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Machine Learning Research in blibli

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Hendri Karisma

- Sr. Research and Development Engineer at blibli.com (PT. Global Digital Niaga)
- Rnd Team for Data Science/intelligence system
- Working for Fraud Detection System. Current working in dynamic recommendation system project.

Definition of Informatics

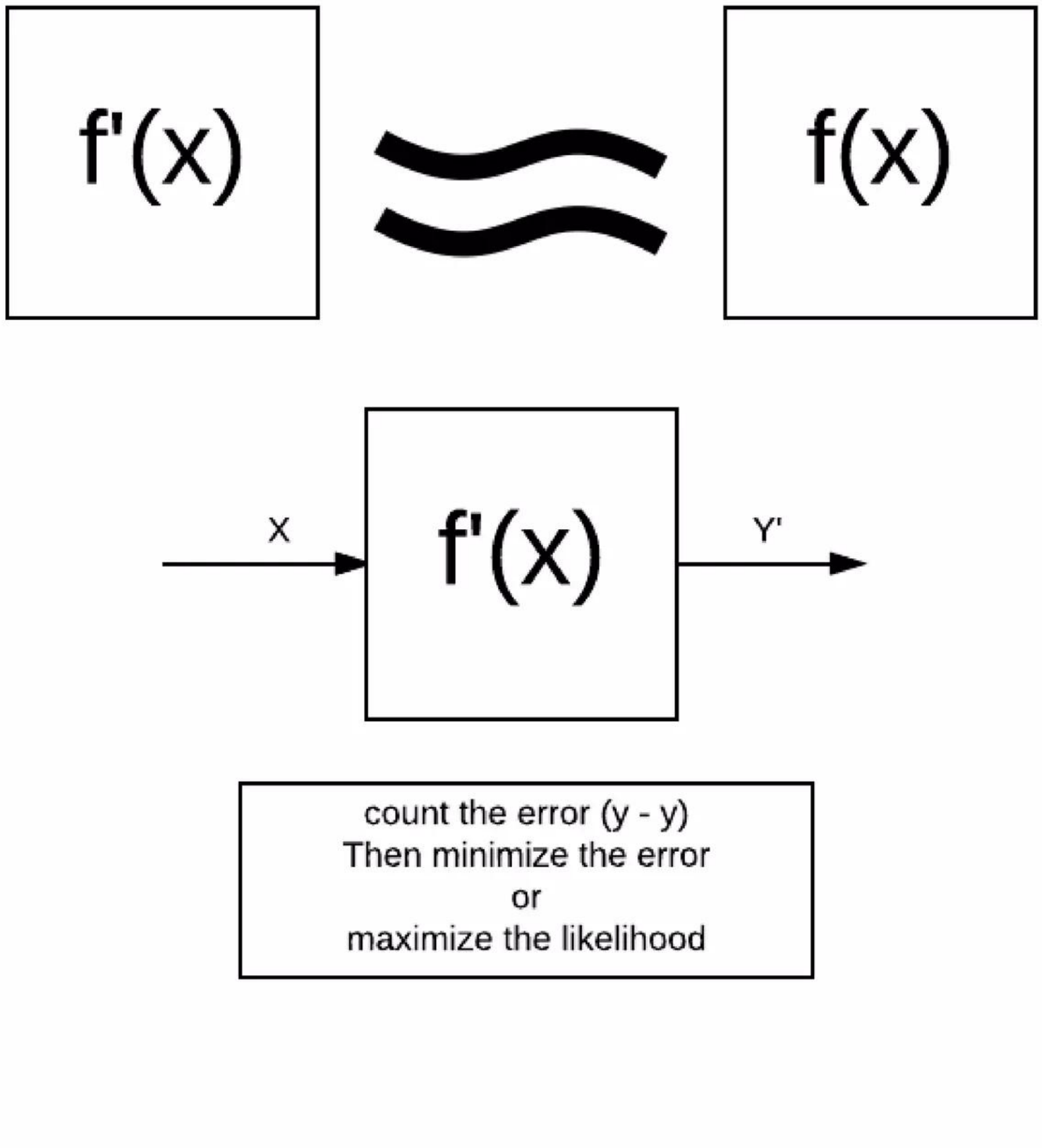
"Automation of Information" –

Prof. Dr. Ing. Iping Supriana

Machine Learning Definition

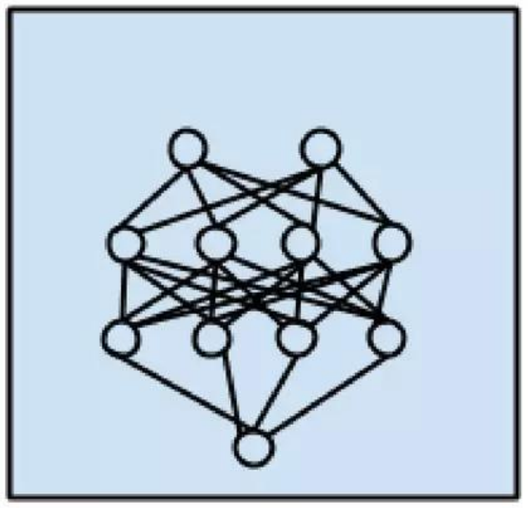
"A computer program is said to learn from experience E with respect to some class of tasks T and performance measure P, if its performance at tasks in T, as measured by P, improves with experience E." – Prof. Tom Mitchel

How it works

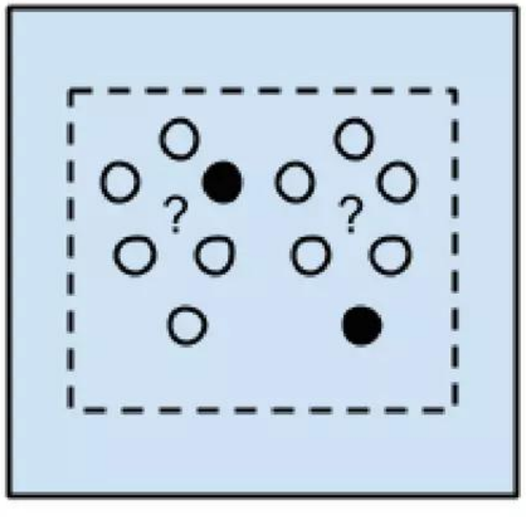

f'(x)
f(x)
X
f'(x)
Y'
count the error (y - y)
Then minimize the error
or
maximize the likelihood

Machine Learning #1

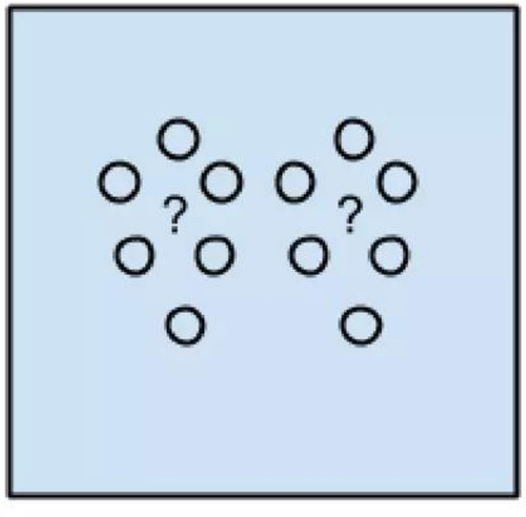
- Supervised
- Unsupervised
- Reinforcement Learning
- Semi-Supervised
- Deep Learning



