COMPUTATIONAL INTELLIGENCE

LABORATORY CLASSES

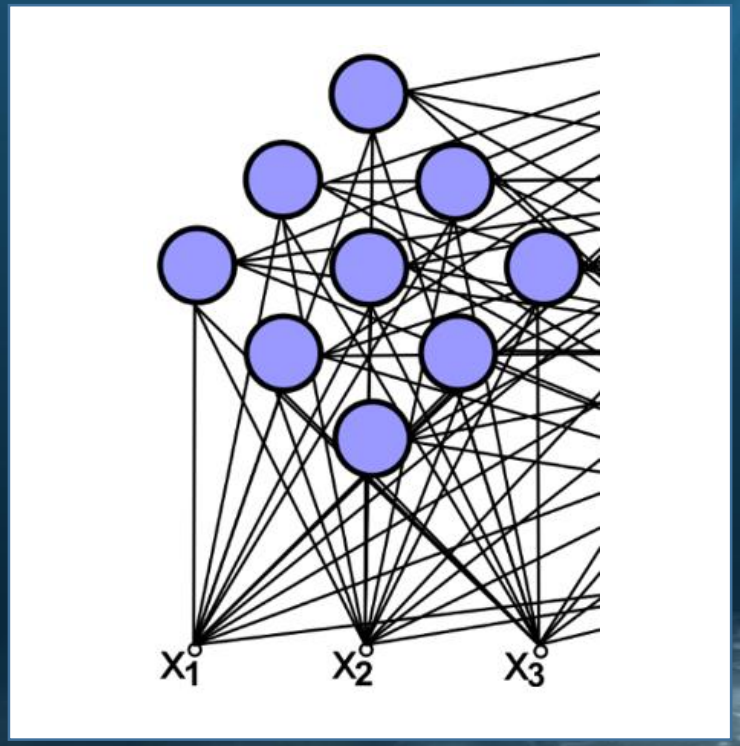
Implementation of a Autoencoder or Self-Organizing Map for Feature Extraction, Clustering or Classification

