

Mapping Regulatory System of WTO Dispute Settlement Body Using Deep Learning

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Abstract

0.0.1 Random Forest on Prediction Matrix: Finding W^*

Algorithm 1: Random Forest To Find W^*

Input: Prediction Matrix $P = (p_{dv}) \in [0, 1]^{|D| \times |V|}$ s.t. $p_{dv} = f_{\theta^*}(t_d, a_v)$

Output: $W^* = (w_{ij}^*) \in [0, 1]^{|V| \times |V|}$

Let number of features $n = |V|$,

number of obseravations $o = |D|$ and

number of trees to ensemble $m \in \mathbb{N}$

for ($v_j \in V$) {

$X \leftarrow \{x_d \mid x_d = (p_{dv_1}, p_{dv_2}, \dots, p_{dv_n}) \text{ s.t. } v \in V \setminus \{v_j\} \text{ and } d \in D\}$

$Y \leftarrow \{y_d \mid y_d = p_{dv_j} / \sigma(p_{v_j}) \text{ s.t. } d \in D \text{ and } \sigma(p_{v_j}) \text{ is a standard deviation of } \{p_{dv_j} \mid d \in D\}\}$

for ($k \in \{1, 2, \dots, m\}$) {

1. $S = \{(x_d, y_d)\} \leftarrow$ Random sample o number of (x_d, y_d) from $X \times Y$ with replacement. Then let X_d notate set of all sampled x_d .

2. Find a decision tree $T_k : X_d \rightarrow \mathbb{R}$ where

$T_k = \{N \mid N = (v_i, b, N_p, \hat{y}) \text{ represents a decision node where}$

$b, \hat{y} \in \mathbb{R}, v_i \in V \setminus \{v_j\} \text{ and } (v_i, b) \text{ splits } S_N \subset S \text{ that reached the node } N$

$\text{into } S_{N_{true}} \text{ and } S_{N_{false}} \text{ with a criterion } p_{dv_i} \geq b \text{ with a parent node } N_p \in T_k$

$\text{if } N \text{ is not a root node. Define } N_p = \emptyset \text{ if } N \text{ is a root node. } \hat{y} \text{ represents}$

$\text{the node's estimate for given input. } v_i \text{ and } b \text{ is } \emptyset \text{ if } N \text{ has no child node(s).}\}$

$\text{that minimizes the MSE loss } \sum_{(x_d, y_d) \in S} \frac{1}{|S|} (y_d - T_k(x_d))^2.$

3. **for** ($N \in T_i$) {

if v_i of $N \neq \emptyset$ **then**

$I_{v_i \rightarrow v_j}^k(N) \leftarrow \text{Var}(S_N) - \text{Var}(S_{N_{true}}) - \text{Var}(S_{N_{false}})$ where $\text{Var}(\cdot)$ is the variance

$\text{of the output variable } y_d \text{ in each subset } S_N, S_{N_{true}} \text{ and } S_{N_{false}}$

$w_{ij}^* \leftarrow \frac{1}{m} \sum_{k \in \{1, 2, \dots, m\}} I_{v_i \rightarrow v_j}^k(N)$

1 Empirical Findings

2 Conclusion

References

Appendix A

A.1 Factual Aspect Example

Excerpt below is from the panel report for the *US - Offset Act (Byrd Amendment)*¹ case.

II. FACTUAL ASPECTS

2.1 This dispute concerns the Continued Dumping and Subsidy Offset Act of 2000 (the “CDSOA” or the “Offset Act”), which was enacted on 28 October 2000 as part of the Agriculture, Rural Development, Food and Drug Administration and Related Agencies Appropriations Act, 2001.¹ The CDSOA amends Title VII of the Tariff Act of 1930 by adding a new section 754 entitled Continued Dumping and Subsidy Offset. Regulations prescribing administrative procedures under the Act were brought into effect on September 21, 2001.

2.2 The CDSOA provides that :

“ Duties assessed pursuant to a countervailing duty order, an anti-dumping duty order, or a finding under the Antidumping Act of 1921 shall be distributed on an annual basis under this section to the affected domestic producers for qualifying expenditures. Such distribution shall be known as “the continued dumping and subsidy offset”. ”

2.3 The term “affected domestic producers” means :

“ a manufacturer, producer, farmer, rancher, or worker representative (including associations of such persons) that –

(A) was a petitioner or interested party in support of the petition with respect to which an anti-dumping duty order, a finding under the Antidumping Act of 1921, or a countervailing duty order has been entered, and

(B) remains in operation.

¹Panel Report, United States — Continued Dumping and Subsidy Offset Act of 2000, WTO Doc. WT/DS217/R (adopted Jan. 27, 2003).

