Automatic Text Annotating: Application on First Samples of Comments Regarding Conventions 87 and 98

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1. Introduction

In this document, we describe the performed analysis in order to predict violations for unlabelled texts. First, we remind some important details about the analysis (corpus and construction of a representation space). Finally, we show the obtained results from machine learning. We will reminder the description of violations to be predicted.

2. Reminders

2.1 Corpus

We have two different conventions, n°87 and n°98. Each of them is considered as a corpus of documents. Each corpus is divided into two groups as illustrated on fig.1.

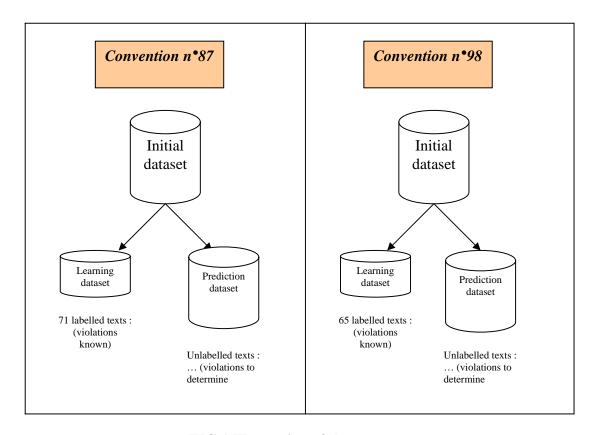


FIG.1 Illustration of the corpus

2.2 Construction of a representation space

A representation space is a mathematical structure able to represent texts in order to analyze them by datamining tools. As described in our previous report, the analysis phases are:

- Terminology extraction (find words and association of words while keeping their meaning)
- Concepts creation (gathering of words and association of words extracted by terminology extraction).
- Use of prediction models (*proximity graphs* and *decision trees*) in order to find key-concepts (violations) in unlabelled texts.

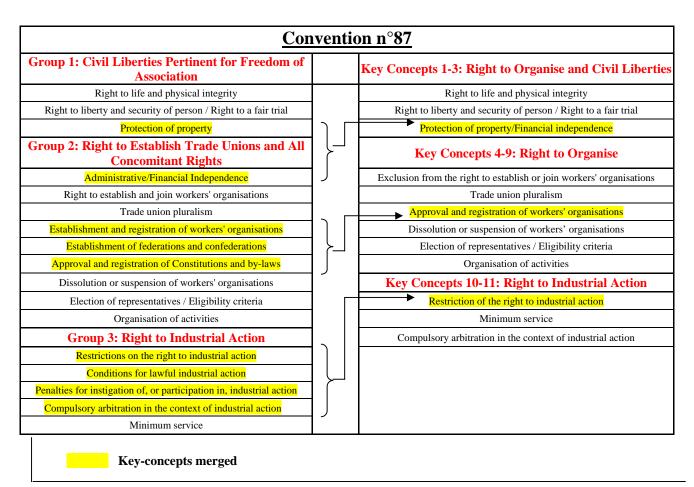
3. Preliminary studies

3.1 Concepts extraction

Several concept lists have been created. A final list which integrates the main candidateterms (words and association of words) seems to capt the essential information contained in the corpus.

3.2 Key concepts

A key-concept is a "violation". It is a feature to be predicted. At the beginning of the study, the Convention n°87 had 17 key-concepts and the Convention n°98 had 10 key-concepts. Some key-concepts have been grouped in order to have a better identification of them. We describe the gatherings here after:



TAB. Key-concepts gathering (Convention n°87)

Convention n°98			
Key Concepts: Protection against Anti-Union Discrimination and Interference Acts	Key Concepts : Protection against Anti-Union Discrimination and Interference Acts		
Anti-union discrimination	Anti-union discrimination		
Acts of interference	Acts of interference		
Solidarist associations	Solidarist associations		
Key Concepts : Collective Bargaining Promotion of free and voluntary collective bargaining	Key Concepts: Collective Bargaining Promotion of free and voluntary collective bargaining		
Exclusion from the right to collective bargaining	Exclusion from the right to collective bargaining		
Designation of the bargaining partner / Most representative trade union	Designation of the bargaining partner / Most representative trade union		
Restrictions on the level and scope of collective bargaining	Restrictions on the level and scope of collective bargaining		
Compulsory arbitration in the context of collective bargaining	Compulsory arbitration in the context of collective bargaining		
Restrictions of the negotiable issues and substantive outcomes of collective bargaining	Restrictions of the negotiable issues and substantive outcomes of collective bargaining / Approval and registration of collective agreements		
Approval and registration of collective agreements			

TAB. Key-concepts gathering (Convention n°98)

We have thus defined a new list of key-concept. Key-concepts situated on the right side of the table are violations to be predicted. The next step of the study is the construction of prediction models. After this construction, it is necessary to test the identification's power of the models. Results are described in the next section.

4. Prediction on a sample test

We have extracted 20 unlabelled texts from each corpus and we applied prediction models. The results are presented here after:

- Convention n°87

Decision trees

Country	Violation	Prob.
	Right to establish and join workers' organisations	96%
Mali 2001	Trade union pluralism	33%
Maii 2001	Protection of property / Financial independence Election of representatives / Eligibility criteria Trade union pluralism Organisation of activities Approval and registration of workers' organisations	31%
	Election of representatives / Eligibility criteria	22%
	Trade union pluralism	100%
	Organisation of activities	100%
	Approval and registration of workers' organisations	100%
Slovakia 2001	Right to establish and join workers' organisations	96%
	Restrictions on the right to industrial action	96%
	Election of representatives / Eligibility criteria	81%
	Protection of property / Financial independence	31%
	Organisation of activities	100%
	Right to establish and join workers' organisations	96%
	Restrictions on the right to industrial action	96%
Switzerland 2001	Approval and registration of workers' organisations	56%
Switzerland 2001	Trade union pluralism	33%
	Protection of property / Financial independence	31%
	Election of representatives / Eligibility criteria	22%
	Trade union pluralism	100%
	Approval and registration of workers' organisations	100%
Norway 2002	Right to establish and join workers' organisations	96%
	Election of representatives / Eligibility criteria	81%
	Protection of property / Financial independence	31%
	Minimum service	100%
	Right to establish and join workers' organisations	96%
	Restrictions on the right to industrial action	96%
	Organisation of activities	89%
Panama 2002	Election of representatives / Eligibility criteria	81%
	Compulsory arbitration in the context of industrial action	81%
	Approval and registration of workers' organisations	56%
	Trade union pluralism	33%
	Protection of property / Financial independence	31%
Guyana 2003	Compulsory arbitration in the context of industrial action	81%
	Restrictions on the right to industrial action	75%
	Right to establish and join workers' organisations	63%
	Trade union pluralism	33%

