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CALGARY

Is Artificial Intelligence the Right Tool for Preventing Homelessness?

Dr. Geoffrey Messier
Department of Electrical & Software Engineering
Schulich School of Engineering
University of Calgary

Land Acknowledgement

I would like to take this opportunity to acknowledge the traditional territories of the people of the Treaty 7 region in Southern Alberta, which includes the Blackfoot Confederacy (comprising the Siksika, Piikani, and Kainai First Nations), as well as the Tsuut'ina First Nation, and the Stoney Nakoda (including the Chiniki, Bearspaw, and Wesley First Nations). The City of Calgary is also home to Métis Nation of Alberta, Region 3.

Supporters and Partners



Objectives

1. What exactly is artificial intelligence (AI) and machine learning?
2. Should AI and machine learning even be used for shelter and housing program delivery? If yes, how?
3. What machine learning techniques are most practical for not-for-profits with mostly non-technical staff?
4. What does a successful application of machine learning look like in a shelter or housing program?

Terminology (is important)

- Data Analytics/Analysis
 - Any use of data to aid in organization, program or individual decision making.
 - Most shelters and housing programs use data analysis to evaluate program delivery.
- Machine Learning
 - Any computer program that can “learn” from past data.
 - “Learning” is the ability to examine patterns in past data and then spot similar patterns in future data.
- Artificial Intelligence (AI)
 - A computer program able to do tasks that that normally require human intelligence and **the ability to make judgements or decisions.**

Housing Vulnerable People

Data, Machine Learning, Artificial Intelligence..?

Could we automate some of this using AI?

- Government Policy
 - National Housing Strategy
 - Calgary Plan to End Homelessness



- Public & Not-for-Profit Agencies
 - Emergency Shelters
 - Housing Programs



- Front-Line Decision Makers

No!!

- But don't just take my word for it...
 - Dr. Andrew Ng is a pioneer in AI (Stanford Comp Sci Professor, Google Brain Project Co-Founder, etc.)
 - Andrew's 1 Second Doctrine for Artificial Intelligence:
“If a typical person can do a mental task with less than one second of thought, we can probably automate it using AI either now or in the near future.”
 - Matching a client to the right support programming takes *much* longer than 1 second.
- Rather than using AI to replace front line decision makers, can machine learning instead be used to support them?

Housing/Shelter “Blood Pressure Cuff”

- Case workers and physicians make decisions using:
 - Client/patient history.
 - Their assessment of the client/patient’s current condition.
- Physicians also use medical measurements (ie. blood pressure, lab tests, etc.).
- Could we use machine learning to estimate whether a client is at risk of an adverse outcome?

Example Problem: Risk of Long Term Shelter Use

- From 2007 to 2020, the Calgary Drop-In Centre saw an average of 268 new clients per month:
 - 85% are transitional, very short term shelter users
 - 12% are episodic users with large gaps in shelter use
 - 3% are long term, chronic shelter users
- Most Housing First strategies prioritize chronic clients.
- How do we know who is chronic?
 1. ~~Wait a long time.~~
 2. Use machine learning to find patterns in early shelter use that suggest someone is at risk of becoming chronic.

Example Solution: Rule Set Search

- Rule set techniques process historical client data to find the best threshold-style tests for identifying an at-risk group.
- Using historical Calgary Drop-In Centre data, chronic clients can be identified by the following rule:

In a Client's First 60 Days:
(Shelter Sleeps) \geq 54 AND (Counsellor Meetings) \leq 11

- Precision: 71%
 - 71% of clients identified by the test actually became chronic.
- Recall: 77%
 - 77% of all chronic clients are identified by this test.

Why is this exciting?

1. It's effective.

- Rule sets perform about the same as deep learning neural networks for this particular problem.

2. It's understandable.

- A non-technical person can both understand threshold rules and validate them with personal experience.

3. It's practical.

- The rules can be implemented on IT systems with commonly available database or spreadsheet style query capabilities.

Some Practicalities

- **Is all this necessary for your housing program/shelter?**
 - Likely only if you have large client volumes.
- **Is your data/IT system ready?**
 - This will work with spreadsheets and/or basic databases but your data can't be fragmented.
 - It's best if you can use data already being collected.
- **Do you have access to data nerds?**
 - Applying the threshold rules can be done by non-technical staff but running the search algorithm to find them requires data expertise.
- **Are your staff ready to use the risk estimates?**
 - Machine learning should be used to improve but not hijack client support decisions.

Conclusions

- AI and machine learning can be used properly to help support but not replace humans working to end homelessness.
- The applications of machine learning are many but estimating risk of adverse outcomes is a good place to start.
- Techniques exist that are a great fit for shelter and housing programs.