Data Anonymization for Local Crisis Response

a project by Aussie Frost for DSCI 410L

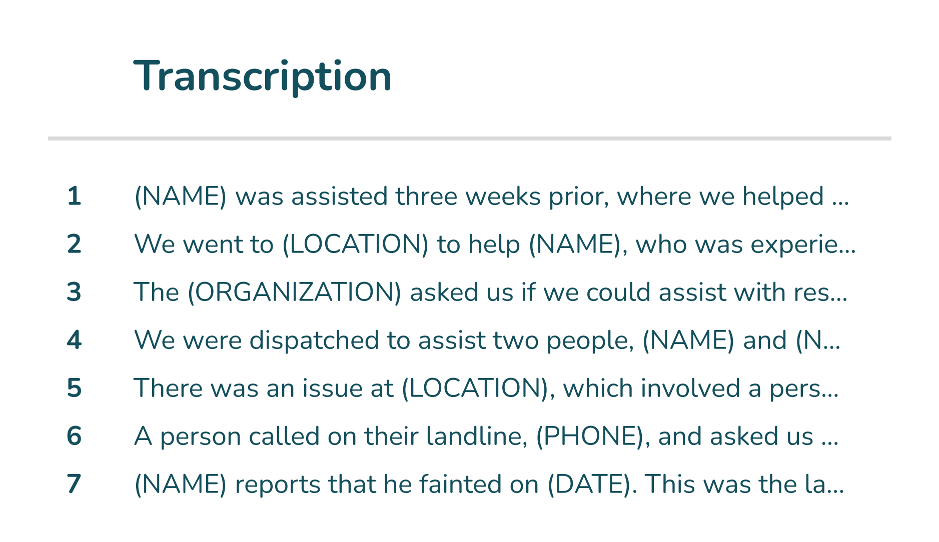
Background

- organizations are collecting data all the time
- this data can be analyzed to provide important insights
- CAHOOTS wants to share data with researchers *without compromising privacy*

Research question

Can a script reliably **remove identifying information** such as names, phone numbers, and addresses **from case narratives**?

