Public Health Agency of Canada | Agence de la santé publique du Canada

Canada

Developing information extraction algorithms for open-source data from event-based surveillance systems

2019 EIOS Global Technical Meeting

Day 2: November 13, 2019

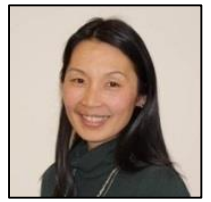
PROTECTING AND EMPOWERING CANADIANS TO IMPROVE THEIR HEALTH

InSIGHT

Internet-based Surveillance Informing Global Health Threats

Co-project Leads:

Erin E. Rees



Victoria Ng

1. AI and IT enhancements

Refine and develop ML algorithms

Digitize data sources

Real-time data capture

3. Advanced analytics

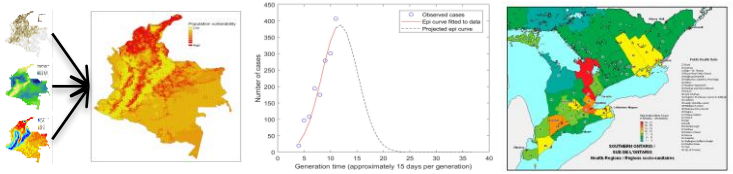
2. Data integration

Social media and search engine data

Google Trends

Human mobility and other data

4. Visualisation of outputs

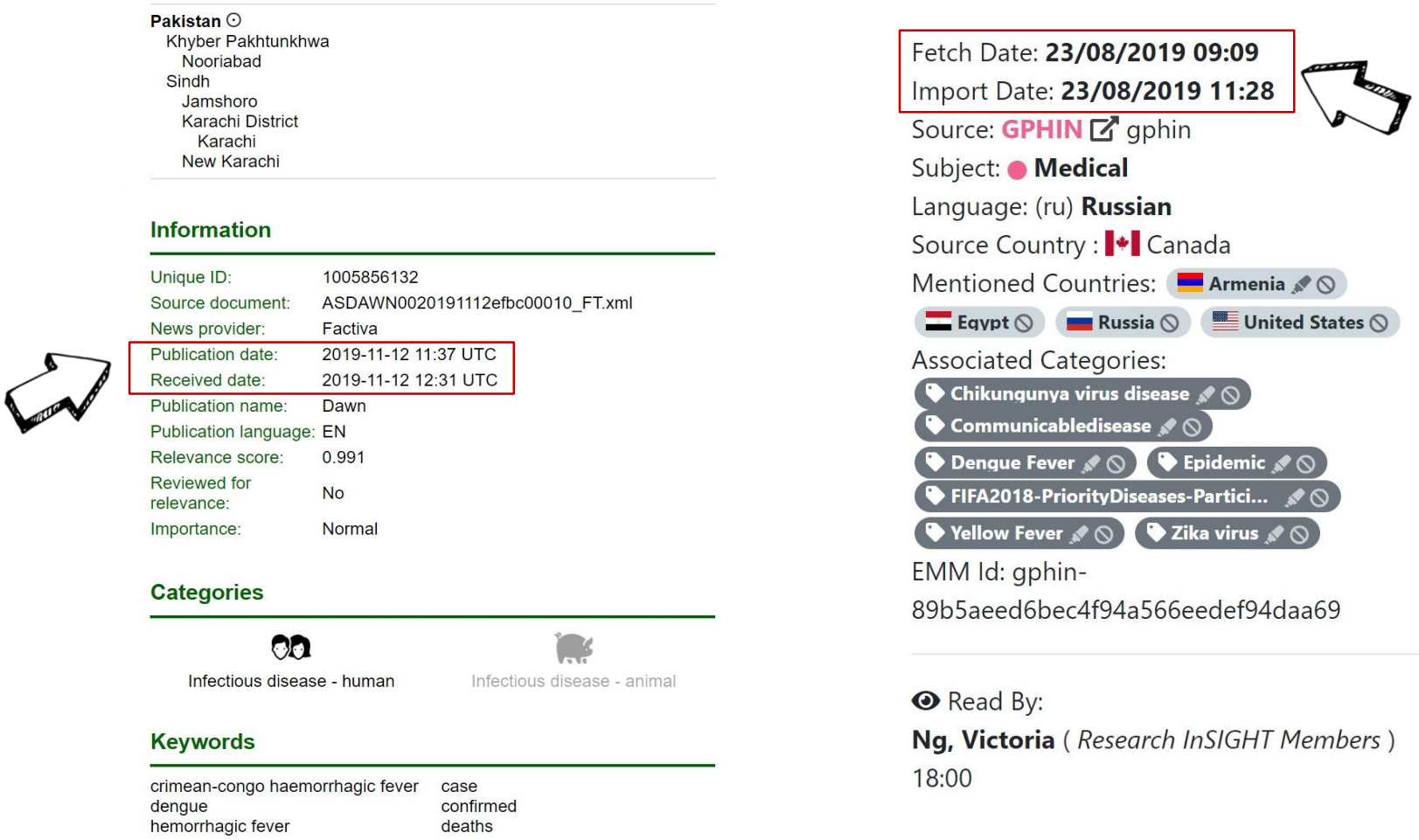


Automated to produce real-time outputs

GOAL: Less time screening for relevancy and more time for threat assessment

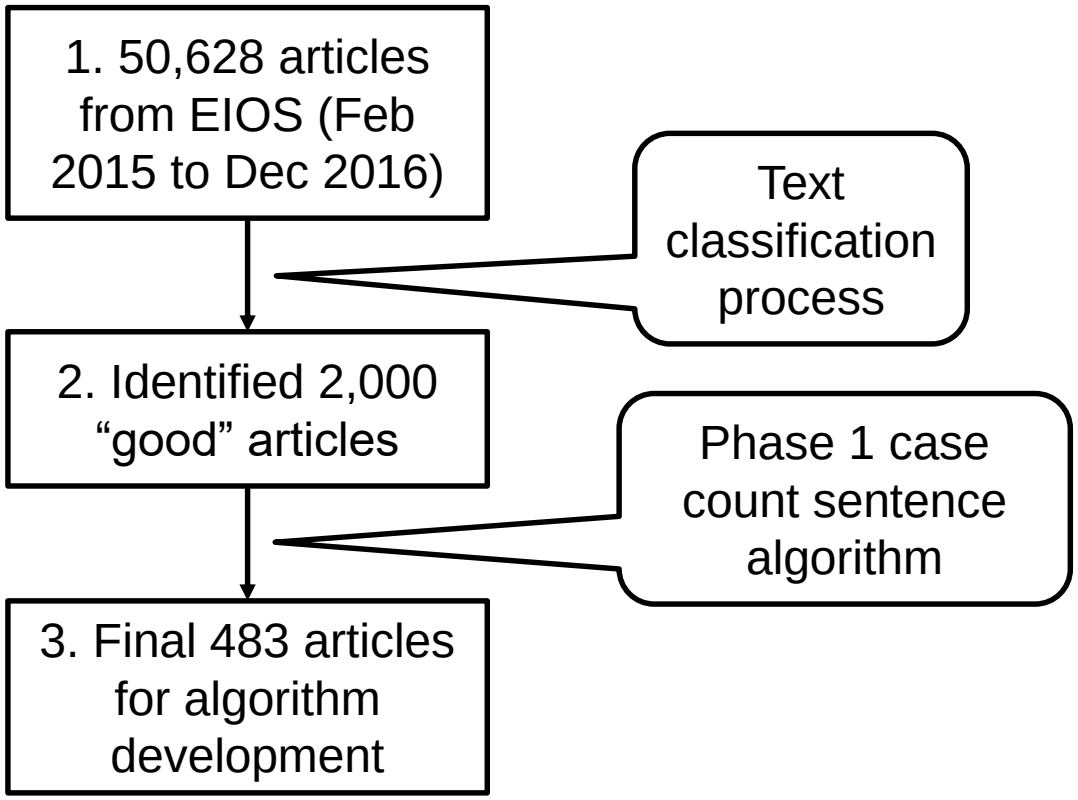
Refine and develop ML algorithms

- Algorithms in GPHIN and EIOS systems:



Candidate disease: Zika virus

1. Case count extraction algorithm
2. Temporal information extraction algorithm



1. Case count extraction

Phase 1: developed for norovirus

100 randomly selected article:
- 56 sentences identified
  - 34 of 56 correct
  - 4 false positives

Phase 2: developing for Zika virus

Annotate case count sentences (483 articles)