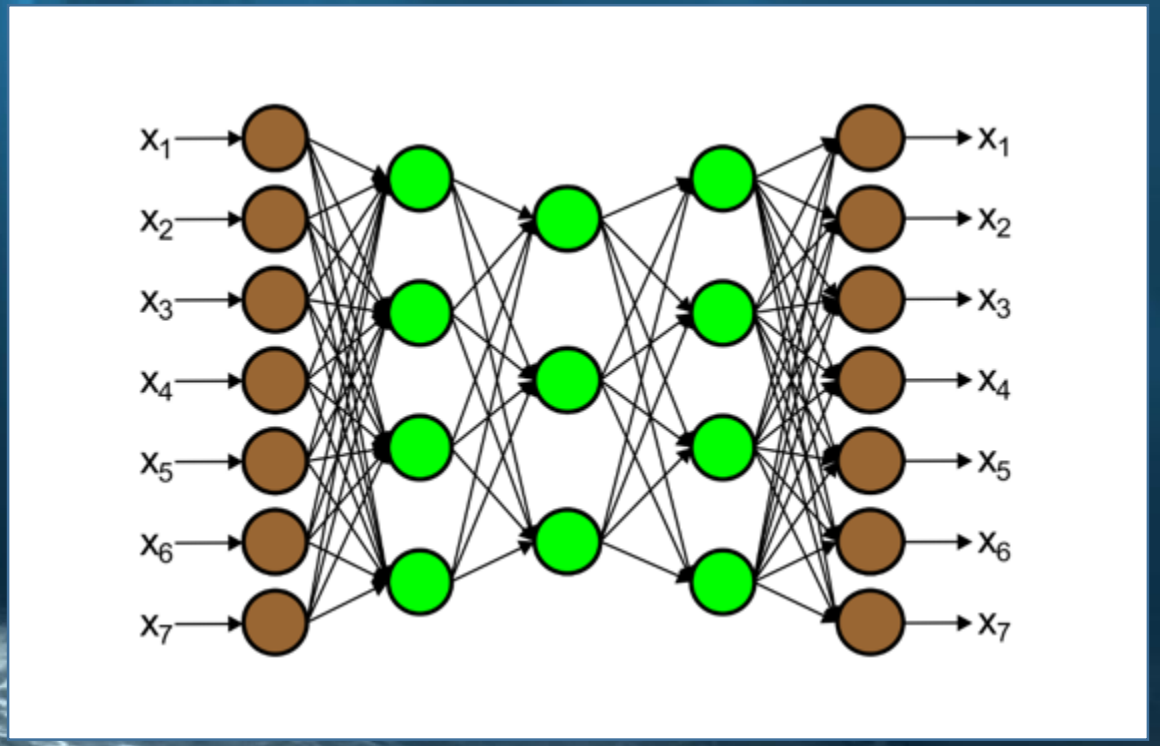
AGH

Adrian Horzyk

Implement SOM or Autoencoder

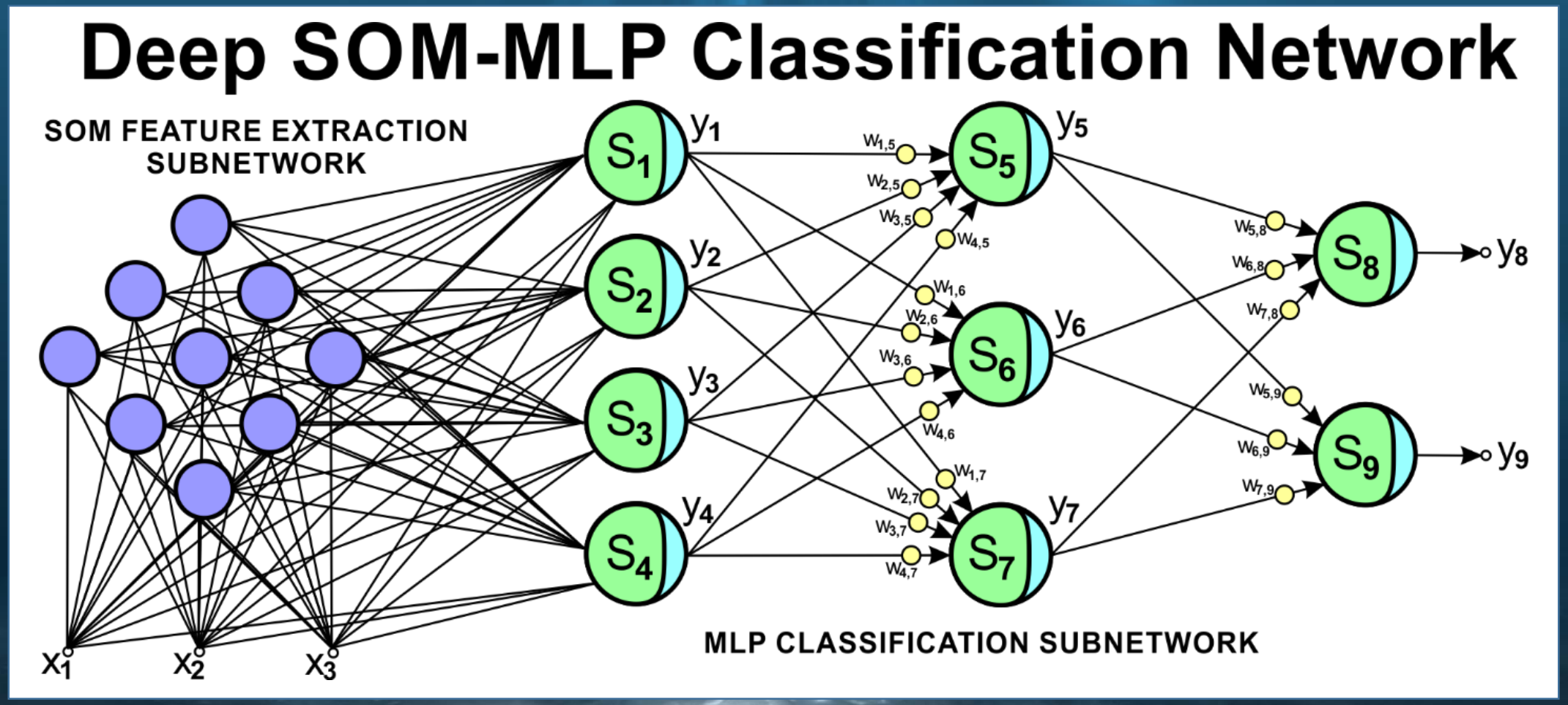
Implement Kohonen's SOM or autoencoder network for given dataset and use it for major feature extraction or clustering of training samples X_1, X_2, …, X_n. Next, combine the chosen network with MLP, using the SOM or autoencoder results as an extra inputs for MLP network and try to create such a hybrid classifier.