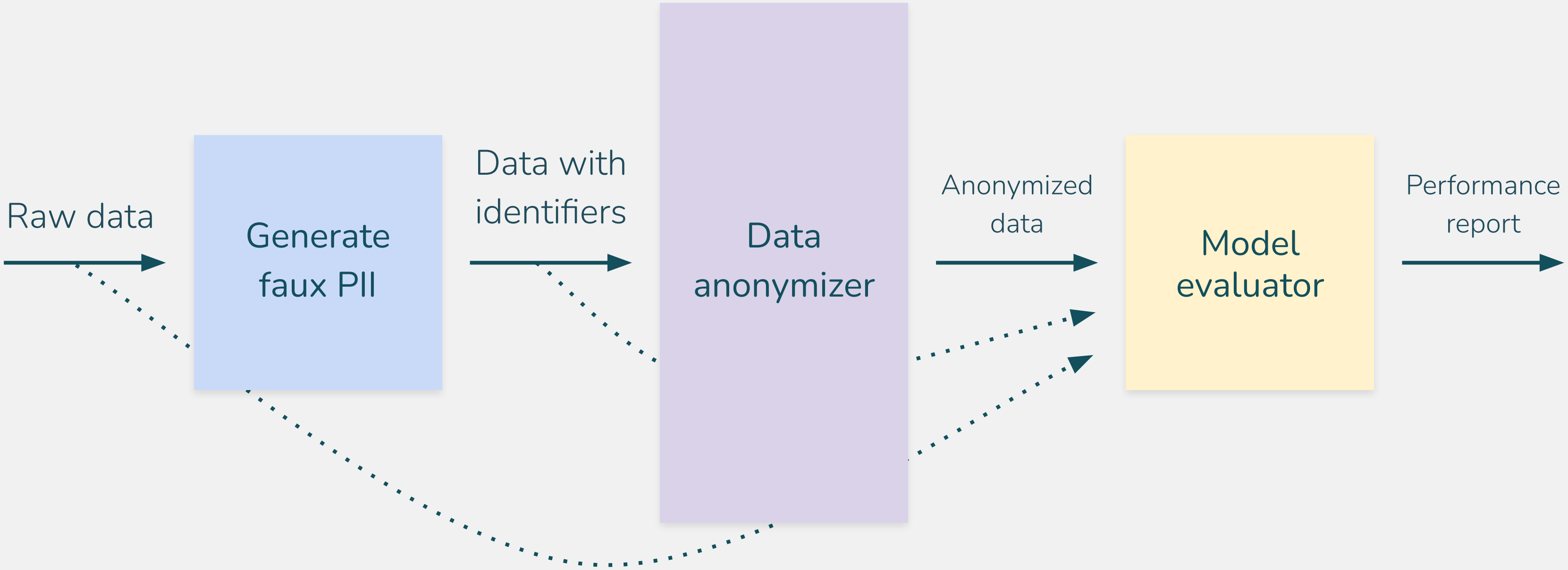
Data – Case narratives



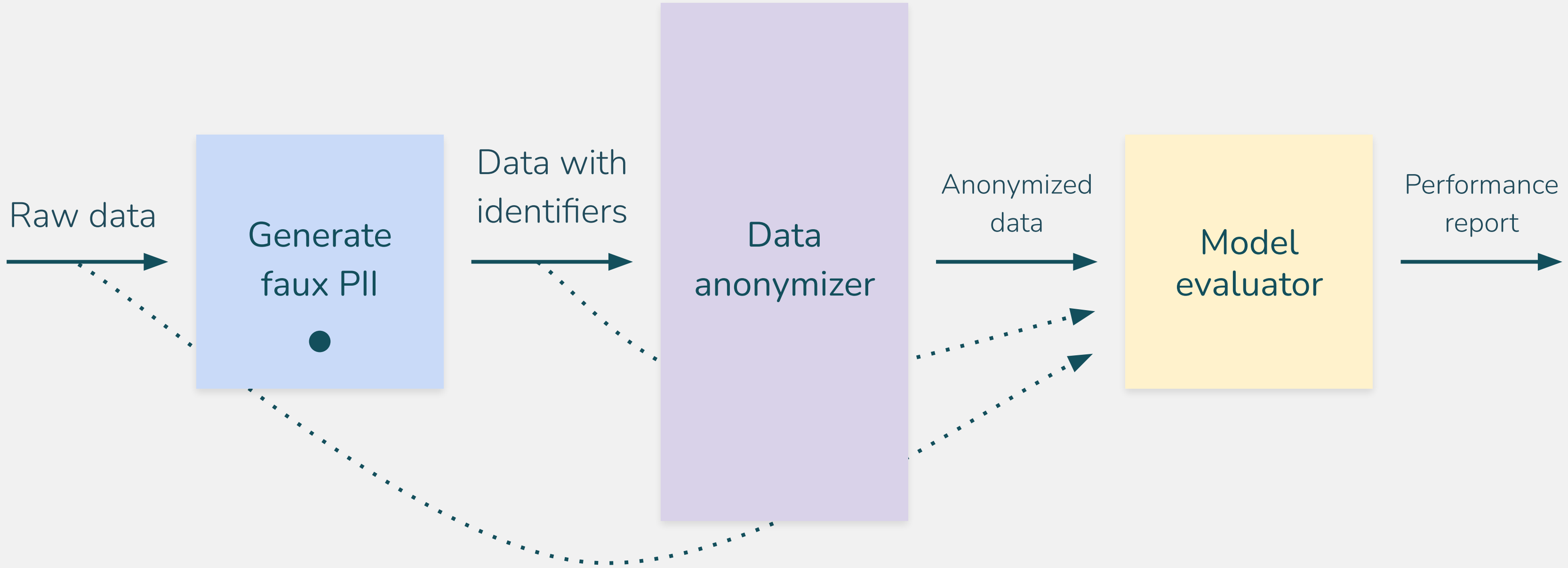
	Transcription
1	(NAME) was assisted three weeks prior, where we helped …
2	We went to (LOCATION) to help (NAME), who was experie…
3	The (ORGANIZATION) asked us if we could assist with res…
4	We were dispatched to assist two people, (NAME) and (N…
5	There was an issue at (LOCATION), which involved a pers…
6	A person called on their landline, (PHONE), and asked us …
7	(NAME) reports that he fainted on (DATE). This was the la…

