Rational, motivated students and suitable Units:

Detecting suspected contract cheating for unsupervised written assignments

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*Curtin University, WA*

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Estimating the size of the problem

• Because a third-party has produced an original piece of work, plagiarism detection software doesn’t work

• Some previous research has looked at how often the same users requested assistance from third-parties for computer code (Lancaster & Clarke, various)
  o Found repeat users
  o 2 month period, 54% of users made between 2 and 7 bid requests
  o 6 users made 51 or more bid requests

• Survey of students in Australia (Curtis & Vardanega, in press) found relatively steady prevalence rates for contract cheating
  o 3.1% at least once in 2004 compared to 2.8% in 2014
What is this talk about?

• Looking at the issue of contract cheating from an opportunity theory perspective
  o Can data identify students who use Computers to Help Evade Available Technology (aka C.H.E.A.T.)?

• An opportunistic analysis of some student data from Murdoch University

• Interesting patterns...

• If we buy the first part, what does this mean for the second part?
  o Targeted prevention at the student-, assessment item-, Unit-, and university-level
  o Next steps
Opportunity expects some people to C.H.E.A.T.?  

- C.H.E.A.T.-ing: possible when three elements combine in time and space  
  - A rational, motivated student  
  - A suitable *unsupervised assessment item*  
  - The absence of a capable guardianship
C.H.E.A.T.-ing: possible when three elements combine in time and space

- A rational, motivated student
- A suitable *unsupervised assessment item*
- The absence of a capable guardianship
How can we use data to examine this?

- Is there any proxy for C.H.E.A.T.-ing that could be used from available data?
  - E.g., parking in disabled bays has been used to identify chronic repeat offenders via *self-selection* (Pease and colleagues)

- What about differences in performance for the same student between supervised and unsupervised assessment items?
  - If people are submitting paid work from third-parties they should do better on unsupervised essays relative to supervised exams

- Based on other ‘problem’ patterns we’d expect to see
  - A general non-randomness of these patterns
  - Repeat targets/locations (some assignments are more suitable than others)
  - Repeat offenders (some students are more *motivated* to cheat that others)
Exploring this idea

• 2015 data for Units completed in the Law School at Murdoch
  o 3,798 results
  o 1,459 students
  o Average 2.6 units per student
  o Range from 1 unit to 9 units completed

• Units offered in a few major discipline areas
  o Criminology
  o Law
  o Legal studies
  o University breadth units

• Data on supervised and unsupervised assessment items
  o Converted to percentages
What would be weird?

- Used 4 different risk rules to find ‘unusual’ patterns between supervised and unsupervised assessment items

- Risk rule 1 4.6% incidence
  - Unsupervised ≥ 70% and Supervised ≤ 50%

- Risk rule 2 8.1% incidence
  - (Unsupervised − Supervised) ≥ 25 percentage points

- Risk rule 3 0.7% incidence
  - Unsupervised ≥ 80% and (Unsupervised − Supervised) ≥ 40 percentage points

- Risk rule 4 0.7% incidence
  - Unsupervised ≥ 60% and Supervised ≤ 30%
Clustering between disciplines: Rule 1 variation

Rule 1 violations by Academic Area

Risk rule 1
4.6% incidence
Unsupervised ≥ 70% and Supervised ≤ 50%
Clustering within discipline: unit-level Rule 1 variation

![Bar chart showing CRM Rule 1 violations - Percentage of Students in Unit.]

- Risk rule 1: 4.6% incidence
- Unsupervised ≥ 70% and Supervised ≤ 50%

High overall Discipline incidence, but still not all Units
Clustering within discipline: unit-level Rule 1 variation

Average overall incidence at discipline level – large variation across Units
Clustering within discipline: unit-level Rule 1 variation

Low overall incidence at discipline level – still some Units with unusual patterns
Combining rule variation at the unit-level

• Calculated the within-Unit incidence percentage as a ratio to the overall average rule violation for each rule
  o Counted if $z$-score $> 1.64$ relative to all other units

Frequency of $z > 1.64$
Combining rules at the unit-level

- Calculated the within-Unit incidence percentage as a ratio to the overall average rule violation for each rule
  - Counted if z-score > 1.64 relative to all other units
Within-student clustering across rules

Rule 1 - Unique Students

- None: 1,299 (89.0%)
- Once: 145 (9.9%)
- Twice: 14 (1.0%)
- Three times: 1 (0.1%)

Expected Count ($\lambda$) = 0.12

$P(\text{count} \geq 2) < .01$
Within-student clustering across rules

**Rule 1 - Unique Students**
- Expected Count ($\lambda$) = 0.12
- $P(\text{count} \geq 2) < .01$

**Rule 2 - Unique Students**
- Expected Count ($\lambda$) = 0.21
- $P(\text{count} \geq 2) < .02$

**Rule 3 - Unique Students**
- Expected Count ($\lambda$) = 0.02
- $P(\text{count} \geq 1) < .02$

**Rule 4 - Unique Students**
- Expected Count ($\lambda$) = 0.02
- $P(\text{count} \geq 1) < .02$
31 students with multiple violations: 2.1% of population...

- Prevalence study estimated 2.8% in 2014
- Repeats common within this sample across rule types
- As a proportion of units in the sample:
  - Students 3, 8, 9, 14, 16, 22, 25, & 31 had weird patterns for 100% of units
  - Students 2, 17, 23 and 27 had weird patterns for 3 out of 4 units
31 students with multiple violations: 2.1% of population...

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  - Students 3, 8, 9, 14, 16, 22, 26, & 32 had weird patterns for 100% of units
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What does all of this mean?

• Just because the patterns are weird, doesn’t mean the students are C.H.E.A.T.-ing

• Type 1 errors – false positives
  o Terrible at exams?
  o Potentially identified for educational support

• Type 2 errors – missing those who do just-enough on exams
  o Students can’t control either mark – they can only control effort
  o Looking across Units prevents one-offs

• Can we use these types of patterns as a proxy for contract cheating?
  o Definitely a proxy for a ‘problem’
  o How could we address the ‘problem’?
Opportunity as a platform for targeted problem prevention

How can we manipulate the risk, reward, effort, excuses, and provocations for this activity?
Manipulating the sides and levels of the problem triangle

- Building on *what works* for crime prevention, we can do things to alter the *risk, reward, and effort* of the problem context at the
  - Student-level (motivated offender)
  - Unsupervised assessment item-level (target)
  - Unit-level (management & guardianship)
  - University-level (super controllers)

- The key to successful, sustainable responses
  - Prevention strategies that are logistically feasible (time and cost)
  - Compatible with other university policy on misconduct and assessment

- Commitment to opportunity reduction as a strategy is key
  - How this can be achieved needs to be tailored to each specific situation
Next steps

- More data

- Analysis of
  - Individual student characteristics
  - Unsupervised assessment items (in high- and low-prevalence Units)

- Trial targeted interventions in high-prevalence units

- Not dependent on apprehension

- On-going evaluation is crucial
Questions...

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