UNIVERSITAS INDONESIA
Faculty of Mathematics and Natural Sciences
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MODULE HANDBOOK

Module designation	*Data Science*
Semester(s) in which the module is taught	*4*
Person responsible for the module	*Dra. Bevina D. Handari, M.Sc., Ph.D.*
Language	*Indonesian*
Relation to curriculum	*Compulsory*
Teaching methods	*Blended Learning, Flipped learning and Collaborative Learning*
Workload (incl. contact hours, self-study hours)	*(Estimated) Asinchronous Forum Discussion in EMAS 1 x 60 mnts (with teacher) + 1 x 60 mnts (between students).* *Contact hours: Flipped Learning 1 x 50 mnts, Lecture 2 x 50 mnts.* *Private study including examination preparation, specified in hours[1]:* *1 hours structured activities and 1 hours individual study per week.*
Credit points	*3 SKS (4.77 ECTS)*
Required and recommended prerequisites for joining the module	*Intelligent Computation*

[1] When calculating contact time, each contact hour is counted as a full hour because the organisation of the schedule, moving from room to room, and individual questions to lecturers after the class, all mean that about 60 minutes should be counted.

Module objectives/intended learning outcomes	*After completing the course, students have the ability* 1. *to study basics, problems, topics, processes, and algorithms in data science* 2. *to process data for use in the next process* 3. *to analyze regression, classification problems, and clustering using the related methods.* 4. *to connect mathematical theory to neural network models* 5. *to cooperate to build a neural network model to predict a solution to a problem* 6. *to cooperate to make a paper using Bahasa Indonesia.*
Content	1. *Data* *Introduction to data science* *Studying and preparing data* *Supervised and Unsupervised* 2. *Regression and classification* *Least square and linear regression* *Linier Classifier and Logistic Regression* *Support Vector Machine* *Decision tree* 3. *Clustering and Similarity* *Nearest Neighbor Search* *K-Means* 4. *Recommending Products and Deep Learning: Searching for images* 5. *Introduction to Deep Learning* 6. *Neural networks with a hidden layer, using forward and back-propagation* 7. *Deep Neural Network* 8. *Aspects of Deep Learning* 9. *Optimization Algorithms* 10. *Hyperparameter tuning, Batch Normalization and Programming Frameworks*
Examination forms	1. *Class activities: Homework, small projects* 2. *Mid-term examination* 3. *Final examination (presentation)*

Study and examination requirements	*The final mark will be weighted as follows:* 1. *Homework (20%)* 2. *Mid-term examination (30%)* 3. *Small Projects (20%)* 4. *Final examinations (30%)* *To successfully pass the module it requires minimum 55% of the total mark.* *Mark — Grade* *85—100 — A* *80—<85 — A-* *75—<80 — B+* *70—<75 — B* *65—<70 — B-* *60—<65 — C+* *55—<60 — C* *40—<55 — D* <40 — E
Reading list (resources)	1. *Aggarwal, C. (2018). Neural Networks and Deep Learning. Cham, Switzerland: Springer* 2. *Alpaydin, E. (2010). Introduction to Machine Learning. MIT Press.* 3. *Deisenroth, A. Aldo, A.F., Ong, C.S. (2020). Mathematics for Machine Learning. Cambridge University Press.* 4. *Goodfellow, I., Bengio, Y., Courville, A. (2016). Deep Learning. MIT Press.* 5. *Kotu, V., Deshpande B., (2019). Data Science Concepts and Practice 2nd Ed, Elsevier Inc, Cambridge.* 6. *Marc Peter Deisenroth., A.Aldo Faisal., Cheng Soon Ong. (2020). Mathematics for Machine Learning. Published by Cambridge University.* 7. *Saltz, J., S. (2018). An Introduction to Data Science, Sage Pub., Syracuse University.* 8. *Swalin, A. (2018). How to Handle Missing Data. https://towardsdatascience.com/how-to-handle-missing-data-86418db0d4* 9. *Vitria, J., et al. (2017). Introduction to Data Science a Phyton Approach to Concepts, Techniques and Applications. Springer, Switzerland.* 10. *Zumel, N., and Mount., J. (2020). Practical Data Science with R. Manning Pub., New York*