Course Syllabus

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| **Course Title** | Data Science | **CRN**  (Course Reference Number) | EE5104 |
| **Subtitle** | - | **Credit** **hour**  (Lecture hours – Lab hours – Credit hours) | 2-1-3 |
| **Course Format** | Lecture ■ Discussion □ Laboratory ■ Practicum □  Blended □ Online □ (Add)\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | | |
| **Course Description** | *[The description briefly and clearly explains the purpose of a basic summary of the course. the description should be 250 words or fewer]*  The goal of this course is to learn the basics of how to use data for designing intelligent mobile and IoT services. The course covers the entire process of data science: data collection, pre-processing, feature extraction, and machine learning modeling. Mobile and wearable sensors will be mainly used, and the types of data covered include motion (e.g., vibration/acceleration, GPS), physiological signals (e.g., heart rate, skin temperature), and interaction data (e.g., app usage). Students will learn the basic digital signal processing and feature extraction techniques. Basic machine learning techniques (e.g., clustering, supervised learning, time-series learning, and deep learning) will be reviewed, and students will master these techniques with in-class practices with Google Co-lab. A final project will help students to apply the techniques learned in the class to solve real-world data science problems. Mobile/wearable datasets collected will be used for the final project (e.g., emotion classification, and interruptibility). | | |

**P1. Course Information**

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| **Instructor** | Prof. Young Tae Noh | **Office** | TBD | |
| **Office Hours** | *9:00AM TO 10:00 AM on Fridays*  TBD | **Office Telephone** | 061-330-XXXX | |
| **E-mail** | ytnoh@kentech.ac.kr | |
| **Discipline** | Energy AI | **Prerequisite** | No Prerequisite | |
| **Target Audience** | Graduate Students |
| **Course Reading & Resources** | | | | |
| **Required Materials** | Lecture Notes will be provided. | | | |
| **Other Recommended Materials (optional)** | - Python Basics  - ML Basics | | | |
| **Course Access** | This is an offline course. However, it may be changed to an on-line course if the situation due to COVID-19 does not allow off-line meeting. | | |
| **Technical & Academic Support** | If you need any technical/academic assistance at any time during the course, please contact your instructor and/or course TA  - Instructor: Prof. Young Tae Noh  - Course Teaching Assistant: TBD | | |

**P2. Course Objectives**

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| **Course Learning Objectives** | Through this course you will:  Learn basic machine learning techniques (e.g., clustering, supervised learning, time-series learning, and deep learning) will be reviewed, and students will master these techniques with in-class practices with Google Co-lab. |
| **Course Learning Activities** | To meet the objectives, you will:  Present final project which will help you to apply the techniques learned in the class to solve real-world sensor data science problems. |

**P3. Topic Outline/Schedule**

**Important note**: Refer to the course calendar for specific dates and times. Activity and assignment details will be explained in detail within each week’s corresponding learning module. If you have any questions, please contact your instructor.

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| **Module 01**  **(Week 01~02)** | **Data Science Basics** | | |
| **Week 01** | **(Mobile) Data Science: Introduction & Paradigm** | - Introduction to Sensor Data Science  **-** Data Analysis Process Overview: Mobile & Fixed Sensing Cases |
| 1. READ: Reading materials will be provided.  2. POST: Lecture Note 01 ~ 02 |
| **Week 02** | **Sensory Data Science: Contextual/Persuasive Computing & Data Viz** | - Key Applications for Sensor Data Science: Context-Aware & Persuasive Computing  - Data Visualization for Sensor Data Science |
| 1. READ: Reading materials will be provided.  2. POST: Lecture Note 03 ~ 04 |
| **Module 02**  **(Week 05~07*)*** | **Data Science Pipeline Part I: Data Collection and Preprocessing** | | |
| **Week 03** | **Datasets & Data Collection** | - Datasets Introduction - K-EmoPhone, K-EmoCon, CrowdSignal  - Sensor Data Collection |
| 1. READ: Reading materials will be provided.  2. POST: Lecture Note 05 ~ 06 |
| **Week 04** | **Sensor Data Pre-processing** | - Handling Noise and Missing Values in Sensory Data  - Dimension Reduction |
| 1. READ: MLQS textbook Chapter 3  2. POST: Lecture Note 07 ~ 08 |
| **Week 05** | **K-EmoPhone & K-EmoCon Challenge (Term Project Topics)** | -SDS Applications: Emotion & Personality |
| 1. READ: Reading materials will be provided.  2. POST: Lecture Note 09 |
| **Week 06** | **DSP Basics** | - Digital Signal Processing Basics I  - Digital Signal Processing Basics II |
| 1. READ: Reading materials will be provided.  2. POST: Lecture Note 10 ~ 11 |
| **Module 03**  **(Week 08~09)** | **Data Science Pipeline Part II: Feature Engineering and Supervised Learning** | | |
| **Week 07** | **Feature Engineering** | - Feature Engineering based on Sensory Data I  - Feature Engineering based on Sensory Data II |
| 1. READ: MLQS textbook Chapter 4  2. POST: Lecture Note 12 ~ 13 |
| **Week 08** | **Midterm Exam** |  |
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| **Week 09** | **Supervised Learning - Basics** | - Learning Based on Sensory Data: Supervised Learning I & II |
| 1. READ: Reading materials will be provided.  2. POST: Lecture Note 14 ~ 15 |
| **Week 10** | **Supervised Learning - Advanced** | Learning Based on Sensory Data: Supervised Learning III & IV |
| 1. READ: Reading materials will be provided.  2. POST: Lecture Note 16 ~ 17 |
| **Week 11** | **Sensor Data & Deep Learning** | Learning Based on Sensory Data: Sensor Data & Deep Learning |
| 1. READ: Reading materials will be provided.  2. POST: Lecture Note 18 ~ 19 |
| **Module 04**  **(Week 10~15)** | **Advanced Topics and Applications** | | |
| **Week 12** | **Project Presentation** | - Final Project Proposal |
| Progress Report & Presentation Guidelines |
| **Week 13** | **Advanced Topics: Active & Interactive ML for Sensing Applications** | - Interactive Machine Learning for Sensing Applications |
| 1. READ: Reading materials will be provided.  2. POST: Lecture Note 20 ~ 21 |
| **Week 14** | **Advanced Topics & SDS Applications** | - Advanced Topics: Interpretable Machine Learning for Sensing Applications  - SDS Applications: Activity Recognition & Condition-based Maintenance |
| 1. READ: Reading materials will be provided.  2. POST: Lecture Note 22 ~ 23 |
| **Week 15** | **SDS Applications** | - SDS Applications: Context-Aware Computing (Interruptibility & Productivity) |
| 1. READ: Reading materials will be provided.  2. POST: Lecture Note 24 ~ 25 |
| - | **Week 16** | **Final Exam & Presentation** | - Final Presentation  - Final Exam |
| Final Report submission. |

**P4. Grading Policy**

Graded Course Activities

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| **Activity** | **Percentage** |
| Participation | 10 |
| Project | 30 |
| Mid-term Exam | 30 |
| Final Exam | 30 |
| **Total** | **100%** |