An Article Title That Spans Multiple Lines to Show Line Wrapping

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Abstract

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1 Wyniki eksperymentów

W ramach projektu przeprocesowano zbiór danych amazon-kindle (https://www.kaggle.com/datasets/asaniczka/amazon-kindle-books-dataset-2023-130k-books) do formatu przyjmowanego przez algorytm, oraz powtórzono eksperymenty zmieniając nastawienia hiperparametrów. Ze względu na olbrzymie wymagania obliczeniowe, trening modeli przeprowadzany był przez 50 epok, zamiast domyślnego tysiąca epok które zaproponowali autorzy. Ponadto dokonano ewaluacji na przygotowanym zbiorze.

Proces tworzenia zbioru danych:

1. Zbiór danych nie zawierał interakcji użytkownik-przedmiot, zatem trzeba było przygotować skrypt który tworzył plik .txt w formacie przyjmowanym przez implementację

2. Najpierw oczyszczono zbiór tak, aby zawierał użytkowników którzy wystawili co najmniej 5 ocen.

3. Na podstawie tego utworzono zbiór interakcji użytkownik - przedmiot

   ```
   # user_id item_id1 item_id2 item_id3 ...
   0 10 20 30
   1 15 25
   2 10 25 35
   ```

4. Ostatnim krokiem było przygotowanie grafu wiedzy, który zawierał trójki relacji w następujący sposób

5. W tym momencie posiadamy główne pliki train.txt, test.txt oraz kg_final.txt które są akceptowane przez algorytm.

   ```
   # (Książka 0, Napisana przez, Autor 100)
   0 0 100
   # (Książka 0, Sprzedana przez, Amazon.com Services
   0 1 200
   # (Książka 0, Należy do kategorii, Rodzicielstwo i
   0 2 300
   # (Książka 0, Opublikowana w, 2015)
   0 3 2015
   ```

Tabele wynikowe:

Rozmiar embeddingów 32, learning rate 1e-4, bez pre-treningu: Rozmiar embeddingów 32, learning

Table 1: *Amazon-book*

Metric	10 Epochs	20 Epochs	30 Epochs	40 Epochs	50 Epochs
Precision@20	0.0043	0.0047	0.0053	0.0061	0.0065
Recall@20	0.0386	0.0414	0.0466	0.0549	0.0586
NDCG@20	0.0184	0.0190	0.0222	0.0261	0.0280
Precision@40	0.0036	0.0041	0.0045	0.0051	0.0054
Recall@40	0.0629	0.0711	0.0792	0.0906	0.0954
NDCG@40	0.0245	0.0265	0.0304	0.0351	0.0373
Precision@60	0.0032	0.0037	0.0040	0.0046	0.0048
Recall@60	0.0820	0.0937	0.1034	0.1190	0.1257
NDCG@60	0.0287	0.0316	0.0358	0.0414	0.0440
Precision@80	0.0029	0.0034	0.0037	0.0042	0.0044
Recall@80	0.1003	0.1144	0.1267	0.1439	0.1512
NDCG@80	0.0325	0.0358	0.0406	0.0465	0.0492
Precision@100	0.0027	0.0032	0.0035	0.0039	0.0041
Recall@100	0.1170	0.1342	0.1477	0.1652	0.1741
NDCG@100	0.0357	0.0396	0.0447	0.0507	0.0537

rate 1e-5, bez pre-treningu:

Rozmiar embeddingów 32, learning rate 1e-5, bez pre-treningu:

Dla zbioru amazon-kindle wyniki prezentują się nastepująco: Rozmiar embeddingów 32, learning rate

Table 2: *Yelp2018*

Metric	10 Epochs	20 Epochs	30 Epochs	40 Epochs	50 Epochs
Precision@20	0.0062	0.0087	0.0102	0.0115	0.0125
Recall@20	0.0122	0.0183	0.0217	0.0251	0.0271
NDCG@20	0.0105	0.0155	0.0185	0.0212	0.0231
Precision@40	0.0055	0.0077	0.0089	0.0099	0.0107
Recall@40	0.0200	0.0298	0.0353	0.0398	0.0428
NDCG@40	0.0131	0.0193	0.0229	0.0260	0.0282
Precision@60	0.0052	0.0070	0.0081	0.0090	0.0096
Recall@60	0.0279	0.0391	0.0457	0.0513	0.0558
NDCG@60	0.0156	0.0224	0.0263	0.0299	0.0322
Precision@80	0.0049	0.0066	0.0076	0.0083	0.0089
Recall@80	0.0346	0.0474	0.0553	0.0614	0.0655
NDCG@80	0.0177	0.0251	0.0294	0.0331	0.0356
Precision@100	0.0047	0.0062	0.0071	0.0078	0.0085
Recall@100	0.0403	0.0550	0.0638	0.0701	0.0747
NDCG@100	0.0195	0.0275	0.0321	0.0359	0.0385

