

**IST 690 Independent Study Deep Learning: A comparative
review on Coursera's Deep Learning AI and Syracuse's MS
Applied Data Science Program Coursework**

by

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Overview:

The following analysis compares Andrew Ng's Deep Learning specialization on Coursera, and the MS in Applied Data Science from Syracuse's University Information School (iSchool). It provides a high level review, that may help in understanding the differences between them.

Emphasis is given on the structure and content of the two methods of teaching. A second portion of this review focuses on the high level understanding of deep learning from the specialization vs. machine learning; the most common model methodology applied in some iSchool classes.

By the end of the reading you should be able to have an idea of the two ways of teaching, as well as to what you would get from them.

Coursera's Deep Learning Specialization:

<https://www.coursera.org/specializations/deep-learning>

Syracuse's Applied Data Science:

<https://ischool.syr.edu/academics/graduate/masters-degrees/ms-in-applied-data-science>

Comparison of Andrew Ng's Deep Learning Specialization MOOC vs Syracuse's University Classes:

Syracuse's University Applied Data Science in the iSchool or Information School program focuses on data capture, management, analysis and communication for decision making. The main objectives of the program are to:

- Describe a broad overview of the major practices of data science.
- Collect and organize data.
- Identify patterns in data via visualization, statistical analysis and data mining
- Develop alternatives strategies based on the data.

- Develop a plan of action to implement the business decisions derived from the analyses.
- Demonstrate communication skills regarding data and its analysis for managers, IT professionals, programmers, statisticians, and other relevant professionals in their organization.
- Synthesize the ethical dimensions of data science practice such as privacy.

All the objectives demonstrate the emphasis on data. The program teaches different techniques to work with data, but it does not focus on deep learning or machine learning specifically. The reason being is that it's a data science program and not a machine learning or deep learning program, therefore they are part of the interdisciplinary approach of data science. For example some great classes include IST 719 Data Visualization where you learn different techniques that help describe and convey the story behind data using charts or graphs, and you do this with no machine/deep learning.

The classes in the program that do teach some neural network based modeling techniques are few, including IST 565 Data Mining and IST 718 Big Data Analytics. In Data Mining you learn about different algorithm including linear/logistic regression, SVM and Decision Trees algorithms. By the end of the semester the class briefly touches upon deep learning where the importance is given to discussions involving innovations such as that of Alpha Go, the first computer program to defeat a professional human Go player. The program was built using neural networks and proved a major feat given the complexity in the game.

This is why when taking the class, for my final presentation I chose to present on voice recognition due to the excitement to learn something about deep learning and trigger word detection, the words used to initiate voice assistants like Siri and Amazon's Alexa.

While networking, and doing some online research, I came upon Andrew Ng's Deep Learning ai Specialization. Andrew is a professor of computer science at

Stanford University. His credentials, and online reviews for the Deep Learning ai Specialization solidified my interest in the course.

In contrast to Syracuse's Applied Data Science Program, Andrew Ng's Deep Learning Specialization primarily focuses on deep learning.

The main topics learned are:

- Neural Networks and Deep Learning
- Improving Deep Neural Networks with Hyperparameter tuning, Regularization and Optimization
- Structuring Machine Learning Projects
- Convolutional Neural Networks
- Natural Language Processing by building Sequence Models such as RNN and LSTM

The specialization is broken down into five sections, all showing an important phase of deep learning. Course 2 and 3 are unique to the Deep Learning ai Specialization. No other courses I perused over talk about these topics in any way how Andrew does. In fact he states that no university course with deep learning courses will teach how to structure machine learning projects. Andrew is just as good as the iSchool in teaching the content in a practical applied way, without going too much into theory. By the end of the courses you realize how good Andrew is at making the quizzes and assignments be straight forward, and appreciate his ability for teaching.

It is because of Andrew that I've confirmed how good massive online open courses or MOOCs are for accessibility. Andrew's deep learning course itself has millions of enrollments and hundred of thousand completions. A main difference therefore between Coursera's specialization and the masters program at Syracuse University is the fact that Andrew teaches more people than any one else thanks to it's online format, price and accessibility, therefore making a big impact on the field.

Syracuse University also offers the Applied Data Science degree online, and this

was in fact, a previous program format for the now popular degree. When it comes to accessibility, Syracuse's programs are harder to pursue, as you have to apply to the program, unlike the Coursera specializations.

In other words, courses like Andrew's, that are turned into digital products via different platforms such as Coursera, may become more valuable if they keep getting reputable. They may not be accredited but for the most part are practical hands on and valuable for learning new skills important to the tech industry.

Comparison between the Machine Learning Approach vs Deep Learning :

The major difference between the Neural Network based modeling techniques in the Deep Learning Specialization and the machine learning based techniques learnt in other iSchool classes is that machine learning algorithms require some sort of structured data and deep learning networks work on layers of artificial neural networks. This means that data is presented differently to the system.

