Deep Learning of Graphs

Natural Disasters Damage to Banks and Firm Investment

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XMU WISE

2021 年 10 月 14 日

Outline

What's this course about?

- Specific statistical methods for many research problems
- Hyperlinks (click here)
  - How to learn (or create) new methods
  - Inference: Using facts you know to learn about facts you don't know
- How to write a publishable scholarly paper
- All the practical tools of research — theory, applications, simulation, programming, word processing, plumbing, whatever is useful
- ⇝ Outline and class materials:

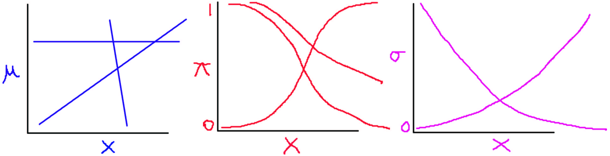
2021

  - The syllabus gives topics, not a weekly plan.
  - We will go as fast as possible subject to everyone following along
  - We cover different amounts of material each week

Alerts

- First level alert
- Second level alert
- Third level alert
- Fourth level alert
- Fifth level alert

Systematic Components: Examples



- $E(Y_i) \equiv \mu_i = X_i\beta = \beta_0 + \beta_1 X_{1i} + \cdots + \beta_k X_{ki}$
- $\Pr(Y_i = 1) \equiv \pi_i = \frac{1}{1+e^{-x_i\beta}}$
- $V(Y_i) \equiv \sigma_i^2 = e^{x_i\beta}$
- Interpretation:
  - Each is a class of functional forms
  - Set β and it picks out one member of the class
  - β in each is an "effect parameter" vector, with different meaning

Negative Binomial Derivation

Recall:

one two three

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$$\Pr(A|B) = \frac{\Pr(AB)}{\Pr(B)} \implies \Pr(AB) = \Pr(A|B)\Pr(B)$$

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$$\text{NegBin}(y|\phi, \sigma^2) = \int_0^\infty \text{Poisson}(y|\lambda) \times \text{gamma}(\lambda|\phi, \sigma^2) d\lambda$$

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$$\begin{aligned} \mathrm{NegBin}(y|\phi,\sigma^2) &= \int_0^\infty \mathrm{Poisson}(y|\lambda) \times \mathrm{gamma}(\lambda|\phi,\sigma^2) d\lambda \\ &= \int_0^\infty \P(y,\lambda|\phi,\sigma^2) d\lambda \end{aligned}$$

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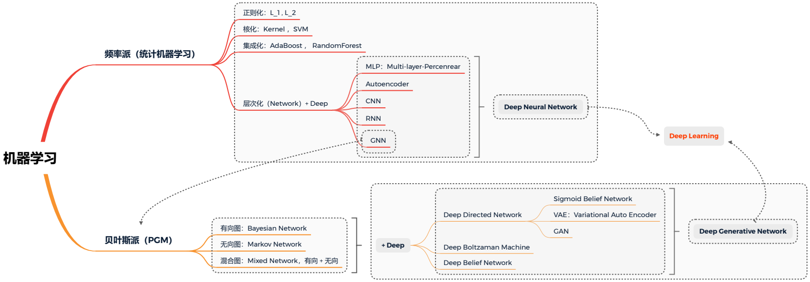
$$\begin{aligned}
\text{NegBin}(y|\phi,\sigma^2) &= \int_0^\infty \text{Poisson}(y|\lambda) \times \text{gamma}(\lambda|\phi,\sigma^2)d\lambda \\
&= \int_0^\infty \P(y,\lambda|\phi,\sigma^2)d\lambda \\
&= \frac{\Gamma\left(\frac{\phi}{\sigma^2-1}+y_i\right)}{y_i!\Gamma\left(\frac{\phi}{\sigma^2-1}\right)}\left(\frac{\sigma^2-1}{\sigma^2}\right)^{y_i}\left(\sigma^2\right)^{\frac{-\phi}{\sigma^2-1}}
\end{aligned}$$

2 columns

- SVM
- GMM
- EM



数据与 tabular 环境

Category of your contents	Different types of each Category		other type of your data
	Different types of each Category		other type of your data
	…………………………		………………
		θ^{-1}kg	
	0.0056 $\pm$ 0.0097, 0.0021 $\pm$ 4.0056		3.5 $\times$ 10^5 ; 5.43 (9.30%)
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	0.0056 $\pm$ 0.0097, 0.0021 $\pm$ 4.0056		3.5 $\times$ 10^5 ; 5.43 (9.30%)
	$\frac{\mu^2}{\pi-2\theta} \times \sqrt[3]{\lVert\nu_i - \hat{\phi}\rVert} + \lim_{s\to\infty} \int_0^{+\infty} f(x)e^{xsi}\mathrm{d}x$		$f(x) \in C^1[0,+\infty], \lVert f(x^n)\rVert_2 \leqslant \lambda$
Mathematical formulas	$\frac{\mu^2}{\pi-2\theta} \times \sqrt[3]{\lVert\nu_i - \hat{\phi}\rVert} + \lim_{s\to\infty} \int_0^{+\infty} f(x)e^{xsi}\mathrm{d}x$		$f(x) \in C^1[0,+\infty], \lVert f(x^n)\rVert_2 \leqslant \lambda$
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	This is the element described in your language		Mathematical language description
	This is the element described in your language		Mathematical language description
	This is the element described in your language		Mathematical language description
Language description	This is the element described in your language		Mathematical language description
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Projection data	3.5 $\times$ 10^5 This is the element described in your language		0.0056 $\pm$ 0.0097, 0.0021 $\pm$ 4.0056
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tabel 1 Contents of different types of tables.