Hand-anonymized Case Narratives courtesy of CAHOOTS

Methods – Anonymization script process

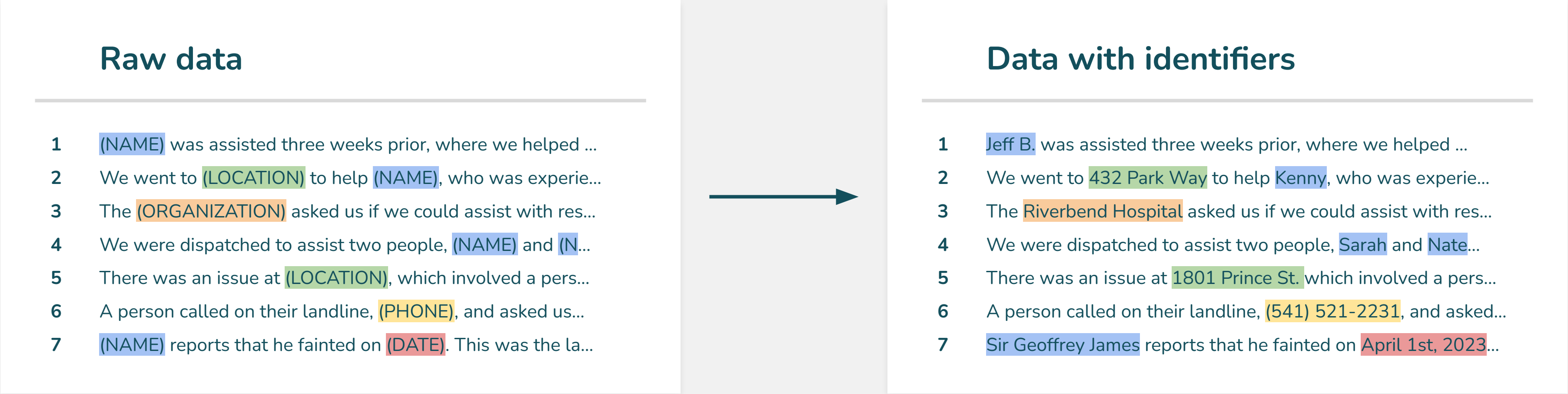


Methods – Anonymization script demo



Methods – Anonymization script demo

Generate faux PII | Replaces labels with randomly generated personal info



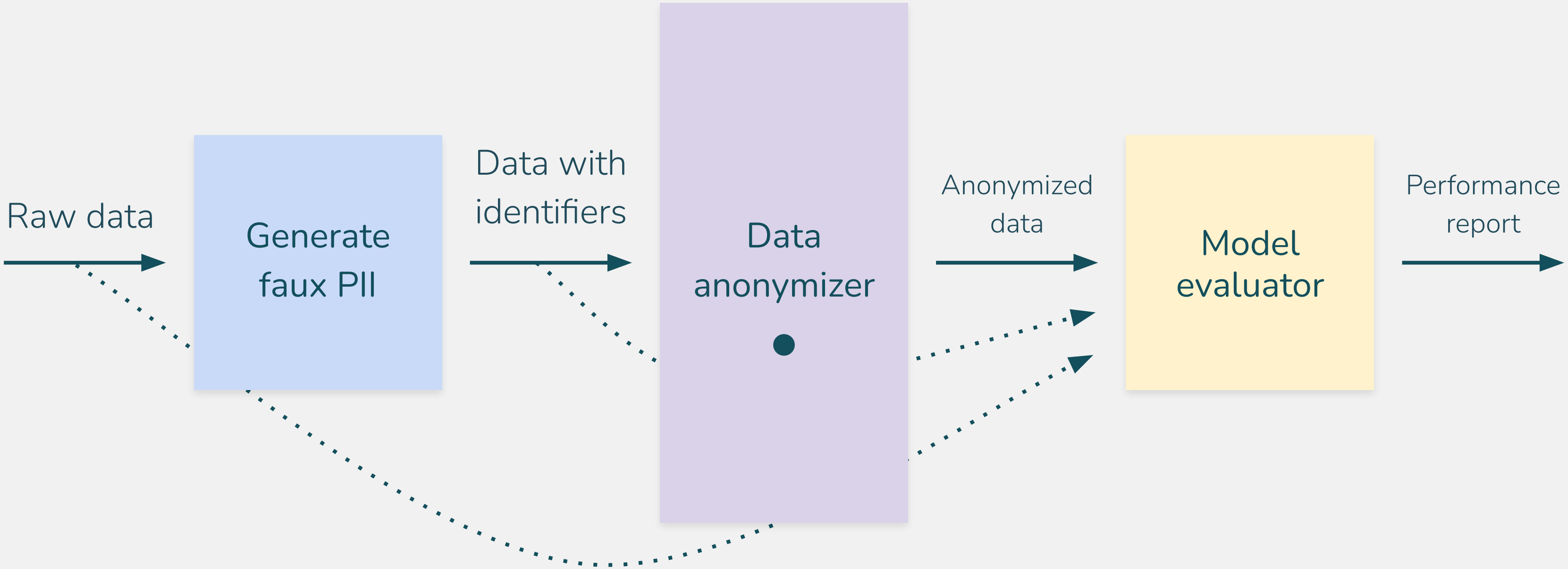
Raw data

1 (NAME) was assisted three weeks prior, where we helped …
2 We went to (LOCATION) to help (NAME), who was experie…
3 The (ORGANIZATION) asked us if we could assist with res…
4 We were dispatched to assist two people, (NAME) and (N…
5 There was an issue at (LOCATION), which involved a pers…