	Protection of property / Financial independence	31%
	Election of representatives / Eligibility criteria	22%
	Restrictions on the right to industrial action	96%
.	Trade union pluralism	33%
Portugal 2003	Protection of property / Financial independence	31%
	Election of representatives / Eligibility criteria	22%
	Trade union pluralism	100%
	Organisation of activities	100%
	Approval and registration of workers' organisations	100%
	Right to establish and join workers' organisations	96%
Turkey 2004	Restrictions on the right to industrial action	96%
•	Compulsory arbitration in the context of industrial action	81%
	Minimum service	60%
	Protection of property / Financial independence	31%
		22%
	Election of representatives / Eligibility criteria	100%
	Approval and registration of workers' organisations	96%
Cameroon 2000	Right to establish and join workers' organisations	
	Trade union pluralism	33%
	Protection of property / Financial independence	31%
N	Right to establish and join workers' organisations	63%
Myanmar 2001	Trade union pluralism	33%
	Protection of property / Financial independence	31%
Saint Lucia 1997	Protection of property / Financial independence	70%
Saint Lucia 1997	Right to establish and join workers' organisations	63%
	Trade union pluralism	33%
	Right to establish and join workers' organisations	96%
	Restrictions on the right to industrial action	96%
Mauritania 1997	Election of representatives / Eligibility criteria	81%
maartana 1997	Compulsory arbitration in the context of industrial action	81%
	Trade union pluralism	33%
	Protection of property / Financial independence	31%
	Approval and registration of workers' organisations	100%
	Right to establish and join workers' organisations	96%
Djibouti 2003	Restrictions on the right to industrial action	96%
	Trade union pluralism	33%
	Protection of property / Financial independence	31%
	Right to establish and join workers' organisations	96%
	Restrictions on the right to industrial action	96%
Antigua and Barbuda 2001	Trade union pluralism	33%
	Protection of property / Financial independence	31%
	Right to establish and join workers' organisations	63%
Kuweit 1997		33%
itamoit 1991	Trade union pluralism	
Chane 4000	Protection of property / Financial independence	31%
Ghana 1996	Trade union pluralism	100%
	Approval and registration of workers' organisations	100%
	Right to establish and join workers' organisations	63%

	Protection of property / Financial independence	33%
	Right to establish and join workers' organisations	63%
Hong-Kong 2004	Trade union pluralism	33%
	Protection of property / Financial independence	31%
	Organisation of activities	100%
	Right to establish and join workers' organisations	96%
Japan 95	Restrictions on the right to industrial action	96%
Japan 33	Approval and registration of workers' organisations	56%
	Trade union pluralism	33%
	Protection of property / Financial independence	31%
	Restrictions on the right to industrial action	96%
Jamaica 95	Compulsory arbitration in the context of industrial action	81%
	Right to establish and join workers' organisations	63%
	Trade union pluralism	33%
	Protection of property / Financial independence	31%

TAB. Identified violations on Conv.87 using Decision trees

Relative neighborhood graph

Country	Violation	Prob.
	trade union pluralism	50,00%
	election of representatives / eligibility criteria	50,00%
	organisation of activities	50,00%
	minimum service	50,00%
Mali 2001	compulsory arbitration in the context of industrial action	50,00%
2001	right to life and physical integrity	50,00%
	right to liberty and security of person / right to a fair trial	50,00%
	right to establish and join workers' organisations	50,00%
	dissolution or suspension of workers' organisations	50,00%
	election of representatives / eligibility criteria organisation of activities minimum service compulsory arbitration in the context of industrial action right to life and physical integrity right to liberty and security of person / right to a fair trial right to establish and join workers' organisations dissolution or suspension of workers' organisations protection of property / financial independence right to establish and join workers' organisations trade union pluralism election of representatives / eligibility criteria organisation of activities protection of property / financial independence approval and registration of workers' organisations restrictions on the right to industrial action right to establish and join workers' organisations trade union pluralism election of representatives / eligibility criteria organisation of activities protection of property / financial independence restrictions on the right to industrial action trade union pluralism election of representatives / eligibility criteria organisation of activities right to establish and join workers' organisations protection of property / financial independence approval and registration of workers' organisations protection of property / financial independence approval and registration of workers' organisations restrictions on the right to industrial action minimum service compulsory arbitration in the context of industrial action trade union pluralism minimum service compulsory arbitration in the context of industrial action restrictions on the right to industrial action trade union pluralism compulsory arbitration in the context of industrial action election of representatives / eligibility criteria	50,00%
	right to establish and join workers' organisations	100,00%
	trade union pluralism	100,00%
	Slovakia 2001 organisation of activities protection of property / financial independence	100,00%
Slovakia 2001	organisation of activities	100,00%
	protection of property / financial independence	100,00%
	approval and registration of workers' organisations	100,00%
	restrictions on the right to industrial action	100,00%
	right to establish and join workers' organisations	100,00%
	trade union pluralism	100,00%
Switzerland 2001	election of representatives / eligibility criteria	100,00%
Switzerland 2001	organisation of activities	100,00%
	protection of property / financial independence	100,00%
	minimum service compulsory arbitration in the context of industrial action right to life and physical integrity right to liberty and security of person / right to a fair trial right to establish and join workers' organisations dissolution or suspension of workers' organisations protection of property / financial independence right to establish and join workers' organisations trade union pluralism election of representatives / eligibility criteria organisation of activities protection of property / financial independence approval and registration of workers' organisations restrictions on the right to industrial action right to establish and join workers' organisations trade union pluralism election of representatives / eligibility criteria organisation of activities protection of property / financial independence restrictions on the right to industrial action trade union pluralism election of representatives / eligibility criteria organisation of activities right to establish and join workers' organisations protection of property / financial independence approval and registration of workers' organisations protection of property / financial independence approval and registration of workers' organisations restrictions on the right to industrial action minimum service compulsory arbitration in the context of industrial action trade union pluralism minimum service compulsory arbitration in the context of industrial action restrictions on the right to industrial action trade union pluralism minimum service compulsory arbitration in the context of industrial action restrictions on the right to industrial action trade union pluralism compulsory arbitration in the context of industrial action	100,00%
	trade union pluralism	100,00%
		100,00%
	election of representatives / eligibility criteria organisation of activities minimum service compulsory arbitration in the context of industrial action right to life and physical integrity right to liberty and security of person / right to a fair trial right to establish and join workers' organisations dissolution or suspension of workers' organisations protection of property / financial independence right to establish and join workers' organisations trade union pluralism election of representatives / eligibility criteria organisation of activities protection of property / financial independence approval and registration of workers' organisations restrictions on the right to industrial action right to establish and join workers' organisations trade union pluralism election of representatives / eligibility criteria organisation of activities protection of property / financial independence restrictions on the right to industrial action trade union pluralism election of representatives / eligibility criteria organisation of activities protection of property / financial independence restrictions on the right to industrial action trade union pluralism election of representatives / eligibility criteria organisation of activities right to establish and join workers' organisations protection of property / financial independence approval and registration of workers' organisations protection of property / financial independence approval and registration of workers' organisations restrictions on the right to industrial action minimum service compulsory arbitration in the context of industrial action trade union pluralism minimum service compulsory arbitration in the context of industrial action trade union pluralism compulsory arbitration in the context of industrial action election of representatives / eligibility criteria	100,00%
	right to establish and join workers' organisations	50,00%
Norway 2002	protection of property / financial independence	50,00%
	approval and registration of workers' organisations	50,00%
	election of representatives / eligibility criteria organisation of activities minimum service compulsory arbitration in the context of industrial action right to life and physical integrity right to liberty and security of person / right to a fair tright to establish and join workers' organisations dissolution or suspension of workers' organisations protection of property / financial independence right to establish and join workers' organisations trade union pluralism election of representatives / eligibility criteria organisation of activities protection of property / financial independence approval and registration of workers' organisations restrictions on the right to industrial action right to establish and join workers' organisations trade union pluralism election of representatives / eligibility criteria organisation of activities protection of property / financial independence restrictions on the right to industrial action trade union pluralism election of representatives / eligibility criteria organisation of activities protection of property / financial independence restrictions on the right to industrial action trade union pluralism election of property / financial independence approval and registration of workers' organisations protection of property / financial independence approval and registration of workers' organisations restrictions on the right to industrial action minimum service compulsory arbitration in the context of industrial action trade union pluralism minimum service compulsory arbitration in the context of industrial action trade union pluralism compulsory arbitration in the context of industrial action restrictions on the right to industrial action trade union pluralism compulsory arbitration in the context of industrial action election of representatives / eligibility criteria organisation of activities minimum service	50,00%
	minimum service	50,00%
	compulsory arbitration in the context of industrial action	50,00%
	trade union pluralism	100,00%
D 0000	•	100,00%
Panama 2002		100,00%
		100,00%
Guyana 2003	_	100,00%
	•	100,00%
		50,00%
		50,00%
		50,00%
		50,00%

