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Automated Opioid News Event-based Surveillance (AONES) Project

Lessons Learned for Using AI in Applied Public Health Projects

Allison Maier
Research Associate
Knowledge Management

Alex Hamilton
Research Associate
Knowledge Management

Nancy Slipp
Research Associate
Knowledge Management

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Disclosure

The authors have no conflicts of interest to declare.

Learning Objectives

Describe the process of developing an AI tool for production

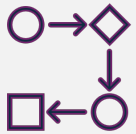
Identify common technical and human resource requirements for developing AI tools.

Explain the iterative data exploration and annotation cycle

Plan for the knowledge exchange and technical production components to ensure tool use and sustainability

Agenda

Project Background



Workflow of an AI Project

Key Takeaways

Questions

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Background

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The Team

Knowledge Advisory Group

Core Team

KFL&A Public Health/ Queen's University

Representatives from
- Grey Bruce Public Health
- York Region Public Heath
- Leeds, Grenville & Lanark Public Health

Representatives from:
- Algoma Public Health
- Brant County Health Unit
- Niagara Region Public Health
- Peel Region Health Unit
- Thunder Bay District Health Unit
- Toronto Public Health
- Wellington-Dufferin-Guelph Public Health
- Public Health Ontario
- Ontario Drug Policy Research Network

- population health managers
- harm reduction workers
- epidemiologists/health analysts
- health policy specialists
- physicians
- librarians
- scientific harm reduction and drug policy experts

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Lived Experience Advisory Group (LEAG)

Definition – Applied AI Projects in Public Health Settings

Applied:

- using AI to build tools for production
- Excludes: tools that are solely software-as-a-service

AI:

- Any number of artificial intelligence or machine learning techniques

Public Health Settings:

- Small service-oriented organizations

The Issue and Idea

Introduction of fentanyl and pandemic worsened drug poisoning crisis

→ Improved harms and harm reduction surveillance

→ Surveillance still limited in ability to detect contamination events and novel negative outcome

→ Use large non-traditional data sources (**Event-Based Surveillance)** and AI to filter and synthesize the information

Project Objectives

Develop and test data pipelines that take in and process near-real-time news data feeds.

Create an applied AI model that filters articles and extract critical situational awareness information.

Build an interactive dashboard that synthesizes extracted information.

Evaluate the process of developing and deploying AI in an applied public health setting.

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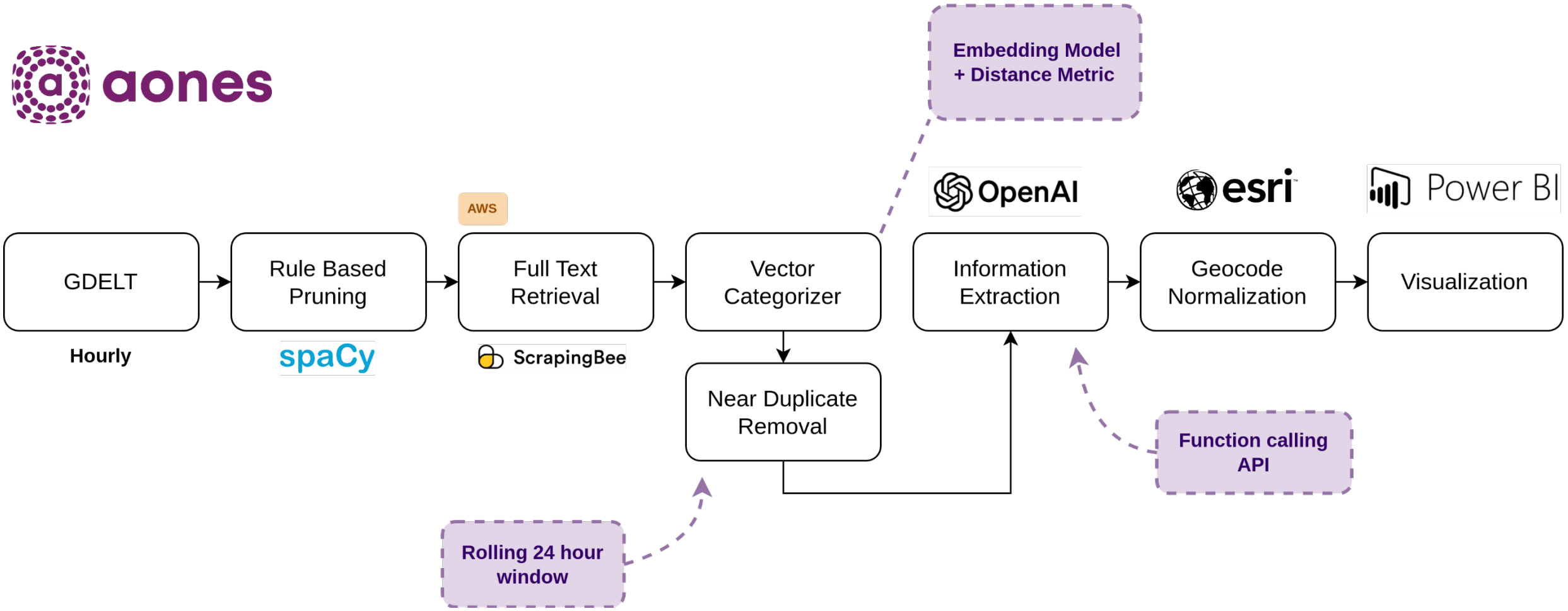
The AONES Pipeline