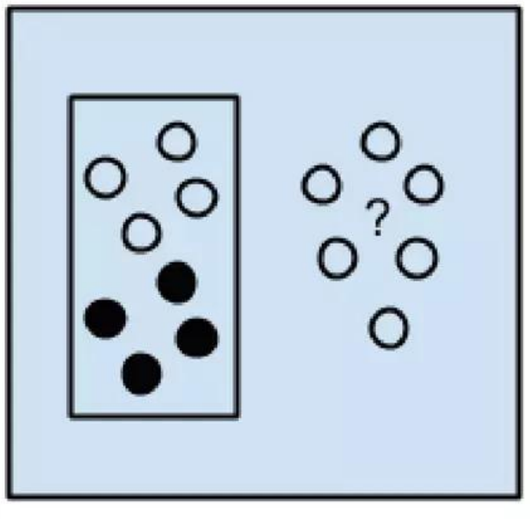
Deep Learning Algorithms



Semi-supervised Learning Algorithms

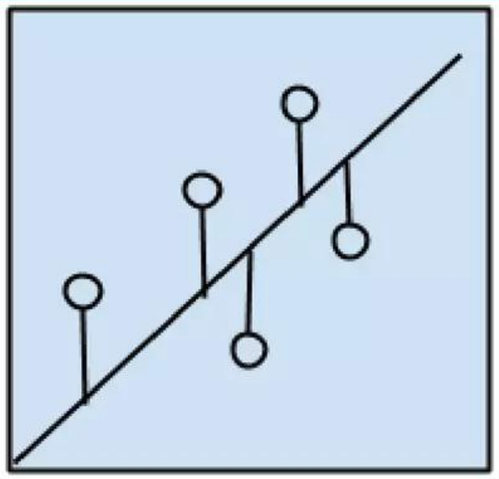


Unsupervised Learning Algorithms

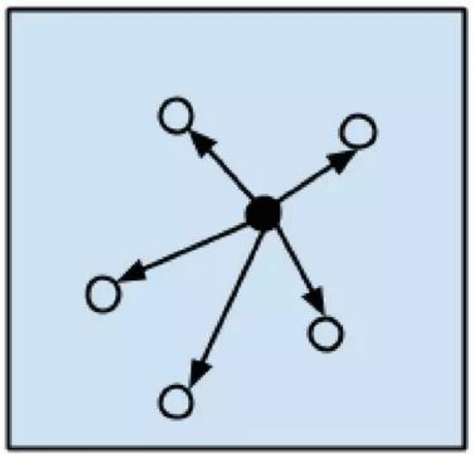


Supervised Learning Algorithms

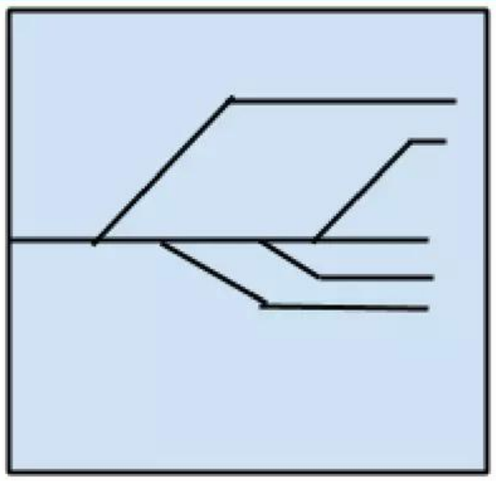
Machine Learning #2



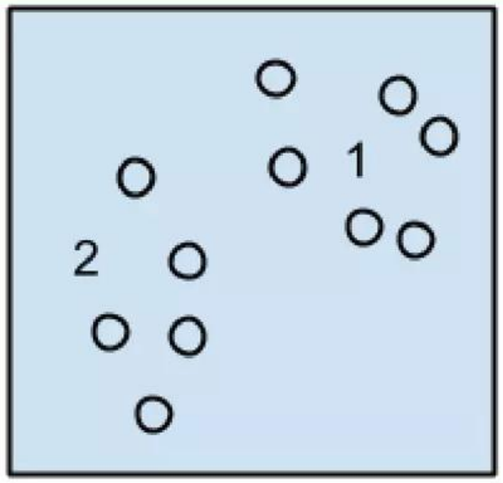
Regression Algorithms



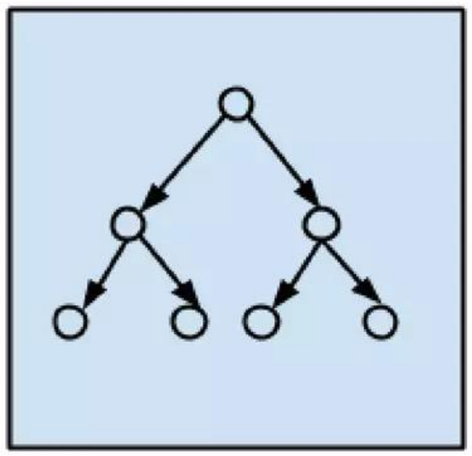
Instance-based Algorithms



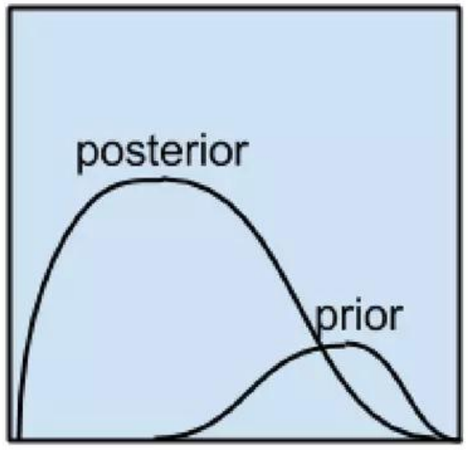
Regularization Algorithms



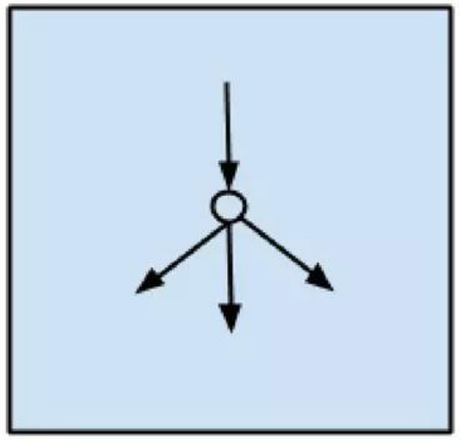
Clustering Algorithms



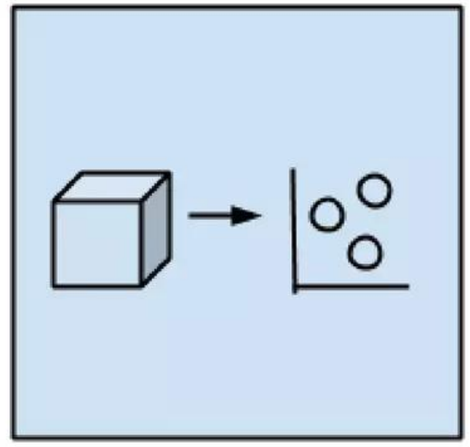
Decision Tree Algorithms



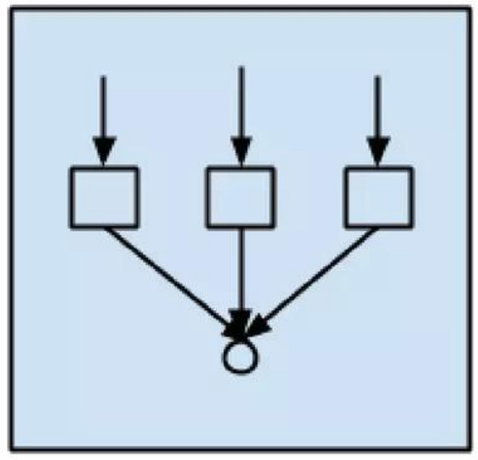
Bayesian Algorithms



Artificial Neural Network Algorithms

