning strategy used is discussion and practice both manually and with a computer program package***					
Bahan Kajian: Materi Pembelajaran	1. Konsep analisis data 2. Metode preprocessing data 3. Analisis deskriptif: pengukuran statistik dan visualisasi data 4. Analisis hubungan variable dan visualisasi data *multivariate* 5. Analisis trend dan pola anomaly 6. Pemodelan*: Supervised* dan *Unsupervised* ***1. Data analysis concept*** ***2. Data preprocessing method*** ***3. Descriptive analysis: statistical measurements and data visualization*** ***4. Analysis of variable relationships and visualization of multivariate data*** ***5. Analyze trends and anomaly patterns*** ***6. Modeling: Supervised and Unsupervised***					
Pustaka/ ***References***	**Utama :**					
	1. *Basic Science, Statistical Theory, Data Collection, Description and Exploration, Computing and Data Processing, Modeling, Industry and Business, Governance and Population, Economics and Management, Health and Environment*					

	Pendukung :
Dosen Pengampu/ *Lecturers*	Dr. Dra. Kartika Fithriasari, M.Si Dr. Santi Wulan Purnami, M.Si Irhamah, M.Si, Ph.D
Matakuliah syarat/ *Pre-requisite Course*	Analisis Multivariat Terapan ***Applied Multivariate Analysis***

Mg Ke- *Week*	**Kemampuan akhir tiap tahapan belajar (Sub-CPMK)** *Final capability for each learning step*	**Penilaian** *Evaluation*		**Bantuk Pembelajaran, Metode Pembelajaran, Penugasan Mahasiswa,** [Estimasi Waktu] Learning Format Learning Methods Assignment for Student [Estimated Time]		**Materi Pembelajaran** [Pustaka] *Learning Material [References]*	**Bobot Penilaian (%)** *Evaluation Weight (%)*
		Indikator *Indicator*	**Kriteria & Bentuk** *Criteria and Format*	**Luring (*offline*)**	**Daring (*online*)**		
(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
1	Dapat menjelaskan konsep-konsep dasar data mining dan aplikasinya ***Can explain the basic concepts of data mining and their applications***	Tugas, Latihan Soal, Laporan Praktikum **Assignments, Practice Questions, Practicum Report**	1. Dapat menjelaskan konsep-konsep dasar data mining 2. Dapat menyebutkan aplikasi data mining dalam berbagai bidang ***1. Can explain the basic concepts of data mining*** ***2. Can mention data mining applications in various fields***	TM: 3x50” BM :3x60” LT: 3x60” **L: 3x50”** **IL : 3x60”** **EA: 3x60”**		Pendahuluan: • pengertian DM, KDD, AI, ML • Alasan menggunakan DM • Tipe Data • Proses KDD • Aplikasi DM • Software DM Metode DM ***Preliminary:*** • ***Understanding DM, KDD, AI, ML*** • ***Reasons for using DM***	5%/5%

						• ***Data Type*** • ***KDD process*** • ***DM application*** • ***DM software*** • ***DM method***	
2-3	Dapat melakukan data integration, transformation, data reduction dan data discretization ***Can perform data integration, transformation, data reduction and data discretization***	Tugas, Latihan Soal, Laporan Praktikum ***Assignments, Practice Questions, Practicum Report***	Dapat melakukan prosedur data integration, transformation, data reduction dan data discretization ***Can perform data integration, transformation, data reduction and data discretization procedures***	TM: 3x50” BM :3x60” LT: 3x60” ***L: 3x50”*** ***IL : 3x60”*** ***EA: 3x60”***		Data integration, transformation, data reduction dan data discretization ***Data integration, transformation, data reduction and data discretization***	10%/15%
4-5	Dapat mendeteksi adanya data missing values dan noisy serta dapat mengatasinya ***It can detect any missing values and noisy data and can handle it***	Tugas, Latihan Soal, Laporan Praktikum *Assignments, Practice Questions,* ***Practicum Report***	1. Dapat menjelaskan pentingnya melakukan preprocessing data 2. Dapat melakukan prosedur data cleaning yang meliputi missing values dan noisy data ***1. Can explain the importance of preprocessing data*** ***2. Can perform data cleaning procedures which include missing values and noisy data***	TM: 3x50” BM :3x60” LT: 3x60” ***L: 3x50”*** ***IL : 3x60”*** ***EA: 3x60”***		Preprocessing data: Cleaning, missing value, noise, imputation ***Preprocessing data: Cleaning, missing value, noise***	10%/25%
6	Dapat melakukan wraping dan web scrapping	Tugas, Laporan Praktikum ***Assignments, Practicum Report***	Dapat menjelaskan prosedur Wrapping dan web Scrapping			Wrapping dan web Scrapping ***Wrapping and web scrapping***	

