Machine Learning Course Syllabus

This course will provide you a general picture of traditional machine learning and modern deep learning algorithms, as well as a plenty of applications. You may master both the theory and practical usage of these algorithms with the lectures and hands-on assignments. You may apply what you have learned to a final project which could be a default one or customized by yourself. Below are the details.

- **Course Time and Location**
  - Time: Monday and Wednesday 13:00-14:30 am
  - Location: LTN-B 406

- **Instructors**
  - Assistant Prof. Gaoang Wang (Office: ZJUI Building 417), gaoangwang@intl.zju.edu.cn

- **TA**
  - **Guanhong Wang** guanhongwang@zju.edu.cn
  - **Zhonghan Zhao** zhaozhonghan@zju.edu.cn
  - **Office Hour:**

    Guanhong Wang, Friday 7-8pm, ZJUI Building C424.

    Zhonghan Zhao, Monday 10-11am, ZJUI Building C424.

- **Course Prerequisites**
  - Python programming
  - Linear algebra, calculus
  - Basic probability and statistics

- **Reference Textbooks**

1. Pattern Recognition and Machine Learning (Christopher M. Bishop)
2. Deep Learning (Ian Goodfellow, Yoshua Bengio, Aaron Courville). (中文版也可以)
3. Machine Learning, A Probabilistic Perspective (Kevin Murphy)
4. 机器学习，周志华
5. 统计学习方法，李航
6. The Elements of Statistical Learning (Trevor Hastie)

- **Grading Policy**

1. Final Exam: 35%
2. Assignment: 5% * 4
3. Small Project: 10%
4. Final Project: 30%
5. Attendance: 5%

- **Letter Grade**

A+	A	A-
97-100	93-96	90-92
B+	B	B-
87-89	83-86	80-82
C+	C	C-
77-79	73-76	70-72
D+	D	D-
67-69	63-66	60-62
F		
<60		

- **Final Exam**
  - You may bring **1 A4-size cheat sheet**. Write down anything you want.

- **Assignment**
  - Assignments include coding and algorithm understanding. You need to submit the assignments with PDF writing (theory part and Notebook) and Jupyter Notebook source code (coding part).
  - **Late days for assignments:** Every student has 3 chances of one late day in total for the assignments. 3 days 80%, 5 days 60%.
  - **Submission:** submit with BlackBoard.

- **Course Project**
  - Apply what you have learned in the class to the problems of your interest. You may choose one of the default course projects, or you can propose you own projects. For the default project, we will provide you with the corresponding dataset or links.
  - **Discuss with Prof and TAs to select your project**
  - **Choose 3 projects from 8-10 project pool: Priority 1, 2, 3.**
  - **Ideally, you will be assigned 1 of the 3 chosen projects. We will have an algorithm to assign the projects based on your priority. If all of your projects are taken by 2 teams, you need to discuss with the Prof again, otherwise your project will be randomly assigned.**
    - We may offer more default project before week 3.
    - Details of the default projects will be announced in Week 3.
    - Project selection before Week 4.
  - **Grade Policy (Report + Presentation)**
    - **Final Report (15%).** We will provide a template, which is similar to a formal conference paper. Each team need to submit a report for your project. The instructors and TAs will evaluate the report from the three perspectives: methodology (5%), results (e.g., test accuracy, 5%), writing (5%).
    - **Project Milestone (5%):** A 2-5 pages report for the progress and preliminary results of your project. (Week 8)
    - **Presentation (10%).** A 10-15 minutes short presentation for each team. We may invite other faculties or student to attend the presentation. Details TBD.
    - The trained models and source code should be submitted as well.

- **Small Project (10%) (week 6 or week 7, due in 3 weeks)**
- **Team size**
  - Students should do final projects in teams of **3-4** people. Teamwork is encouraged. Larger teams are expected to do larger projects.
  - **Contribution**: In the final report we ask for a statement of what each team member contributed to the project. Team members will typically get the same grade, but we may differentiate in extreme cases of unequal contribution. You can contact us in confidence in the event of unequal contribution.
- **Resources**
  - You can use any deep learning / machine learning framework you like (PyTorch, TensorFlow, Chainer, MXNet, etc.)
  - You may use any existing code, libraries, and refer to any papers, books, online references, etc. for your project. However, you must cite your sources in your report and clearly indicate which parts of the project are your contribution and which parts were implemented by others.
  - Do not look at another ECE449 group's code. **Plagiarism is definitely not allowed, and you will be graded as 0 for this project part.**

Course Syllabus (Minor adjustments might be made during the course)

Each assignment due in 2 weeks

One Pytorch tutorial in office hour in week 5, 1 extra point for attendance

Event	Contents
Lecture 01	Introduction
Lecture 02	Linear Regression
Lecture 03	Support Vector Machine
Lecture 04	MLP, Backprop
Lecture 05	Deep Learning and CNN
Lecture 06	Variants of CNN
Lecture 07	RNN and LSTM
Lecture 08	Transformer
Lecture 09	GNN
Lecture 10	Attention Mechanism
Lecture 11	Auto-encoder
Lecture 12	Detection and Segmentation
Lecture 13	Representation Learning

Lecture 14	Generative Models
Lecture 15	Large Language Modeling
Lecture 16	Multi-model Learning
Lecture 17	Logistic Regression
Lecture 18	Decision Tree and Random Forest
Lecture 19	Boosting and Ensemble Learning
Lecture 20	k-Means
Lecture 21	Gaussian Mixture Model and EM
Lecture 22	PCA
Lecture 23	Structure Prediction
Lecture 24	Reinforcement Learning 1
Lecture 25	Reinforcement Learning 2
Lecture 26	Active Learning
Lecture 27	**Review and Project Presentation**
Lecture 28	**Project Presentation**