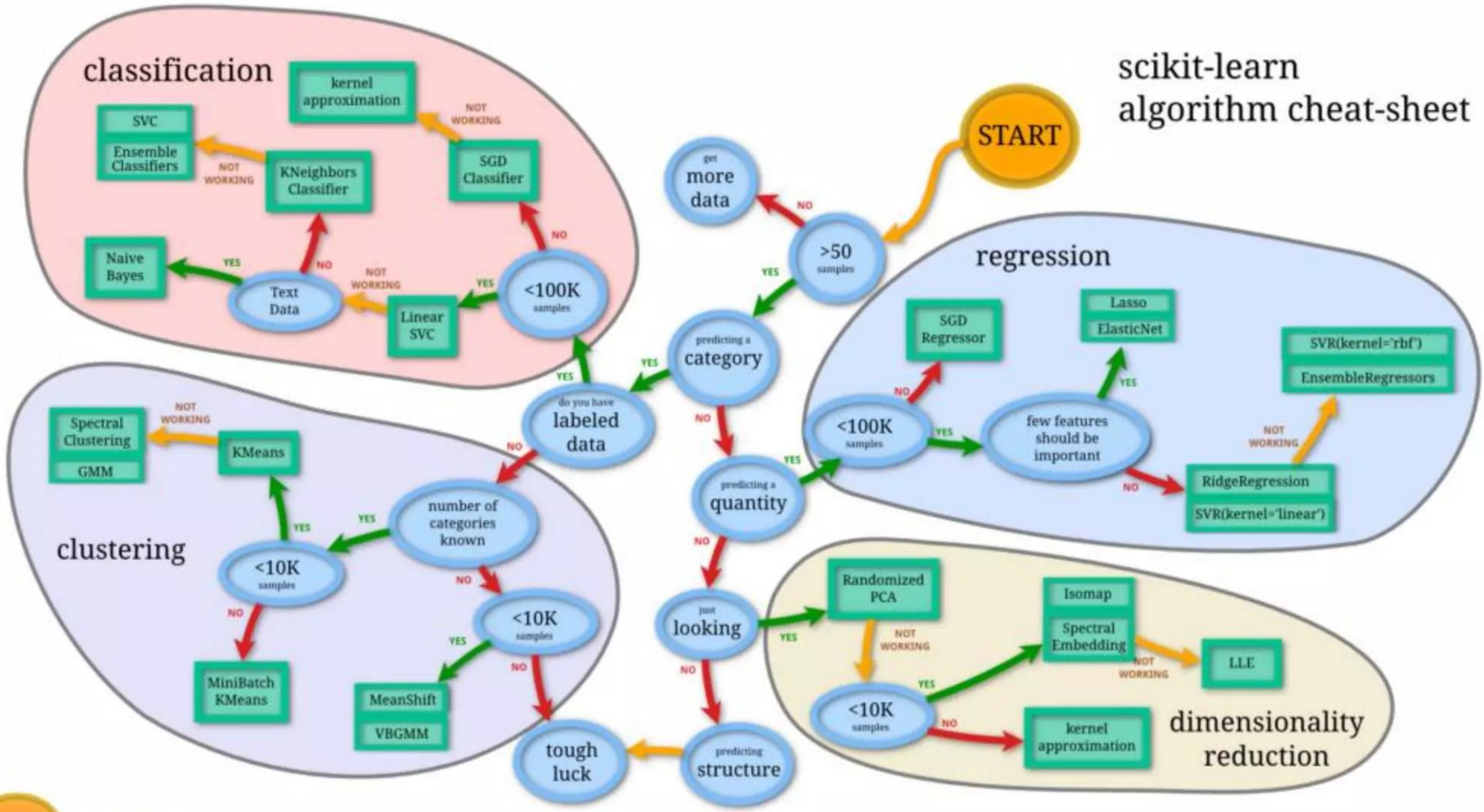


Dimensional Reduction Algorithms



Ensemble Algorithms

Machine Learning Taxonomy



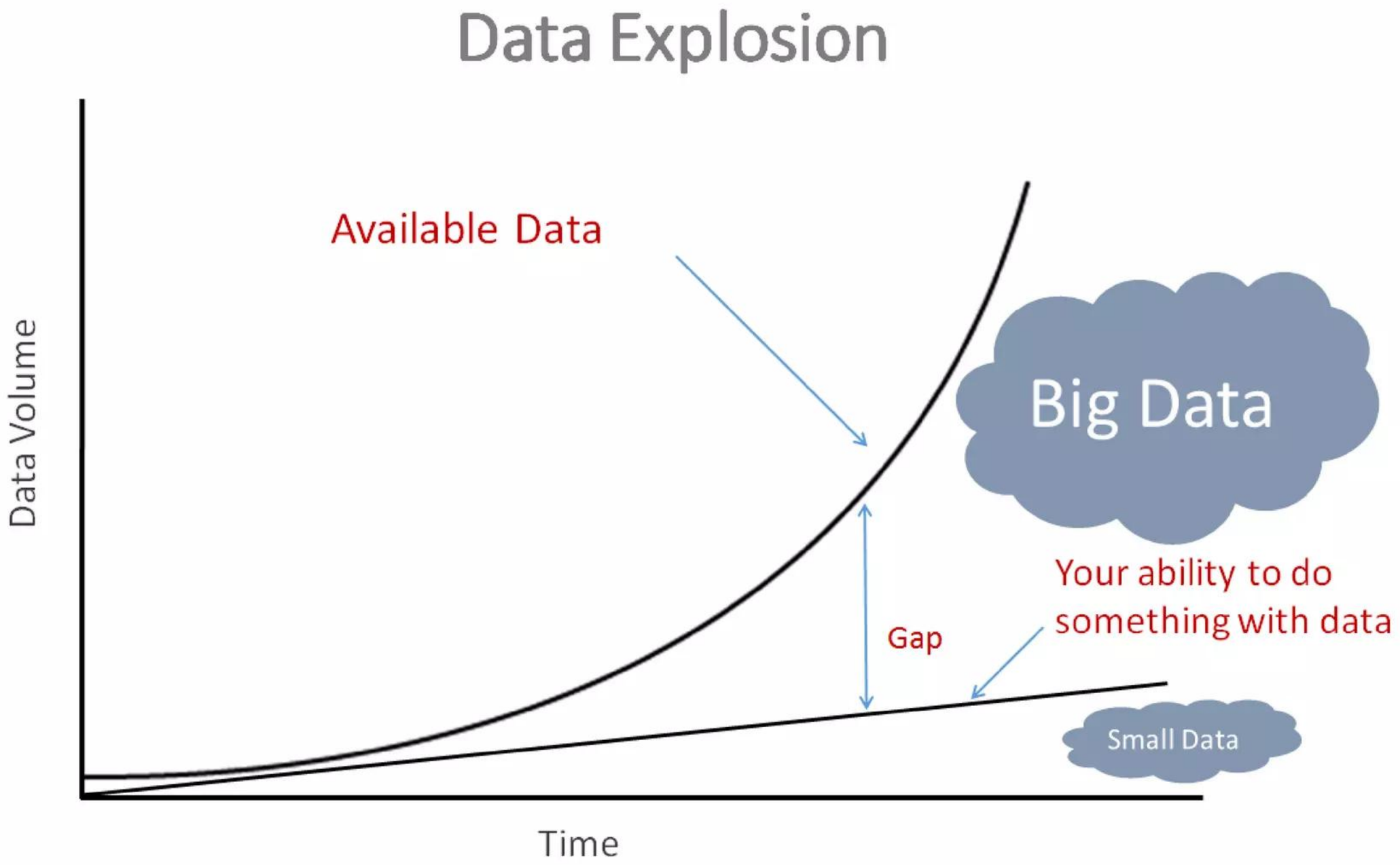
JVM Tech (tools) for ML

- weka
- Deeplearning4j (working with spark and GPU)
- H2O (working with spark and GPU, support Tensorflow, MxNet, and cafe)
- jcuDNN (JNI for wrapping nVidia cuDNN)
- Mahout
- MLlib spark

Artificial Intelligence in Industry

- **Fraud Detection System**
- **Dynamic Recommendation System and User Profiling**
- **Traveling Salesman Problem and Binpacking Problem for better warehouse management**
- **Social Media Analysis**
- Chatbot
- Company condition forecasting
- Governance simulation

The Complexity #1



The Complexity #2

