Electoral Incentives and Porks: Exploring Parliamentary Questions Using Convolutional Neural Networks

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Research Questions

- Are the legislators in the SNTV-MMD (single non-transferable vote in multi-member districts) more likely to bring home the bacon by promising the provision of particularistic goods?
- Does the switch of electoral system from the SNTV to the SMDs (single member districts) reduce legislators' incentives to cultivate a personal reputation by paying less attention to distributive (pork barrel) policies?
- Dose it change legislator electoral strategies by increasing more attention to universalism policies such as regulatory policies?

Background

In this paper, we quantitatively investigate legislators' electoral strategies and communication style by applying a deep learning model to measure pork-barrel features on parliamentary questions in Taiwan Legislative Yuan from 1993 to 2020.

- The SNTV-MMD was the major system to elect legislators before 2008 in Taiwan.
- This was thought to intensify majority-seeking parties to run more than one candidate in a district, which increases incentives for candidates to run on personal votes against their party reputation. Given this, candidates were competing with competitors from not only opponent parties, but the same party as well.
- The SNTV-MMD in Taiwan has been criticized for creating excessive intra-party chaos and competition(e.g. Cox 1990), as well as encouraging factional and candidate-centered electoral politics (e.g. Batto and Huang 2016; Wu 2003). Therefore, some East-Asian democracies in 1990s such as Japan, South Korea and Taiwan started to reform the electoral system by changing SNTV-MMD to single-member districts (SMD-MMM).

The Literature: Personal Votes and Pork Barrels

The electoral system such as SNTV-MMD, which combines plurality rule with a single vote per voter and a district magnitude larger than one, was believed to increase intra-party (centrifugal) competition (e.g. Cox 1990). Parties or party leaders have incentive to nominate more than one candidate to run in each district, which required their candidates to compete against each other.

Given this the SNTV system, candidates were competing with competitors from not only opponent parties, but the same party as well. As results, candidates were incentivized to attract votes by giving out more distributive benefits to their own constituency, rather than nation-wide. Therefore, Candidates face the major threat from co-partisan candidates and therefore, are likely to seek personal votes by promising particularistic benefits for their sincere voters (e.g. Carey and Shugart 1995; Catalinac 2016)

Training and Validation Loss

All learning curve history until 1000 epochs can be found at the TensorBoard.

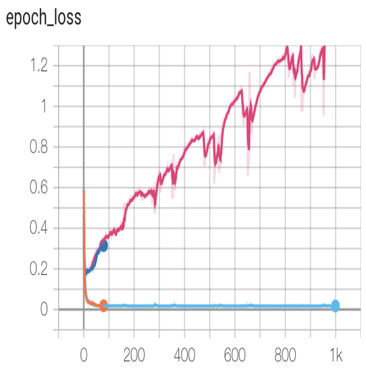

Figure 1. The Loss and Validation Loss

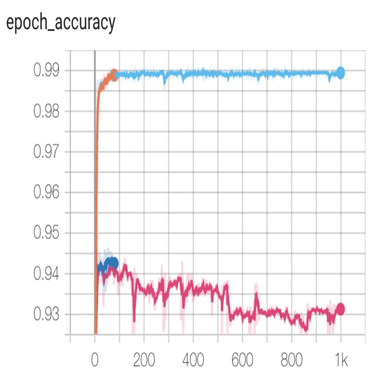

Figure 2. The Accuracy and Validation Accuracy

Training Data

Hand-labelled Pork Barrel Legislation

- We have trained a convolutional neural network with TensorFlow 2.6 on the human-labelled pork-barrel legislation, including the bills and the amendments from Legislative Yuan from 2004 to 2007.
- The collection of training data consists of 7243 pieces of legislation in total and containing 4852 training sets and 2391 test sets, respectively.