Table 3: *Last-FM*

Metric	10 Epochs	20 Epochs	30 Epochs	40 Epochs	50 Epochs
Precision@20	0.0051	0.0067	0.0076	0.0081	0.0088
Recall@20	0.0183	0.0256	0.0296	0.0323	0.0348
NDCG@20	0.0114	0.0157	0.0182	0.0202	0.0217
Precision@40	0.0047	0.0061	0.0068	0.0073	0.0078
Recall@40	0.0346	0.0462	0.0528	0.0564	0.0609
NDCG@40	0.0166	0.0224	0.0256	0.0280	0.0301
Precision@60	0.0045	0.0057	0.0063	0.0067	0.0071
Recall@60	0.0499	0.0647	0.0730	0.0777	0.0834
NDCG@60	0.0210	0.0277	0.0314	0.0341	0.0365
Precision@80	0.0043	0.0054	0.0059	0.0063	0.0067
Recall@80	0.0643	0.0815	0.0909	0.0966	0.1038
NDCG@80	0.0248	0.0321	0.0361	0.0390	0.0419
Precision@100	0.0042	0.0052	0.0057	0.0060	0.0063
Recall@100	0.0778	0.0975	0.1078	0.1147	0.1219
NDCG@100	0.0282	0.0361	0.0404	0.0436	0.0464

1e-4, bez pre-treningu:

Table 4: *Amazon-kindle*

Metric	10 Epochs	20 Epochs	30 Epochs	40 Epochs	50 Epochs
Precision@20	0.0059	0.0049	0.0070	0.0073	0.0059
Recall@20	0.0340	0.0211	0.0184	0.0212	0.0200
NDCG@20	0.0210	0.0179	0.0110	0.0178	0.0224
Precision@40	0.0061	0.0048	0.0083	0.0074	0.0056
Recall@40	0.0424	0.0271	0.0274	0.0267	0.0215
NDCG@40	0.0237	0.0218	0.0138	0.0230	0.0271
Precision@60	0.0050	0.0041	0.0077	0.0083	0.0048
Recall@60	0.0540	0.0314	0.0307	0.0343	0.0303
NDCG@60	0.0290	0.0256	0.0171	0.0295	0.0303
Precision@80	0.0054	0.0040	0.0075	0.0086	0.0057
Recall@80	0.0596	0.0395	0.0345	0.0441	0.0409
NDCG@80	0.0375	0.0292	0.0205	0.0329	0.0344
Precision@100	0.0062	0.0040	0.0061	0.0075	0.0046
Recall@100	0.0681	0.0482	0.0443	0.0489	0.0524
NDCG@100	0.0426	0.0324	0.0237	0.0384	0.0428

Największy problem sprawiało utworzenie samego zbioru danych, gdyż wymagało ono od nas opracowania grafu wiedzy. Ponadto, ontologia tego grafu nie opierała się na Freebase, tak jak w przypadku pozostałych zbiorów danych, więc nie jesteśmy do końca pewni jej poprawności. Największym ograniczeniem zaś był czas treningu modelu, dla 50 epok trening jednego modelu na cPU trwał około 20 godzin na stacji roboczej (z procesorem i7 14700). Po modernizacji kodu i środowiska tak, aby korzystać z GPU, czas treningu dla 50 epok skrócił się do około 2,5 godziny.

2 Introduction

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Automatically referencing an equation number using its label: Equation 1.

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3 Methodologies

3.1 Sample Sites & Processing

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3.2 Species Identification

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3.3 Data Analysis

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4 Results

Referencing a table using its label: Table 5.

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[1] Example footnote text.

Table 5: *Example single column table.*

Location		
East Distance	West Distance	Count
100km	200km	422
350km	1000km	1833
600km	1200km	890

Figure 1: *Anther of thale cress (Arabidopsis thaliana), fluorescence micrograph. Source: Heiti Paves, https://commons.wikimedia.org/wiki/File:Tolmukapea.jpg.*

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Referencing a figure using its label: Figure 1.

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4.1 International Support

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ÀÁÂÃÄÅÈÉÊËÌÍÎÏÒÓÔÕÖØÙÚÛÜŸÝÑ
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4.2 Links

This is a clickable URL link: LaTeX Templates. This is a clickable email link: vel@latextemplates.com. This is a clickable monospaced URL link: `https://www.LaTeXTemplates.com`.

