

Regulatory decision making for nurses; is the regulatory environment ready for AI?

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with thanks to our colleagues Professor Kostas Stathis, Dr Ivan Petej

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Ackn Charlie O'Hara



**AI =
technology that
imitates aspects of
human
decision making abilities,
using algorithms to calculate,
predict, interpret data**





**Machine learning =
models that learn from data**

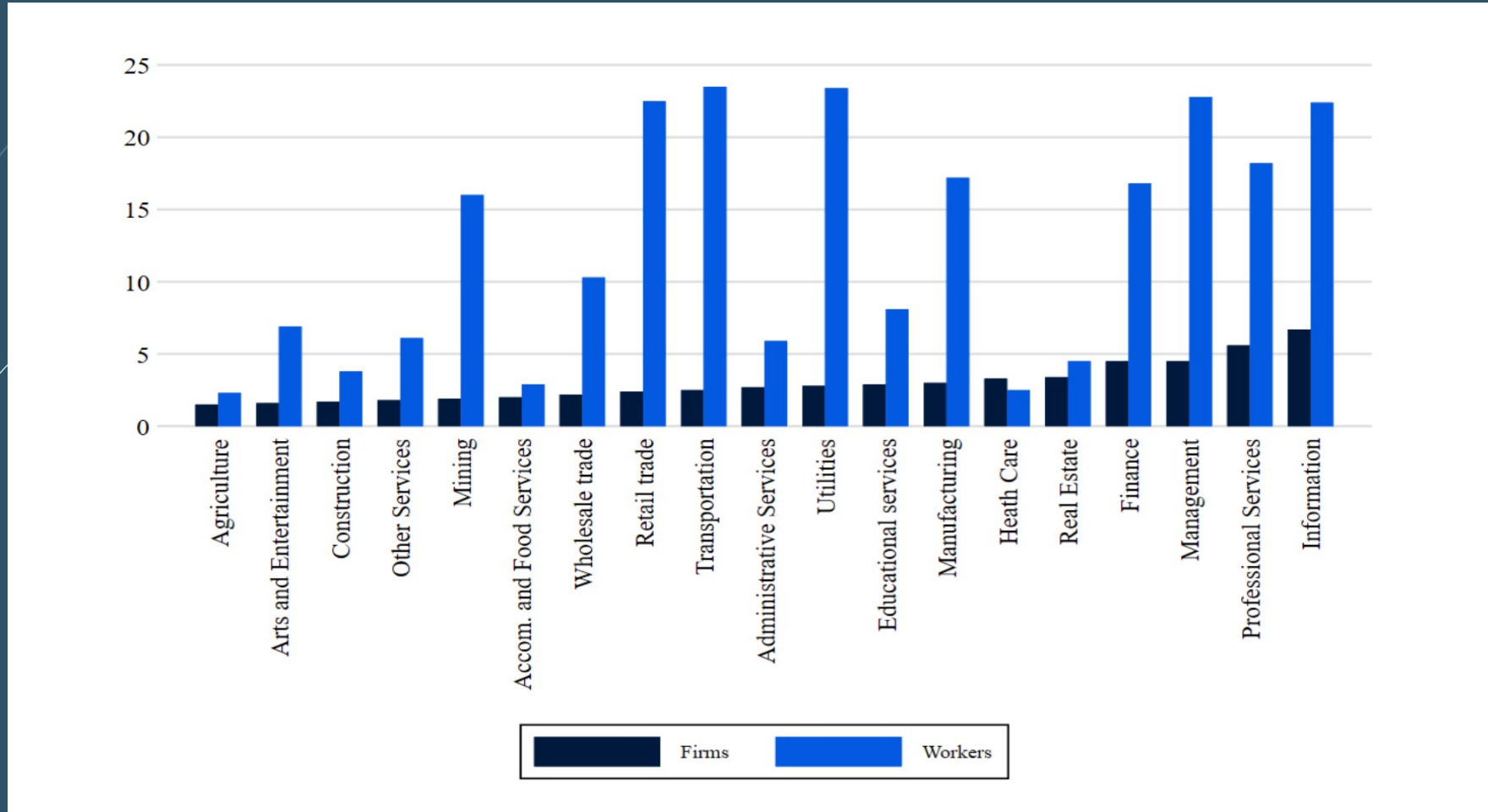
2 types

supervised

self supervised



The impact of AI



Is the regulatory environment ready for AI?

