Unveiling Racial Stereotypes in Malaysia using Word Embeddings

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Research Question

- A stereotype is a generalized belief about a particular category of people (Mikewell, 1999).
- Research have used word embeddings to measure stereotypes, assuming that it is capable of capturing subtle stereotypes in the training texts.
- Does word embedding provide an alternative to conventional approaches of studying ethnic stereotypes?
- To what extent do stereotypes estimated by word embeddings reflect the reality?

Background

- Malaysia is a multi-ethnic country.
- Malays constitute 69.6% of the population. The Chinese and Indians populations represent 22.6% and 6.8% respectively. (Department of Statistics in Malaysia, 2020)
- 'Divide and Rule' policy during the British colonization
  - Malays farmed and fished in villages
  - Chinese worked in retail trade in towns
  - Indians worked on rubber plantation grounds

Data

- Period: 2017 - 2021

Year	Chinese (China Press)	Malay (BERNAMA)	English (The Malay Mail)
2017	7,732	35,950	15,355
2018	10,857	37,277	22,224
2019	10,831	38,604	2,0079
2020	15,468	29,843	22,545
2021 (up to July)	8,674	13,812	10,652
Total	**53,562**	**154,946**	**90,855**

Table 1: Number of articles for each language by year.

- Articles collected using web scraping technique.
- Limited availability as online data only goes back to 2017.

Methodology

Using word embeddings trained on news articles in 3 languages,

- ▶ Identify most closely associated words with different ethnic groups and determine whether the words are consistent with previous literature.

- ▶ Calculate cosine similarity between ethnic labels and adjectives for socioeconomic status as a proxy for `socioeconomic stereotypes`, and compare the score against actual level of wages for different ethnic groups.

Ethnic Group Labels

Language	Ethnicity	Most Common Labels		
Malay	Malays	bumiputera (2,988)	pribumi (2,196)	orang melayu (1,526)
	Chinese	masyarakat cina (782)	kaum cina (456)	bangsa cina (111)
	Indians	masyarakat india (1,218)	kaum india (557)	orang india (68)
Chinese	Malays	马来人 (2,253)	土著 (1,574)	巫裔 (1,481)
	Chinese	华裔 (3,640)	华社 (2,702)	华人 (2,243)
	Indians	印裔 (1,343)	印度人 (164)	印度裔 (4)
English	Malays	pribumi (3,869)	malays (3,698)	bumiputera (2,294)
	Chinese	chinese (10,681)	-	-
	Indians	indian (3,241)	indians (979)	-

Table 2: Top 3 prevalent labels for each ethnic group in each language.[1]

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[1]The number in the bracket represents the raw frequency of the labels in the data.

Malay in English Articles (1/2)

Year	Top 10 closest words				
2017	indians	erode	nonmalays	nonmalay	bastion
	mudah	ibans	natives	heartlands	kadazans
2018	bumiputeras	indians	ethnic	kadazans	ibans
	nonmalays	natives	dayaks	ethnocentric	fundamentalists
2019	kadazans	malaymuslims	indians	ibans	nonmalays
	disunited	bumiputera	belittle	domination	kingmakers
2020	malaybumiputera	ethnic	bumiputeras	slims	chauvinist
	nationalists	alienate	nonbumiputeras	demography	sympathisers
2021	electorate	indians	nonmalays	nonmalay	discord
	creed	ballots	garner	races	formidable

Table 3: 10 closest words with 'Malays' for each year.

- ▶ located closely to many other ethnic labels, such as indians, bumiputeras, and kadazans.
- ▶ no label for Chinese -> semantically further away from Malays compared to other ethnic groups.

Malay in English Articles (2/2)

Year	Top 10 closest words				
2017	indians	erode	nonmalays	nonmalay	bastion
	mudah	ibans	natives	heartlands	kadazans
2018	bumiputeras	indians	ethnic	kadazans	ibans
	nonmalays	natives	dayaks	ethnocentric	fundamentalists
2019	kadazans	malaymuslims	indians	ibans	nonmalays
	disunited	bumiputera	belittle	domination	kingmakers
2020	malaybumiputera	ethnic	bumiputeras	slims	chauvinist
	nationalists	alienate	nonbumiputeras	demography	sympathisers
2021	electorate	indians	nonmalays	nonmalay	discord
	creed	ballots	garner	races	formidable

Table 4: 10 closest words with 'Malays' for each year.