Workflow of an AI Project

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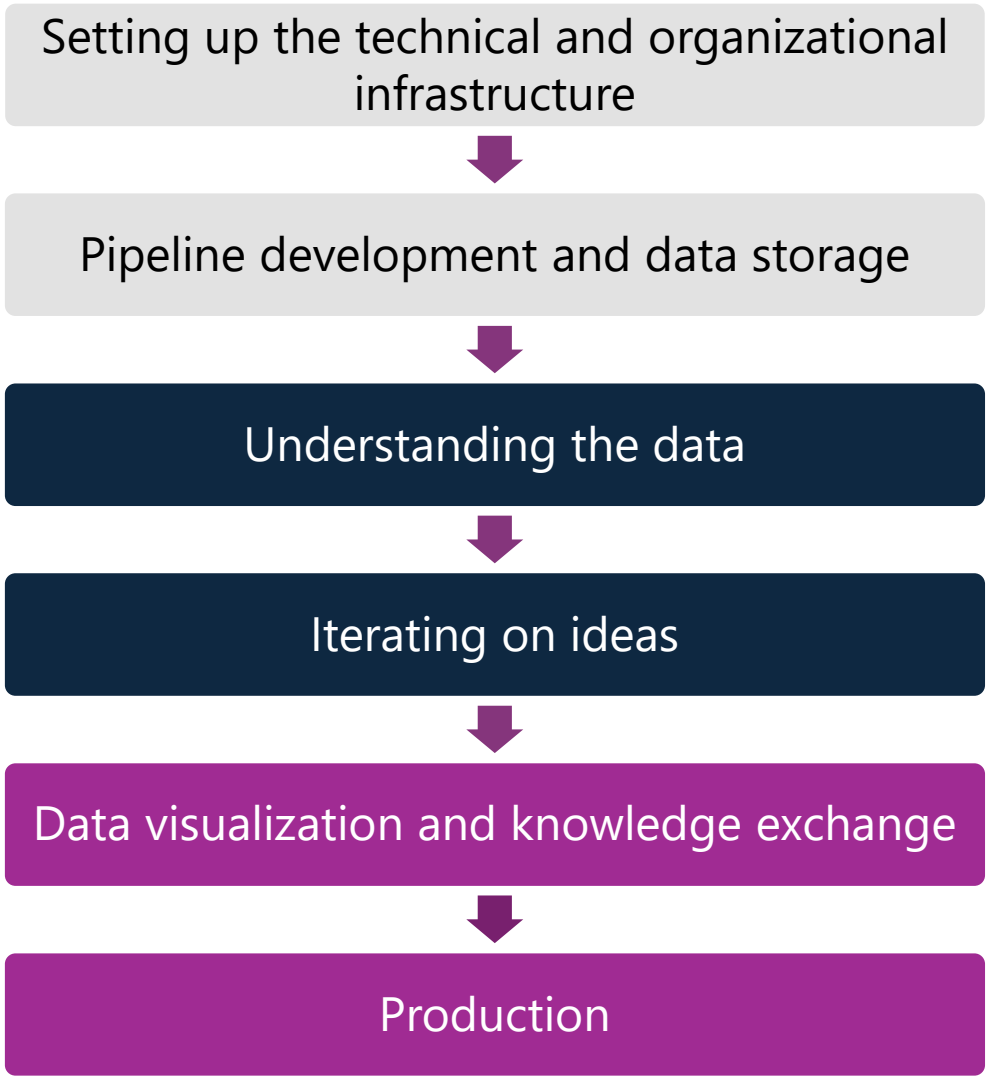
Workflow of an AI Project