- ▶ Nurse Discipline
- ▶ There are a small number of high risk nurses
- ▶ 70+% of cases require no regulatory action
- ▶ Better use of data may help to focus on higher order risks and improve regulation

Research Question

Can we develop new tools to aid regulatory decision making in disciplinary work?

Aim

- Calculate risk level from complaints data
- Link cases to regulatory standards
- Link cases to previous similar cases
- Reduce the workload for regulators

Design principles

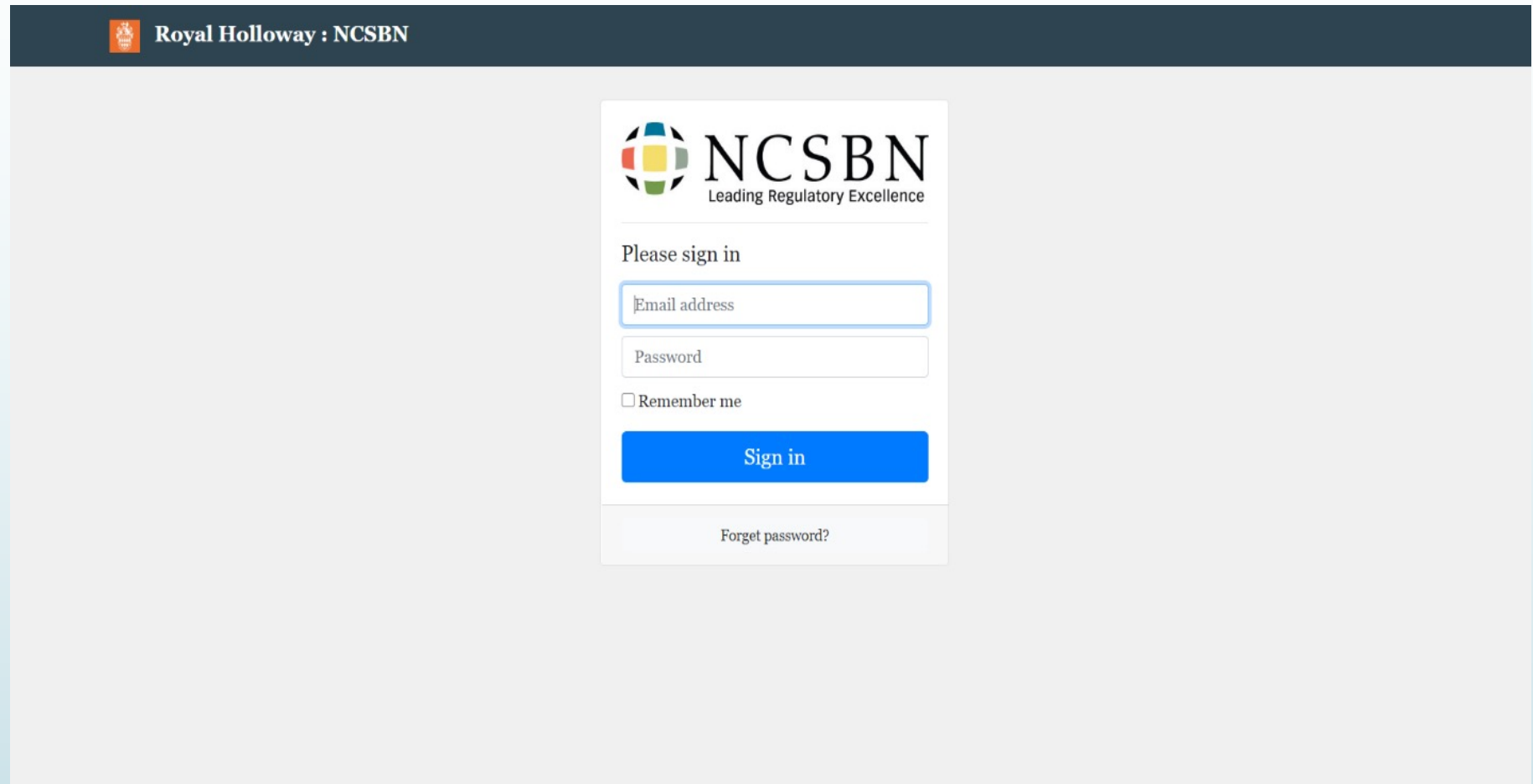
fairness, accountability sustainability transparency
(Leslie, 2019)