▶ words that represent stereotypes, such as `ethnocentric`,
  `fundamentalists`, `disunited`, `kingmaker`, `chauvinist`,
  and `nationalists`.

Chinese in English Articles

Year	Top 10 closest words				
2017	vernacular	nationaltype	indians	indian	ethnic
	jiao	tamil	zong	nationals	parentage
2018	guilds	indians	ethnic	hokkien	ibans
	kadazans	vernacular	punjabi	zong	huazong
2019	indians	kadazans	indian	ethnic	ibans
	zheng	educationists	siamese	lunar	nonchinese
2020	nationals	indians	indian	cny	educationist
	ethnic	decorations	lunar	clan	ghosts
2021	lunar	indian	oranges	clan	hokkien
	lantern	countdown	usher	chauvinist	eve

Table 5: 10 closest words with 'Chinese' for each year.

▶ many terms in the education sphere such as vernacular,
huazong (Chinese secondary schools) and educationists.

Qualitative assessment (1/2)

There exist some overlaps between the stereotypes found by previous studies and those from word embeddings, but not comprehensively .

David et al. (2016)

Top 3 Malays' perceptions towards Chinese: kind, helpful, sporting

▶ Chinese in Malay articles (2020): 'berbudi' (virtous)
▶ Chinese in Malay articles (2021): 'dermawan' (philanthropist)

Ibrahim et al. (2010)

How Malaysian Chinese see Malays in terms of belief and attitude: lazy, religious, conservative, friendly, racist

▶ Malay in Chinese articles (2018): '种族主义' (racist)

Qualitative assessment (2/2)

Anuar et al. (2016)

Highest belief: their ethnic should be a role model to other ethnics.

- ▶ Malays in Chinese articles (2020): '沙文主义 ' (chauvinism)
- ▶ Indians in Chinese articles (2019): '沙文主义 ' (chauvinism)
- ▶ Indians in Chinese articles (2021): '楷模 ' (role model)
- ▶ Chinese in Malay articles (2017): 'cauvinis' (chauvinist)
- ▶ Malays and Chinese in English articles (2020): 'chauvinist'

Kuppusamy (2006)

'Minority Chinese and Indians see the majority Malays, ..., as lazy'

Stereotypes vs Reality

Is semantic relationship in word embeddings aligned with reality?

▶ Socioeconomic stereotype: a stereotype that can be validated against quantitative measures

▶ Socioeconomic Stereotype Score: cosine similarity between each ethnic label and the adjective for being high-income/rich

▶ Compare the score of socioeconomic stereotype against the actual level of wage for each ethnic group
  ▶ positive correlation -> good accuracy of stereotypes
  ▶ negative correlation -> bad accuracy of stereotypes

Accuracy in English Articles

Mean income (blue) and Socioeconomic stereotype (red)[2]
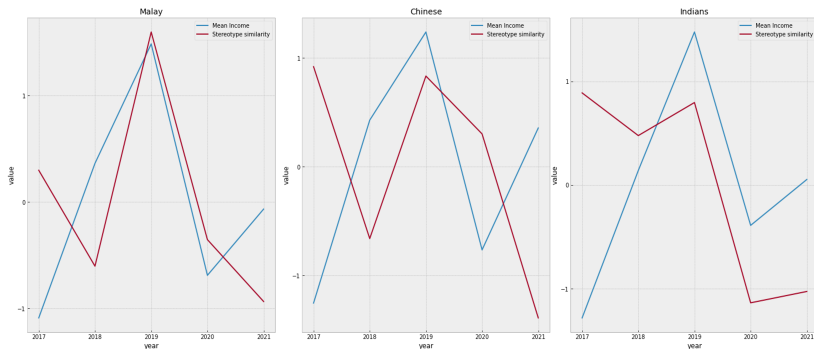
- ▶ Ethnic labels: `malays`, `chinese` , `indians`
- ▶ Adjective: `highincome`

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[2]Both data are normalized.

