Reading memo for GRL

* Book: GRL (Graph Representation Learning) by W.L. Hamilton (2020)

General points for **thorough** reading (not extensive reading)

- Read **every** words and mark/memorize important words.
- Try to understand **every piece** the authors want to tell us - if needed, read other reference(s).
- However, if you cannot understand something after you have tried more than 30 minutes, discuss it with others.
- Try to use low-entropy description in explaining.

#01, liangz

range: from the title page to p8 (end of Chapter 1).

** NOTICE: ** please read both the scanned pictures and this memo.

i: title page

- official book
- author William L. Hamilton was an Assistant Professor at that time at McGill Univ.
- McGill Univ., a famous university in Canada, 12 Nobel laureates, and graduate Yoshua Bengio (2018 ACM Turing Award, one of the three Godfathers of deep learning)

ii: Abstract page

- no-free-lunch theorem
- ⇒ inductive bias is important before optimization (and before machine learning). Ex. Consider to use a linear regression to analyze a dataset. The assumption that a linear regression is approporiate is an inductive bias.
- What is induction?
- Lin & Tegmark'16 Why does deep and cheap learning work so well? ⇒ Assumptions: (1) Low polynomial order in the real world (2) Locality of data (3) Symmetry phenomenon.
- 3 graph learning topics: (1) embedding (2) CNN → Graph (3) Message-passing approach

iii-v: Contents

- not important now

vi: Preface

- “past seven years” ⇒ graph learning started from 2013
- at 2020, fastest growing sub-areas of deep learning
- audience: shall have some background in machine learning and deep learning (e.g., Goodfellow et al, 2016)

vii-viii: Acknowledgements

- connections of the author (e.g., Jure Leskovec is a famous researcher in network science)

p1: Chapter 1 Introduction

- node, edge, relations, graph ⇒ ask the audience to illustrate some graphs
- Zachary Karate Club Network (1977) and on its importance

p2:

- It mentioned “a dramatic increase in the quantity and quality of graph data in the last 25 years.” ⇒ Why 25 years? (hint: It means since 1995)
- ML is not the only way but may be interesting.
- adjacency matrix, adjacency list, simple graph and {0,1}
- (optional) graph processing from adjacency list to adjacency matrix seems an evidence showing human consumes matter and energy to increase its order.

p3:

- multi-graph (variable number of types/relations) vs multi-relational graph (fixed number of types/relations)
- Heterogeneous graph (inner edges important than inter edges), multipartite graph (no inner edges, only inter edges), multiplex graph (inter edges important than inner edges)
- attribute or feature

p4:

- graph (abstract structure) and network (real-world data)
- supervised (predict an output) and unsupervised (infer pattern)
- node classification: predict the label of a node given a small number of labelled nodes (|V_train| « |V|)

p5:

- applications: bot detection in a social network, function of proteins in the interactome, classify the topic based on links, etc
- difference from a standard supervised learning: the assumption/bias of iid (independent and identically distributed) or no.
- popular inductive bias used in graph learning: homophily (same attrubute with neighbors), structural equivalence (similar local structure → similar label), heterophily (e.g., gender).

p6:

- supervised learning and semi-supervised learning, and GL (no iid assumption)
- relation prediction: e.g., recommendation system, side-effect. Notice the requirement of inductive bias.

p7:

- clustering and community detection
- graph classification, regression, and clustering (to the audience: what is the general difference?)

p8:

- iid assumption and why? → Li-Yang
- Additional comment: Causal relation and correlation. ML is often consider the latter approach but actually we need to consider the former.

From:
https://aw.gsais.kyoto-u.ac.jp/wiki/ - **Future Wisdom @ GSAIS (Shishu-Kan) , Kyoto U.**

Permanent link:
https://aw.gsais.kyoto-u.ac.jp/wiki/doku.php?id=public:grl_readingmemo

Last update: **2024/04/04 07:12**