Methodology


Quantitative and Qualitative summary

- *5,700 (anonymized) disciplinary cases (US,UK,Australia)*
- *Reliability testing of prototype*
- *Gender debiasing techniques*
- *Qualitative testing with regulatory staff*

An overview of the prototype decision support tool



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Task 1: calculating risk using anonymized data

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Predict new cases

1) Select a prediction model
Logistic regression

2) Choose the data file to predict
Choose File No file chosen

3) Click to start processing
[Upload & Predict](#)

Results summary

Number of cases: 50

Percentage of the predicted categories

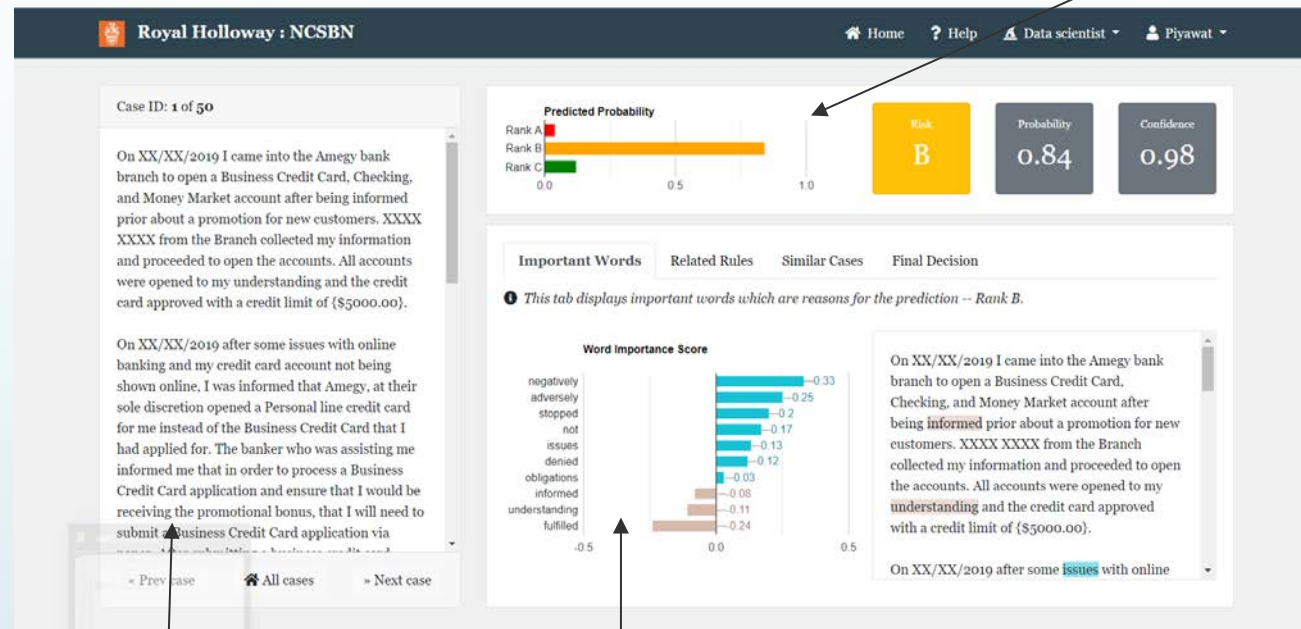
Risk A	18%
Risk B	26%
Risk C	56%

1 - 20 of 50 [Download CSV](#)