6 A person called on their landline, (PHONE), and asked us…
7 (NAME) reports that he fainted on (DATE). This was the la…

Data with identifiers

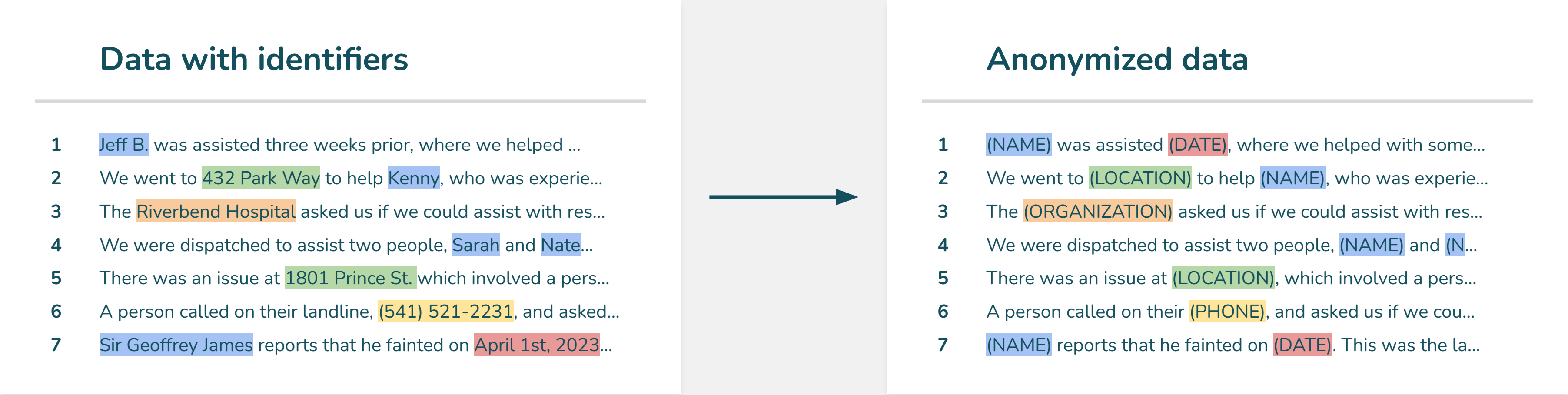
1 Jeff B. was assisted three weeks prior, where we helped …
2 We went to 432 Park Way to help Kenny, who was experie…
3 The Riverbend Hospital asked us if we could assist with res…
4 We were dispatched to assist two people, Sarah and Nate…
5 There was an issue at 1801 Prince St. which involved a pers…
6 A person called on their landline, (541) 521-2231, and asked…
7 Sir Geoffrey James reports that he fainted on April 1st, 2023…

