Deep-Learning 공개소프트웨어

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소프트웨어 중심사회의 Think Tank SPRi Software Policy & Research Institute

OSS for DL

- TensorFlow, Google, 2015. 11. 9
- DMTK(CNTK), Microsoft, 2015. 11. 12(2016. 1. 25)
- Torch, Facebook, 2015. 1. 16
- CaffeOnSpark, Yahoo, 2016. 2. 26
- Warp-CTC, Baidu, 2016. 1. 14
- Veles, 삼성전자, 2015. 11월
- DIGITS, NVIDIA, 2015. 3월
- DL4j, Skymind, 2014. 6월
- …

Source Open 이유: Give & Take

- **Give**
  - 공유: 개발과정의 시행착오 최소화, 누구나 쉽고 빠르게 접근
  - 공헌: 집단지성에 의한 협력개발로 당분야 기술발전에 기여
  - 공익: AI(DL) 기술의 잘못된 사용을 사전에 방지

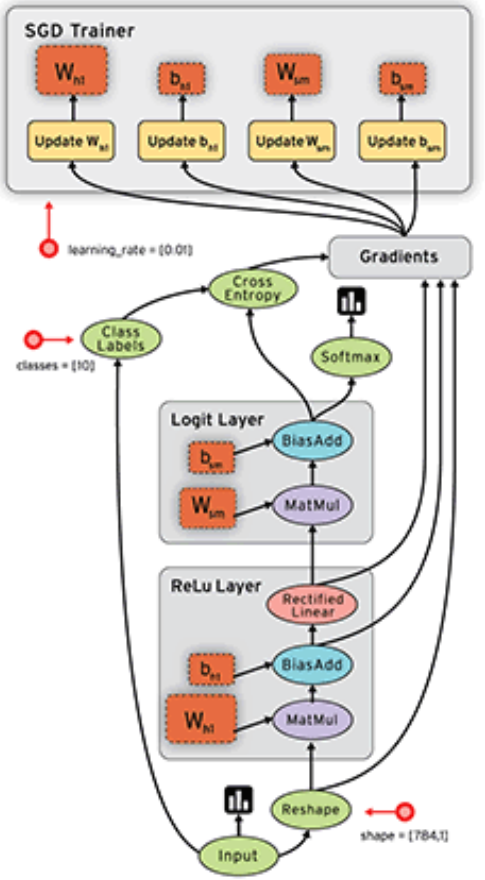
- **Take**
  - 기술주도권 확보: 표준화, 다양한 응용 발굴, 시장영향력 확대
  - 인력수급: User 확장, 인재 확보
  - 기술개선: 외부연구자의 도움에 의한 feedback 및 기술개선 효과

TensorFlow(1)

- **Google Brain Team, 2015. 11. 9**

"…, we hope to create an open standard for exchanging research ideas and putting machine learning in products"

- **https://www.tensorflow.org/**
- **DL library based on Data Flow Graphs**
- **version–up from DistBelief(2011)**
- **Language options: Python, C++**
- **64-bit Linux, Mac OS X, Android, iOS**
- **Apache 2.0 open source license**



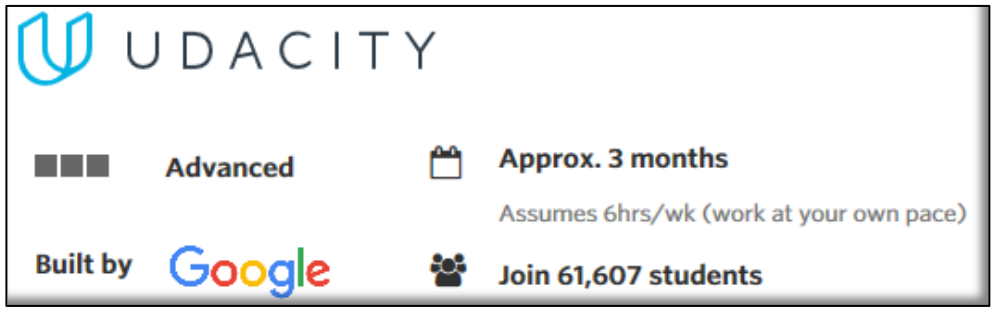
Data Flow Graph

TensorFlow(2)

- **Applications**

  Gmail(smart reply, spam filtering), Speech recognition, Google Translate, Google Photos, Google DeepDream, Google RankBrain, …

