Finite-State Machine

The City College of New York
CSc 59929 – Introduction to Machine Learning
Fall 2017 – Erik K. Grimmelmann, Ph.D.

Definition

- A **finite-state machine** (FSM) is a mathematical model of computation. It is an abstract machine that can be in exactly one of a finite number of states at any given time.

- The FSM can change from one state to another in response to some external inputs; the change from one state to another is called a transition.

- An FSM is defined by a list of its states, its initial state, and the conditions for each transition.

The City College of New York
CSc 59929 – Introduction to Machine Learning
Fall 2017 – Erik K. Grimmelmann, Ph.D.

2

Alternate Names for a Finite State Machine

- Finite-State Automaton
- Finite Automaton
- State Machine

The City College of New York
CSc 59929 – Introduction to Machine Learning
Fall 2017 – Erik K. Grimmelmann, Ph.D.

3

Example of a Subway Turnstile

- States
    - Locked
    - Unlocked

- Inputs
    - Successful MetroCard Swipe
    - Push

The City College of New York
CSc 59929 – Introduction to Machine Learning
Fall 2017 – Erik K. Grimmelmann, Ph.D.

4

Example of a Subway Turnstile

State Transition Table

Current State	Input	Next State	Output
Locked	Successful MetroCard swipe	Unlocked	Unlocks the turnstile
	Push	Locked	None
Unlocked	Successful MetroCard swipe	Unlocked	None
	Push	Locked	Locks the turnstile after going through

The City College of New York
CSc 59929 – Introduction to Machine Learning
Fall 2017 – Erik K. Grimmelmann, Ph.D.

5

Example of a Subway Turnstile

State/Event Table

Input	Current State	
	Locked	**Unlocked**
Successful MetroCard swipe	Unlocked	No change
Push	No change	Locked

The City College of New York
CSc 59929 – Introduction to Machine Learning
Fall 2017 – Erik K. Grimmelmann, Ph.D.

6

Directed Graph of
State Diagram for a Subway Turnstile

The City College of New York
CSc 59929 – Introduction to Machine Learning
Fall 2017 – Erik K. Grimmelmann, Ph.D.

7

Directed Graph of
State Diagram for a Subway Turnstile

The City College of New York
CSc 59929 – Introduction to Machine Learning
Fall 2017 – Erik K. Grimmelmann, Ph.D.