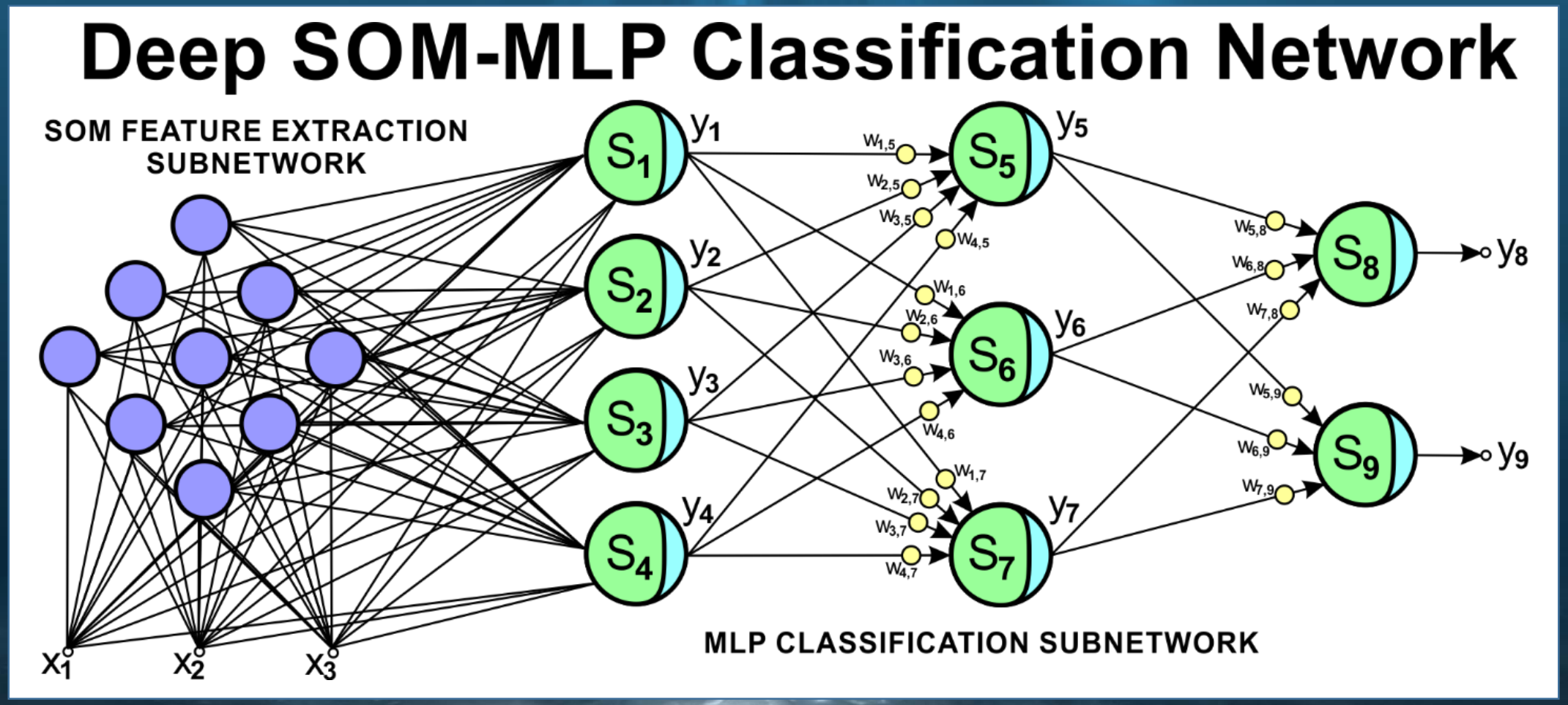
Use SOM in your Deep MLP Classifier

In the first layer of the already developed MLP network, add the unsupervised trained SOM for initial features extraction and develop a deep MLP Classifier for the Iris or Wine data. Use all output nodes of the SOM as inputs to the MLP network, as well as raw inputs x_1, x_2, …, x_n. Compare results with the already developed solutions.



