

## Realistic knowledge-based waiting times for radiotherapy patients

Addressing the pain of waiting

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### The "Netflix Prize"

 \$1,000,000 prize for improving reccomendation system by 10%

 Open competition for best algorithm to predict ratings based on previous ratings

 Harnessing previous information to make predictions about future information:

"Learning from data" "Knowledge-based solutions" "Machine learning"

# The problem?

Waiting...

... when there are other things that can be done.

#### Patients experience

- -- 3 different types of waiting in radiation oncology
- 1. Treatment planning
  - Waiting at home by the phone
  - Can last days to weeks
- 2. Daily-fractionated treatments
  - Waiting in the waiting room
  - Can last minutes to hours
- 3. Consultations with physician
  - Waiting in the waiting room
  - Can last minutes to hours
- Difficult for staff to predict.
- Only rough estimates are given based on experience.

Can we build an algorithm to accurately predict how long a patient is expected to wait?

### Solution: Machine learning

- **Goal:** To provide radiotherapy patients with personalized predictions regarding how long they will wait for the provision of care in the Department of Radiation Oncology at the MUHC
- How: Learn data from previous patients to make predictions for future patients.
- ML is trending! Major companies are already working on this kind of learning process.



## How does ML work?

Basic steps

#### 1. Define the problem

Not knowing how long to wait.

### 2. Define your dataset

- Putting in historical patient information such as:
  - Time of the appointment, doctor, diagnosis, etc.
- Getting out the duration of an appointment to infer a waiting estimate.

### **3.**Choosing the right algorithm

There is no perfect model; only a model that is good enough.

#### 4. Validate your algorithm

- Divide your existing dataset into training and testing sets.
- Cross-validate.

## Results



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Residual histogram



### Conclusions

- Machine learning can be successfully applied to waiting times in Radiation Oncology.
- Future work
  - Communicate waiting times to patients
  - An app is currently in development





This can have a significant impact on patient lives!

# Thanks!







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