**Course Syllabus**

|  |
| --- |
| **CNU International Summer Session** |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Course Title** | | | **Practical Machine Learning** | | | | | | | | | | | | | | | | | | |
| **Course Type** | | | In-class | | | | | | | | **Credits**  **(hours)** | | | 3 | | | | | | | |
| **Department** | | | Math & Stats | | | | | | | | **Professor** | | | Hamid Usefi | | | | | | | |
| **Classification**  **(year in school)** | | | Graduate | | | | | | | | **Course Code** | | | GR23817 | | | | | | | |
| **Class room** | | | Natural Science 1-230 | | | | | | | | **E-mail** | | | [usefi@mun.ca](mailto:usefi@mun.ca) | | | | | | | |
| **Prerequisite(s)** | | | n/a | | | | | | | | | | | | | | | | | | |
|  | | |  | | | |  | | |  |  | | |  | | | | | | | |
| **Course objectives** | | | * **Develop Proficiency in Machine Learning Tools and Techniques:** Equip students with the skills to utilize Python and scikit-learn effectively, enabling them to implement machine learning models and perform data analysis competently. * **Enhance Analytical and Problem-Solving Abilities:** Foster critical thinking and problem-solving skills through hands-on projects involving real-world datasets, where students learn to derive actionable insights from complex information. | | | | | | | | | | | | | | | | | | |
| **Course Summary** | | | This course offers a exploration of fundamental and advanced techniques in data science with a strong emphasis on machine learning. The course introduces students to a systematic approach for extracting information from data-rich environments using computational principles, statistical methods, and algorithmic models. Key topics include dimensionality reduction, supervised and unsupervised learning, and the application of Python and scikit-learn to real-world data sets.  Theoretical discussions in lectures are complemented by practical sessions where students apply concepts to solve problems and execute projects. The course is designed to develop both analytical thinking and technical proficiency, preparing students for advanced research in data science or careers in industries where data-driven decision-making is crucial. | | | | | | | | | | | | | | | | | | |
| **Teaching Methods** | | | **Teaching Methods** | | | | | | | | | | | | | | | | | | |
| Lecture | Presentation/Discussion | | | | Problem Based Learning | | | | Project Based Learning | Flipped Learning | | | Experiment/ Practices | | | | Others  (Describe) | |
| x |  | | | |  | | | |  |  | | | x | | | |  | |
| < Lecture>  - For each day, lecture slides are distributed.  - Basic concepts and examples are demonstrated during lectures.  < Practices >  - Provide Jupiter notebook codes and hands-on coding in class. These notes will be shared via google drive.  -We will use google colab for most of the python programming. | | | | | | | | | | | | | | | | | | |
| **Grading** | | | Mid-Term | Final | | Individual Tasks | | | Team Projects | | | Class participation | | | Attendance | | Others  (Describe) | | | | **Total** |
| **30** | **30** | | **40** | | |  | | |  | | |  | |  | | | | **100** |
| ※ Pursuant Section 28 of the Guidelines on Class Management, grading methods can be adjusted for the physically impaired.  ※ Under Section 29 of the University Regulations on Academic Affairs, a student automatically fails a course in case of failure to attend more than 3/4 classes. (More than four(4) times absence) | | | | | | | | | | | | | | | | | | |
| **Accommodations for Handicapped** | | | - Visually impaired: provision of course related materials in audio, note taking helper, permission to record the lecture  - Audibly impaired: provision of course related materials in visual, note taking helper, permission to have e-learning lectures in sign language or shorthand  - Physically or mentally challenged: provision of course related materials, note taking helper, permission to record the lecture   * Any other requests that are considered necessary: provision of assisted   ingress and egress to the classrooms and other supports | | | | | | | | | | | | | | | | | | |
| **Textbooks & References** | | | | | | | | | | | | | | | | | | | | | |
| Category | Title | | | | Author | | | | | | | Publisher | | | | | | | Year of publication | | |
| Main textbook | **An Introduction to Statistical Learning with Applications in Python** | | | | G. James, D. Witten, T. Hastie and R. Tibshirani, Jonathan  Taylor. | | | | | | | Springer | | | | | | | 2023 | | |
| Others | Introduction to Machine Learning with Python | | | | Sarah Guido, Andreas Muller | | | | | | | O’Reilly Media | | | | | | | 2016 | | |
| Reference |  | | | | | | | | | | | | | | | | | | | | |
| **Daily Course Schedule** | | | | | | | | | | | | | | | |
|  | | | | | | | | | | | | | | | |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Day**  **(3hurs)** | **Lecture Topic** | **Hours per day** | **Method of Instruction** | **Class Materials & Assignments** |
| 1 | Introduction to Machine learning | 3 | Lecture | Lecture Slides |
| 2 | Supervised and Unsupervised Learning | 3 | Lecture | Lecture Slides |
| 3 | Python and Scikit-learn | 3 | Hands-on coding | Jupiter notebook codes/google colab |
| 4 | NumPy and Pandas | 3 | Hands-on coding | Jupiter notebook codes/google colab |
| 5 | Data Pre-Processing | 3 | Lecture and coding | Lecture Slides/ Jupiter notebook codes |
| 6 | Data Cleaning | 3 | Lecture and coding | Lecture Slides/ Jupiter notebook codes |
| 7 | Model Evaluation and Selection | 3 | Lecture | Lecture Slides |
| 8 | k-Nearest Neighbours | 3 | Lecture and coding | Lecture Slides/ Jupiter notebook codes |
| 9 | Linear Models | 3 | Lecture and coding | Lecture Slides/ Jupiter notebook codes |
| 10 | Tree-Based Methods | 3 | Lecture and coding | Lecture Slides/ Jupiter notebook codes |
| 11 | Support Vector Machines | 3 | Lecture and coding | Lecture Slides/ Jupiter notebook codes |
| 12 | Ensemble Methods | 3 | Lecture and coding | Lecture Slides/ Jupiter notebook codes |
| 13 | Neural Networks I | 3 | Lecture and coding | Lecture Slides/ Jupiter notebook codes |
| 14 | Neural Networks II | 3 | Lecture and coding | Lecture Slides/ Jupiter notebook codes |
| 15 | Student Presentations | 3 |  | Lecture Slides |

|  |
| --- |
| **References** |
| Each student is required to complete a project based on a dataset, which will involve writing a detailed report and delivering a presentation. The project constitutes 20% of the final grade. Additionally, there will be four assignments distributed throughout the course, collectively accounting for another 20% of the final grade.  Students will present their projects in a 10–15 minutes presentation. Depending on the class size, multiple lecture sessions may be scheduled to accommodate all presentations towards the end of the course. |