Use SOM in your Deep MLP Classifier

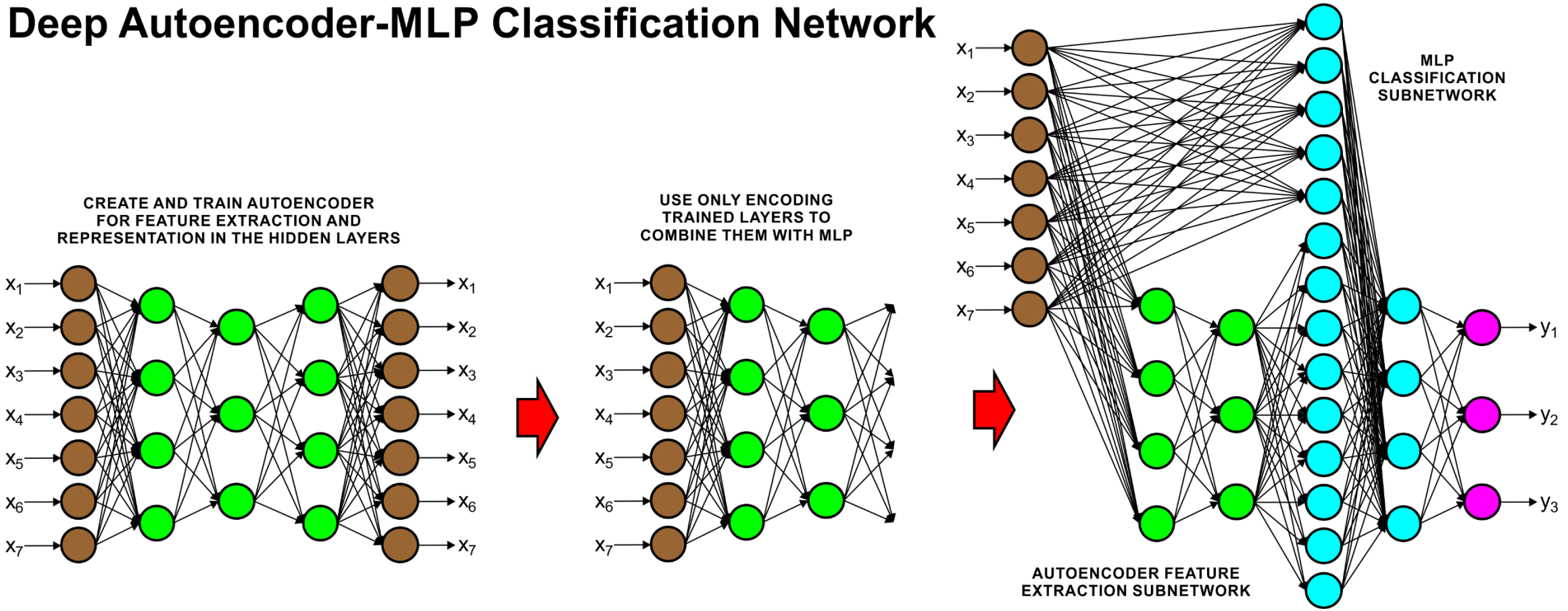
First, create a SOM network and train it to get groups of training samples represented by its nodes.
Second, use all SOM outputs computed for each original input data and original raw input data $x_1, x_2, \ldots, x_n$ to stimulate the MLP network instead of using only the original input data.