Background

Cyclic development

Using the project



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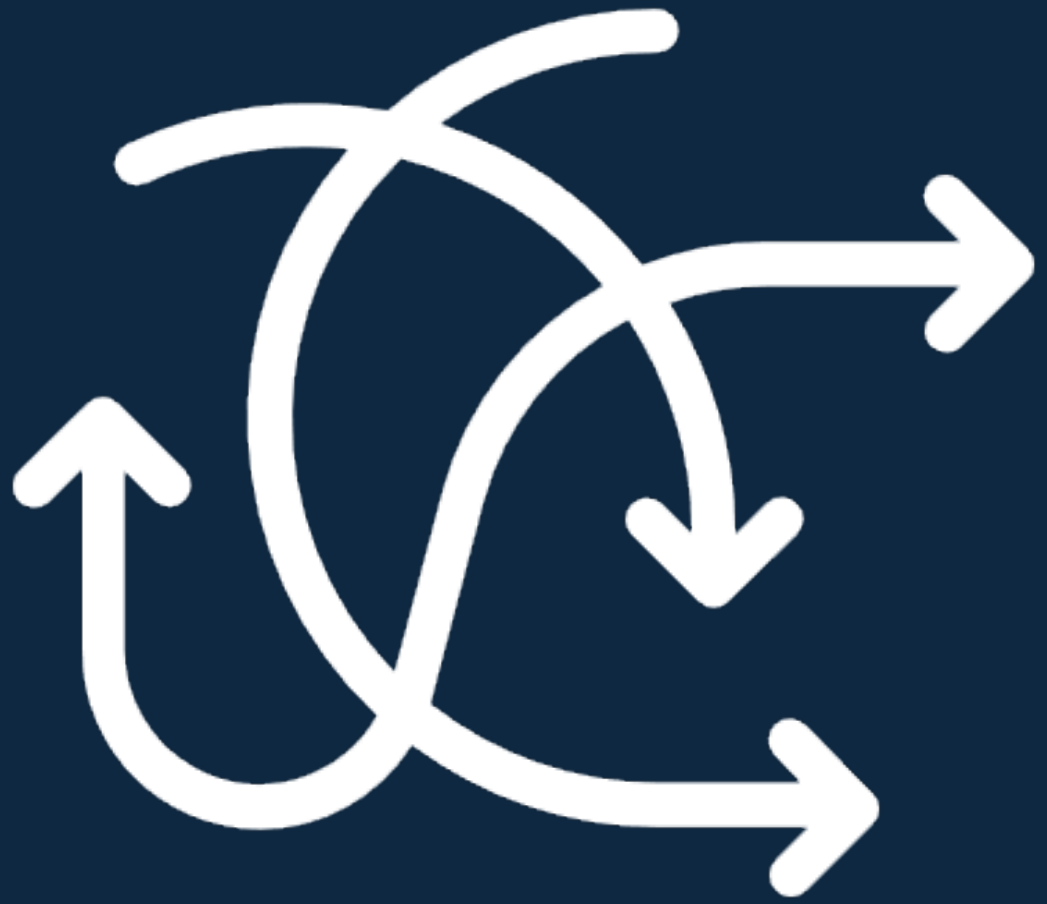
Principle challenge



Projects are experimental and explorative.

When you start, you don’t know where you are going to end up.

The speed of development in the industry can result in radical course changes.