Companies, business, or persons that have ceased the production of the product covered by the order or finding or who have been acquired by a company or business that is related to a company that opposed the investigation shall not be an affected domestic producer. ”

2.4 In turn, the term “qualifying expenditure” is defined by the CDSOA as “expenditure[s] incurred after the issuance of the anti-dumping duty finding or order or countervailing duty order in any of the following categories: “

- (A) Manufacturing facilities.
- (B) Equipment.
- (C) Research and development.
- (D) Personnel training.
- (E) Acquisition of technology.
- (F) Health care benefits to employees paid for by the employer.
- (G) Pension benefits to employees paid for by the employer.
- (H) Environmental equipment, training or technology.
- (I) Acquisition of raw materials and other inputs.
- (J) Working capital or other funds needed to maintain production.” ”

2.5 The CDSOA provides that the Commissioner of Customs shall establish in the Treasury of the United States a special account with respect to each order or finding⁸ and deposit into such account all the duties assessed under that Order.⁹ The Commissioner of Customs shall distribute all funds (including all interest earned on the funds) from the assessed duties received in the preceding fiscal year to affected domestic producers based on a certification by the affected domestic producer that he is eligible to receive the distribution and desires to receive a distribution for qualifying expenditures incurred since the issuance of the order or finding.¹⁰ Funds deposited in each special account during each fiscal year are to be distributed no later than 60 days after the beginning of the following fiscal year.¹¹ The CDSOA and regulations prescribe that (1) if the total amount of the certified net claims filed by affected domestic producers does not exceed the amount of the offset available, the certified net claim for each affected domestic producer will be paid in full, and (2) if the certified net claims exceed the amount available, the offset will be made

on a pro rata basis based on each affected domestic producer’s total certified claim.

2.6 Special accounts are to be terminated after “(A) the order or finding with respect to which the account was established has terminated; (B) all entries relating to the order or finding are liquidated and duties assessed collected; (C) the Commissioner has provided notice and a final opportunity to obtain distribution pursuant to subsection (c); and (D) 90 days has elapsed from the date of the notice described in subparagraph (C).” All amounts that remain unclaimed in the Account are to be permanently deposited into the general fund in the US Treasury.¹²

2.7 The CDSOA applies with respect to all anti-dumping and countervailing duty assessments made on or after 1 October 2000¹³ pursuant to an anti-dumping order or a countervailing order or a finding under the Antidumping Act of 1921 in effect on 1 January 1999 or issued thereafter. [END]

A.2 Collected Cited Articles for 143 WTO DSB Cases

DS refers to *Dispute Settlement* and this notation is officially adopted by WTO DSB.

WTO DSB identifies each dispute with a unique number for each case such as DS2 and DS18.

Case Number	Cited Articles (GATT 1994)
DS 2	I, III, XXII:1
DS 18	XI, XIII
DS 22	VI:3, VI:6
DS 31	III, XI
DS 34	XI, XIII, XXIV
DS 46	XVI
DS 56	II, VII, VIII, X
DS 58	I, XI, XIII, XX
DS 60	VI
DS 62	II
DS 67	II, XXIII, XXIII:1

DS 68	II, XXII:1, XXIII:1
DS 69	II, III, X, XIII, XXVIII
DS 75	III:2
DS 76	XI
DS 87	III:2
DS 90	XI:1, XIII, XVIII:11
DS 98	XIX
DS 103	X, XI, XIII
DS 108	III:4, XVI
DS 121	XIX
DS 122	VI
DS 135	III, XI, XXIII, XXIII:1(b)
DS 136	III:4, VI
DS 139	I:1, III:4, XXIV
DS 141	I, VI
DS 146	III, XI
DS 152	I, II, III, VIII, XI
DS 155	III:2, X:3(a), XI:1
DS 161	II, III, X, XI, XVII
DS 162	III, III:4, VI, XI
DS 165	I, II, VIII, XI
DS 166	I, XIX
DS 174	I, III:4
DS 175	III, III:4, XI, XI:1
DS 177	I, II, XIX
DS 184	VI, X
DS 202	I, XIII, XIX
DS 207	II, XIX:1
DS 212	VI:3
DS 217	VI:2, VI:3, X:3, XXIII:1