- Big data : volume, variety, velocity, and veracity. (You might consider a fifth V, value.)
- Knowledge representation or the architecture of the model
- Unimplemented methods/algorithms in any libraries
- **Stack of methods**
- Data mostly unlabeled data
- Data resources (microservices)
- Features Engineering (especially from unstructured data)
- Machines (Hardware)
- High Performance Computing

Stack of Methods

- More complex methods and models
- Methods characteristic & behavior
- Methods customization
- Ex. Semi-supervised, Deep learning, features engineering
- Sample cases : our research in FDS and dynamic recommendation system

High Performance Computing

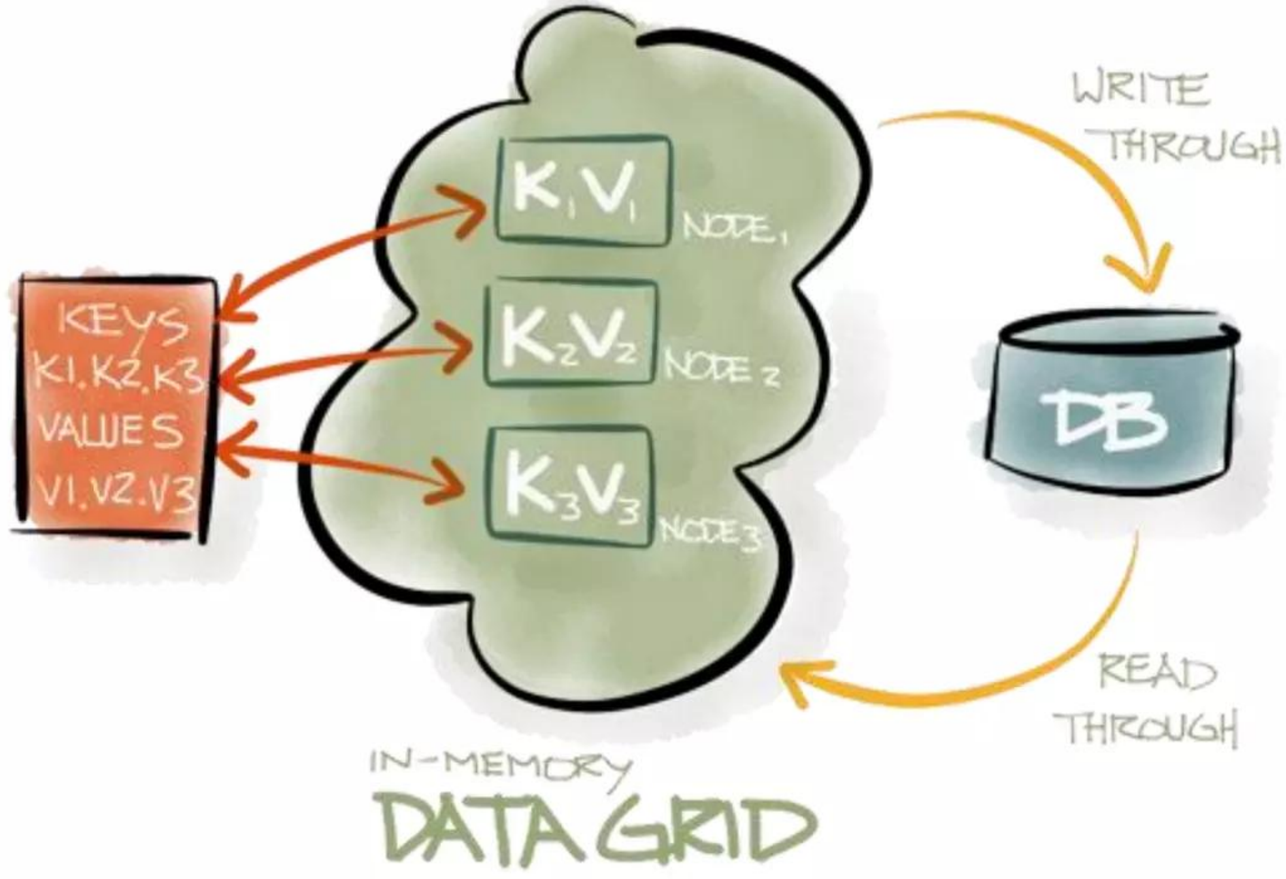
https://hadoop4usa.wordpress.com/2012/04/13/scale-out-up/