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Background Infrastructure: Hardware Acquisition

Determining requirements

Time delays

Communication between components

Collaboration with IT

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Background Infrastructure: In-house vs. Services

In-house (e.g., purpose-built models)	Services (e.g., scraping services, LLMs)
Upfront costs	Operational costs
Better compute and accuracy (for now)	Better performance
Significant development time with need for individual components (e.g., extraction, disambiguation, entity-linking)	End-to-end
	Long-term dependencies (risk of change)

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Background Infrastructure: Organizational Policies

Policies and Procedures

Security – sensitive data or not?

Team – who do you have and what is the team maturity?

Knowledge users
Content experts

Data engineers
IT specialists

Data scientists
Data visualization and KE experts

Background: Pipeline Development

What?	Software that manages series of processing steps
Why?	Monitoring Graceful failure Granularity and debugging
How?	Many options, e.g., Dagster
Where?	On-premise vs. cloud
When?	From the start!

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Background: Data Storage

How do we store data (format and structure)?

- ✓ Lifecycle
- ✓ Efficient
- ✓ Columnar
- ✓ Uptime

Impact of public health/ healthcare data:

- ➢ Role-based access
- ➢ Logging and auditing
- ➢ Policies and procedures

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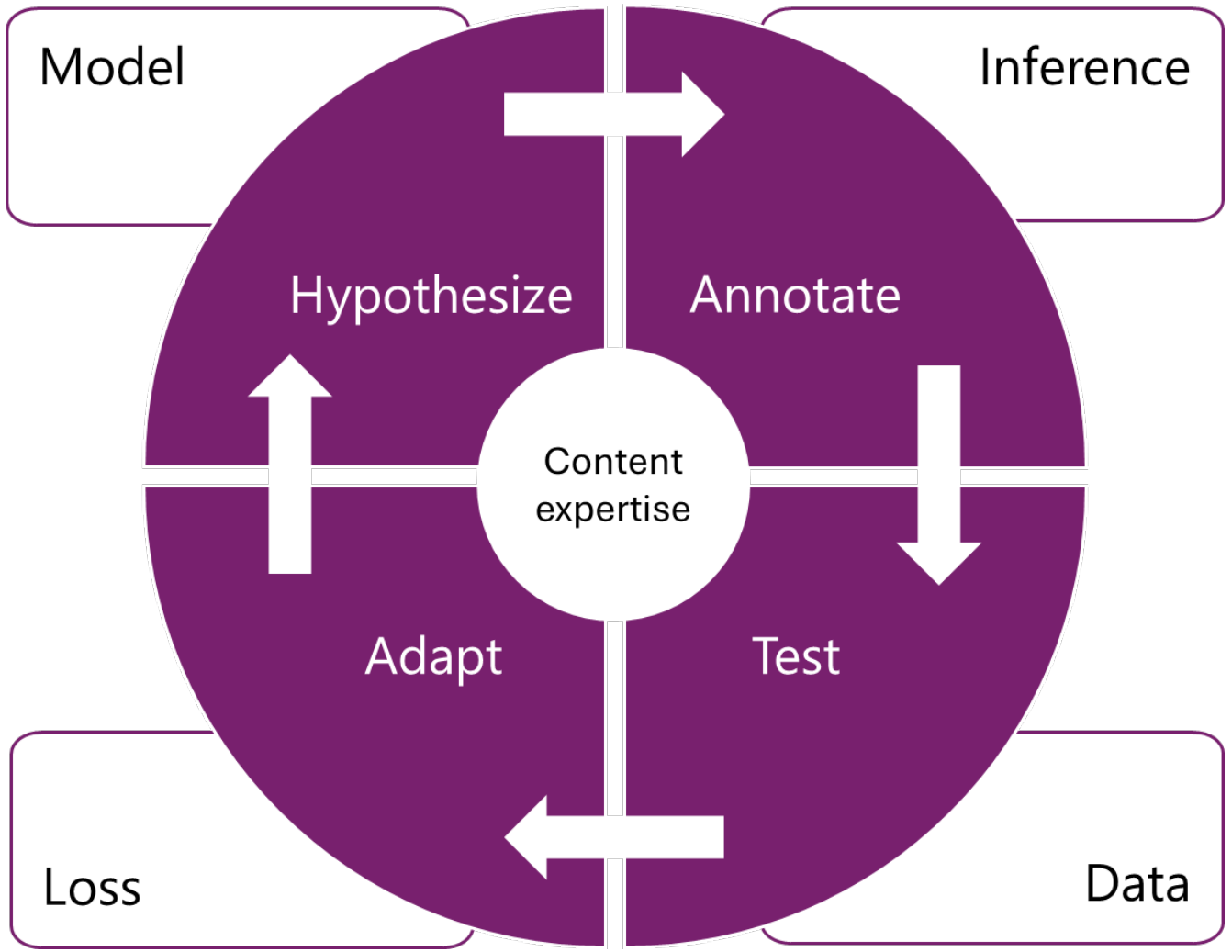
Cyclic Development: Understanding the Data