Accuracy in English Articles

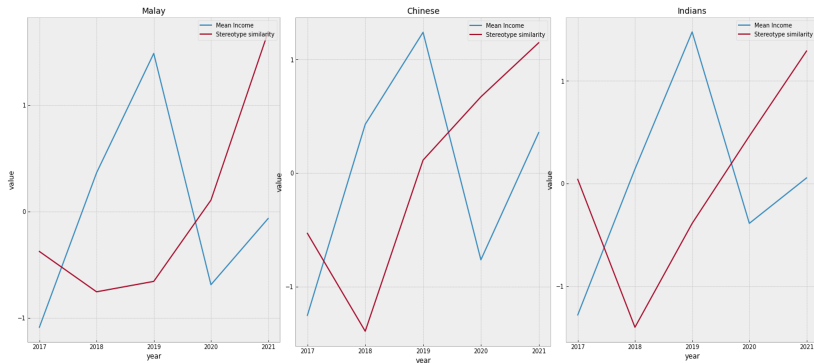Table 6: Pearson correlation coefficient between actual mean income and socioeconomic stereotypes.

Ethnicity	Coefficient	p-value
Malay	0.820	0.387
Chinese	0.246	0.842
Indian	0.817	0.391

- ▶ Highly positive correlation for Malays and Indians
- ▶ However, statistically insignificant due to small sample size

Accuracy in Chinese Articles

Mean income (blue) and Socioeconomic stereotype (red)
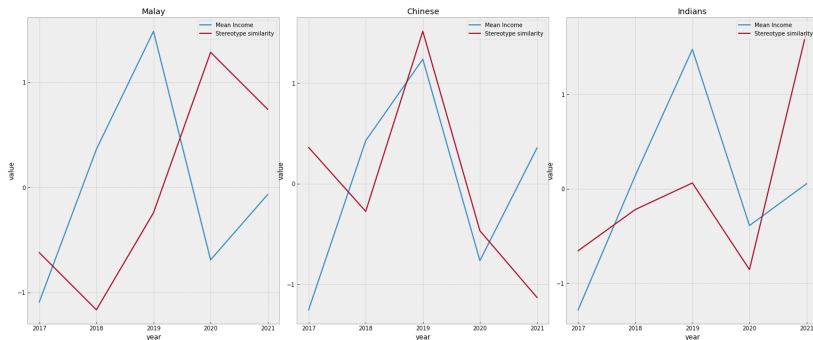
- ▶ Ethnic labels: 巫裔 (Malay), 华裔 (Chinese), 印裔 (Indian)
- ▶ Adjective: 富裕 (Rich)

Accuracy in Chinese Articles

Table 7: Pearson correlation coefficient between actual mean income and socioeconomic stereotypes.

Ethnicity	Coefficient	p-value
Malay	-0.602	0.589
Chinese	0.855	0.347
Indian	0.894	0.295

- ▶ Highly positive correlation for Chinese and Indians
- ▶ Interestingly, negative correlation for Malays
    - ▶ a case of inaccurate stereotype due to information lag
- ▶ However, statistically insignificant due to small sample size

Accuracy in Malay Articles

Mean income (blue) and Socioeconomic stereotype (red)

- ▶ Ethnic labels: `kaum melayu` (Malay), `kaum cina` (Chinese), `kaum india` (Indian)
- ▶ Adjective: `kaya` (Rich)

Accuracy in Malay Articles

Table 8: Pearson correlation coefficient between actual mean income and socioeconomic stereotypes.