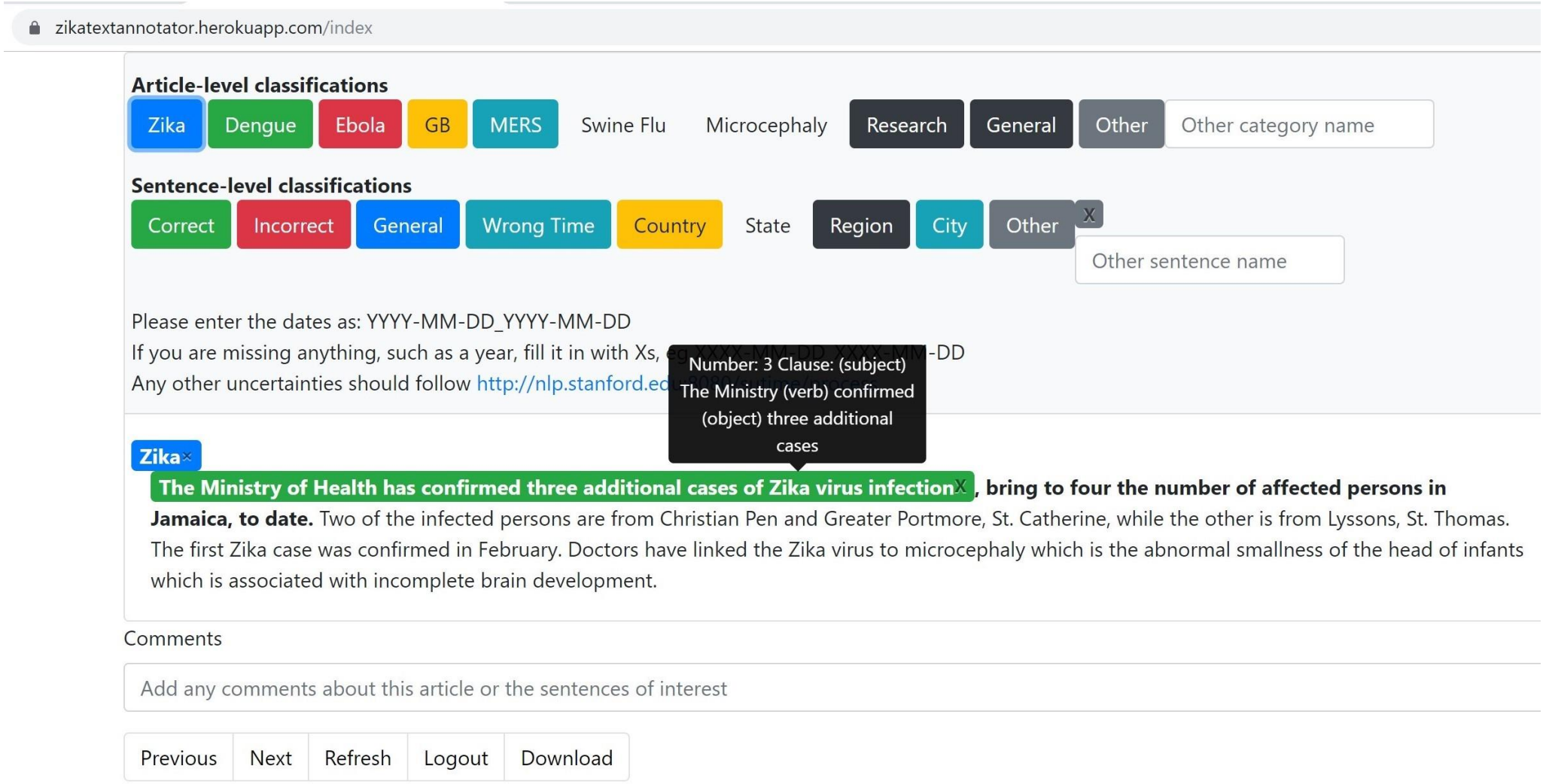
Algorithm development and evaluation

Current status

Dr. Adrian Verster

Health Canada / Santé Canada

The Zik-meister

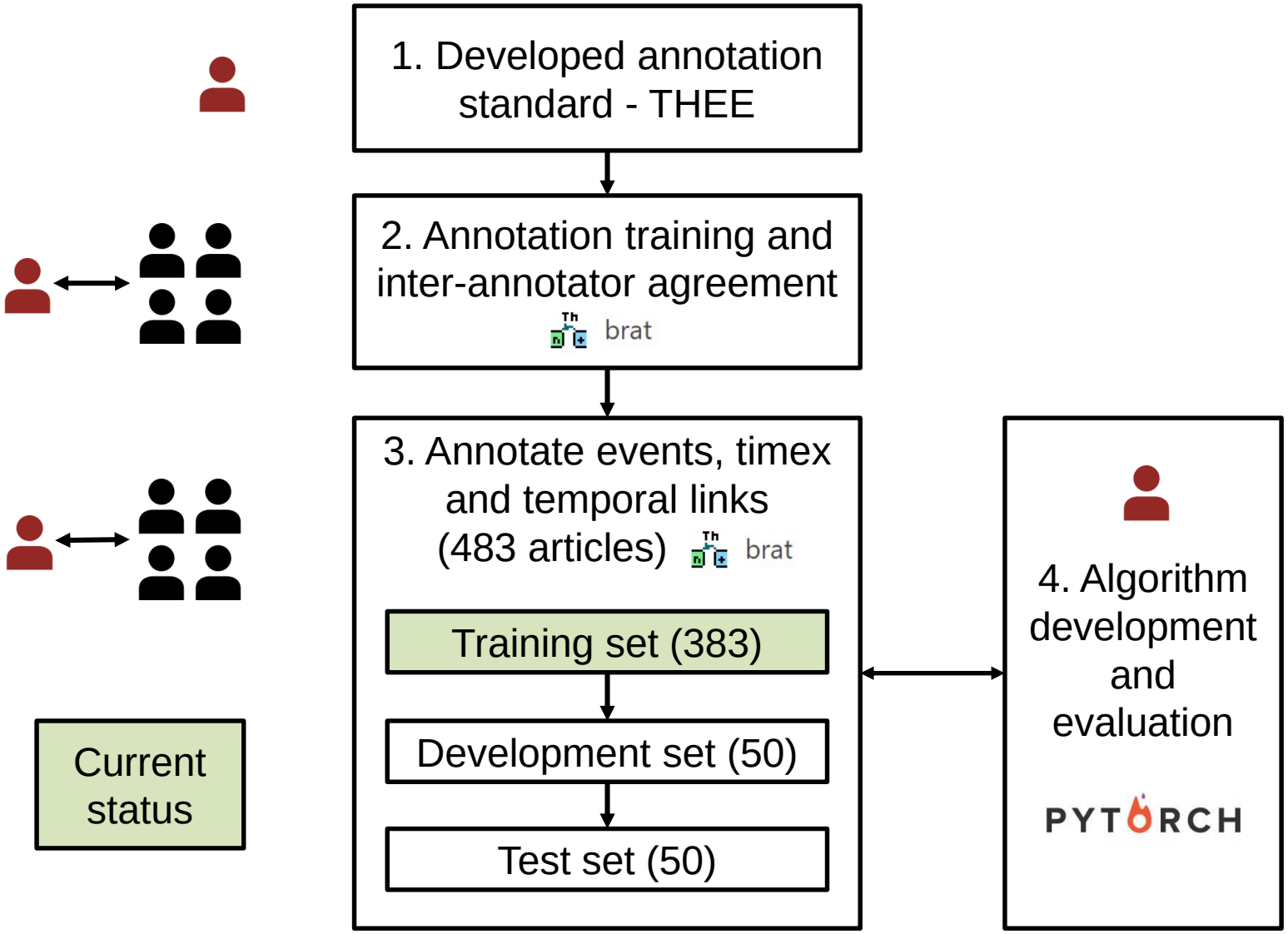


Preliminary results

- Examples of true positive sentences:
  - "*Five new locally acquired cases were announced Wednesday in Miami-Dade County*"
  - "*Officials in Connecticut on Thursday announced two new cases of the Zika virus*"
  - "*The announcement came as Australia confirmed its first two cases of the virus*"

- Examples of true negative sentences:
  - "*Approximately one in five people infected with the virus show symptoms*"
  - "Of California's 77 cases, the greatest numbers resulted from travel to El Salvador .."
  - "*There have been at least four confirmed cases of Louisiana residents who were diagnosed with the illness after traveling abroad*"