Use an Autoencoder in your Deep MLP Classifier

First, create an autoencoder and train it using the previously implemented backpropagation algorithm.
Next, combine this autoencoder with the already developed (deep) MLP network.
Compare results on Iris, Wine, and other training datasets with the already developed solutions.

Deep Autoencoder-MLP Classification Network



Bibliography and References

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LECTURES

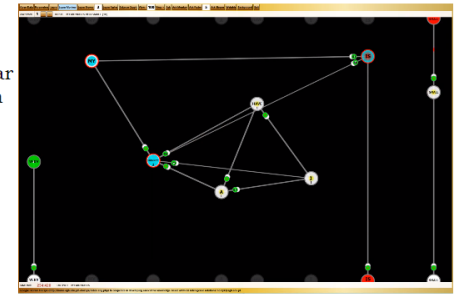
(will be renewed and expanded during the semester)

- Introduction to Artificial and Computational Intelligence
- Artificial Neural Networks, Multilayer Perceptron MLP, and Backpropagation BP
- Radial Basis Function Networks RBFN
- Unsupervised Training and Self Organizing Maps SOM
- Recurrent Neural Networks
- Introduction of Final Projects and Description of Requirements
- Associative Neural Graphs and Associative Structures
- Deep Associative Semantic Neural Graphs DASNG
- Associative Pulsing Neural Networks
- Deep Learning Strategies and Convolutional Neural Networks
- Support Vector Machines SVM
- Fuzzy Logic and Neuro-Fuzzy Systems
- Motivated and Reinforcement Learning
- Linguistic, Semantic Memories, and Cognitive Neural Systems
- Psychological Aspects of Intelligence, Human Needs, and Personality
- Writing Journal Papers

COMPUTATIONAL INTELLIGENCE

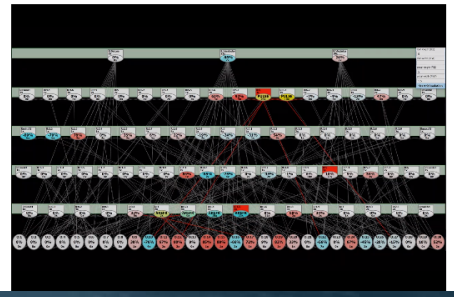
This course includes 28 lectures, 14 laboratory classes, and 14 project classes.

What is this course about?



This course is intended to give students a broad overview and deep knowledge about popular solutions and efficient neural network models as well as to learn how to construct and train intelligent learning systems in order to use them in everyday life and work. During the course we will deal with the popular and most efficient models and methods of neural networks, fuzzy systems and other learning systems that enable us to find specific highly generalizing models solving difficult tasks. We will also tackle with various CI and AI problems and work with various data and try to model their structures in such a way to optimize operations on them throughout making data available without necessity to search for them. This is a unique feature of associative structures and systems. These models and methods will allow us to form and represent knowledge in a modern and very efficient way which will enable us to mine it and automatically draw conclusions. You will be also able to understand solutions associated with various tasks of motivated learning and cognitive intelligence.

Lectures will be supplemented by laboratory and project classes during which you will train and adapt the solution learned during the lectures on various data. Your hard work and practice will enable you not only to obtain expert knowledge and skills but also to develop your own intelligent learning system implementing a few of the most popular and efficient CI methods.



Expected results of taking a part in this course:

- **Broad knowledge** of neural networks, associative and fuzzy systems as well as other intelligent learning systems.
- **Novel experience** and **broaden skills** in construction, adaptation and training of neural networks and fuzzy systems.
- **Ability to construct** intelligent learning systems of various kinds, especially deep learning solutions.
- **Good and modern practices** in modelling, construction, learning and generalization.
- **Own intelligent learning system** to use in your life or work.
- **Satisfaction** of enrollment to this course.

http://home.agh.edu.pl/~horzyk/lectures/ahdydci.php