

## 主導課程二：機器學習 Machine Learning

### 課程基本資料

開設學校：台灣大學

開授教師：林軒田

授課語言：英語授課

同步遠距上課時間：星期一 13:20~16:20

### 課程概述

Machine learning allows computational systems to adaptively improve their performance with experience accumulated from the data observed. This course introduces the basics of learning theories, the design and analysis of learning algorithms, and some applications of machine learning.

The course is designed to prepare junior graduate students with a solid background of machine learning and allow them to use machine learning techniques appropriately in their future research or industry projects.

### 課程內容大綱

Week	Date	syllabus	todo/done
1	2-Sep	course introduction; <b>topic 1: when can machines learn?</b> the learning problem	homework 0 announced
2	9-Sep	learning to answer yes/no; types of learning	homework 1 announced
3	16-Sep	feasibility of learning; <b>topic 2: why can machines</b>	

		<b>learn?</b> training versus testing	
<b>4</b>	23-Sep	the VC dimension; noise and error	homework 2 announced
<b>5</b>	30-Sep	<b>topic 3: how can machines learn?</b> linear regression; logistic regression	
<b>6</b>	7-Oct	linear models for classification; nonlinear transformation	homework 0 due; homework 1 due; homework 2 due; homework 3 announced
<b>7</b>	14-Oct	<b>topic 4: how can machines learn better?</b> hazard of overfitting; regularization	
<b>8</b>	21-Oct	validation; three learning principles	homework 3 due; homework 4 announced; final project announced
<b>9</b>	28-Oct	<b>topic 5: how can machines learn by embedding numerous features?</b> linear support vector machine; dual support vector machine	
<b>10</b>	4-Nov	kernel support vector machine; soft-margin support vector machine	homework 4 due; homework 5 announced
<b>11</b>	11-Nov	<b>topic 6: how can machines learn by combining predictive features?</b> blending and bagging; adaptive boosting	
<b>12</b>	18-Nov	decision tree; random forest; gradient boosted decision tree	homework 5 due; homework 6 announced
<b>13</b>	25-Nov	<b>topic 7: how can machines learn by distilling hidden</b>	

		<b>features?</b> neural network; (preliminary) deep learning	
<b>14</b>	2-Dec	modern deep learning	homework 6 due; homework 7 announced
<b>15</b>	9-Dec	<b>no class as instructor needs to attend ACML 2024 and NeurIPS 2024;</b> recording: machine learning for modern artificial intelligence	
<b>16</b>	16-Dec	finale	homework 7 due
<b>17</b>	23-Dec	<b>no class and winter vacation started (really?)</b>	final project due

### 參考書目

- Learning from Data, by Yaser Abu-Mostafa, Malik Magdon-Ismail and Hsuan-Tien Lin, Language: English teaching

### 成績評量方式

- 70% homework
- 30% project (tentative)