2. Temporal information extraction

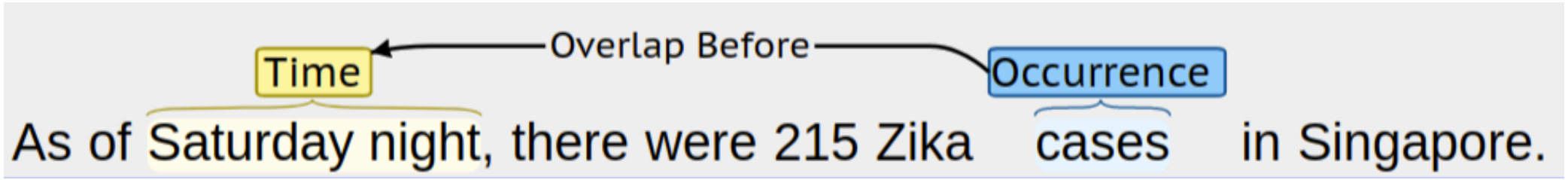


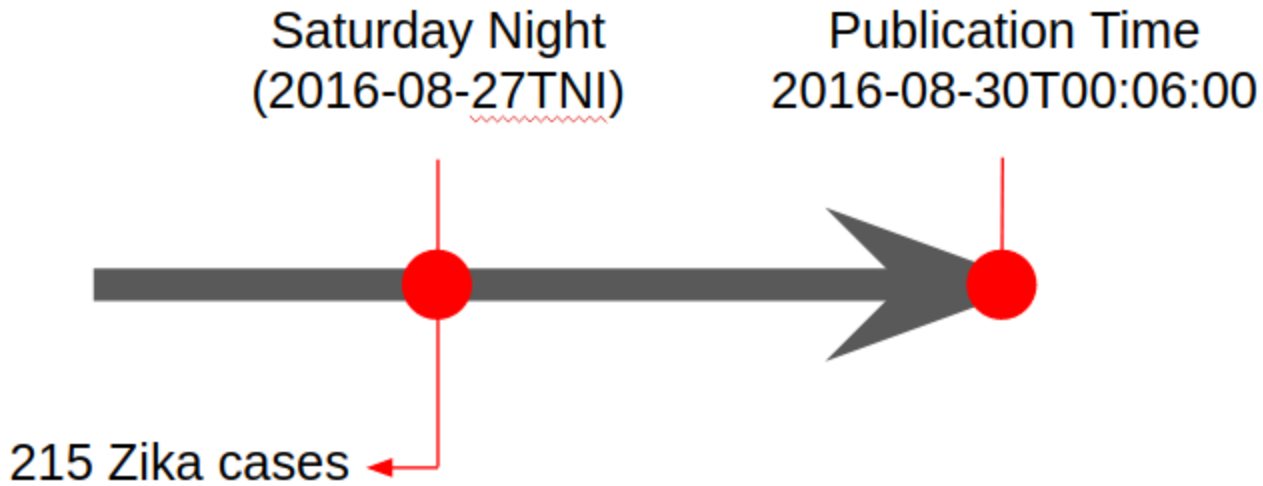
Computer Science
UNIVERSITY OF TORONTO

Jingcheng (Frank) Niu

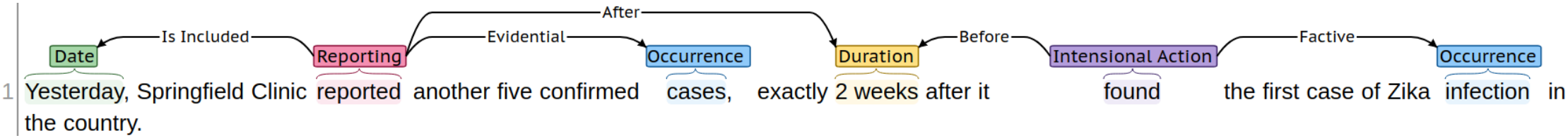
Dr. Gerald Penn

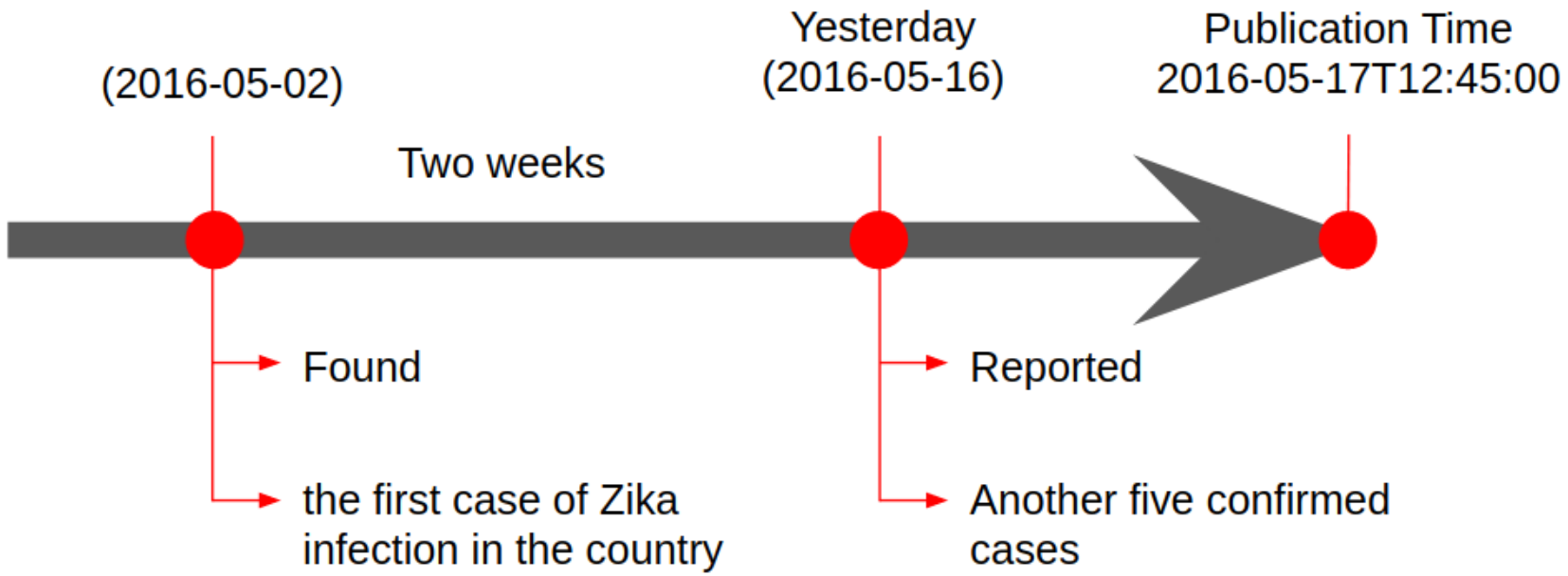
THEE annotation examples





THEE annotation examples





Preliminary results against TimeBank corpus

- TIMEX
  - 'classification_f1': {'p': 90.95, 'r': 84.74, 'f1': 87.73}
  - 'identification_f1': {'p': 90.95, 'r': 89.79, 'f1': 90.36}

Current state of the art:
p: 0.90, r: 0.85, f1:0.86

Source: Llorens et al (2013)

- EVENT
  - 'classification_f1': {'p': 85.96, 'r': 55.43, 'f1': 67.4}
  - 'identification_f1': {'p': 85.96, 'r': 61.69, 'f1': 71.83}

Current state of the art:
p: 0.81, r: 0.86, f1:0.83

Source: Llorens et al (2013)

$$\text{Precision} = \frac{True\ Positive}{True\ positive + False\ Positive} \qquad \text{Recall} = \frac{True\ Positive}{True\ positive + False\ Negative} \qquad \text{F1 Score} = 2 * \frac{Precision * Recall}{Precision + Recall}$$

Review

- Event
  - Reporting
  - Aspectual
  - IAction
  - IState
  - Occurrence
- TimeX
  - Date
  - Time
  - Duration
  - Set

- Temporal links
  - Before
  - After
  - Simultaneous
  - Is_Include
  - During
  - Identity
- Aspectual links
  - Initiation
  - Reinitiation
  - Termination
  - Culmination
  - Continuation

- SLINK:
  - Modal
  - Factive
  - Counter-Factive
  - Evidential
  - Negatively Evidential
  - Conditional

Questions and acknowledgements

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Canada

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from open sources

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