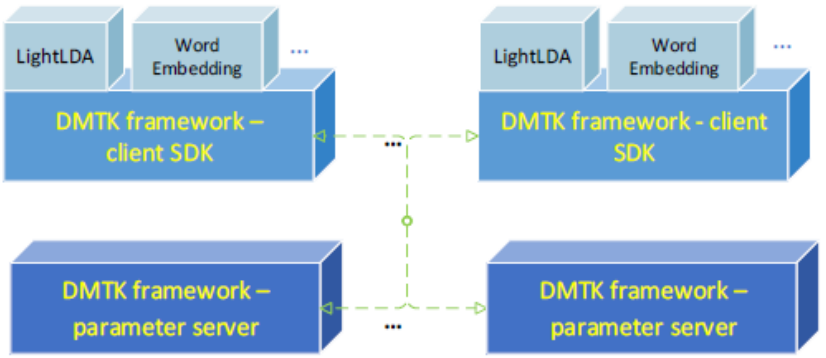
- **TensorFlow courseware in Udacity(MOOC)**
  - https://www.udacity.com/course/deep-learning--ud730



  - Prerequisites
    - Minimum 2 years of programming experience (preferably in Python)
    - Git and GitHub experience (assignment code is in a GitHub repo)
    - Basic machine learning knowledge (especially supervised learning)
    - Basic statistics knowledge (mean, variance, standard deviation, etc.)
    - Linear algebra (vectors, matrices, etc.)
    - Calculus (differentiation, integration, partial derivatives, etc.)

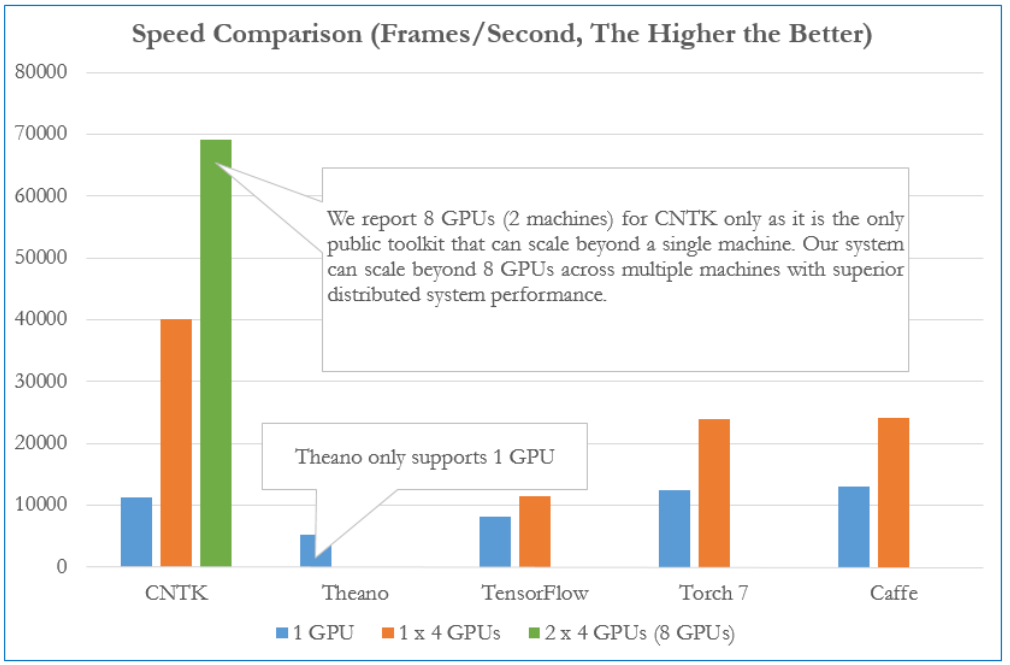
DMTK

- **Microsoft Asia research lab, 2015. 11. 12**
- **http://www.dmtk.io/, https://github.com/Microsoft/DMTK**
- **Distributed Machine Learning Toolkit**
  - 빅데이터를 다수의 컴퓨터로 학습할 수 있는 library(framework)
- **Client/Server방식; C++기반 SDK**
- **Windows server 2012, or Ubuntu 12.04**
- **MS Visual studio 2013(Windows), or g++ 4.8(Linux)**
- **MIT open source license**
- **Applications**
  - topic modeling, word embedding
  - computer vision, text/speech understanding