8
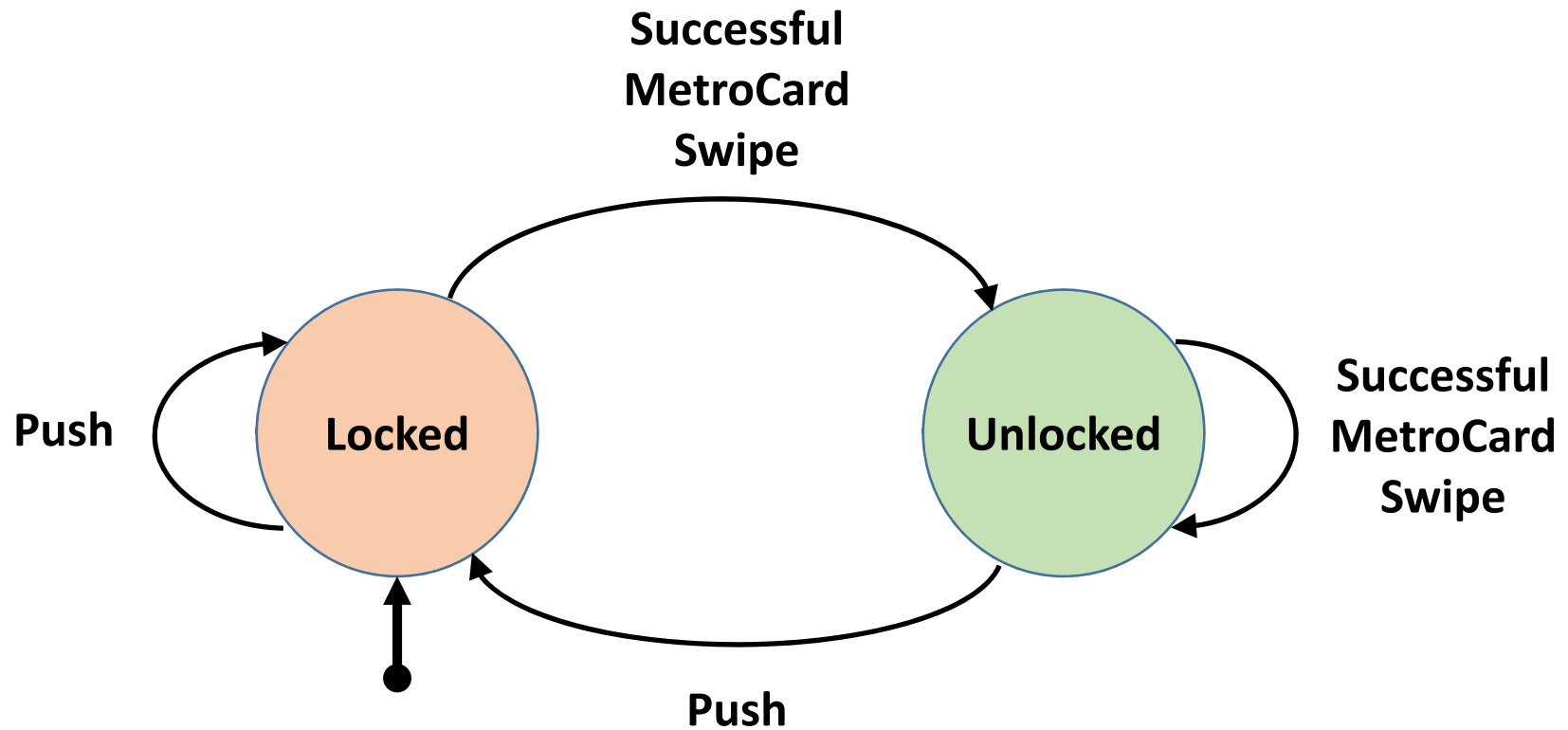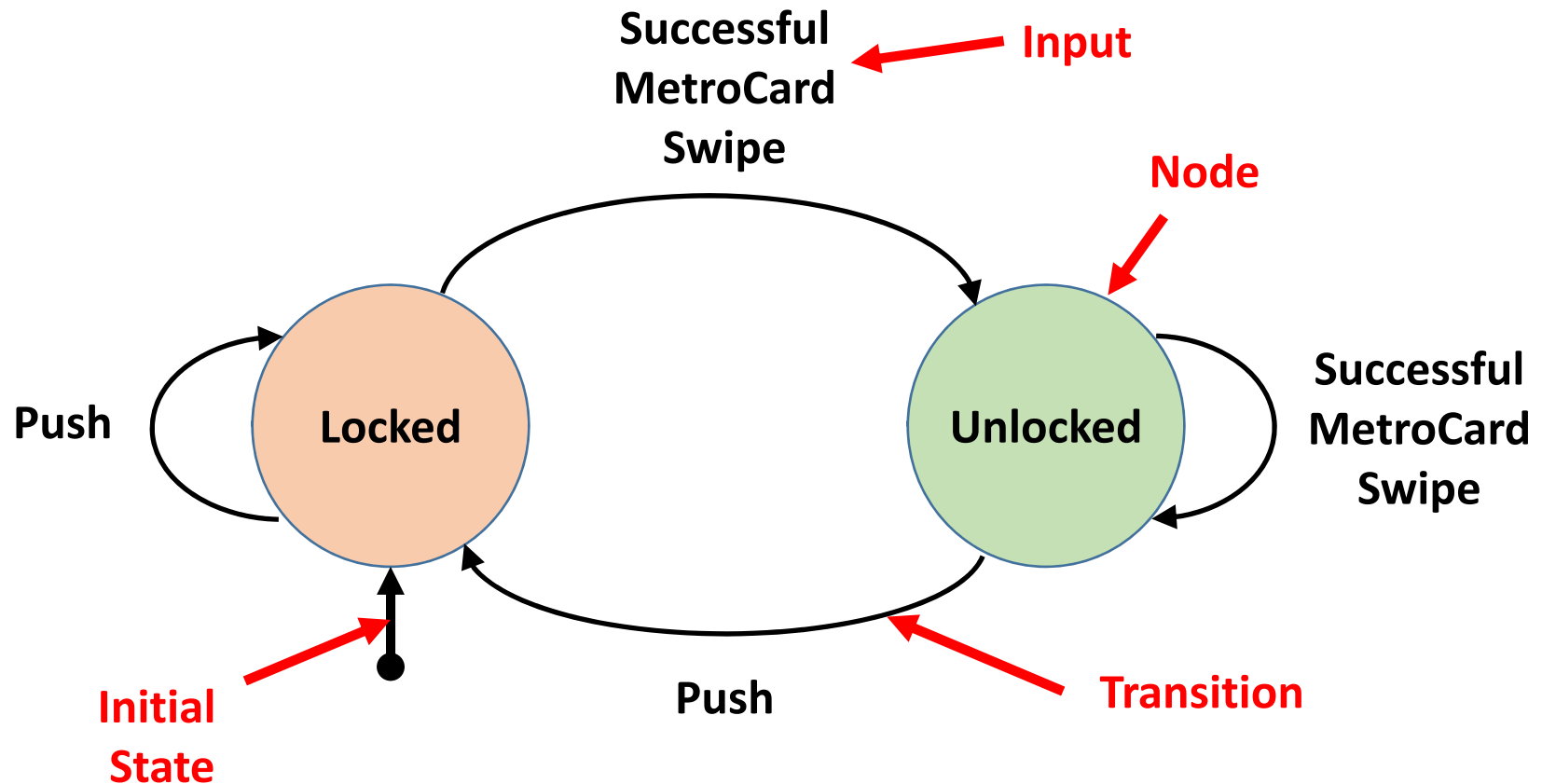
State Flow Graph from KDnuggets

Analytics, Data Science, Machine Learning Platforms, 2016 vs 2017

from KDnuggets,
https://t.co/YW8AofGKxg

The City College of New York
CSc 59929 – Introduction to Machine Learning
Fall 2017 – Erik K. Grimmelmann, Ph.D.