Machines

- **Cluster machine**
- **GPU machines (OpenCL and nvidia CUDA)**

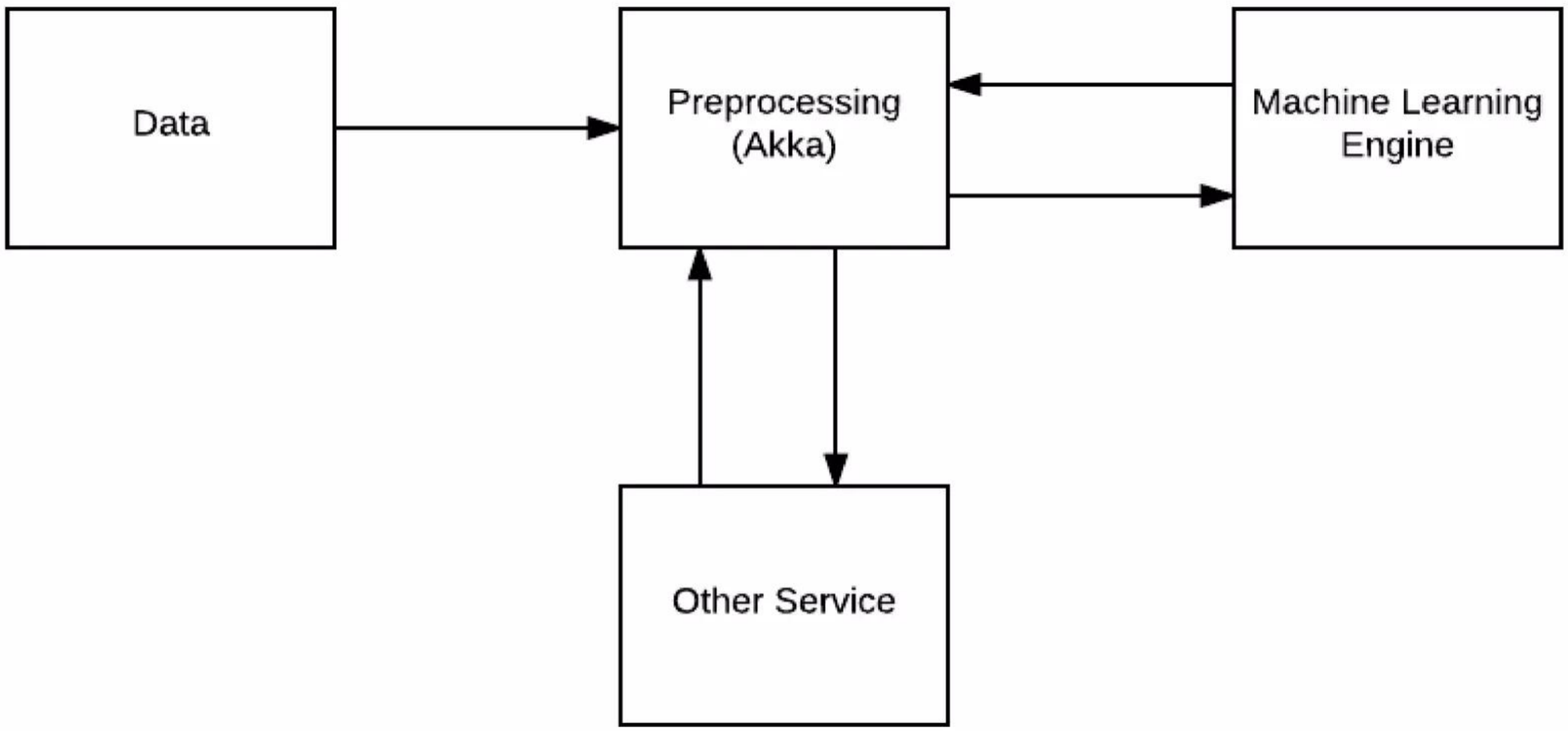
High Performance Computing #2

- **In-memory data fabric**: provides low-latency access and processing of large quantities of data by distributing data across the dynamic random access memory (DRAM), Flash, or SSD of a distributed computer system.