	restrictions on the right to industrial action	50,00%
	right to establish and join workers' organisations	100,00%
	election of representatives / eligibility criteria	100,00%
Dortugal 2002	organisation of activities	100,00%
Portugai 2003	protection of property / financial independence	100,00%
Portugal 2003 Turkey 2004 Cameroon 2000 Myanmar 2001 Saint Lucia 1997 Mauritania 1997	approval and registration of workers' organisations	100,00%
	restrictions on the right to industrial action	100,00%
	right to establish and join workers' organisations	100,00%
	trade union pluralism	100,00%
	election of representatives / eligibility criteria	100,00%
Turkey 2004	organisation of activities	100,00%
	protection of property / financial independence	100,00%
	approval and registration of workers' organisations	100,00%
	restrictions on the right to industrial action	100,00%
	right to establish and join workers' organisations	100,00%
Cameroon 2000	restrictions on the right to industrial action	33,33%
	right to establish and join workers' organisations	100,00%
	trade union pluralism	100,00%
Myanmar 2001	protection of property / financial independence	100,00%
	organisation of activities	50,00%
	restrictions on the right to industrial action	50,00%
	right to establish and join workers' organisations	100,00%
	protection of property / financial independence	75,00%
	restrictions on the right to industrial action	75,00%
	approval and registration of workers' organisations	50,00%
Saint Lucia 1997	trade union pluralism	25,00%
	organisation of activities	25,00%
	dissolution or suspension of workers' organisations	25,00%
	election of representatives / eligibility criteria	25,00%
	election of representatives / eligibility criteria	100,00%
	organisation of activities	100,00%
Turkey 2004 Cameroon 2000 Myanmar 2001 Saint Lucia 1997	compulsory arbitration in the context of industrial action	100,00%
	trade union pluralism	75,00%
Mauritania 1997	right to establish and join workers' organisations	25,00%
	protection of property / financial independence	25,00%
	approval and registration of workers' organisations	25,00%
	restrictions on the right to industrial action	25,00%
	right to establish and join workers' organisations	100,00%
	election of representatives / eligibility criteria	100,00%
Djibouti 2003	organisation of activities	100,00%
	compulsory arbitration in the context of industrial action	100,00%
	protection of property / financial independence	100,00%
	approval and registration of workers' organisations	100,00%
Audin and B. L. Cook	restrictions on the right to industrial action	100,00%
Antigua and Barbuda 2001	right to life and physical integrity	100,00%

	right to liberty and security of person / right to a fair trial	100,00%
	right to establish and join workers' organisations	100,00%
	dissolution or suspension of workers' organisations	100,00%
	protection of property / financial independence	100,00%
	right to establish and join workers' organisations	75,00%
	trade union pluralism	75,00%
Kuweit 1997	protection of property / financial independence	50,00%
	minimum service	25,00%
	compulsory arbitration in the context of industrial action	25,00%
	right to establish and join workers' organisations	100,00%
Ghana 1996	protection of property / financial independence	100,00%
Gilaria 1990	restrictions on the right to industrial action	50,00%
	minimum service	50,00%
	right to establish and join workers' organisations	100,00%
Hong-Kong 2004	trade union pluralism	100,00%
	protection of property / financial independence	100,00%
	right to establish and join workers' organisations	100,00%
	trade union pluralism	100,00%
	election of representatives / eligibility criteria	100,00%
Japan 95	organisation of activities	100,00%
	minimum service	100,00%
	compulsory arbitration in the context of industrial action	100,00%
	restrictions on the right to industrial action	100,00%
	trade union pluralism	100,00%
	election of representatives / eligibility criteria	100,00%
Jamaica 95	organisation of activities	100,00%
	minimum service	100,00%
	compulsory arbitration in the context of industrial action	100,00%

