ARTIFICIAL INTELLIGENCE AND DEEP LEARNING

WEEK 6
2021 SPRING

Deep Learning Libraries

- Software Library is a group of program codes and data that contain functions, (object) types, macros etc. that are frequently used to develop a software.
- In any programming language, most of the functions (types, objects or macros) required while writing a code (algorithm or applications) will be necessary not only in that code but in many different codes that will be written.
- Instead of writing these functions from strarch, putting them into a format so that we could call them only by their names and inputs would provide a very valuable benefit in terms of time and workload. Libraries are created for this purpose, at the same time playing an important role in information sharing across developers.
- Libraries can be either in the form of main libraries that contain essential functions for a compiler to work (ex: stdio.h for C and C++) or designed specifically for very different applications areas and contain complex structures that could be useful only in that area.

Deep Learning Libraries

- Artificial intelligence and deep learning can be analyzed in two categories in terms of context:
  - Artificial General Intelligence: is a set of software and hardware based systems that is designed with inspiration from human neural system that has the ability of visual recognition, speaking, sound recognition, movement, accounting and judgement skills and continue learning process by itself.
  - Artificial Narrow Intelligence: They are the artificial intelligence systems with a narrow context that are developed for the solution of a given problem and learn from a dataset that is spesific to that problem.
- Artificial general intelligence is a very comprehensive and extensive research area over which research is carried out today by certain large organisations trying to realize it with teams of thousands of people.
- Artificial narrow intelligence, on the other hand is a research area that could be researched individually today that is spesific to a certain applications with successful results been obtained for approximately 30 years.
- For this reason, almost all of the present libraries are developed towards artificial narrow intelligence applications, generally covering a given applications area or methodology groups.

Deep Learning Libraries

- With the introduction of Deep Learning concept, studies on different fields inlcuding voice and face recognition have started and many institutions/teams started to create their own deep learning libraries.

- The availability of deep learning libraries naturally depends on the programming language used. Programming languages that are commonly used in artificial intelligence and deep learning are:

- Python
  - Matlab
  - C/C++
  - Java/Javascript
  - R

Deep Learning Libraries- Pyhton

- **Pyhton** is considered as the most widely used (%57) programming language since it is employed in the background of many deep learning libraries (Kızrak 2018).

- Pyhton libraries that are frequently used are given in the table below.

Library	Developer
TensorFlow	Google
Caffe	Berkeley Vision and Learning Center
Caffe2	Facebook
PyTorch	Facebook
Keras	Francois Chollet
Theano	Montreal İnstitute for Learning Algorithms Lab.

Deep Learning Libraries- Matlab

- Various libraries are available for Matlab that can be used in many deep learning applications with its wide area of usage.
- Matlab libraries can be created more easily when compared to other programming languages. Therefore, most of the available libraries are the ones that were developed by individual researchers towards spesific applications.
- Some of these are given in the table below.

Library	Developer
cuDNN	NVIDIA
Deep Learning Toolbox	Matlab
NIH Library	A.B.D. Ulusal Sağlık Enstitüsü
ConvNet	Matlab
MatDL	Haytham M. Fayek

Deep Learning Libraries– C/C++

- Usage of C and C++ that are among the most widely used programming languages today in the field of deep learning is also present. Various libraries are created in this direction. You can find some of these in the table below.

Library	Developer
Cuda Convnet	Alex Krizhevsky
MShadow	Distributed (Deep) Machine Learning Community
CXXNET	Distributed (Deep) Machine Learning Community
Eblearn	Pierre Sermanet
CUV Library	AIS lab (Bonn)

Deep Learning Libraries- Java/Javascript

- Java ve Javascript are high-level programming languages just like C/C++ However, unlike C group programming languages, Java and Javascript are relatively distant languages with their similarities being limited to name and foundation principles.

- For this reason, Java and Javascript do not have mutual libraries. In the table below, various examples of libraries developed for Java and Javascript.

Library	Language	Developer
java.awt.event	Java	Oracle
java.io	Java	Oracle
Joose	Javascript	Malte Ubl
SWFObject	Javascript	Geoff Stearns
AngularJS	Javascript	Google

Deep Learning Libraries- R

- Being the most commonly used programming language in data visualization, R is also commonly used in different deep learning applications alongside different fields such as statistical calculation. In the table below, selected examples of deep learning libraries employing R language are presented.

Library	Developer
h20	Erin LeDell
mxnet	Apache
Darch	CRAN
Deepnet	Xiao Rong
Mayer RBM	Zach Mayer

Deep Learning Libraries- R

- Homework: Review a (open Access) library prepared in the programming language according to the last number of your student ID as given in table below. In your review, provide information regarding:
  - Content of the library(functions, types, other classes if available)
  - Aim of the library(ex: image processing, word guessing etc.)
  - Developer of the library & history

  Prepare the review in the form of a brief report (1-2 pages).

Last No of Student ID	Programming Language
0-1	Pyton
2-3	Matlab
4-5	C/C++
6-7	Java/Javascript
8-9	R