#	Complaint	Predicted Risk	Predicted Prob	Confidence Score	Final Decision
1	On XX/XX/2019 I came into the Amegy bank branch to open a Business Credit Card, Checking, and Money Market account after being informed prior about a promotion ...	B	0.84	0.98	Not entered
2	I have been unemployed since XXXX. Navient called me everyday and sometimes three times a day to collect. They kept giving me forbearance and reporting my loan delinquent. ...	A	0.99	0.99	Not entered
3	I have requested a loan estimate from a broker named XXXX XXXX at HST mortgage XXXX VA that has taken all my information and yet she denies me a loan estimate and ...	C	0.88	0.95	Not entered
4	XXXX has been non-compliant with removing the unverified account (XXXX XXXX XXXX XXXX XXXX) which has been deleted by XXXX and XXXX. XXXX and XXXX...	C	0.65	0.76	Not entered
5	I co-signed for my son 's Honda with Honda Financial services. His XX/XX/XXXX payment bounced. We were not notified until the account was past due. I immediately ...	C	0.98	0.98	Not entered
6	Please be advised this is my second complaint about Absolute Recovery Services , LLC. As stated in my previous complaint Absolute Recovery Services , LLC is violating ...	C	0.87	0.98	Not entered

Tool highlights key elements used in the prediction of risk category

Predicted risk level, probability & confidence



The complaint text used by the algorithm

Scores key words detected in the text

Task 2 & 3: compare current case with rules and previous similar cases

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Case ID: 1 of 50

On XX/XX/2019 I came into the Amegy bank branch to open a Business Credit Card, Checking, and Money Market account after being informed prior about a promotion for new customers. XXXX XXXX from the Branch collected my information and proceeded to open the accounts. All accounts were opened to my understanding and the credit card approved with a credit limit of (\$5000.00).

On XX/XX/2019 after some issues with online banking and my credit card account not being shown online, I was informed that Amegy, at their sole discretion opened a Personal line credit card for me instead of the Business Credit Card that I had applied for. The banker who was assisting me informed me that in order to process a Business Credit Card application and ensure that I would be receiving the promotional bonus, that I will need to submit a Business Credit Card application via

Prev case All cases Next case

Predicted Probability

Rank A
Rank B
Rank C

0.0 0.5 1.0

Risk
B

Probability
0.84

Confidence
0.98

Important Words Related Rules Similar Cases Final Decision

This tab shows rules from the regulations which are related to this case.

Rule 38i-1

Rule 38i: These will vary significantly from case to case but might include:

- the registrant committing violent offences or conduct or being verbally abusive

Related text sentence(s): Amegy is stating that it is within their rights and terms that they may evaluate me for personal credit card, when a business application has been submitted, but I have yet to receive where in the credit card application those terms are stated.

Result: Violation

Rule 401.2-D

Record of case manager decision

Relates to Texas Board of Nursing rules

Compares case to previous similar cases

Reliability results: Phase 1 testing

1241 cases

Model	Accuracy
Majority Baseline	0.617 \pm 0.032
C1: Gradient Boost.	0.671 \pm 0.025
C2: AdaBoost	0.646 \pm 0.028
C3: CNNMultiTask	0.668 \pm 0.029
C4: BERT-base	0.680 \pm 0.038
C5: Meta info	0.662 \pm 0.029
Ensemble model	0.708 \pm 0.036