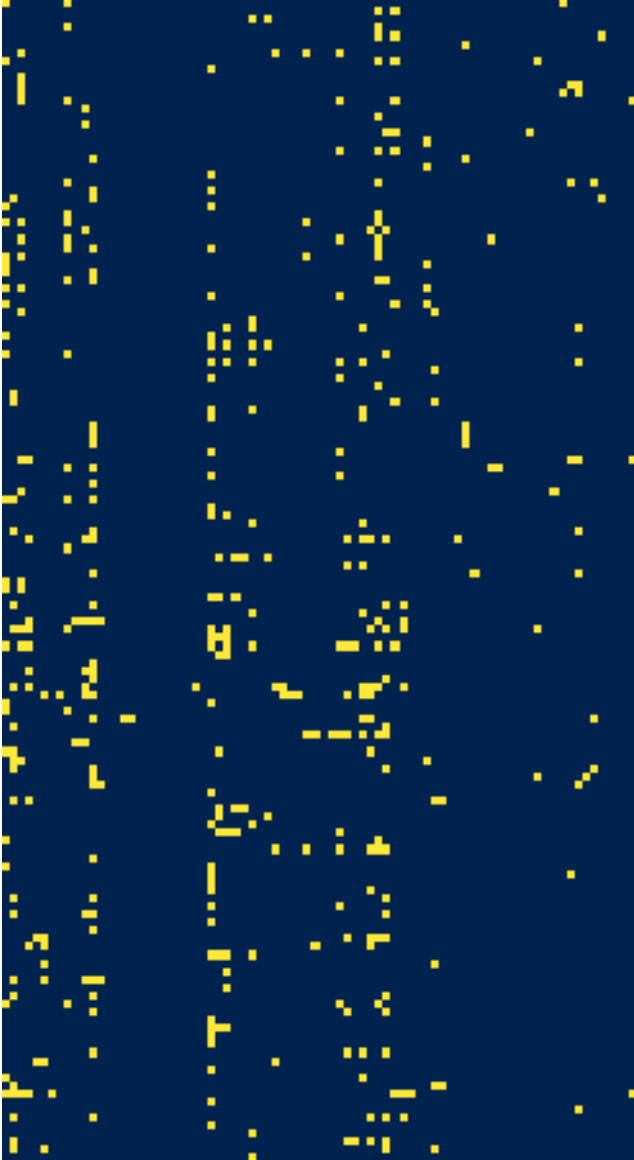
DS 219	I, VI
DS 221	VI, VI:2, VI:3, VI:6
DS 231	I, III, XI:1
DS 234	VI, VI:2, VI:3, X, X:3, XXIII:1
DS 238	XIX:1
DS 244	VI, X
DS 245	XI
DS 246	I:1
DS 248	I:1, XIII, XIX:1
DS 257	VI, VI:3, X:3
DS 264	VI, X:3
DS 265	III:4, XVI
DS 266	III:4, XVI
DS 267	III:4, XVI
DS 268	VI, X
DS 269	II, II:1, XXIII, XXIII:1, XXVIII
DS 276	III, III:4, XVII, XVII:1
DS 282	VI, X
DS 283	III:4
DS 286	II, XXII
DS 290	I, I:1, III, III:4
DS 294	VI
DS 295	VI, VI:2
DS 296	VI:3, X:3
DS 301	I:1, III:4, XXIII:1
DS 302	II:1, III:2, III:4, X:1, X:3, X:3(a), XI:1, XV
DS 308	III
DS 312	VI:1, VI:2(a), VI:2(b), VI:6
DS 315	X:1, X:3
DS 316	III:4, XVI:1, XXIII:1

DS 320	I, II
DS 321	I, II
DS 322	VI, VI:1, VI:2(a)
DS 332	I:1, III:4, XI:1, XIII:1
DS 336	VI:3, X:3
DS 339	II:1, III:1, III:2, III:4, III:5, XI, XIII:1
DS 343	I:1, II, II:1, III, VI, VI:2, X:3(a), XI:1, XIII:1, XX
DS 344	VI, VI:1, VI:2
DS 345	I, II, II:1, VI, VI:2, VI:3, X, X:1, X:2, XI, XIII
DS 350	VI:1, VI:2
DS 353	III:4
DS 360	II:1, III:2, III:4
DS 363	III:4, XI:1
DS 366	I:1, II:1, III:2, V:6, VII, VII:1, X:3, X:3(a), XI, XIII:1
DS 371	II:1(b), II:3, III:2, III:4, VII:1, VII:2, VII:5, X:1, X:3, X:3(a)
DS 379	I, VI
DS 381	I, III
DS 384	III:4, IX, IX:2, X:3, X:3(a), XXIII:1(b)
DS 392	I:1, XI:1
DS 394	VIII, VIII:1, VIII:4, X, X:1, X:3, XI, XI:1
DS 396	III:1, III:2
DS 397	I, I:1, VI:1, X:3(a)
DS 399	I:1, II, XIX
DS 400	I:1, III:4, XI:1, XXIII:1(b)
DS 406	III:4, XX, XXIII:1(a)
DS 412	III:4, III:5, XXIII:1
DS 414	VI
DS 415	I:1, II:1, XIX:1, XIX:2
DS 422	VI:1, VI:2(a), VI:2(b)
DS 425	VI:1, VI:6