Machine Learning Flow

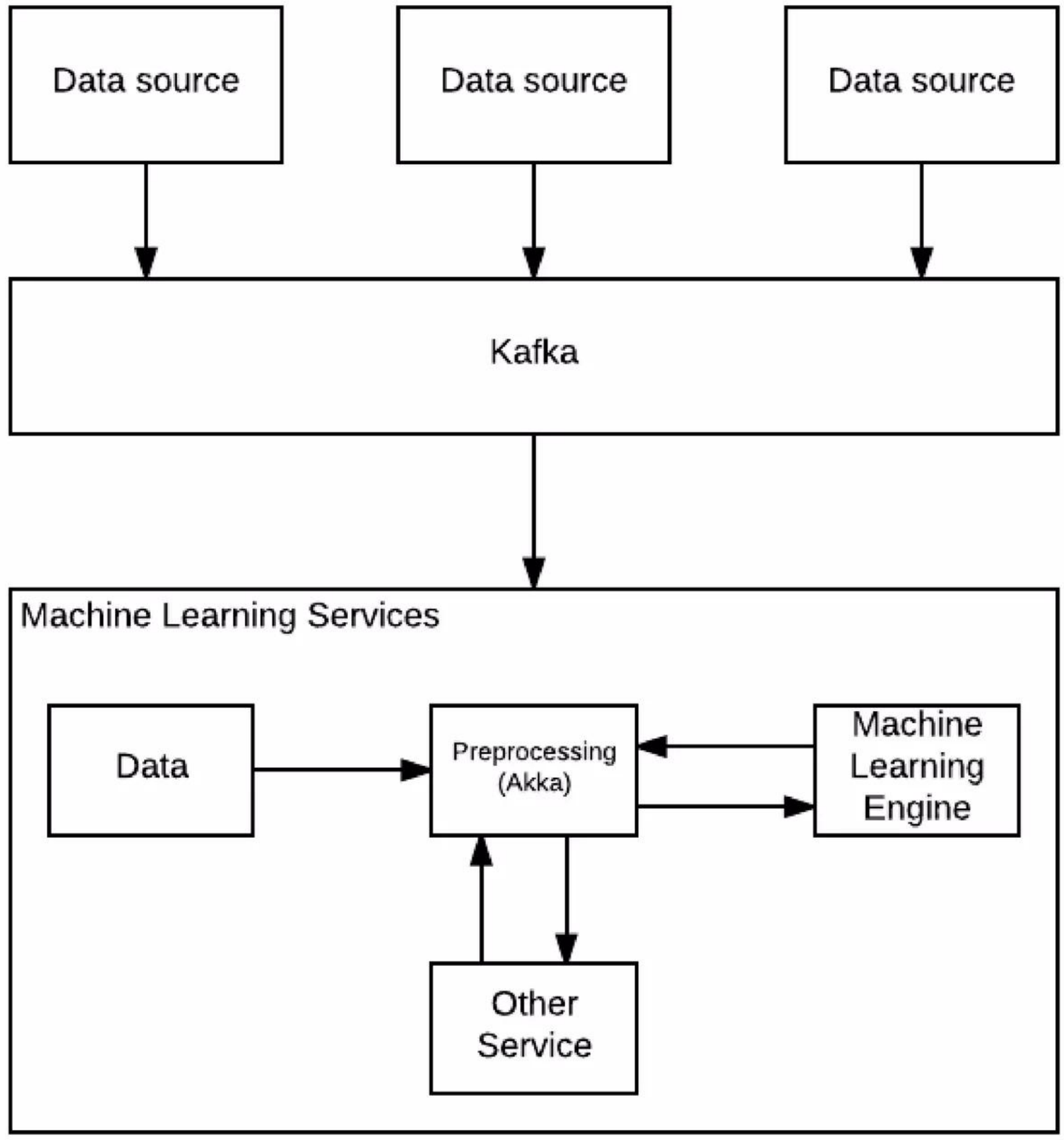
Scala + Play + Akka + Mongo



The problem is microservices

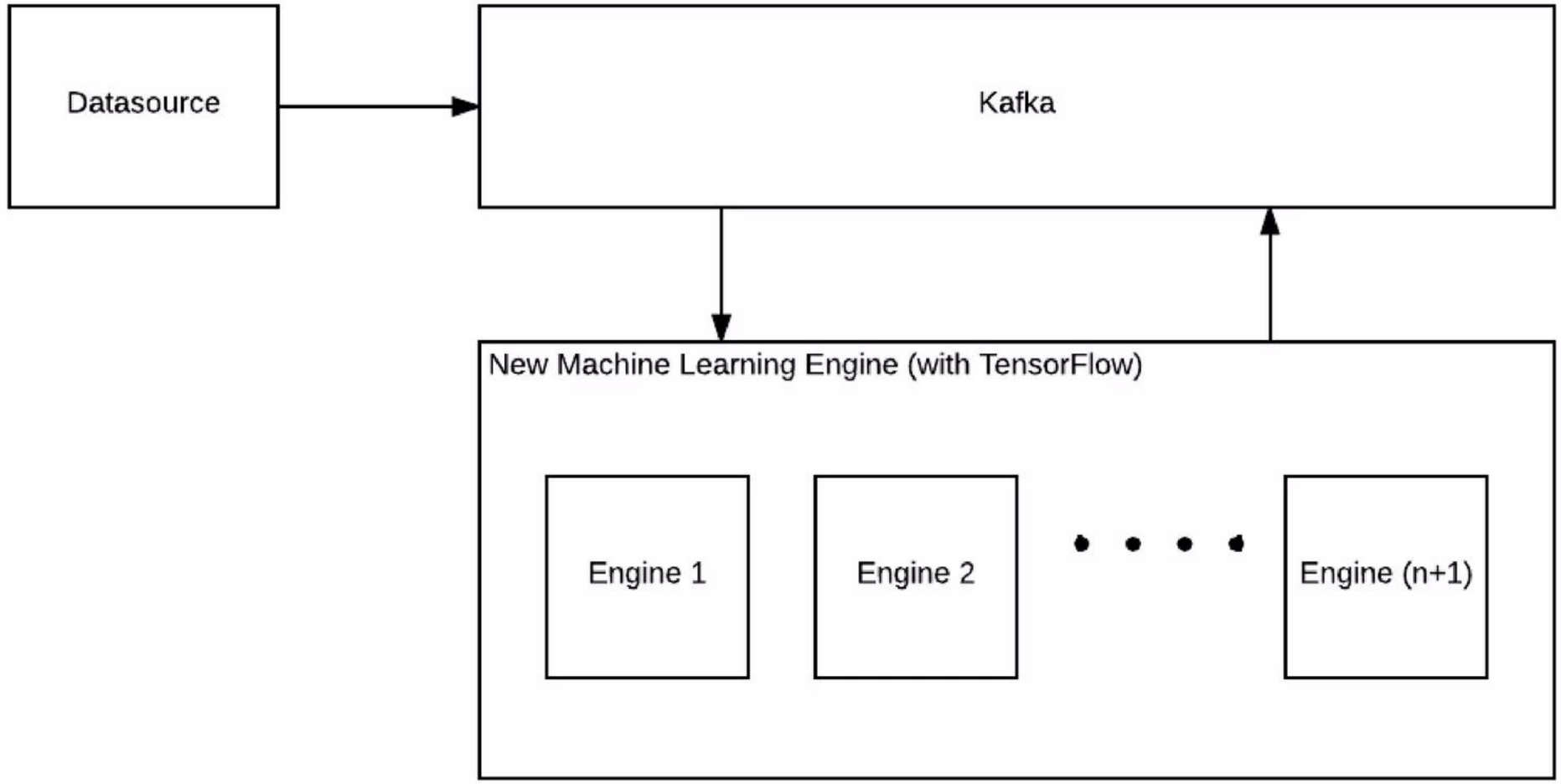
Next Machine Learning Flow

Scala + Play +
Akka + Mongo +
kafka