TAB. Identified violations on Conv.87 using RNG

- Convention n°98

Decision trees

Turkey 1997 Right to collective bargaining Designation of the bargaining partner / Most representative trade union Negotiable issues-substantive outcomes / approval-refusal 2.4% Sweden 1997 Designation of the bargaining partner / Most representative trade union Negotiable issues-substantive outcomes / approval-refusal 5.0% Haiti 1997 Anti-union discrimination 9.3% Negotiable issues-substantive outcomes / approval-refusal 2.4% Jamaica 1999 Designation of the bargaining partner / Most representative trade union Negotiable issues-substantive outcomes / approval-refusal 5.0% Anti-union discrimination 8.3% Anti-union discrimination 8.3% Anti-union discrimination 9.3% Anti-union discrimination Negotiable issues-substantive outcomes / approval-refusal 2.4% Anti-union discrimination Negotiable issues-substantive outcomes / approval-refusal 2.4% Anti-union discrimination 8.3% Acts of interference 1.00% Negotiable issues-substantive outcomes / approval-refusal 2.4% Anti-union discrimination 8.9% Acts of interference 1.00% Negotiable issues-substantive outcomes / approval-refusal 8.9% Right to collective bargaining Designation of the bargaining partner / Most representative trade union 8.9% Chad 1998 Negotiable issues-substantive outcomes / approval-refusal 8.9% Negotiable issues-substantive outcomes / approval-refusal 8.9% Negotiable issues-substantive outcomes / approval-refusal 9.9% Ominican Republic 1998 Right to collective bargaining Negotiable issues-substantive outcomes / approval-refusal 9.9% Negotiable issues-substantive outcomes / approval-refusal 9.9% Anti-union discrimination 9.93% Anti-union discrimin	Country	Violation	Prob.
Designation of the bargaining partner / Most representative trade union Negotiable issues-substantive outcomes / approval-refusal 100% Sweden 1997 Designation of the bargaining partner / Most representative trade union Negotiable issues-substantive outcomes / approval-refusal 50% Hatit 1997 Anti-union discrimination Negotiable issues-substantive outcomes / approval-refusal 24% Jamaica 1999 Designation of the bargaining partner / Most representative trade union Negotiable issues-substantive outcomes / approval-refusal 50% Anti-union discrimination 93% Anti-union discrimination 93% Anti-union discrimination Negotiable issues-substantive outcomes / approval-refusal 24% Anti-union discrimination Negotiable issues-substantive outcomes / approval-refusal 24% Anti-union discrimination Negotiable issues-substantive outcomes / approval-refusal 24% Anti-union discrimination 93% Acts of interference 100% Negotiable issues-substantive outcomes / approval-refusal 24% Negotiable issues-substantive outcomes / approval-refusal 24% Right to collective bargaining Designation of the bargaining partner / Most representative trade union Negotiable issues-substantive outcomes / approval-refusal 24% Chad 1998 Negotiable issues-substantive outcomes / approval-refusal 50% Anti-union discrimination Negotiable issues-substantive outcomes / approval-refusal 24% Anti-union discrimination Negotiab		Anti-union discrimination	93%
Designation of the bargaining partner / Most representative trade union Negotiable issues-substantive outcomes / approval-refusal Sweden 1997 Begination of the bargaining partner / Most representative trade union Negotiable issues-substantive outcomes / approval-refusal Anti-union discrimination Negotiable issues-substantive outcomes / approval-refusal Anti-union discrimination Negotiable issues-substantive outcomes / approval-refusal Anti-union discrimination Sri Lanka 1999 Anti-union discrimination Acts of interference Designation of the bargaining partner / Most representative trade union Negotiable issues-substantive outcomes / approval-refusal Anti-union discrimination Acts of interference Negotiable issues-substantive outcomes / approval-refusal Anti-union discrimination Negotiable issues-substantive outcomes / approval-refusal Anti-union discrimination Negotiable issues-substantive outcomes / approval-refusal Anti-union discrimination Negotiable issues-substantive outcomes / approval-refusal Acts of interference Negotiable issues-substantive outcomes / approval-refusal Leeland 1998 Iceland 1998 Iceland 1998 Negotiable issues-substantive outcomes / approval-refusal Anti-union discrimination Negotiable issues-substantive outcomes / a	Turkey 1997	Right to collective bargaining	89%
Designation of the bargaining partner / Most representative trade union	runcy 1007	Designation of the bargaining partner / Most representative trade union	100%
Haiti 1997 Anti-union discrimination 93% Haiti 1997 Anti-union discrimination 93% Approval-refusal 24% Jamaica 1999 Designation of the bargaining partner / Most representative trade union 100% Apoliable issues-substantive outcomes / approval-refusal 50% Arti-union discrimination 93% Arti-union discrimination 93% Arti-union discrimination 93% Arti-union discrimination 93% Arti-union discrimination 100% Designation of the bargaining partner / Most representative trade union 100% Acts of interference 100% Right to collective bargaining 100% Acts of interference 100% Acts of interference 100% Regoliable issues-substantive outcomes / approval-refusal 24% Right to collective bargaining 100% Regoliable issues-substantive outcomes / approval-refusal 100% Chad 1998 Regoliable issues-substantive outcomes / approval-refusal 100% Chad 1998 Regoliable issues-substantive outcomes / approval-refusal 100% Acts of interference 100% Anti-union discrimination 100% Acts of interference 100% Anti-union discrimination 100% Acts of interference 100% Right to collective bargaining 100% Acts of interference 100% Right to collective bargaining 100% Acts of interference 100% Right to collective bargaining 100% Acts of interference 100% Acts of interference 100% Acts of interference 100% Right to collective bargaining 100% Acts of interference 100% Right to collective bargaining 100% Acts of interference 100% Anti-union discrimination 100% Acts of interference 100% Acts of i		Negotiable issues-substantive outcomes / approval-refusal	24%
Haiti 1997 Anti-union discrimination 93% Anti-union discrimination 100% Approval-refusal 24% Jamaica 1999 Designation of the bargaining partner / Most representative trade union 100% Anti-union discrimination 100% Acts of interference 100% Anti-union discrimination 100% Acts of interference 100% Regotiable issues-substantive outcomes / approval-refusal 24% Right to collective bargaining partner / Most representative trade union 60% Regotiable issues-substantive outcomes / approval-refusal 24% Anti-union discrimination 80% Acts of interference 100% Acts of in	Swadan 1997	Designation of the bargaining partner / Most representative trade union	100%