CNTK

- **Microsoft, 2016. 1. 25**
- **http://www.cntk.ai/**
- **Computational Network Toolkit**
  - 복잡한 구조의 다계층 신경망을 구성할 수 있는 딥러닝 툴킷
  - High speed performance
- **MS Cortana, skype 번역**
- **C++, (Python)**



Torch

- **Facebook, 2015. 1. 16 (origin - 2002. 10월)**
- **http://torch.ch/**
- **Deep learning library for Lua/LuaJIT language**
- **Linux, Mac OS X, Android, iOS**
- **Used by FAIR, Google DeepMind, MS, NVIDIA, IBM, Twitter, …**
- **Key Features**
  - Large-scale Convolutional NN
  - Parallelization over Multiple GPUs
- **Optimized for NVIDIA GPU(CUDA)**
- **BSD open source license**

CaffeOnSpark

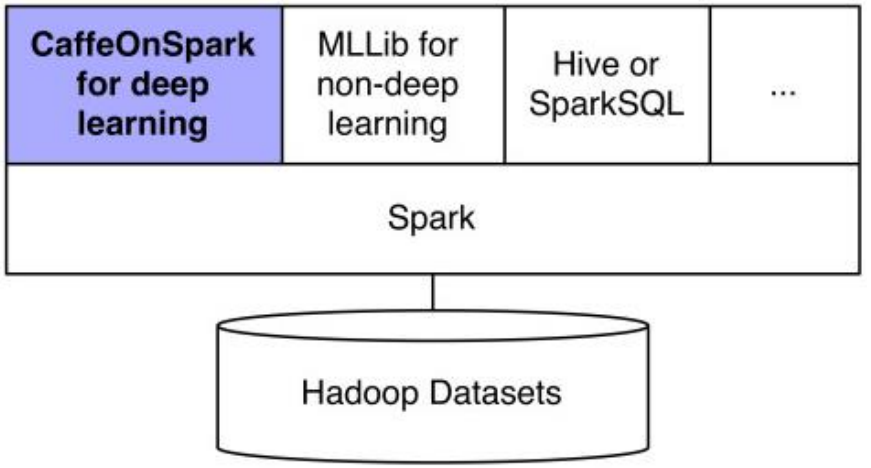
- **Yahoo, 2016. 2. 26**
- **https://github.com/yahoo/CaffeOnSpark**
- **Deep learning system written in C++**

  "…, we created CaffeOnSpark to allow deep learning training and testing to be embedded into Apache Spark applications"

- **Yahoo flicker(photo sharing),**

  음성인식, 비디오분석, …
- **Apache 2.0 open-source license**
- **Open data: 2000만 사용자의**

  뉴스피드 정보(1.5TB)



Caffe

- **BVLC(Berkeley Vision and Learning Center)**
- **https://github.com/BVLC/caffe**
- **Open source framework: fast way to apply deep learning**
  - C++/CUDA architecture (Python, Matlab interfaces)
  - Tools, reference models, demos, and fast & well-tested codes
  - Seamless switch between CPU and GPU
  - Optimized for Ubuntu(Linux) 14.04 and 12.04
- **BSD 2-Clause license**

Framework	License	Core language	Binding(s)	CPU	GPU	Open source	Training	Pretrained models	Development
Caffe	BSD	C++	Python, MATLAB	✓	✓	✓	✓	✓	distributed
cuda-convnet [7]	unspecified	C++	Python		✓	✓	✓		discontinued
Decaf [2]	BSD	Python		✓		✓	✓	✓	discontinued
OverFeat [9]	unspecified	Lua	C++,Python	✓				✓	centralized
Theano/Pylearn2 [4]	BSD	Python		✓	✓	✓	✓		distributed
Torch7 [1]	BSD	Lua		✓	✓	✓	✓		distributed

Warp-CTC

- **Baidu Silicon Valley AI Lab(SVAIL), 2016. 1. 14**

  "…, we want to make end-to-end deep learning easier and faster so researchers can make more rapid progress." (Andrew Ng)

