Automatic Metadata Extraction: The High Energy Physics Use Case

Joseph Boyd

June 24, 2015

Contents

1	1.1	oduction Motivation
	1.2 1.3	Aims
	1.4	Outline
2	•	ervised Sequence Learning
	$\frac{2.1}{2.2}$	Log-linear Models
	2.2	2.2.1 Hidden Markov Models
	2.3	Conditional Random Fields
	۷.5	2.3.1 Feature Engineering
		2.0.1 Teature Diignicering
3	Auto	omatic Metadata Extraction
	3.1	Metadata Extraction
	3.2	Related Works
4		lementation and Data
	4.1	GROBID
	$\frac{4.2}{4.3}$	Extensions
	4.5	Data Acquisition
5	Resu	ults and Analysis
	5.1	Experiment Summary
	5.2	Evaluation Method
	5.3	Baseline
		5.3.1 Header model - Cora dataset
		5.3.2 Header model - Cora dataset appending HEP dataset
		5.3.3 Header model - Cora and HEP combined datasets
		5.3.4 Header model - HEP dataset
		5.3.5 Header model - HEP dataset appending CORA dataset
		5.3.6 Header model - HEP dataset appending 1/3 CORA dataset
		5.3.7 Header model - HEP dataset appending 2/3 CORA dataset
		5.3.8 Segmentation model - Cora dataset
		5.3.9 Segmentation model - Cora dataset appending HEP dataset
		5.3.10 Segmentation model - Cora and HEP combined datasets
		5.3.11 Segmentation model - HEP dataset
		5.3.12 Segmentation model - HEP dataset appending CORA dataset

	5.4		risation			
		5.4.1	Header model - $L2 = 0 \dots \dots$			
		5.4.2	Header model - $L2 = 1e^{-6}$			
		5.4.3	Header model - $L2 = 1e^{-6}$			
		5.4.4	Header model - $L2 = 1e^{-4}$			
		5.4.5	Header model - $L2 = 1e^{-3}$			
	5.5	Diction	aries			
		5.5.1	Header model - HEP dataset			
		5.5.2	Header model - HEP dataset appending CORA dataset			
		5.5.3	Segmentation model - HEP dataset			
		5.5.4	Segmentation model - HEP dataset appending CORA dataset			
		5.5.5	Header Model - HEP dataset - 2^{nd} Degree Features			
			Header Model - HEP dataset Appending CORA - 2^{nd} Degree Features			
		5.5.7	Header Model - HEP dataset - 3^{rd} Degree Features			
			Header Model - HEP dataset Appending CORA - 3^{rd} Degree Features			
	5.6		$aries + stop words \dots \dots$			
			Header model - HEP dataset			
			Header model - HEP dataset appending CORA dataset			
			Segmentation model - HEP dataset			
			Segmentation model - HEP dataset appending CORA dataset			
			Header Model - HEP dataset - 2^{nd} Degree Features			
			Header Model - HEP dataset Appending CORA - 2^{nd} Degree Features			
		5.6.7	Header Model - HEP dataset - 3^{rd} Degree Features			
			Header Model - HEP dataset Appending CORA - 3^{rd} Degree Features			
	5.7		Selection			
			Segmentation Model - HEP dataset - 5 Tokens			
			Segmentation Model - HEP dataset - 10 Tokens			
			Segmentation Model - HEP dataset - 15 Tokens			
			Segmentation Model - HEP dataset - 20 Tokens			
	5.8		htein			
			Segmentation Model - HEP dataset - Binary Threshold (0.05)			
			Segmentation Model - HEP dataset - Binary Threshold (0.1)			
		5.8.3	Segmentation Model - HEP dataset - Binary Threshold (0.2)			
		5.8.4	Segmentation Model - HEP dataset - Binary Threshold (0.4)			
		5.8.5	Segmentation Model - HEP dataset - Binary Threshold (0.8)			
			Segmentation Model - HEP dataset - Ternary Threshold			
			Segmentation Model - HEP dataset - Quaternary Threshold			
	5.9		nape			
		5.9.1	Segmentation Model - HEP dataset - Binary Threshold			
			Segmentation Model - HEP dataset - Ternary Threshold			
	5.10		tte Matching			
	0.20		Segmentation Model - HEP dataset			
6		clusion	4			
	6.1		ury			
			Key Results			
	6.2	Future	Work			
7	Refe	eferences				
8	App	Appendices				

1 Introduction

- 1.1 Motivation
- 1.2 Aims
- 1.3 Main Results
- 1.4 Outline

2 Supervised Sequence Learning

- 2.1 Log-linear Models
- 2.2 Graphical Models
- 2.2.1 Hidden Markov Models
- 2.3 Conditional Random Fields
- 2.3.1 Feature Engineering

3 Automatic Metadata Extraction

- 3.1 Metadata Extraction
- 3.2 Related Works

4 Implementation and Data

- 4.1 GROBID
- 4.2 Extensions
- 4.3 Data Acquisition

5 Results and Analysis

- 5.1 Experiment Summary
- 5.2 Evaluation Method
- 5.3 Baseline
- 5.3.1 Header model Cora dataset
- 5.3.2 Header model Cora dataset appending HEP dataset
- 5.3.3 Header model Cora and HEP combined datasets
- 5.3.4 Header model HEP dataset
- 5.3.5 Header model HEP dataset appending CORA dataset
- F 2.6. Useday model. HED detect amonding 1/2 CODA detect