Course Catalogue

Module Code	Semester	ECTS	SWS	Lecture	Tutorial	Lab
MECH-B-5-MLDS-MLDS2-ILV	5	5	4	2	0	0

Course Name	Drive Systems
Lecturer	D. T. McGuiness, Ph.D (Daniel.McGuiness@mci.edu) (4A-434c)
Study Programme	Mechatronik Design Innovation
Official Name	Machine Learning and Data Science 2 — **Lingo**: English
Lecture Prerequisites	The student should be comfortable with working with either Python and should have gained a working knowledge of statistics.
Course Objectives	**Warning:** This is the content only covered by me as this lecture is shared by Peter Kandolf in Tutorials. The goal of this lecture is to give you a much deeper understanding of how machine learning algorithms work and work through practical examples. In this lecture we will focus on Neural Networks (NN) a type of machine learning algorithm with uncountable amount of applications in industry.
Primary Course Content	Lecture Homepage on GitHub | WebBook
Secondary Course Content(s)	*Neural Networks: Methodology and Applications* by Gérard Dreyfus , *Python for Data Analysis: Data Wrangling with Pandas, Numpy, and iPython* by Wes McKinney , *Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow* by Aurélien Géron , *TensorFlow for Deep Learning: From Linear Regression To Reinforcement Learning* by B. Ramsundar, and R. B. Zadeh , *AI and Machine Learning for Coders* by Moroney L. , *Neural Networks and Deep Learning* by Aggarwal S. ,
Homework(s) and Project(s)	Personal Assignment (40) Final Exam (60)

Assessment Criteria

Assignment Type	Effect	Count
Personal Assignment	40	1
Final Exam	60	1

Lecture Structure

Order	Topic	Units	Self Study
1	Support Vector Machines	4	8
	Introduction | Linear svm Classification | Nonlinear svm Classification | svm Regression | Understanding Linear svm Classifiers		
2	Decision Trees	4	8
	Introduction | Training and Visualising Decision Trees | Making Predictions | Estimating Class Probabilities | The CART Training Algorithm | Gini Impurity or Entropy? | Regularization Hyperparameters | Regression | Sensitivity to Axis Orientation | DTs Have a High Variance		
3	Ensemble Learning and Random Forests	4	8
	Introduction | Bagging and Pasting | Random Forests | Boosting | Bagging v. Boosting | Stacking		
4	Dimensionality Reduction	4	8
	Introduction | Main Approaches to Dimensionality Reduction | Principal Component Analysis (PCA) | Random Projection | Locally Linear Embedding		
5	Unsupervised Learning	4	8
	Introduction | Clustering Algorithms | Gaussian Mixtures		
6	Introduction to Artificial Neural Networks	4	8
	Introduction | From Biology to Silicon: Artificial Neurons | Implementing mlps with Keras		
7	Computer Vision using Convolutional Neural Networks	4	8
	Introduction | Visual Cortex Architecture | Convolutional Layers | Pooling Layer | Implementing Pooling Layers with Keras | CNN Architectures | Implementing a ResNet-34 CNN using Keras | Using Pre-Trained Models from | Pre-Trained Models for Transfer Learning | Classification and Localisation | Object Detection | Object Tracking | Semantic Segmentation		
8	**Sum**	28	56

- Any major announcements will be made on SAKAI regarding any possible date/content/structural changes for the assignment(s), exam(s).
- Any lecture material will be posted at the lectures corresponding GitHub home-page. The link will be present on the lectures SAKAI homepage.

- If there are any questions regarding course content/exams/assignments please do not refrain from contacting me (Daniel.McGuiness@mci.edu).