9
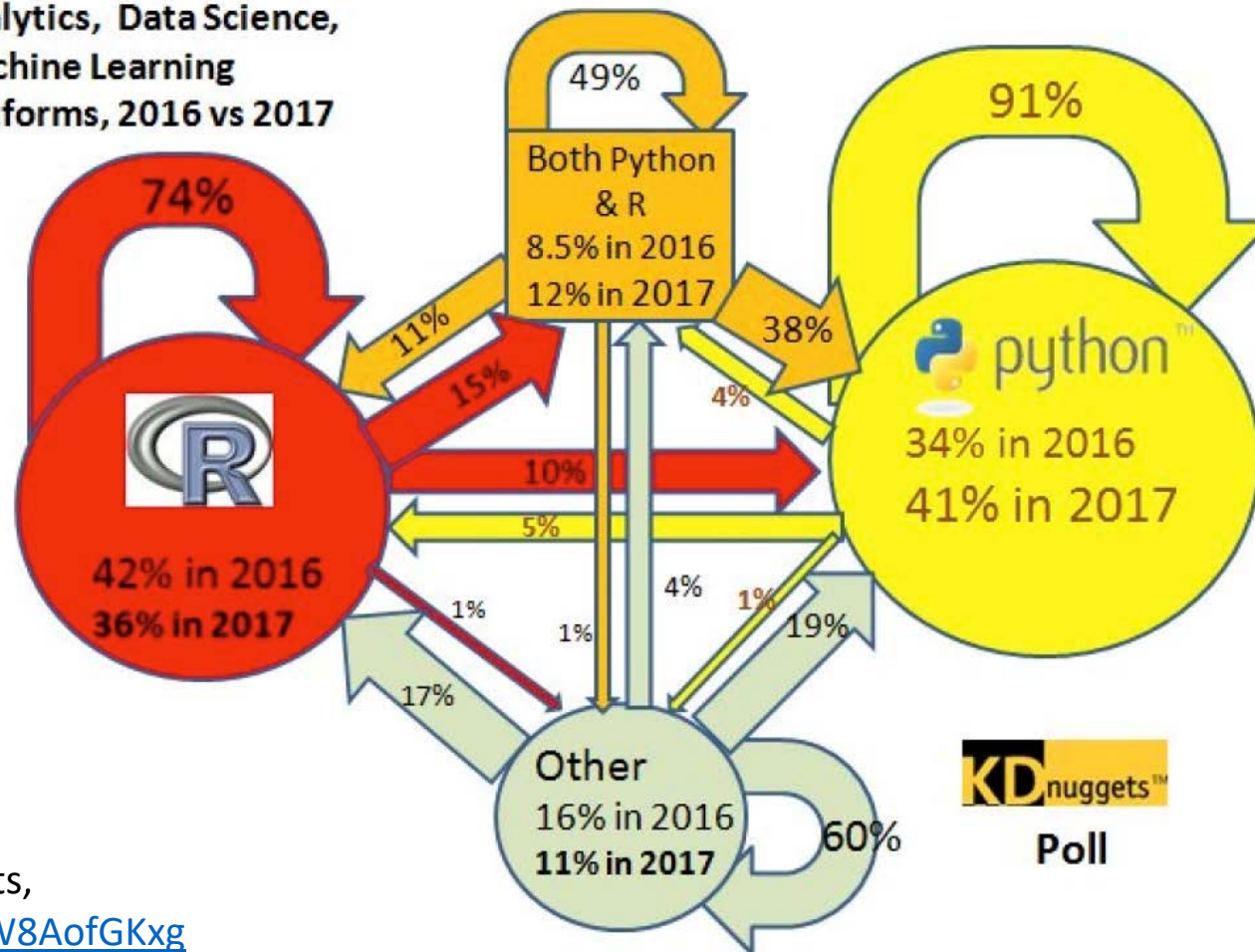
KDnuggets

- **KDnuggets™** is a leading site on Business Analytics, Big Data, Data Mining, Data Science, and Machine Learning

- **www.kdnuggets.com**

- **KD** stands for **K**nowledge **D**iscovery

The City College of New York
CSc 59929 – Introduction to Machine Learning
Fall 2017 – Erik K. Grimmelmann, Ph.D.

10