Negotiable issues-substantive outcomes / approval-refusal 24% Jamaica 1999 Designation of the bargaining partner / Most representative trade union 100% Negotiable issues-substantive outcomes / approval-refusal 55% Anti-union discrimination 93% Acts of interference 100% Designation of the bargaining partner / Most representative trade union 100% Negotiable issues-substantive outcomes / approval-refusal 24% Anti-union discrimination 93% Acts of interference 100% Designation of the bargaining partner / Most representative trade union 100% Negotiable issues-substantive outcomes / approval-refusal 24% Anti-union discrimination 93% Acts of interference 100% Right to collective bargaining 28% Designation of the bargaining partner / Most representative trade union 60% Negotiable issues-substantive outcomes / approval-refusal 24% Right to collective bargaining 88% Level and scope of collective bargaining 88% Negotiable issues-substantive outcomes / approval-refusal 50% Chad 1998 Negotiable issues-substantive outcomes / approval-refusal 50% Anti-union discrimination 93% Negotiable issues-substantive outcomes / approval-refusal 50% Anti-union discrimination 93% Anti-union discrimination 93% Acts of interference 100% Negotiable issues-substantive outcomes / approval-refusal 24% Anti-union discrimination 93% Acts of interference 100% Negotiable issues-substantive outcomes / approval-refusal 24% Anti-union discrimination 93% Acts of interference 100% Negotiable issues-substantive outcomes / approval-refusal 24% Anti-union discrimination 93% Acts of interference 100% Negotiable issues-substantive outcomes / approval-refusal 24% Anti-union discrimination 93% Acts of interference 100% Negotiable issues-substantive outcomes / approval-refusal 24% Right to collective bargaining partner / Most representative trade union 100% Negotiable issues-substantive outcomes / approval-refusal 24% Right to collective bargaining 100% Negotiable issues-substantive outcomes / approval-refusal 100% Negotiable issues-substantive outcomes / approv	Oweden 1937	Negotiable issues-substantive outcomes / approval-refusal	50%
Designation of the bargaining partner / Most representative trade union 100%	Haiti 1007	Anti-union discrimination	93%
Negotiable issues-substantive outcomes / approval-refusal 50%	11atti 1991	Negotiable issues-substantive outcomes / approval-refusal	24%
Negotiable issues-substantive outcomes / approval-refusal 50%	lamaica 1000	Designation of the bargaining partner / Most representative trade union	100%
Acts of interference	Jamaica 1999	Negotiable issues-substantive outcomes / approval-refusal	50%
Designation of the bargaining partner / Most representative trade union 100% Negotiable issues-substantive outcomes / approval-refusal 24% Anti-union discrimination 33% Acts of interference 100% Right to collective bargaining partner / Most representative trade union 60% Negotiable issues-substantive outcomes / approval-refusal 24% Iceland 1998 Right to collective bargaining partner / Most representative trade union 89% Level and scope of collective bargaining 89% Regotiable issues-substantive outcomes / approval-refusal 50% Chad 1998 Negotiable issues-substantive outcomes / approval-refusal 50% Chad 1998 Negotiable issues-substantive outcomes / approval-refusal 50% Anti-union discrimination 93% Venezuela 1998 Designation of the bargaining partner / Most representative trade union 100% Negotiable issues-substantive outcomes / approval-refusal 24% Anti-union discrimination 93% Anti-union discrimination 93% Acts of interference 100% Right to collective bargaining partner / Most representative trade union 93% Anti-union discrimination 93% Anti-union discrimination 93% Acts of interference 100% Regotiable issues-substantive outcomes / approval-refusal 24% Belize 2002 Right to collective bargaining partner / Most representative trade union 60% Negotiable issues-substantive outcomes / approval-refusal 24% Anti-union discrimination 93% Acts of interference 100% Regotiable issues-substantive outcomes / approval-refusal 24% Right to collective bargaining partner / Most representative trade union 93% Regotiable issues-substantive outcomes / approval-refusal 24% Right to collective bargaining partner / Most representative trade union 93% Right to collective bargaining partner / Most representative trade union 100% Regotiable issues-substantive outcomes / approval-refusal 24% Right to collective bargaining partner / Most representative trade union 100% Regotiable issues-substantive outcomes / approval-refusal 50% Right to collective bargaining partner / Most representative trade union 100% Regotiable issues-substantive ou		Anti-union discrimination	93%
Designation of the bargaining partner / Most representative trade union Negotiable issues-substantive outcomes / approval-refusal Anti-union discrimination Acts of interference 100% Right to collective bargaining partner / Most representative trade union Negotiable issues-substantive outcomes / approval-refusal 24% Right to collective bargaining Negotiable issues-substantive outcomes / approval-refusal 24% Chad 1998 Level and scope of collective bargaining Negotiable issues-substantive outcomes / approval-refusal 50% Chad 1998 Negotiable issues-substantive outcomes / approval-refusal 50% Negotiable issues-substantive outcomes / approval-refusal 50% Chad 1998 Negotiable issues-substantive outcomes / approval-refusal 50% Negotiable issues-substantive outcomes / approval-refusal 50% Anti-union discrimination 50% Negotiable issues-substantive outcomes / approval-refusal 40% Anti-union discrimination 50% Negotiable issues-substantive outcomes / approval-refusal 40% Anti-union discrimination 60% Negotiable issues-substantive outcomes / approval-refusal 40% Anti-union discrimination 60% Negotiable issues-substantive outcomes / approval-refusal 40% Anti-union discrimination 60% Negotiable issues-substantive outcomes / approval-refusal 40% Anti-union discrimination 60% Negotiable issues-substantive outcomes / approval-refusal 40% Anti-union discrimination 80% Negotiable issues-substantive outcomes / approval-refusal 40% Negotiable issues-substantive outcomes / approval-refusal 40% Negotiable issues-substantive outcomes / approval-refusal 40% Right to collective bargaining 60% Negotiable issues-substantive outcomes / approval-refusal 60% Negotiable issues	Sri I anka 1000	Acts of interference	100%
Anti-union discrimination 93% Acts of interference 100% Right to collective bargaining 24% Right to collective bargaining 24% Right to collective bargaining 24%	SII Lailka 1999	Designation of the bargaining partner / Most representative trade union	100%
Acts of interference		Negotiable issues-substantive outcomes / approval-refusal	24%