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Collaboration with End-users

Solutions are only effective when they address the needs of those who require them.

Involvement throughout development process:

- Scoping
- Extraction
- Data visualization and knowledge exchange

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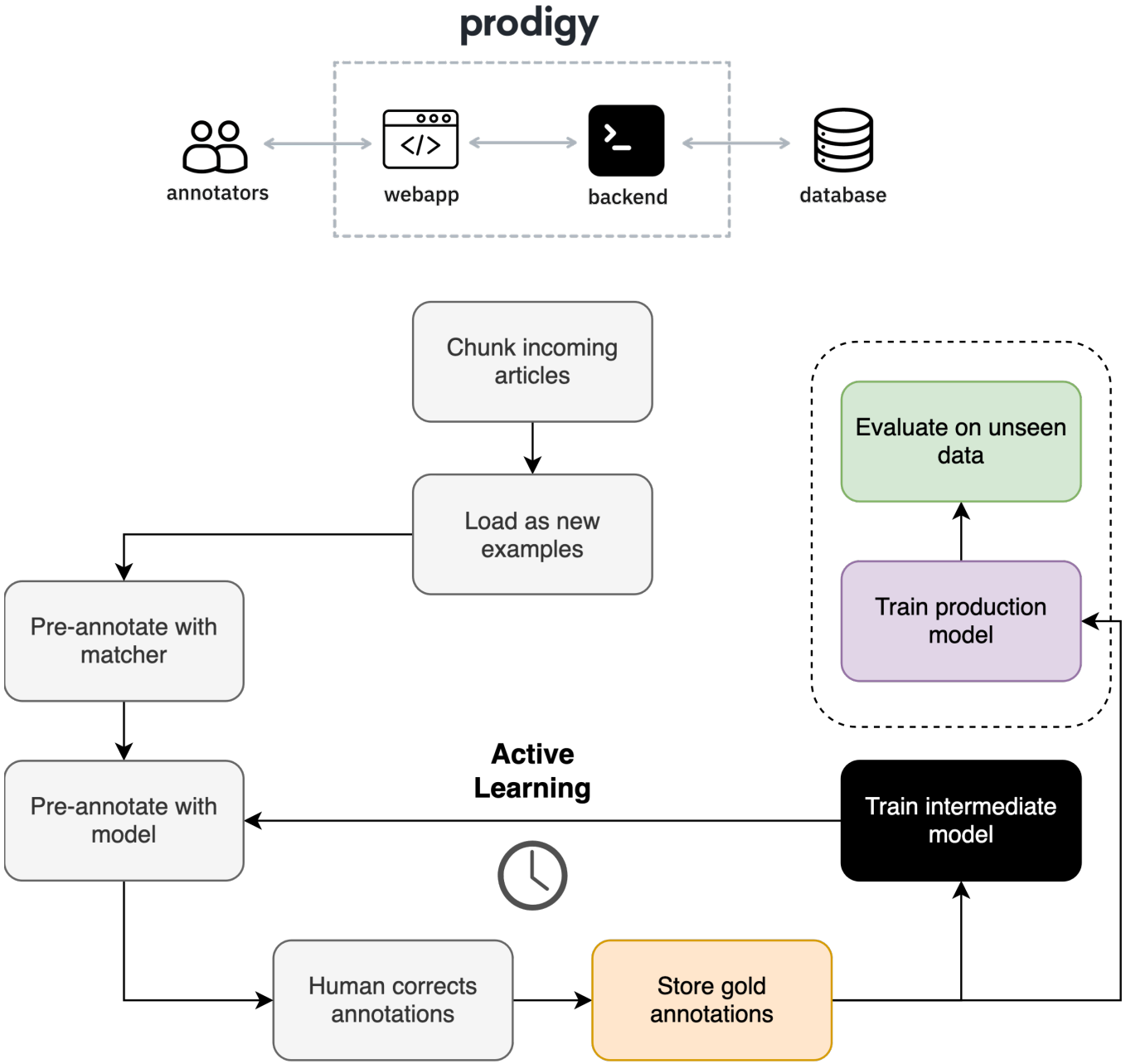
Qualitative Analysis Approaches