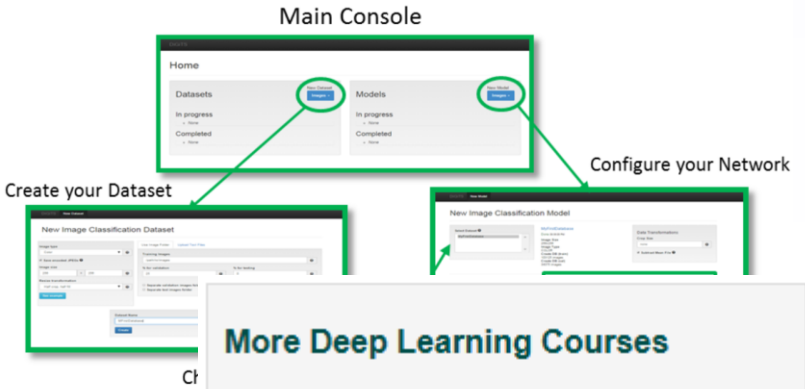
- **https://github.com/baidu-research/warp-ctc**
- **a C library along with integration for Torch**
- **specialized for time-series data, such as speech recognition**
- **used for developing 'DeepSpeech2'**
- **Ubuntu 14.04 and OSX 10.10**

Veles

- **삼성전자, 2015. 11월**
- **https://velesnet.ml/**
- **Distributed platform for rapid DL application development**
  - Platform - https://github.com/Samsung/veles
  - Zincz plugin – NN engine (all widely used NN topologies)
  - Mastodon – Java bridge for Hadoop, etc
  - SoundFeatureExtraction – audio signal library
- **support OpenCL and CUDA**
- **Flow-based programming using Python**
- **Apache 2.0 open-source license**

DIGITS

- NVIDIA, 2015. 3. 17
- https://developer.nvidia.com/digits, https://github.com/NVIDIA/DIGITS



- Interactive system for developing, training and visualizing deep neural netwo
- Integrates Caffe, utilizing cuDNN for GPU a
- Deep learning courses for NVIDIA Develop
  - https://developer.nvidia.com/deep-learning-courses

More Deep Learning Courses

Introduction to Deep Learning, by Andrew Ng (Coursera | YouTube)

NYU Course on Deep Learning, by Yann LeCun (TechTalks)

Neural Networks for Machine Learning" course, by Geoffrey Hinton (Coursera)

Deep Learning for Computer Vision, a NIPS tutorial by Rob Fergus (slides , video)

CalTech's introductory deep learning course, by Yasser Abu-Mostafa (YouTube)

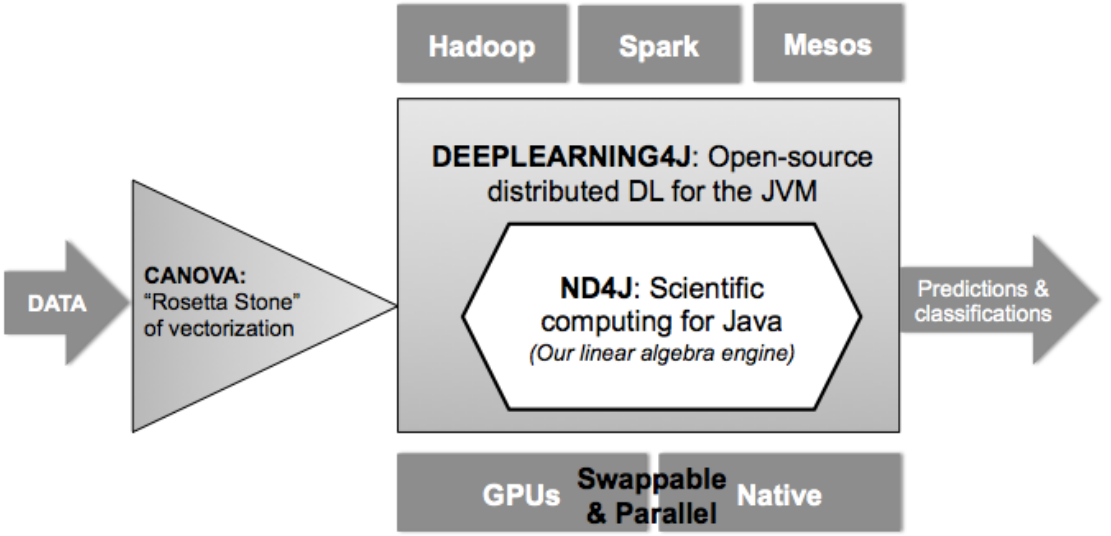
Stanford CS224d: Deep Learning for Natural Language Processing (homepage)

DL4j

- **Skymind(startup), 2014. 6월**

"… we just want to make deep learning applicable to everybody else"

- **Java와 Scala로 작성된 첫 상용 수준의 오픈소스 분산처리 딥러닝 라이브러리 - http://deeplearning4j.org/**
- **Apache 2.0 open source license**
- **Applications**
  - Face/image recognition
  - Voice search
  - Speech-to-text (transcription)
  - Spam filtering (anomaly detection)
  - Fraud detection
  - Recommender Systems (CRM)
  - Regression



