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| **Course** | Machine Learning and Lab | |  |
| **Title :** |  |
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| [Sylabus] |  |  |  |
|  |  |  |  |
|  | Category | Major selection (major selection) |  |
|  |  |  |  |
|  | Number(section) | 47771(01) |  |
|  |  |  |  |
|  | Title | Machine Learning and Lab |  |
| Course |  |  |  |
| Credit(Hours) | 3 Credit(4 Hours) |  |
|  |  |
|  |  |  |  |
|  | Type | Lecture+Experiment/Practice |  |
|  |  |  |  |
|  | Time(Room) | Tue 06,07,08/33-710, Thu |  |
|  | 01/33-710 |  |
|  |  |  |
|  | school year | 3/4 year |  |
|  |  |  |  |

**2022-1st Semester**

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|  | Department or | Department of Statistics |  |
|  | Division |  |
|  |  |  |
|  | Name |  |  |
|  |  |  |  |
|  | Phone |  |  |
| Instructor |  |  |  |
| E-mail |  |  |
|  |  |  |
|  |  |  |  |
|  | Homepage |  |  |
|  |  |  |  |
|  | Office Hours |  |  |
|  |  |  |  |
| Assistant | name & phone |  |  |
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|  |  | Evaluation Method | |  |  | absolute evaluation |  |
|  |  |  |  |  |  |  |  |
|  |  | □ Attendance (10%) | | | □ Portfolio (0%) | □ Participation (10%) |  |
|  | Grading |  |  |  |  |  |  |
|  |  | □ Assignment (20%) | | | □ Quiz (0%) | □ Midterm Report (0%) | □ Midterm Exam (30%) |
|  |  | □ Final Report (0%) | | | □ Final Exam (30%) | □ Other (0%) |  |
|  |  |  |  |  | |  |  |
|  | Type | | Lecture and Practice , PBL , Foreign Language | | |  |  |
|  |  |  |  |  |  |  |  |
|  | Teaching Method | | Lecture , Practice | |  |  |  |
|  |  |  |  |  |  |  |  |
|  |  |  | It is considered plagiarism to draw any idea or any language from someone else wihout adequately crediting that | | | | |
|  | Plagiarism Policy | | source in your work. It doesn't matter whether the source is a published author, another student, a Web site without | | | | |
|  |  |  | clear authorship, a Web site that sells academic papers, or any other person: Taking credit for antone else's work | | | | |
|  |  |  | is stealing, and it is unacceptable in all academic situations, whether you do it intentionally or by accident. | | | | |

Any student with a disability is welcome to contact the instructor to get academic accommodations, and may be in touch with the Student Accessibility Services by calling 02-6490-6273 to discuss the process for requesting accommodations.

Course Objectives

- This class is a foreign language class conducted in English.

(This course will be presented in English)

o Understanding the principles of various machine learning methods

(Understanding the mechanisms of various machine learning methods)

o Understanding the evaluation of machine learning methods

(Understanding assessment of the performances of machine learning methods)

o Applying appropriate machine learning methods to real data

(Building sounds skills in machine learning)

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|  | Course Description | Textbooks and Reference Materials |
|  |  |  |
|  | In this course, based on R or Python, there are many learning problems | An Introduction to Statistical Learning: with applications in R |
|  | The methodology used is introduced here. The main topics are decision trees and nerves. | G. James, D. Witten, T. Hastie, and R. Tibshirani, |
|  | Various supervised learning techniques and evaluation methods such as networks, association rules, clusters, | Springer. |
|  | There are self-learning techniques such as the dimension reduction method. |  |

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|  | Specialty competency | Representative competency |
|  |  |  |
|  | Statistical Modeling | Primary |
|  |  |  |
|  | Mathematical Methods |  |
|  |  |  |
|  | Statistical Data Processing |  |
|  |  |  |
|  | Statistical Data Analysis | Secondary |
|  |  |  |
|  | Programming |  |

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| Specialty competency | Representative competency |
|  |  |
| Problem Solving | Secondary |
|  |  |
| Collaboration |  |
|  |  |
| Global Competence |  |
|  |  |
| Ethics in Statistical Practice and Communication |  |
|  |  |

**Course Title:** Machine Learning and Practice **2022year 1st Semester**

[Weekly Lesson Plan]