- Inductive methods
- Annotation = coding

Pruning

	Out
g*, arrest* or indict* for trafficking/ ssion of opioid + other substance or opioid where specific opioid is stated, if only stated exclude (note: some jurisdictions c charge is "opium or heroin") in which and in what quantities)	includes "convict*", or "sentenc*", "face trial" (because typically there are delays), "prosecuted", "defense laywer", or any other mentions of trial (e.g., closing arguments)
scribing the appearance/physical s of opioids (including ls, powder)	mention of drug charges without ever specifying specific substances
f contamination (e.g., laced with, minated with, blended with, for, mixture of, mixed with,	articles on diversion of opioids from medical/veterinary clinics without any specific inclusion criteria above (I.e., specific opioids/amounts, other substances)
street names of drugs	historic accounts of addiction
sure to opioid (I.e., children, first mals)	new laws or policies
miology of overdoses/other re/ increasing/ surge/ rise/ spike/ g outcomes)	child neglect charges due to drugs (except where accidental exposure rule is met)
ug warning	driving under the influence charges
nusual outcomes of drugs	descriptions of other drugs (e.g., drugs used instead of opioids)
ual accounts of overdoses where mbos of drugs or unusual outcomes d	wanted alerts for criminals ("wanted poster")
of overdoses	general interviews with opioid academics
ptions of subpopulations more at risk, ding specific settings (prisons, shelters, campments)	generic border patrol/policing articles (without specific mentions of seizures)
	most air quality testing for drugs, unless meets

Understanding the Data: Technical Processes



Cyclic Development: Iterating on Ideas

- First solution is never the final solution
- Non-ideal evaluation and decision-making
- Fail fast
- What is good enough?

Iterating on ideas: Models

In-House Models

- Lightweight
- Time-consuming to annotate

LLMs

- Flexible and scalable
- Concerns over latency, cost and privacy

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Iterating on ideas: Structured Data Extraction

Challenge: Generative models produce more text

Solution: Function calling and enforcing schema

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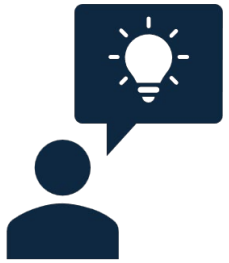
Production: Data visualization

Only visible component

How do you share the data – text, graphics



Contextualizing the data and the tool to support appropriate interpretation

Production: Monitoring and Evaluation

Vibes checks

Time consuming

Erosion of the data

Data shifts

Model rot

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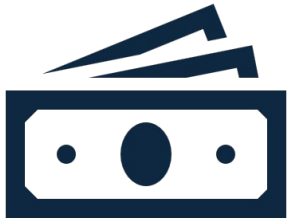
Production: Sustainability and Maintenance

Changes in services



Funding and human resources long-term

Upfront time into sustainable pipelines

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So what?

Production ML adds complexity and time

Risky – you can't be sure it will work when you start

Don't be married to the method

Focus on the problem and the end users

Majority of the work isn't the ML component

Team dynamics matter – and each new project will get easier

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Use the tool:
www.kflaphi.ca/aones/

Contact Us:

allison.maier@kflaph.ca
alexander.hamilton@kflaph.ca

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