Right to collective bargaining 98% Designation of the bargaining partner / Most representative trade union 60% Negotiable issues-substantive outcomes / approval-refusal 24% Right to collective bargaining 88% Level and scope of collective bargaining 88% Negotiable issues-substantive outcomes / approval-refusal 50% Chad 1998 Negotiable issues-substantive outcomes / approval-refusal 50% Anti-union discrimination 93% Acts of interference 100% Right to collective bargaining 98% Czech Republic 2003 Right to collective bargaining partner / Most representative trade union 60% Negotiable issues-substantive outcomes / approval-refusal 24% Acts of interference 100% Right to collective bargaining partner / Most representative trade union 60% Negotiable issues-substantive outcomes / approval-refusal 24% Right to collective bargaining 98% Regotiable issues-substantive outcomes / approval-refusal 24% Right to collective bargaining 98% Negotiable issues-substantive outcomes / approval-refusal 24% Right to collective bargaining 89% Negotiable issues-substantive outcomes / approval-refusal 24% Right to collective bargaining 89% Negotiable issues-substantive outcomes / approval-refusal 24% Negotiable issues-substantive outcomes / approval-refusal 24% Negotiable issues-substantive outcomes / approval-refusal 24% Negotiable issues-substantive outcomes / approval-refusal 38% Negotiable issues-substantive outcomes / approval-		Anti-union discrimination	93%
Designation of the bargaining partner / Most representative trade union Negotiable issues-substantive outcomes / approval-refusal Level and scope of collective bargaining Negotiable issues-substantive outcomes / approval-refusal Level and scope of collective bargaining Negotiable issues-substantive outcomes / approval-refusal Chad 1998 Negotiable issues-substantive outcomes / approval-refusal Sow. Chad 1998 Negotiable issues-substantive outcomes / approval-refusal Anti-union discrimination Pesignation of the bargaining partner / Most representative trade union Negotiable issues-substantive outcomes / approval-refusal Anti-union discrimination Negotiable issues-substantive outcomes / approval-refusal Acts of interference Czech Republic 2003 Right to collective bargaining Designation of the bargaining partner / Most representative trade union Negotiable issues-substantive outcomes / approval-refusal Acts of interference Right to collective bargaining Designation of the bargaining partner / Most representative trade union Negotiable issues-substantive outcomes / approval-refusal Anti-union discrimination Negotiable issues-substantive outcomes / approval-refusal Designation of the bargaining partner / Most representative trade union Level and scope of collective bargaining Negotiable issues-substantive outcomes / approval-refusal		Acts of interference	100%
Negotiable issues-substantive outcomes / approval-refusal 24% Right to collective bargaining 89% Level and scope of collective bargaining 80% Negotiable issues-substantive outcomes / approval-refusal 50% Chad 1998 Negotiable issues-substantive outcomes / approval-refusal 50% Chad 1998 Negotiable issues-substantive outcomes / approval-refusal 50% Negotiable issues-substantive outcomes / approval-refusal 24% Negotiable issues-substantive outcomes / approval-refusal 26% Negotiable issues-substa	Morocco 1999	Right to collective bargaining	89%
Right to collective bargaining 89% Level and scope of collective bargaining 89% Level and scope of collective bargaining 89% Negotiable issues-substantive outcomes / approval-refusal 50% Chad 1998 Negotiable issues-substantive outcomes / approval-refusal 50% Dominican Republic 1998 Right to collective bargaining 89% Negotiable issues-substantive outcomes / approval-refusal 50% Negotiable issues-substantive outcomes / approval-refusal 50% Anti-union discrimination 93% Negotiable issues-substantive outcomes / approval-refusal 24% Anti-union discrimination 23% Acts of interference 100% Right to collective bargaining 89% Designation of the bargaining partner / Most representative trade union 60% Negotiable issues-substantive outcomes / approval-refusal 24% Anti-union discrimination 93% Right to collective bargaining partner / Most representative trade union 93% Negotiable issues-substantive outcomes / approval-refusal 24% Right to collective bargaining 89% Designation of the bargaining partner / Most representative trade union 100% Level and scope of collective bargaining 89% Negotiable issues-substantive outcomes / approval-refusal 50% Negotiabl		Designation of the bargaining partner / Most representative trade union	60%
Level and scope of collective bargaining 80%		Negotiable issues-substantive outcomes / approval-refusal	24%
Negotiable issues-substantive outcomes / approval-refusal 50% Chad 1998 Negotiable issues-substantive outcomes / approval-refusal 50% Negotiable issues-substantive outcomes / approval-refusal 50% Negotiable issues-substantive outcomes / approval-refusal 50% Anti-union discrimination 93% Designation of the bargaining partner / Most representative trade union 100% Negotiable issues-substantive outcomes / approval-refusal 24% Anti-union discrimination 93% Acts of interference 100% Right to collective bargaining partner / Most representative trade union 60% Negotiable issues-substantive outcomes / approval-refusal 24% Belize 2002 Right to collective bargaining partner / Most representative trade union 60% Negotiable issues-substantive outcomes / approval-refusal 24% Right to collective bargaining partner / Most representative trade union 93% Negotiable issues-substantive outcomes / approval-refusal 24% Right to collective bargaining 93% Negotiable issues-substantive outcomes / approval-refusal 24% Right to collective bargaining 98% Designation of the bargaining partner / Most representative trade union 100% Level and scope of collective bargaining 98% Negotiable issues-substantive outcomes / approval-refusal 50%		Right to collective bargaining	89%
Chad 1998 Negotiable issues-substantive outcomes / approval-refusal 50% Dominican Republic 1998 Right to collective bargaining Negotiable issues-substantive outcomes / approval-refusal 89% Venezuela 1998 Anti-union discrimination 93% Designation of the bargaining partner / Most representative trade union 100% Negotiable issues-substantive outcomes / approval-refusal 24% Acts of interference 100% Right to collective bargaining 89% Designation of the bargaining partner / Most representative trade union 60% Negotiable issues-substantive outcomes / approval-refusal 24% Belize 2002 Anti-union discrimination 93% Negotiable issues-substantive outcomes / approval-refusal 24% Trinidad and Tobago 2001 Right to collective bargaining 89% Designation of the bargaining partner / Most representative trade union 100% Level and scope of collective bargaining 89% Designation of the bargaining partner / Most representative trade union 100% Level and scope of collective bargaining 80% Negotiable issues-substantive outcomes / approval-refusal 50%	Iceland 1998	Level and scope of collective bargaining	80%