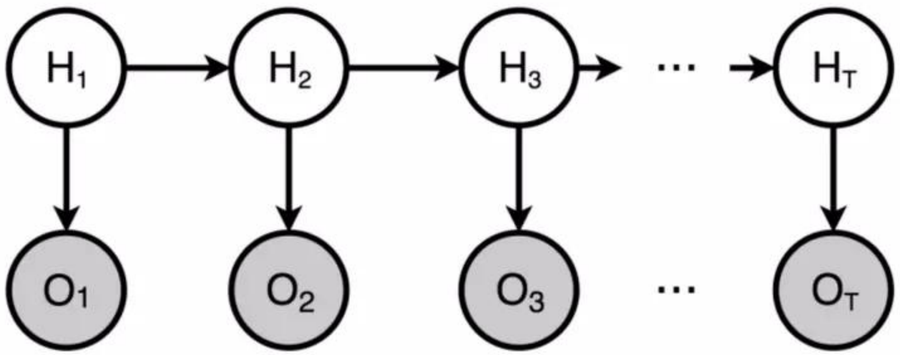


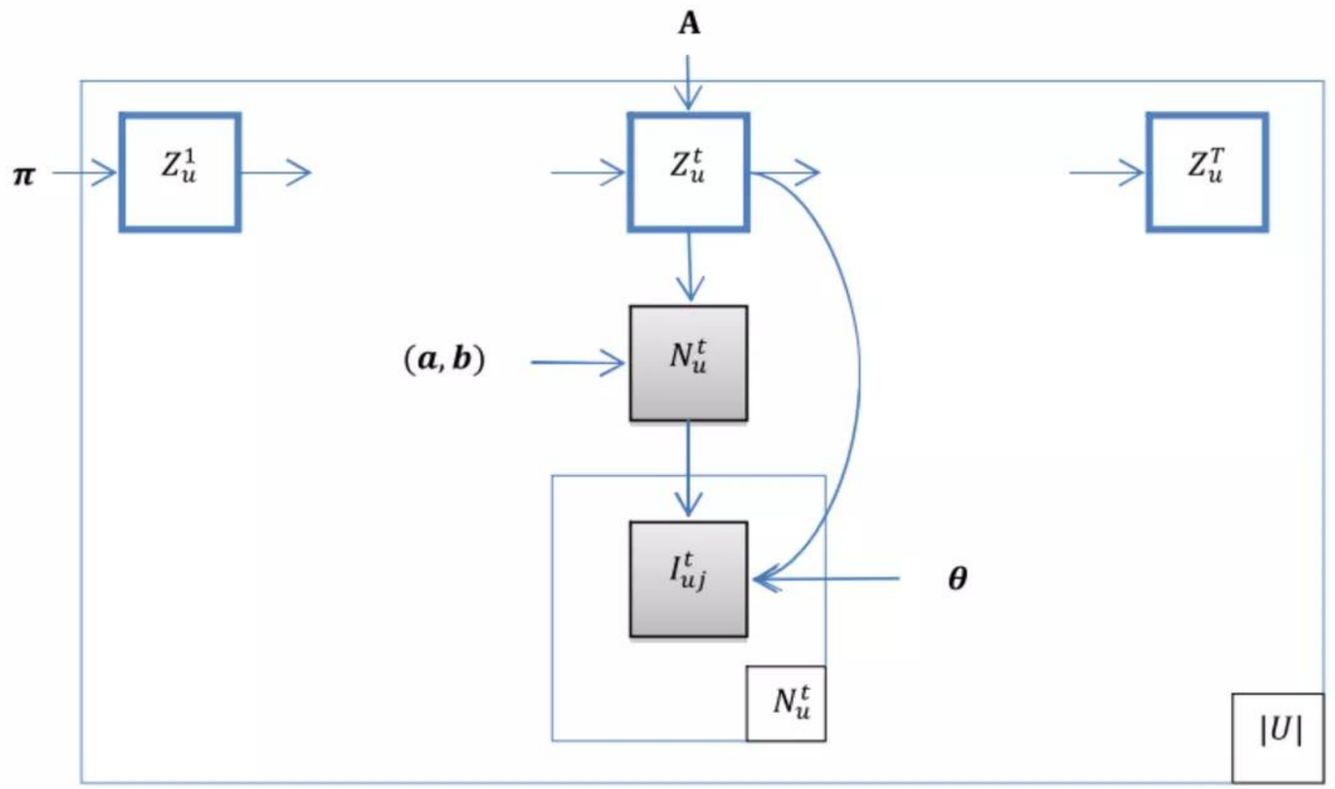
New Engine Machine Learning

- Kafka
- Tensorflow (utilize GPU)
- Spark
- Java/Scala/python



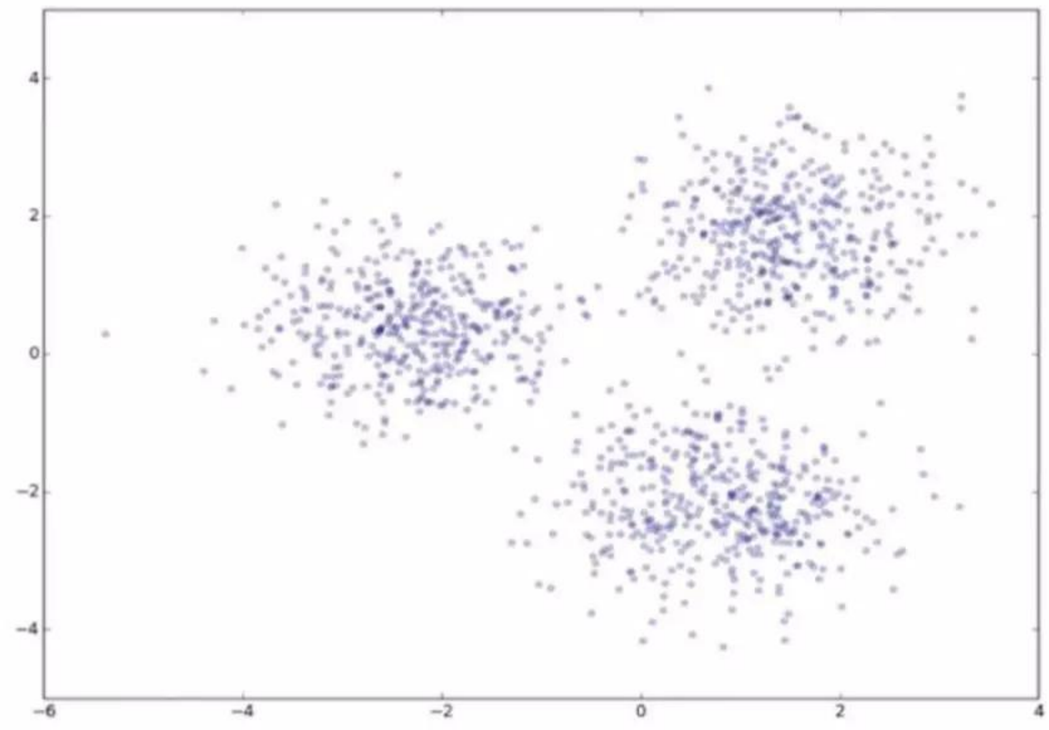
Dynamic Collaborative Filtering using HMM