DL OSS 선택 기준

- Target applications – NN Models
- Open source license
- Data-oriented vs Model-oriented
- Language bindings, OS
- Multi-GPU?
- Business partnership

Wikipedia Comparison

- https://en.wikipedia.org/wiki/Comparison_of_deep_learning_software


Deep learning software by nam

This list is incomplete; you can help by ex

Software	Creator
Caffe	Berkeley Vision a Learning Cente community contribu
CNTK	Microsoft
Deeplearning4j	Various; originally A Gibson
Neural Designer	Artelnics
OpenNN	Artelnics
SystemML[22]	IBM Research, Databricks, Netfli
TensorFlow	Google Brain tea
Theano	Université de Mont
Torch	Ronan Collobert, K Kavukcuoglu, Cle Farabet

Software	Creator	Software license[3]	Open source	Platform	Written in
Caffe	Berkeley Vision and Learning Center, community contributors	BSD 2-Clause License	Yes	Ubuntu, OS X, AWS,[1] unofficial Android port,[2] Windows support by Microsoft Research,[3] unofficial Windows port[4]	C++, Python[5]
CNTK	Microsoft	Free[12]	Yes	Windows, Linux[13]	C++
Deeplearning4j	Various; originally Adam Gibson	Apache 2.0	Yes	Linux, OSX, Windows, Android, CyanogenMod (Cross-platform)	Java, Scala, C
Neural Designer	Artelnics	Proprietary	No	Windows, OS X, Linux	C++
OpenNN	Artelnics	GNU LGPL	Yes	Cross platform	C++
SystemML[22]	IBM Research, Databricks, Netflix[23]	Apache 2.0	Yes	Linux, Mac OS, Windows	Java, R
TensorFlow	Google Brain team	Apache 2.0	Yes	Linux, Mac OS X (no support for Windows yet[24])	C++, Python
Theano	Université de Montréal	BSD license	Yes	Cross-platform	Python
Torch	Ronan Collobert, Koray Kavukcuoglu, Clement Farabet	BSD License	Yes	Linux, Android,[28] Mac OS X, iOS	C, Lua