Right to collective bargaining 89% Negotiable issues-substantive outcomes / approval-refusal 50% Anti-union discrimination 93% Designation of the bargaining partner / Most representative trade union 100% Negotiable issues-substantive outcomes / approval-refusal 24% Anti-union discrimination 93% Acts of interference 100% Right to collective bargaining 89% Designation of the bargaining partner / Most representative trade union 60% Negotiable issues-substantive outcomes / approval-refusal 24% Belize 2002 Anti-union discrimination 93% Negotiable issues-substantive outcomes / approval-refusal 24% Right to collective bargaining 89% Designation of the bargaining partner / Most representative trade union 93% Negotiable issues-substantive outcomes / approval-refusal 24% Right to collective bargaining 89% Designation of the bargaining partner / Most representative trade union 100% Level and scope of collective bargaining 80% Negotiable issues-substantive outcomes / approval-refusal 50% Negotiable issues-substantive outcomes / approval-ref		Negotiable issues-substantive outcomes / approval-refusal	50%
Negotiable issues-substantive outcomes / approval-refusal 50%	Chad 1998	Negotiable issues-substantive outcomes / approval-refusal	50%
Negotiable issues-substantive outcomes / approval-refusal 50%	Dominican Republic 1998	Right to collective bargaining	89%
Designation of the bargaining partner / Most representative trade union 100%	Dominioun Republic 1990	Negotiable issues-substantive outcomes / approval-refusal	50%
Negotiable issues-substantive outcomes / approval-refusal Anti-union discrimination Acts of interference Right to collective bargaining partner / Most representative trade union Negotiable issues-substantive outcomes / approval-refusal Belize 2002 Belize 2002 Anti-union discrimination Negotiable issues-substantive outcomes / approval-refusal Cuinca 2004		Anti-union discrimination	93%
Anti-union discrimination 93% Acts of interference 100% Right to collective bargaining 88% Designation of the bargaining partner / Most representative trade union 60% Negotiable issues-substantive outcomes / approval-refusal 24% Right to collective bargaining partner / Most representative trade union 93% Anti-union discrimination 93% Negotiable issues-substantive outcomes / approval-refusal 24% Right to collective bargaining 88% Designation of the bargaining partner / Most representative trade union 100% Level and scope of collective bargaining 80% Negotiable issues-substantive outcomes / approval-refusal 50% Negotiable issues-substantive outcomes / approval-refusal 50%	Venezuela 1998	Designation of the bargaining partner / Most representative trade union	100%
Czech Republic 2003 Acts of interference Right to collective bargaining Designation of the bargaining partner / Most representative trade union Negotiable issues-substantive outcomes / approval-refusal Anti-union discrimination Negotiable issues-substantive outcomes / approval-refusal Aright to collective bargaining Posignation of the bargaining partner / Most representative trade union Negotiable issues-substantive outcomes / approval-refusal Aright to collective bargaining Designation of the bargaining partner / Most representative trade union Level and scope of collective bargaining Negotiable issues-substantive outcomes / approval-refusal Cuince 2001		Negotiable issues-substantive outcomes / approval-refusal	24%
Czech Republic 2003 Right to collective bargaining 89% Designation of the bargaining partner / Most representative trade union 60% Negotiable issues-substantive outcomes / approval-refusal 24% Belize 2002 Anti-union discrimination 93% Negotiable issues-substantive outcomes / approval-refusal 24% Right to collective bargaining 89% Designation of the bargaining partner / Most representative trade union 100% Level and scope of collective bargaining 80% Negotiable issues-substantive outcomes / approval-refusal 50%		Anti-union discrimination	93%
Designation of the bargaining partner / Most representative trade union Negotiable issues-substantive outcomes / approval-refusal Anti-union discrimination Negotiable issues-substantive outcomes / approval-refusal Aright to collective bargaining Right to collective bargaining Designation of the bargaining partner / Most representative trade union Level and scope of collective bargaining Negotiable issues-substantive outcomes / approval-refusal Solventians 2001		Acts of interference	100%
Negotiable issues-substantive outcomes / approval-refusal Anti-union discrimination Negotiable issues-substantive outcomes / approval-refusal 24% Right to collective bargaining Designation of the bargaining partner / Most representative trade union Level and scope of collective bargaining Negotiable issues-substantive outcomes / approval-refusal 50% Cuinos 2001	Czech Republic 2003	Right to collective bargaining	89%
Belize 2002 Anti-union discrimination Negotiable issues-substantive outcomes / approval-refusal 24% Right to collective bargaining Designation of the bargaining partner / Most representative trade union Level and scope of collective bargaining Negotiable issues-substantive outcomes / approval-refusal 50% Cuinos 2004		Designation of the bargaining partner / Most representative trade union	60%
Negotiable issues-substantive outcomes / approval-refusal 24% Right to collective bargaining 89% Designation of the bargaining partner / Most representative trade union 100% Level and scope of collective bargaining 80% Negotiable issues-substantive outcomes / approval-refusal 50%		Negotiable issues-substantive outcomes / approval-refusal	24%
Negotiable issues-substantive outcomes / approval-refusal 24% Right to collective bargaining 89% Designation of the bargaining partner / Most representative trade union 100% Level and scope of collective bargaining 80% Negotiable issues-substantive outcomes / approval-refusal 50%	Belize 2002	Anti-union discrimination	93%
Trinidad and Tobago 2001 Designation of the bargaining partner / Most representative trade union 100% Level and scope of collective bargaining 80% Negotiable issues-substantive outcomes / approval-refusal 50%	201120 2002	Negotiable issues-substantive outcomes / approval-refusal	24%
Level and scope of collective bargaining Negotiable issues-substantive outcomes / approval-refusal Suiza 2001		Right to collective bargaining	89%
Level and scope of collective bargaining 80% Negotiable issues-substantive outcomes / approval-refusal 50%	Trinidad and Tobago 2001	Designation of the bargaining partner / Most representative trade union	100%
Cuinos 2004		Level and scope of collective bargaining	80%
Guinea 2001 Anti-union discrimination		Negotiable issues-substantive outcomes / approval-refusal	50%
y tria distribution	Guinea 2001	Anti-union discrimination	93%