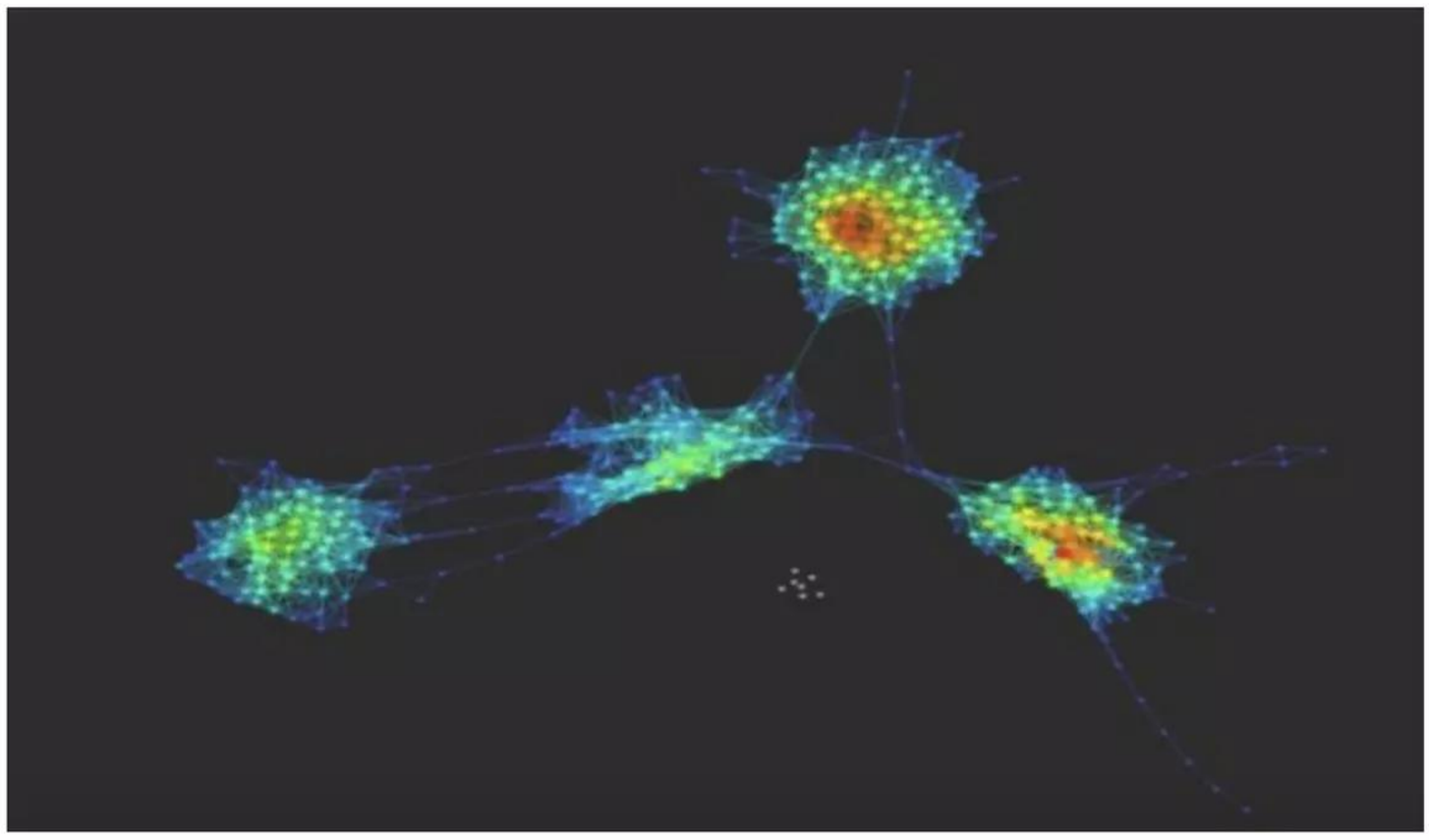


Algorithm	Control Parameters
1. Use data collected over time period 1 ... t_{trn} for training 2. ***Initialize*** $\boldsymbol{\pi}, \mathbf{A}, (\boldsymbol{a}, \boldsymbol{b}), \boldsymbol{\theta}$ to small random values 3. ***E-step***: compute $P(Z_u^t \mid I_u^{1:T})$ and $P(Z_u^{t-1}, Z_u^t \mid I_u^{1:T})$ using Equations (2) and (3). 4. ***M-step***: estimate $\boldsymbol{\pi}, \mathbf{A}, \boldsymbol{\theta}$ using Equations (7), (8) and (10). Estimate $(\boldsymbol{a}, \boldsymbol{b})$ using Section 2.1 of (Minka 2002) 5. If expected log likelihood has not converged go to step 2 6. For each user u compute $R(i, u)$ of each item i for time period $t_{trn} + 1$ using Equation (12) a. ***Recommend top N*** items with highest $R(i, u)$	1. Set K to a value that maximizes the AIC score 2. Set length of the time period to 1 month a. Smaller if user preferences change quickly b. Larger if constrained by computing resource

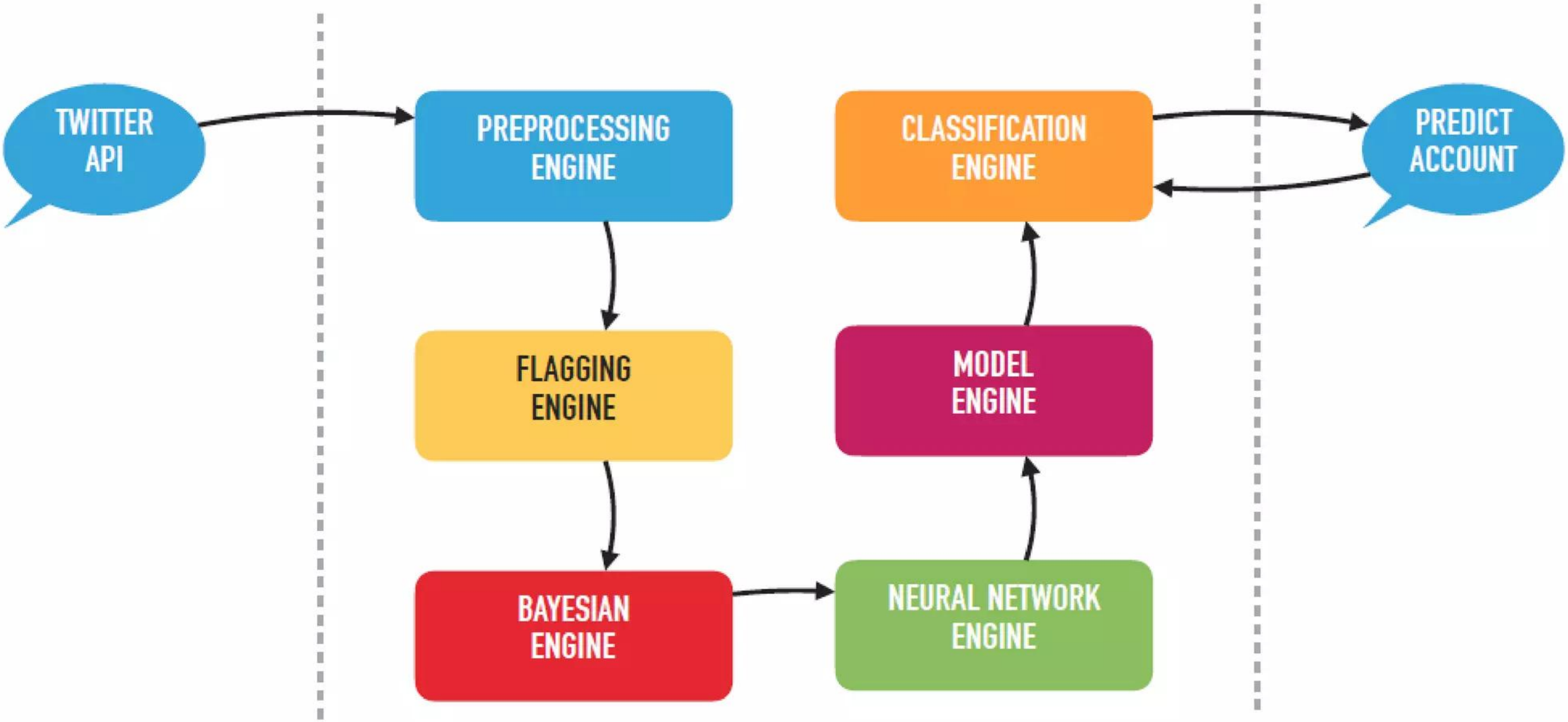
Topological Data Analysis



- Coordinate invariance
- Deformation Invariance
- Compressed Representations



Averi Project



Example

AVERI PROJECT

twitter prostitution account detection

THANK YOU

Any question?