OpenAI

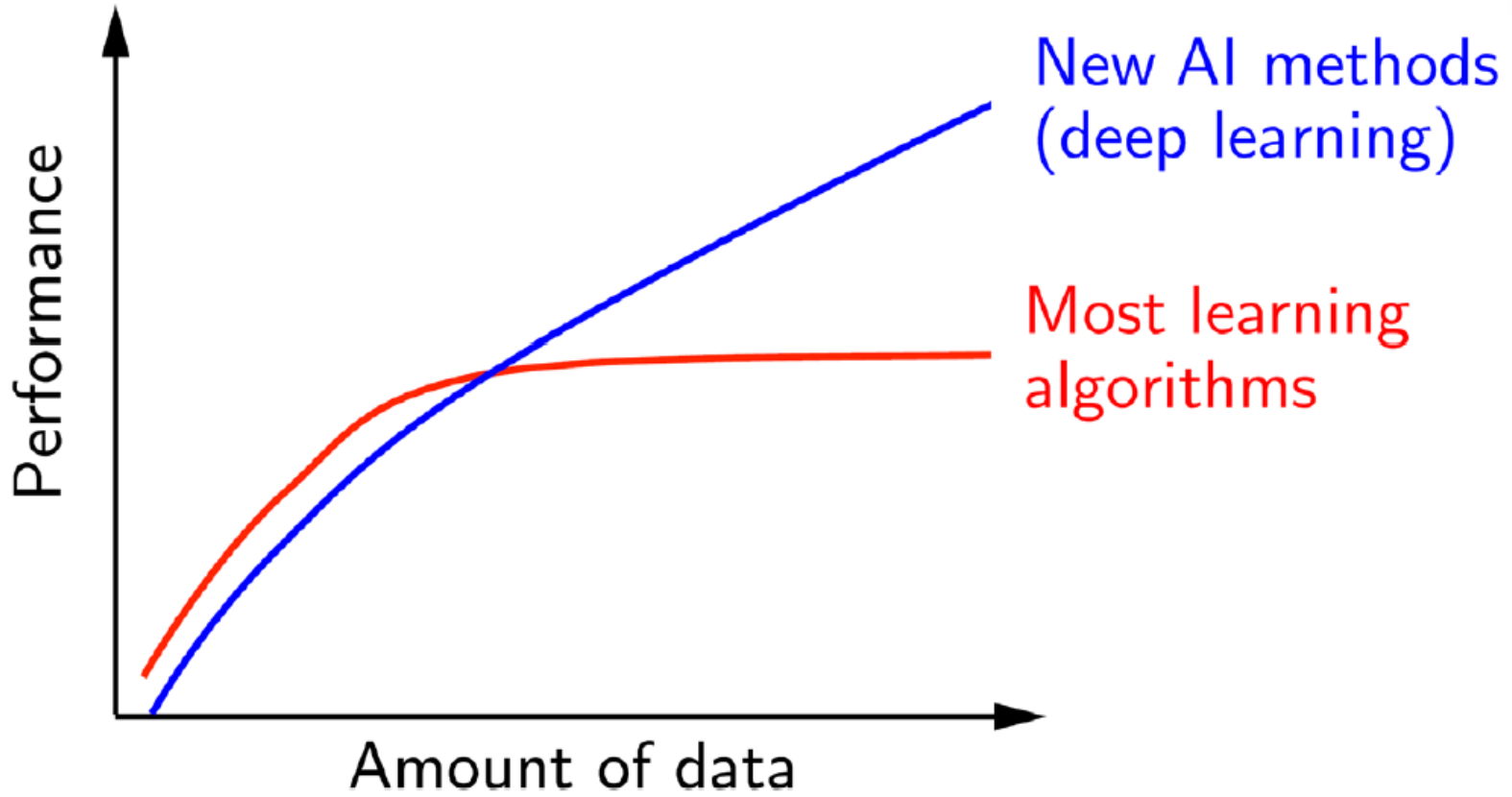
- **2015. 12. 11 설립, www.openai.com**
- **Non-profit AI organization with $1B fund**
  - Elon Musk(Tesla 창업자) & Sam Altman(Y combinator 대표)
  - Paypal, Amazon, Infosys, LinkedIn, …
- **Motivated by concerns about existential risk from advanced AI**

"…, if advanced AI someday gains the ability to re-design itself at an ever-increasing rate, an unstoppable intelligence explosion could lead to human extinction" (Stephen Hawking, Stuart Russell, etc)

- **Aims**
  - promote and develop open-source friendly AI to benefit humanity
  - freely collaborate with other institutions and researcher by making its patents and research open to the public

Deep Learning Breakthrough

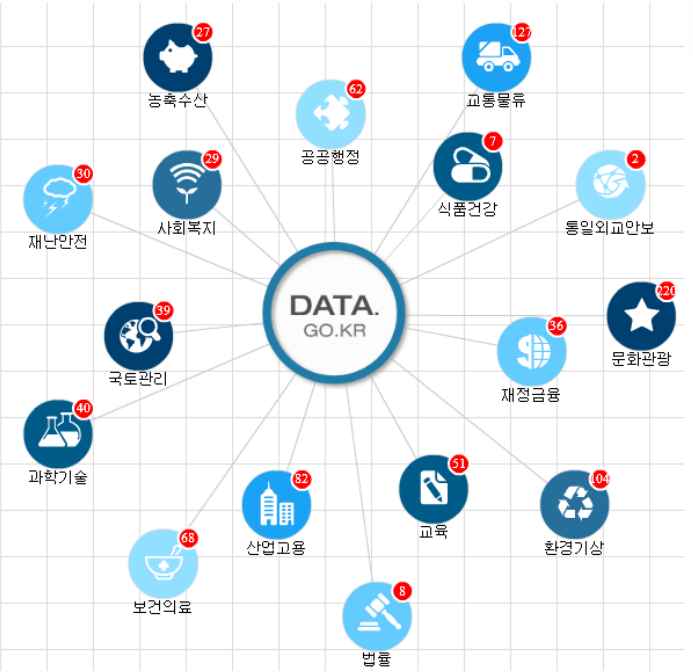
- **Breakthrough = DL + BigData**



[윤성로, 딥러닝 워크샵 2015]

open Data

- **공공데이터 포털(행자부, 2011.6): www.data.go.kr**
  - 「공공데이터의 제공 및 이용 활성화에 관한 법률」 제21조(공공데이터포털의 운영)



- **K-ICT 빅데이터센터(미래부, 2013.11): https://kbig.kr/**

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