Machine learning algorithms are built to learn, and be able to accomplish tasks by understanding labeled data, and trained several times by people to get a desired output, whereas deep learning networks rely on the nested layers in neural networks to put data through hierarchies, that makes for learning of their own. An over simplistic comparison would be that machine learning algorithms always need human intervention when the output is not the desired one, and deep learning networks do not. The reality however as explained by Andrew is that deep learning approaches also need human intervention, and labeled data depending on the task being done, as explained in Course 3 of structuring deep learning projects. Another thing to remember is that the quality of the data determines how good a result is.

To better illustrate the differences between the two, we can look at a specific problem, and the way it can be solved with the two approaches. One of the main tasks of the Deep Learning Specialization was to identify images of cats, and it also mentions how to do so with both cats and dogs.

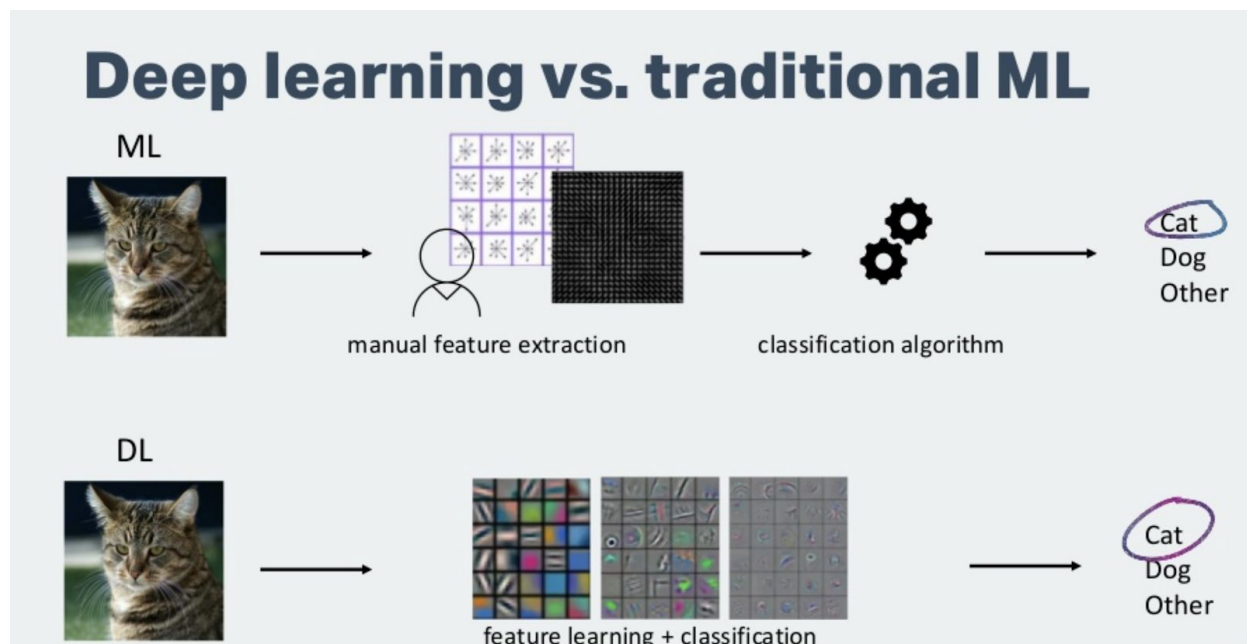
Identifying cat and dog images from a collection using Deep Learning:

- Artificial Neural Networks send the input data of images through layers of the network with each network defining specific features of images hierarchically.
- Once data is passed through the layers within the deep neural network, the system classifies the cat and dog images using specific identifiers.

Identifying cat and dog images from a collection using Machine Learning:

- Label pictures for cats and dogs.
- Use structured data on machine learning algorithm to learn.
- Classify pictures of both animals based on features learn through labels.

Picture showing keypoint differences of DL and ML:



A point to make is that machine learning algorithms cannot solve problems with the same level of high complexity like the deep learning approach can, given the need for labeled data. The meaning of this is that deep learning neural networks can be used on a much larger scale. Andrew believes deep learning will only

become more important to solve problems, in part because we're generating more data than before, and because a neural network is only able to see edges or concepts within layers of neural networks when exposed to a million data points or so.

Conclusion:

In conclusion both Syracuse's University Applied Data Science Program and Coursera's deep learning specialization teach you to work with data. One however, teaches how to work with traditional machine learning methods and the other given the availability of more data, teaches how to use neural networks to solve problems.

The approach of the iSchool to teach in a hands on applied format is a great way to learn. However with the rise of massive open online courses and the high demand for data skills in the job market, along with the accessibility, reputability of some of these courses, and tech skill offerings I only see them as a valuable contribution for data enthusiasts, technologists and professionals anywhere.