5 Discussion

This statement requires citation [**Smith:2023qr**]. This statement requires multiple citations [**Smith:2023qr**, **Smith:2024jd**]. This statement contains an in-text citation, for directly referring to a citation like so: **Smith:2024jd**.

5.1 Subsection One

Suspendisse potenti. Vivamus suscipit dapibus metus. Proin auctor iaculis ex, id fermentum lectus dapibus tristique. Nullam maximus eros eget leo pretium dapibus. Nunc in auctor erat, id interdum risus. Suspendisse aliquet vehicula accumsan. In vestibulum efficitur dictum. Sed ultrices, libero nec fringilla feugiat, elit massa auctor ligula, vehicula tempor ligula felis in lectus. Suspendisse sem dui, pharetra ut sodales eu, suscipit sit amet felis. Donec pretium viverra ante, ac pulvinar eros. Suspendisse gravida consectetur urna. Pellentesque vitae leo porta, imperdiet eros eget, posuere sem. Praesent eget leo efficitur odio bibendum condimentum sit amet vel ex. Nunc maximus quam orci, quis pulvinar nibh eleifend ac. Quisque consequat lacus magna, eu posuere tellus iaculis ac. Sed vitae tortor tincidunt ante sagittis iaculis.

Table 6: *Example two column table with fixed-width columns.*

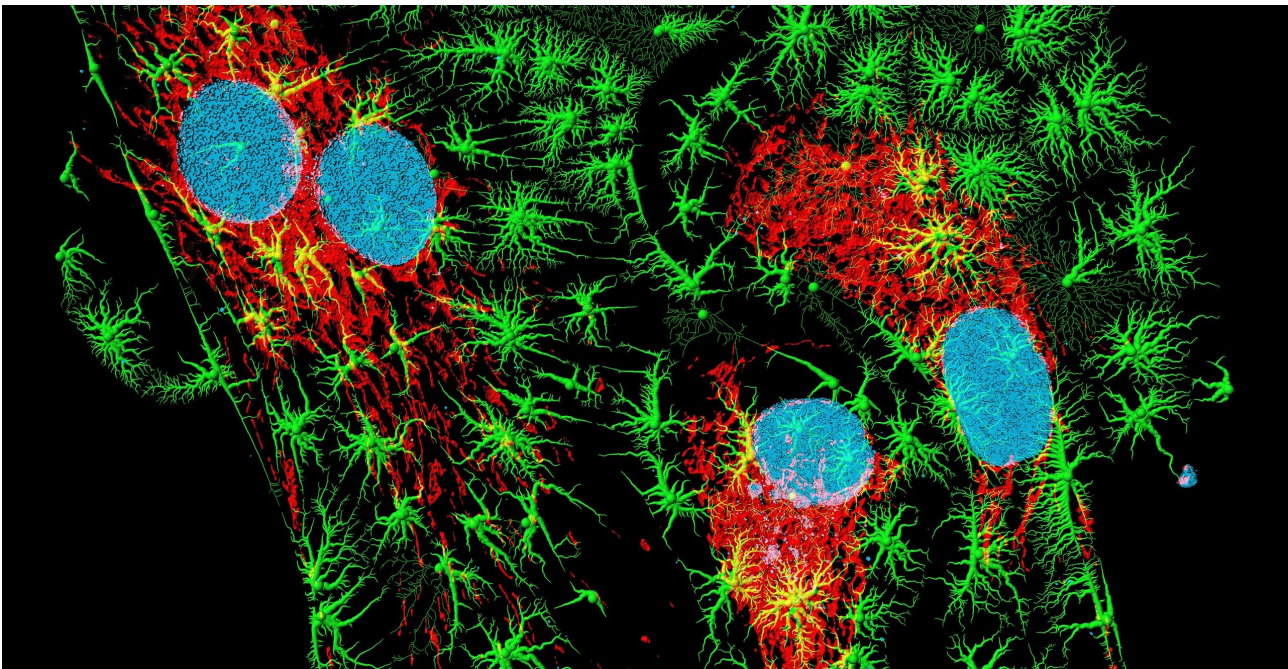| Location		
East Distance	West Distance	Count
100km	200km	422
350km	1000km	1833
600km	1200km	890

Figure 2: *Bovine pulmonary artery endothelial cells in culture. Blue: nuclei; red: mitochondria; green: microfilaments. Computer generated image from a 3D model based on a confocal laser scanning microscopy using fluorescent marker dyes. Source: Heiti Paves, https://commons.wikimedia.org/wiki/File:Fibroblastid.jpg.*

5.2 Subsection Two

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