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| --- | --- | --- | --- | --- | --- |
| Week | Contents | Teaching | Teaching | Requirements, |  |
| Method | Materials | Assignments, etc. |  |
|  |  |  |
|  | 1. Overview of Machine Learning: |  |  |  |  |
|  | 1-1. What is machine learning, 1-2. What is model evaluation |  | Introduction to |  |  |
|  | is it |  |  |  |
|  |  | Statistical |  |  |
| One |  |  |  |  |
|  |  | LearningCh. 1 & 2. |  |  |
|  | 1. Introduction to Statistical Learning |  |  |  |
|  |  |  |  |  |
|  | 1-1. What is Statistical Learning, 1-2. Assessing |  |  |  |  |
|  | Model Accuracy |  |  |  |  |
|  |  |  |  |  |  |
|  | 2. Linear Model I |  |  |  |  |
|  | 2-1. Simple star regression model, 2-2. Multiple Linear Regression Model I |  | Introduction to |  |  |
|  |  |  |  |  |
| 2 | 2. Linear Regression Part I |  | Statistical |  |  |
|  |  | LearningCh. 3 |  |  |
|  | 2-1. Simple Linear regression, 2-2. Multiple Linear |  |  |  |
|  |  |  |  |  |
|  | Regression |  |  |  |  |
|  |  |  |  |  |  |
|  | 3. Linear Model II |  |  |  |  |
|  | 3-1. Multiple Linear Regression Model II, 3-2. Extension of the linear model |  | Introduction to |  |  |
|  |  |  |  |  |
| 3 | 3. Linear Regression II |  | Statistical |  |  |
|  | LearningCh. 3 |  |  |
|  | 3-1. Multiple Linear Regression Part 2, 3-2. Other |  |  |  |
|  |  | continued |  |  |
|  | Considerations in the Regression Models |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |  |
|  | 4. Categorization I |  |  |  |  |
|  | 4-1. Introduction to Categorization, 4-2. logistic regression model |  | Introduction to |  |  |
|  |  |  |  |  |
| 4 | 4. Classification |  | Statistical |  |  |
|  |  | LearningCh. 4 |  |  |
|  | 4-1. An Overview of Classification, 4-2. Logistic |  |  |  |
|  |  |  |  |  |
|  | Regression |  |  |  |  |
|  |  |  |  |  |  |
|  | 5. Categorization II |  |  |  |  |
|  | 5-1. Generative Model, 5-2. of various categorization methods. |  | Introduction to |  |  |
|  | compare |  |  |  |
|  |  | Statistical |  |  |
| 5 |  |  |  |  |
|  |  | LearningCh. 4 |  |  |
|  | 5. Classification II |  |  |  |
|  |  | continued |  |  |
|  | 5-1. Generative Models 5-2. A Comparison of |  |  |  |
|  |  |  |  |  |
|  | Classification Method |  |  |  |  |
|  |  |  |  |  |  |
|  | 6. Resampling |  |  |  |  |
|  | 6-1. Cross-Validation, 6-2. bootstrap |  | Introduction to |  |  |
| 6 |  |  | Statistical |  |  |
|  | 6. Resampling Methods |  | LearningCh. 5 |  |  |
|  | 6-1. Cross-Validation, 6-2. Bootstrap |  |  |  |  |
|  |  |  |  |  |  |
|  | 7. Linear Model Selection and Normalization I |  |  |  |  |
|  | 7-1. Subset Selection Method, 7-2. shrinkage model |  | Introduction to |  |  |
| 7 |  |  | Statistical |  |  |
|  | 7. Linear Model Selection and Regularization |  | LearningCh. 6 |  |  |
|  | 7-1. Subset Selection, 7-2. Shrinkage Methods |  |  |  |  |
|  |  |  |  |  |  |
| 8 | Midterm exam |  |  |  |  |
| Midterm |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |  |
|  | 9. Linear Model Selection and Normalization II |  |  |  |  |
|  | 9-1. Dimensional Reduction, 9-2. High dimensionality and multicollinearity |  | Introduction to |  |  |
| 9 |  |  | Statistical |  |  |
| 9. Linear Model Selection and Regularization |  | LearningCh. 6 |  |  |
|  |  |  |  |
|  | 9-1. Dimension Reduction Methods, 9-2. |  | Continued |  |  |
|  | Considerations in High Dimensions |  |  |  |  |
|  |  |  |  |  |  |
|  | 10. Tree Model I |  |  |  |  |
|  | 10-1. Introduction to Nonlinear Methods, 10-2. Introduction to the tree method |  | Introduction to |  |  |
|  |  |  |  |  |
| 10 | 10. Tree Methods I |  | Statistical |  |  |
|  |  | LearningCh. 7 & 8 |  |  |
|  | 10-1. An Overview of Non-linear Methods, 10-2. |  |  |  |
|  |  |  |  |  |
|  | An Overview of Tree Methods |  |  |  |  |
|  |  |  |  |  |  |

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|  | 11. Tree II |  |  |  |  |
|  | 11-1. Bagging method, 11-2. Random Forest, 11-3. booth |  | Introduction to |  |  |
|  | chat |  |  |  |
|  |  | Statistical |  |  |
| 11 |  |  |  |  |
|  |  | LearningCh. 8 |  |  |
|  | 11. Tree Methods II |  |  |  |
|  |  | continued |  |  |
|  | 11-1. Bagging, 11-2. Random Forests, 11-3. |  |  |  |
|  |  |  |  |  |
|  | Boosting |  |  |  |  |
|  |  |  |  |  |  |
| 12 | Supplementary Week |  |  |  |  |
|  |  |  |  |  |  |
|  | 13. Support Vector Machine |  |  |  |  |
|  | 13-1. Margin and support vectors, 13-2. support vector machine |  |  |  |  |
|  |  |  | Introduction to |  |  |
| 13 | 13. Support Vector Machine |  | Statistical |  |  |
|  | 13-1. Margins, Classifiers, Support vectors, and |  | LearningCh. 9 |  |  |
|  | Support Vector Classifiers, 13-2. Support Vector |  |  |  |  |
|  | Machines |  |  |  |  |
|  |  |  |  |  |  |
|  | 14. Unsupervised Learning |  |  |  |  |
|  | 14-1. Principal Component Analysis, 14-2. Clustering Analysis |  | Introduction to |  |  |
|  |  |  |  |  |
| 14 | 14. Unsupervised Learning |  | Statistical |  |  |
|  |  | LearningCh. 10. |  |  |
|  | 14-1. Principal Component Analysis, 14-2. |  |  |  |
|  |  |  |  |  |
|  | Clustering Methods |  |  |  |  |
|  |  |  |  |  |  |
|  | 15. Neural Networks |  |  |  |  |
|  | 15-1. Introduction of Neural Networks, 15-2. of neural networks |  |  |  |  |
|  | learning |  |  |  |  |
| 15 |  |  | Lecture Slides |  |  |
|  | 15. Neural Networks |  |  |  |  |
|  | 15-1. An Overview of Neural Networks, 15-2. |  |  |  |  |
|  | Neural Network Learning |  |  |  |  |
|  |  |  |  |  |  |
| 16 | Finals |  |  |  |  |
| Final Exam |  |  |  |  |
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