Group Workshop Syllabus

1. Overview

<table>
<tr><td>Title</td><td colspan="3">Deep Learning</td></tr>
<tr><td>Targeted Students</td><td colspan="3">College students interested in: Deep Learning / AI / Data Science / Machine Learning / Statistics / Computer Science.</td></tr>
<tr><td rowspan="4">Prerequisites</td><td rowspan="2">High School Students</td><td>Required course/Knowledge</td><td>-</td></tr>
<tr><td>Recommended Materials for preparing for the course</td><td>-</td></tr>
<tr><td rowspan="2">College Students</td><td>Required course/Knowledge</td><td>Calculus I</td></tr>
<tr><td>Recommended Materials for preparing for the course</td><td>Distributed separately (see attached document)</td></tr>
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2. Program Introduction and Objectives

<table>
<tr><td>Introduction</td><td>

- **Background**

Deep learning became the engine behind many of today's data-driven products and applications. It is found in products ranging from financial services to health and from self-driving cars to security. This course will help you understand how and why deep learning's dominance came about and what you can do to use it your own work.

- **Aim**

This course aims to provide an introduction to the fundamentals of deep learning. It will cover the most common forms of model architectures and primarily the algorithms used to train them. Attention will also be payed to how deep learning manifests in both distributed and constrained compute platforms (e.g., computing clusters, wearables and phones). Theory and principles will be presented, but this will go hand-in-hand with a focus on practical experience such as using existing frameworks and implementing (simplified versions) of core algorithms. Students will be taught the basics of neural networks, convolutional networks, recurrent networks; and introduced to concepts such as: dropout, batch normalization, and types of hyper-parameter optimization. Applications in
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	the area of audio and image processing will be discussed. ● **Description** **This is a practice-driven deep learning course that assumes familiarity with college-level Calculus I and some programming experience.**
Course Objectives	**An understanding of the core concepts and theory related to varieties of deep learning (such as convolutional and recurrent architectures), along with common applications of such models. The building of hands-on expertise in training and modelling using deep architectures with existing frameworks – complemented with experiences implementing basic versions of key algorithms. Awareness of distributed and constrained variants of deep learning techniques suitable for cloud and mobile/embedded environments.**
Software/Tools (if any)	Python 3, TensorFlow and or PyTorch

3. Program Schedule

Week		Lecture	Mentor Session (lab/case study, etc.)	Assignment	Reading Materials
1	**Topic**	**Introduction to DNNs**	**Training DNNs**	**Weekly summary.**	
	Detail	From linear classifiers to deep models.	The core mechanics of DNN training.		
2	**Topic**	**Convolutional Neural Networks**	**The art of DNN training I**	**Weekly summary.**	
	Detail	A detailed look at the core DNN layer for vision.	Practical DNN training tips and tricks.		
3	**Topic**	**Recurrent Neural Networks**	**The art of DNN training II**	**Weekly summary.**	
	Detail	A detailed look at the core DNN layers for recurrence.	Practical DNN training tips and tricks.		
4	**Topic**	**Under the Hood**	**Resource Management in DNNs**	**Weekly summary.**	
	Detail	An exploration of the systems powering the DNN models.	An exploration of the software methods accelerating DNNs.		
5	**Topic**	**Research Seminar I**	**Research Seminar I**	**Group progress report (verbal).**	
	Detail	Best practices in DNN research and a final project seminar.	Research seminar I continued. A CNN project demo.		
6	**Topic**	**Research Seminar II**	**Research Seminar II**	**Group progress report (verbal).**	
	Detail	Best practices in DNN research and a final project seminar.	Research seminar II continued. An RNN project demo.		
7	**Final Project Review Week**				
7	**Final Written Reporting and Oral Presentation**				