Ethnicity	Coefficient	p-value
Malay	-0.798	0.411
Chinese	-0.365	0.762
Indian	-0.227	0.854

► Negative correlation for all ethnicity
► However, statistically insignificant due to small sample size

Different Types of Stereotypes (in English articles)

Using POS tagging followed by manual categorisation,

- **Socioeconomic status**

  'rural', 'affluent', 'marginalised', 'suburb', 'disadvantaged', 'wealthy', 'semiurban', 'poorer', 'sidelined', 'industrial', 'privileged', 'impoverished', 'richer', 'suburban', 'poorest', 'underprivileged', 'lowerincome', 'powerless', 'suppressed', 'urban', 'middleincome', 'highincome'

- **Appearances**

  slim', 'beautiful', 'young', 'old'

- **Personal qualities**

  'passive', 'multiethnic', 'active', 'staunch', 'disgusting', 'secular', 'criminal', 'aspiring', 'upbeat', 'pessimistic', 'grassroot', 'entrepreneurial', 'ridiculed', 'despicable', 'aggrieved', 'traditional', 'courted', 'estranged', 'reformist', 'segregated', 'positive', 'outgoing', 'shameful', 'nationalist', 'negative', 'struggled', 'nonpartisan', 'rational', 'oppressed' etc
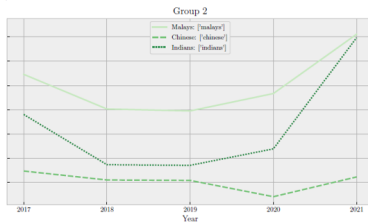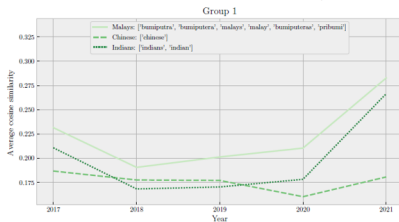
- **Occupations**

  'police', 'retired', 'attendant', 'entrepreneurs', 'judge', 'pilot', 'cook', 'psychologist', 'economist', 'chefs', 'manager', 'clerk', 'lawyer', 'farmer', 'accountant', 'photographer', 'administrator', 'nurse', 'surgeon', 'designer', 'author', 'chemist', 'scientist', 'operator', 'doctor', 'soldier' etc

Stereotype scores over time (1/2)

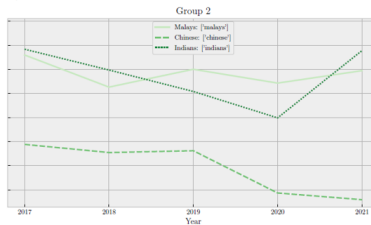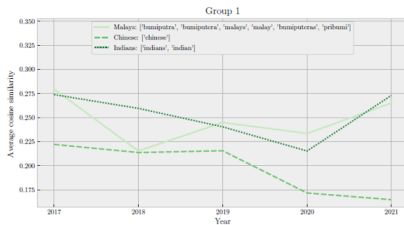Stereotype scores (Appearances) in English articles over time
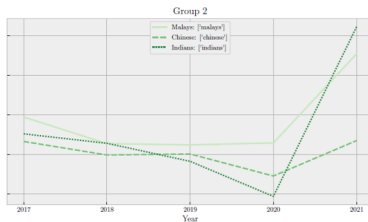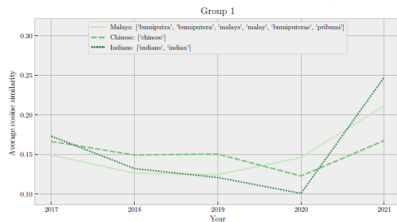
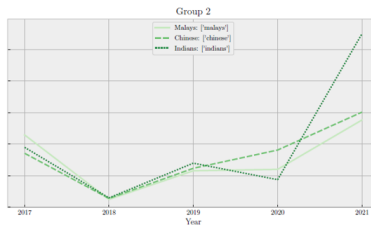Stereotype scores (Personal Qualities) in English articles over time
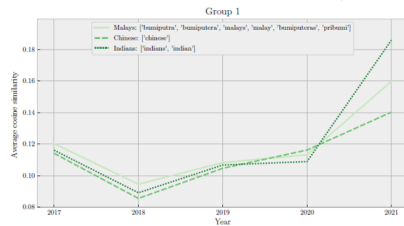
Stereotype scores over time (2/2)

Stereotype scores (Socioeconomic Status) in English articles over time

Stereotype scores (Occupations) in English articles over time

Preliminary conclusions

- ▶ Word embeddings - a complement of conventional approaches, but not a replacement
- ▶ Stereotypes existing in news media, particularly socioeconomic stereotype, may not reflect reality