Word2Vec

topic 1			topic 2			topic 3			topic 4		
1	科技	0.9995	2	板块	mm	3	科技	mm	4	3500	mm
1	板块	0.9994	2	锂电池	mm	3	新能源	mm	4	反弹	mm
1	调整	0.9994	2	a 股	mm	3	in	机构	4	指数	
1	资金	0.9994	2	芯片	mm	3	in	板块	4	清仓	
1	业绩	0.9994	2	散户	mm	3	in	半导体	4	券商	mm
1	公司	0.9994	2	震荡	mm	3	in	中国	4	科技	mm
1	股价	0.9994	2	早盘	mm	3	in	芯片	4	in	mm
1	股市	0.9994	2	inches	mm	3	in	mm	4	in	mm
1	大跌	0.9994	2	inches	mm	3	in	mm	4	in	mm
1	基金	0.9994	2	inches	mm	3	in	mm	4	in	mm

tabel 2 Word2Vec of texts

Structural Features

Levels of Structure

- usual LaTeX \section, \subsection commands
- ‘frame’ environments provide slides
- ‘block’ environments divide slides into logical sections
- ‘columns’ environments divide slides vertically (example later)
- overlays (à la prosper) change content of slides dynamically

例 (Overlay Alerts)

On the first overlay, this text is highlighted (or *alerted*).
On the second, this text is.

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Algoritmos 代码 1

Algorithm 1: Algorithm Example

```
input  : x: float, y: float
output: r: float
while True do
    r = x + y;
    if r >= 30 then
        "O valor de r é maior ou iqual a 10.";
        break;
    else
        "O valor de r = ", r;
    end
end
```

Reviewing DeepWalk algorithm

Algorithm 2: Reviewing random walk + skip gram

for $n = 1, 2, \ldots, N$ **do**

  Pick w_1^n according to a probability distribution $P(w_1)$. Generate a vertex sequence $(w_1^n, \cdots, w_L^n)$ of length L by a random walk on network G ;

  for $j = 1, 2, \ldots, L\text{-}T$ **do**

    for $r = 1, 2, \ldots, T$ **do**

      Add vertex-context pair (w_j^n, w_{j+r}^n) to multiset $\mathcal{D}$;

      Add vertex-context pair (w_{j+r}^n, w_j^n) to multiset $\mathcal{D}$

Run SGNS on $\mathcal{D}$ with b negative samplpes.

Example:Mnist

```python
### Using the SkLearn interface ###
from keras.datasets import mnist
from catboost import CatBoostClassifier,Pool
from sklearn.model_selection import GridSearchCV
from sklearn.metrics import accuracy_score
import numpy as np
(X,y),(X_test,y_test) = mnist.load_data()
# (60000,28,28)
print('x_shape:',X.shape)
# 60000
print('y_shape:',y.shape)
X = X.reshape(X.shape[0],-1)/255
X_test = X_test.reshape(X_test.shape[0],-1)/255

param_test = {'iterations':np.arange(10,51,20),'learning_rate':[0.1,0.2],
        'depth':np.arange(4,9,2)}

cat = CatBoostClassifier(eval_metric="AUC",one_hot_max_size=31,l2_leaf_reg= 9,silent=False)
grid_search = GridSearchCV(estimator=cat,param_grid=param_test,cv=2,verbose=2,n_jobs=-1)
grid_search.fit(X,y)
# grid_search.cv_results_  # Search for detailed results
grid_search.best_params_
grid_search.best_score_
cat = grid_search.best_estimator_  # Best model
y_pred = cat.predict(X_test)
accuracy = accuracy_score(y_pred,y_test)
print("The test set accuracy rate is:%.2f%%"%(accuracy*100.0))
```

Blocks

Normal block

A set consists of elements.

Alert block

$2 = 2$.

Example block

The set $\{1, 2, 3, 5\}$ has four elements.

Theorems and Proofs

The proof uses *reductio ad absurdum*.

定理

There is no largest prime number.

证明.

1. Suppose p were the largest prime number.

4. But $q+1$ is greater than 1, thus divisible by some prime number not in the first p numbers.

□

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3. Then $q+1$ is not divisible by any of them.
4. But $q+1$ is greater than 1, thus divisible by some prime number not in the first p numbers. □

Data

Methodology and Variables

Regression Results

Details

参考文献 I

Hosono K and Miyakawa D and Uchino T, et al.
Natural disasters damage to banks and firm investment, 2016.
https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.592.8648&rep=rep1&type=pdf

Thanks!