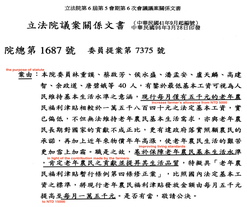

Figure 3. An Example of Labelled Data for Training

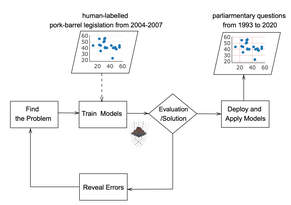

Figure 4. The Machine Learning Workflow

Identifying Attributes

Luor and Liao (2009) have created hand-labelled legislation by reading the purpose of statute, devoted either to promoting the pork-barrel project (earmarked projects) in a district or cultivating favored specific population groups by providing subsidies such as agriculture allowance to the farmers.The collection of legislation was manually labelled with binary-instance classification.

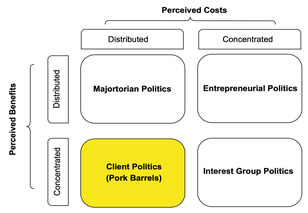

Figure 5. A Way of Classifying the Politics of Different Policy Type

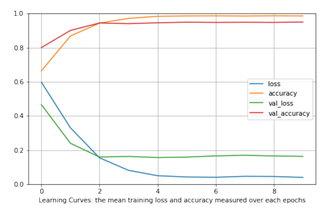

Figure 6. Learning Curves

Retrain the Model until 9 Epochs

The training accuracy and the validation accuracy gradually increase, while the loss for the training and the validation decreases until the 9th epoch. To prevent over-fitting in test set, we stop training the model after 9 epochs.

Evaluating CNN Model

- We quickly reach an accuracy of 98.6% on the training data at 8th epoch (loss: 0.0428, accuracy: 0.9864, val_loss: 0.1744; val_accuracy: 0.9423).
- The test-set accuracy turns out to be 94.2%. It is a bit lower than the training set accuracy (0.9864%). It slightly over-fit on training set. (loss: 0.1744; accuracy: 0.9423)

	precision	recall	f1-score	support
0	0.95	0.97	0.96	1566
1	0.94	0.91	0.92	825
accuracy			0.95	2391
macro avg		0.94	0.94	2391
weighted avg	0.95	0.95	0.95	2391

Table 1. Model Performance.

Declaring the CNN Model

- In the context of the text classification task, the trained model essentially learns the condensed features of bag-of-words instead of learning the pattern from the entire corpus.
- The implementation of the CNN is similar to that described by Kim (2014), except that this paper does not apply word embedding model for tokenization.

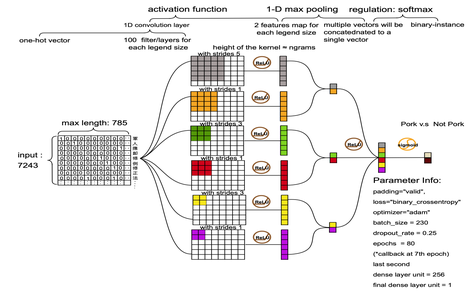

Figure 7. Model and Building

Tentative Findings

- I aim to incorporate this application to classify the parliamentary questions and evaluate the hypothesis by looking at how electoral reform reduces legislator's incentive to deliver pork barrel projects.
- A stable decrease in the total number of pork-featured questions are accompanied by the electoral reform in 2008. Consistent with the literature, switching from SNTV to Single-Member Districts reduces legislators' incentives to propose particularistic benefits but increases the attention to universalism (national) policies. For more information about pork-featured questions and the design of the CNN model, you can find PorkCNN on my GitHub page.

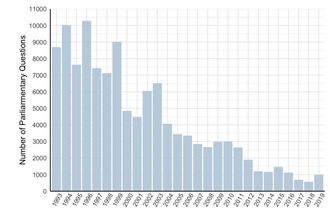

Figure 8. The Number of Parliamentary Questions Web-scraped from Taiwan Legislative Yuan

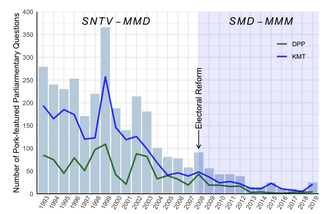

Figure 9. The Number of Parliamentary Questions Identified as Pork-barrel Feature

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