	Acts of interference	100%
	Designation of the bargaining partner / Most representative trade union	60%
	Negotiable issues-substantive outcomes / approval-refusal	24%
	Anti-union discrimination	93%
Malaysia 2000	Right to collective bargaining	89%
	Negotiable issues-substantive outcomes / approval-refusal	24%
	Anti-union discrimination	93%
Iraq 2000	Right to collective bargaining	89%
	Negotiable issues-substantive outcomes / approval-refusal	24%
	Acts of interference	100%
Fiji 2000	Designation of the bargaining partner / Most representative trade union	60%
	Negotiable issues-substantive outcomes / approval-refusal	50%
Brazil 2000	Designation of the bargaining partner / Most representative trade union	89%
B14211 2000	Negotiable issues-substantive outcomes / approval-refusal	50%
	Anti-union discrimination	93%
Ukraine 1999	Acts of interference	100%
Oktaine 1999	Designation of the bargaining partner / Most representative trade union	100%
	Negotiable issues-substantive outcomes / approval-refusal	24%
	Anti-union discrimination	93%
Honduras 1999	Acts of interference	100%
1101144140 1000	Designation of the bargaining partner / Most representative trade union	60%
	Negotiable issues-substantive outcomes / approval-refusal	24%

 $TAB.\ Identified\ violations\ on\ Conv. 98\ using\ Decision\ trees$

Relative neighborhood graph

Country	Violation	Prob.
	anti-union discrimination	100%
Turkey 1997	designation of the bargaining partner / most representative trade union	100%
	negotiable issues and substantive outcomes of collective bargaining	100%
	designation of the bargaining partner / most representative trade union	100%
Turkey 1997 anti-union discrimination designation of the bargaining partner / most representative trade union negotiable issues and substantive outcomes of collective bargaining designation of the bargaining partner / most representative trade union anti-union discrimination acts of interference negotiable issues and substantive outcomes of collective bargaining anti-union discrimination acts of interference designation of the bargaining partner / most representative trade union acts of interference designation of the bargaining partner / most representative trade union acts of interference designation of the bargaining partner / most representative trade union acts of interference designation of the bargaining partner / most representative trade union acts of interference designation of the bargaining partner / most representative trade union right to collective bargaining negotiable issues and substantive outcomes of collective bargaining anti-union discrimination negotiable issues and substantive outcomes of collective bargaining anti-union discrimination acts of interference promotion of free and voluntary collective bargaining right to collective bargaining compulsory arbitration in the context of collective bargaining promotion of free and voluntary collective bargaining acts of interference compulsory arbitration in the context of collective bargaining promotion of free and voluntary collective bargaining acts of interference compulsory arbitration in the context of collective bargaining promotion of free and voluntary collective bargaining acts of interference compulsory arbitration in the context of collective bargaining promotion of free and voluntary collective bargaining acts of interference compulsory arbitration in the context of collective bargaining promotion of free and voluntary collective bargaining acts of interference compulsory arbitration in the context of collective bargaining itself to collective bargaining acts of interference oright to collective bargaining acts of interference right	33%	
Sweden 1997	acts of interference	33%
	negotiable issues and substantive outcomes of collective bargaining	33%
	anti-union discrimination	100%
Haiti 1997	acts of interference	100%
	designation of the bargaining partner / most representative trade union	100%
lemeire 4000		100%
Jamaica 1999	designation of the bargaining partner / most representative trade union	100%
		100%
	designation of the bargaining partner / most representative trade union	100%
Sri Lanka 1999	right to collective bargaining	50%
	negotiable issues and substantive outcomes of collective bargaining	50%
	anti-union discrimination negotiable issues and substantive outcomes of collective bargaining anti-union discrimination	50%
	negotiable issues and substantive outcomes of collective bargaining	100%
	anti-union discrimination	50%
Morocco 1999	acts of interference	50%
MOIOCCO 1999	promotion of free and voluntary collective bargaining	50%
	right to collective bargaining	50%
	compulsory arbitration in the context of collective bargaining	50%
	promotion of free and voluntary collective bargaining	100%
	right to collective bargaining	100%
Icoland 1008	designation of the bargaining partner / most representative trade union negotiable issues and substantive outcomes of collective bargaining designation of the bargaining partner / most representative trade union anti-union discrimination acts of interference negotiable issues and substantive outcomes of collective bargaining anti-union discrimination acts of interference designation of the bargaining partner / most representative trade union acts of interference designation of the bargaining partner / most representative trade union acts of interference designation of the bargaining partner / most representative trade union acts of interference designation of the bargaining partner / most representative trade union right to collective bargaining negotiable issues and substantive outcomes of collective bargaining anti-union discrimination negotiable issues and substantive outcomes of collective bargaining anti-union discrimination acts of interference promotion of free and voluntary collective bargaining anti-union discrimination acts of interference compulsory arbitration in the context of collective bargaining promotion of free and voluntary collective bargaining injet to collective bargaining anti-union discrimination acts of interference compulsory arbitration in the context of collective bargaining promotion of free and voluntary collective bargaining injet to collective bargaining anti-union discrimination acts of interference compulsory arbitration in the context of collective bargaining promotion of free and voluntary collective bargaining injet to collective bargaining acts of interference right to collective bargaining designation of the bargaining partner / most representative trade union negotiable issues and substantive outcomes of collective bargaining designation of the bargaining partner / most representative trade union anti-union discr	100%
icelana 1990		50%
		50%
	compulsory arbitration in the context of collective bargaining	50%
	promotion of free and voluntary collective bargaining	100%
Chad 1998	right to collective bargaining	100%
	level and scope of collective bargaining	100%
	acts of interference	100%
Dominican Republic 1998	right to collective bargaining	100%
Dominican Republic 1990	designation of the bargaining partner / most representative trade union	100%
	negotiable issues and substantive outcomes of collective bargaining	100%
Venezuela 1998	designation of the bargaining partner / most representative trade union	100%
Czech Republic 2003		100%
	acts of interference	100%
		100%
		100%
Belize 2002	anti-union discrimination	100%

	acts of interference	50%
	designation of the bargaining partner / most representative trade union	50%
	right to collective bargaining	50%
Trinidad and Tobago 2001	designation of the bargaining partner / most representative trade union	100%
Trimuda ana Tobago 2001	negotiable issues and substantive outcomes of collective bargaining	100%
	anti-union discrimination	100%
Guinea 2001	acts of interference	100%
	designation of the bargaining partner / most representative trade union	50%
	negotiable issues and substantive outcomes of collective bargaining	100%
Malaysia 2000	promotion of free and voluntary collective bargaining	33%
	right to collective bargaining	33%
Iraq 2000	negotiable issues and substantive outcomes of collective bargaining	100%
	acts of interference	100%
	designation of the bargaining partner / most representative trade union	100%
Fiji 2000	negotiable issues and substantive outcomes of collective bargaining	100%
	right to collective bargaining	50%
	anti-union discrimination	50%
	promotion of free and voluntary collective bargaining	100%
Brazil 2000	right to collective bargaining	100%
	negotiable issues and substantive outcomes of collective bargaining	100%
	anti-union discrimination	100%
	acts of interference	50%
Ukraine 1999	right to collective bargaining	50%
	designation of the bargaining partner / most representative trade union	50%
	negotiable issues and substantive outcomes of collective bargaining	50%
	anti-union discrimination	100%
Honduras 1999	acts of interference	100%
	designation of the bargaining partner / most representative trade union	100%

TAB. Identified violations on Conv.98 using Decision trees

5. Predictions' improvement

The representation space (extracted concepts) seems to own good characteristics. The main way in order to improve the accuracy of the models is to increase the number of labelled texts. For that, we will give our classification of key-concepts founded by machine learning methods. After the experts correction, we will re-integrate each incorrect labelled text and re-design machine learning. The result of this operation should be an improvement of the prediction.

6. Conclusion and future work

The concepts seems to be able to determine the main part of violations contained in the texts. The key of a model improvement is an increase of the learning database, i.e, the number of labelled texts. For that, we need to know the real violations of texts included in the sample test. We will then re-integrate these texts in the model construction and, thanks to this operation, we hope improve the accuracy.