Team perspectives and ethical concerns

- ▶ Team perspectives varied significantly –
 - ▶ Computer Scientists
 - ▶ Lawyer
 - ▶ Clinical and regulatory
 - ▶ Social Scientists
- ▶ Michael Sandel (2018)
 - ▶ Privacy and surveillance
 - ▶ Bias and discrimination
 - ▶ The role of human judgment



Qualitative Research Methodology

- Three online focus groups with nurse regulators - 28 participants
 - Australia (n=10);
 - United Kingdom (n=11);
 - Texas, USA (n=7)
- The online focus groups were facilitated by 3 members of the research team
- The six phases of **Braun and Clark's** thematic analysis was used :
 1. Familiarisation with the data
 2. Generating initial codes
 3. Searching for themes
 4. Reviewing themes
 5. Defining and naming themes
 6. Producing the report



Themes raised in our research

Themes	Sub-themes
1. Negotiating trust and trustworthiness	1a Prioritising honesty and transparency 1b A balanced appraisal of human/machine capability 1c Impacting language
2. Affirming fairness and non-discrimination	2a Minimising bias 2b Avoiding fabrication 2c Accountability
3. Managing burdens and benefits	3a Shades of grey 3b Fears of falling through cracks 3c Black box 3d Effectiveness and burden reduction



The future?

Ensure a deliberative process

Balancing enthusiasm and caution and recognizing the bias of the contributor

- 'idealogues' and 'romantics'
- 'pragmatists' and 'objectionist'

Preparing the workforce (both regulators and professionals)

Policy preparation for public- effective legislation and regulation

'Politics of accommodation'

Conclusions

- ✓ Using AI tools in nurse regulation is feasible & has the potential to bring benefits
- ✓ This work needs replication with a larger US dataset involving multiple states
- ✓ Engagement with regulatory staff, nurses and patients essential to successful integration

References

Austin, Z., van der Gaag, A., Jago, R., Gallagher, A., Zasada, M., Banks, S. (2019) Understanding complaints to regulators about paramedics in the UK and social workers in England: findings from a multi method study, *Journal of Medical Regulation*, 104, 3, 19-28

Jago, R. van der Gaag, A., Stathis, K., Petej, I., Lertvittayakumorn, P., Krishnamurthy, Y., Gao, Y., Caceres Silva, J., Webster, M., Gallagher, A. & Austin, Z. (2021) Use of Artificial Intelligence in Regulatory Decision-Making, *Journal of Nursing Regulation*, 12(3), 11-19.

Lertvittayakumjorn, P., Petej, I., Gao, Y., Krishnamurthy, Y., van der Gaag, A., Jago, R., Stathis, K.. (2021) Supporting complaints investigation for nursing and midwifery agencies. 59th meeting of the Association of Computational Linguistics <https://aclanthology.org/2021.acl-demo.10.pdf>

Leslie D (2019) Understanding AI ethics and safety: a guide for the responsible design and implementation of AI systems in the public sector
https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3403301

Sandel, M. J. The Ethics of Artificial Intelligence. *Foreign Affairs*, 2018, 97(4), 10-16.

Van der Gaag, A., Jago, R., Gallagher, A., Stathis, K., Webster, M., Austin, Z. (2023) Artificial Intelligence in Health Professions Regulation: An Exploratory Qualitative Study of Nurse Regulators in Three Jurisdictions. *Journal of Nursing Regulation*, 14 (2), 10-17.

Van der Gaag, A., Gallagher, A., Zasada, M., Jago, R., Banks, S., Austin, Z. (2017) People like us? Understanding complaints about paramedics and social workers https://www.hcpc-uk.org/resources/reports/2017/people-like-us-understanding_-complaints-about-paramedics-and-social-workers/

White House (2022) The impact of AI on the future of workforces in the European Union and the US: TTC-EA-CEA Report

Wolf, G. (2020) 'Embracing the future: Using Artificial Intelligence in Australian Health Practitioner Regulation' 28 JML 21



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Thank you

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