	Can perform wrapping and web scrapping		***Can explain wrapping and web scrapping procedures***				
7	Dapat melakukan visualisasi data multivariat ***Can perform multivariate data visualization***	Tugas, Latihan Soal, Laporan Praktikum ***Assignments, Practice Questions, Practicum Report***		Tugas, Latihan Soal, Laporan Praktikum ***Assignments, Practice Questions, Practicum Report***		Visualisasi Data Multivariat ***Multivariate data visualization***	
8	ETS						
9	Dapat menjelaskan feature selection dan feature extraction dan menerapkannya pada data ***Can explain feature selection and feature extraction and apply it to data***	Tugas, Latihan Soal, Laporan Praktikum ***Assignments, Practice Questions, Practicum Report***	Dapat menjelaskan konsep feature selection dan feature extraction dan menerapkannya pada data ***Can explain the concept of feature selection and feature extraction and apply it to data***	TM: 3x50” BM :3x60” LT: 3x60” ***L: 3x50”*** ***IL : 3x60”*** ***EA: 3x60”***		Feature selection /Feature extraction ***Feature selection /Feature extraction***	12,5%/ 37,5%
10	Dapat menjelaskan Mining Associations rule dan recommendation system serta menerapkan pada data ***Can explain Mining Associations rules and***	Tugas, Latihan Soal, Laporan Praktikum ***Assignments, Practice Questions, Practicum Report***	Dapat melakukan prosedur Mining Associations rule dan Recommender System ***Can perform Mining Associations rule and Recommender System procedures***	TM: 3x50” BM :3x60” LT: 3x60” ***L: 3x50”*** ***IL : 3x60”*** ***EA: 3x60”***		Mining Associations rule: Apriori Methods, Recommender System: Collaborative Filtering	12,5%/50%

	recommendation systems and apply them to data					***Mining Associations rule: Apriori Methods, Recommender System: Collaborative Filtering***	
11	Dapat menjelaskan konsep unsupervised learning dan menerapkan pada data ***Can explain unsupervised learning concepts and apply them to data***	Tugas, Latihan Soal, Laporan Praktikum ***Assignments, Practice Questions, Practicum Report***	1. Dapat melakukan metode clustering dalam problem riil 2. Dapat mengevaluasi hasil cluster ***1. Can do the clustering method in real problems*** ***2. Can evaluate cluster results***	TM: 3x50” BM :3x60” LT: 3x60” ***L: 3x50”*** ***IL : 3x60”*** ***EA: 3x60”***		Unsupervised Learning Method (Cluster methods): K-Medoid, DBScan ***Unsupervised Learning Method (Cluster methods): K-Medoid, DBScan***	5%/55%
12-13	Dapat menjelaskan konsep supervised learning dan menerapkan pada data ***Can explain unsupervised learning concepts and apply them to data***	Tugas, Latihan Soal, Laporan Praktikum ***Assignments, Practice Questions, Practicum Report***	1. Dapat melakukan prosedur SVM pada problem data riil 2. Dapat menyajikan hasil analisis menjadi informasi yang menarik ***1. Can perform SVM procedures on real data problems*** ***2. Can present the results of the analysis into interesting information***	TM: 2x3x50” BM :2x3x60” LT: 2x3x60” ***L: 2x3x50”*** ***IL : 2x3x60”*** ***EA: 2x3x60”***		Supervised Learning Method: Support Vector Machine (SVM) ***Supervised Learning Method: Support Vector Machine (SVM)***	10%/ 85%
14	Dapat menerapkan metode dan menganalisis dengan menggunakan ukuran evaluasi yang sesuai pada problem klasifikasi serta regresi	Tugas, Latihan Soal, Laporan Praktikum ***Assignments, Practice Questions, Practicum Report***	1. Dapat melakukan prosedur credibility untuk problem klasifikasi 2. Dapat melakukan prosedur credibility untuk problem regresi	TM: 3x50” BM :3x60” LT: 3x60” ***L: 3x50”*** ***IL : 3x60”***		Credibility: Evaluating what’s been learned ***Credibility: Evaluating what’s been learned***	5%/100%

	Can apply and analyze methods using appropriate evaluation measures on classification and regression problems		***1. Can perform credibility procedures for classification problems*** ***2. Can perform credibility procedures for regression problems***	***EA: 3x60”***			
15	Dapat melakukan visualisasi secara interaktif ***Can perform interactive visualization***					Interactive visualisation (R Shinny) ***Interactive visualisation (R Shinny)***	
16	**Evaluasi Akhir Semester / Ujian Akhir Semester**						

	RENCANA ASESMEN & EVALUASI *Assesment and Evaluation Plan* Program Studi Sarjana Statistika / *Statistics Undergraduate Program* **DATA MINING DAN VISUALISASI /** *Data Mining and Visualization*		**RA&E** SLK-1
Kode MK: SS234522 *Course Code:* *SS234522*	**Bobot sks (T/P):** 3 *CREDITS : 3*	**Rumpun MK:** Statistika Komputasi dan Sains Data *Course cluster:* *Computational Statistics and Data Science*	Smt: 5 *Semester 5*
OTORISASI *AUTHORIZATION*	**Penyusun** *Author*	**Koordinator RMK** *Coordinator of course cluster*	**Kaprodi** *Head of Department* Dr. Kartika F, M.Si.

Mg ke (1)	Sub CP-MK (2)		Bentuk Asesmen (Penilaian) / Evaluation Type (3)	Bobot / Scoring (%) (4)
	No	Kemampuan akhir / Final Capability		
1		Tuliskan kemampuan akhir Sub CP-MK *Write down the final capability of Sub CP-MK*	Tuliskan bentuk asesmen *Write down the form of assessment*	
2				
3				
			Total Bobot Penilaian	**100%**