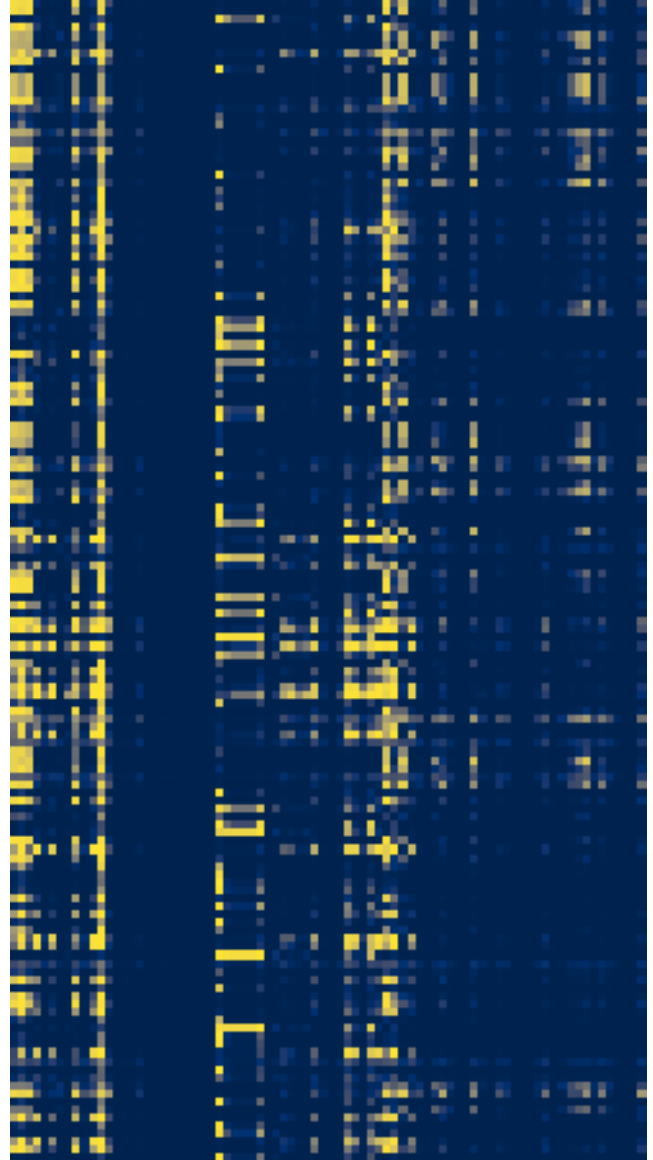
DS 427	VI, VI:3
DS 429	VI:1, VI:2, VI:2(a), X
DS 430	I, XI
DS 431	VII, VIII, X, X:3(a), XI, XI:1
DS 435	III:4
DS 436	I, VI
DS 437	VI, XXIII
DS 440	VI
DS 442	VI, X:3(a)
DS 447	I:1, III:4, XI:1
DS 449	VI, X
DS 453	I:1, III:2, III:4, XI:1
DS 454	VI
DS 456	III:4
DS 457	II:1(a), II:1(b), X:1, X:3(a), XI, XI:1
DS 461	II:1, II:1(b), VIII:1, X:3(a)
DS 464	VI, VI:1, VI:2, VI:3
DS 468	II:1(b), XIX:1
DS 471	VI:2
DS 472	I:1, II:1(b), III:2, III:4, III:5
DS 473	VI:2
DS 475	I:1, III:4, XI:1
DS 476	I, III, X, XI
DS 477	III:4, X:1, XI:1
DS 479	VI
DS 480	VI, VI:1, VI:2
DS 482	VI
DS 483	VI
DS 484	III:4, X:1, X:3, XI:1
DS 485	II:1(a), II:1(b), VII

DS 486	VI
DS 488	I, X:3
DS 490	I:1, XIX:1, XIX:2
DS 492	I, I:1, II, II:1, II:2, XIII, XIII:1, XIII:2, XXVIII
DS 493	VI
DS 495	XXIII:1
DS 499	I:1, III:4, X:3(a), XI:1, XIII:1
DS 504	VI
DS 505	VI:3
DS 513	I:1, X:1, X:2, X:3(a), XI:1
DS 518	I:1, II:1(b), XI:1, XIX:1
DS 523	VI:3

A.3 Technical Details



(a) Co-citation



(b) Prediction

Figure 1: **Co-citation & Prediction**