Methods – Anonymization script demo



Methods – Anonymization script demo

Data anonymizer — Uses named entity recognition, RegEx, and predefined terms to identify PII



Data with identifiers

1 Jeff B. was assisted three weeks prior, where we helped ...

2 We went to 432 Park Way to help Kenny, who was experie...

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6 A person called on their landline, (541) 521-2231, and asked...

7 Sir Geoffrey James reports that he fainted on April 1st, 2023...

Anonymized data

1 (NAME) was assisted (DATE), where we helped with some...

2 We went to (LOCATION) to help (NAME), who was experie...

3 The (ORGANIZATION) asked us if we could assist with res...

4 We were dispatched to assist two people, (NAME) and (N...

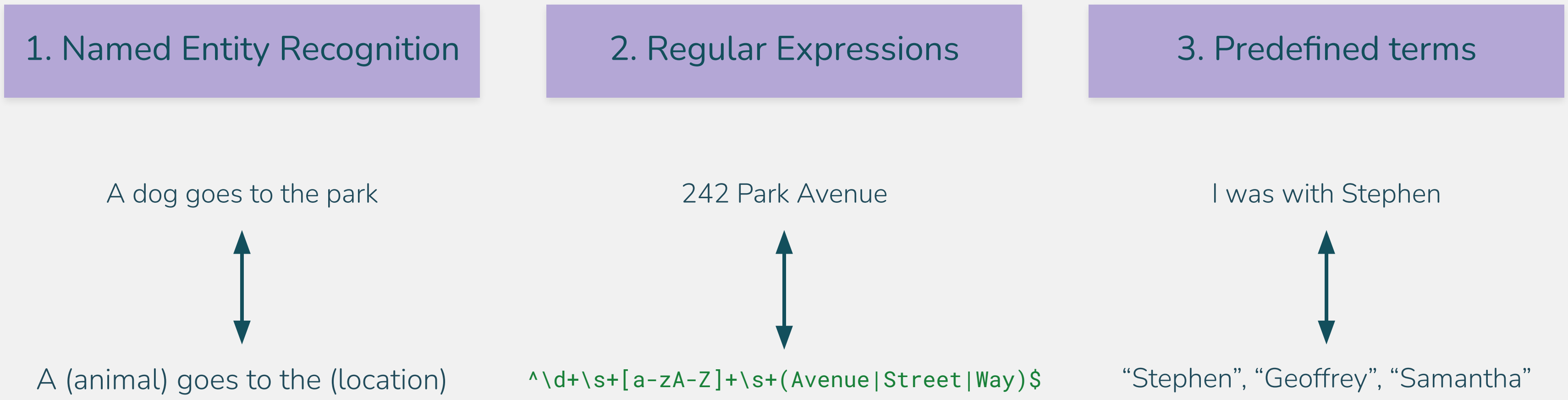
5 There was an issue at (LOCATION), which involved a pers...

6 A person called on their (PHONE), and asked us if we cou...

7 (NAME) reports that he fainted on (DATE). This was the la...

Methods – Anonymization script demo

Data anonymizer	Uses named entity recognition, RegEx, and predefined terms to identify PII



1. Named Entity Recognition

A dog goes to the park

A (animal) goes to the (location)

2. Regular Expressions

242 Park Avenue

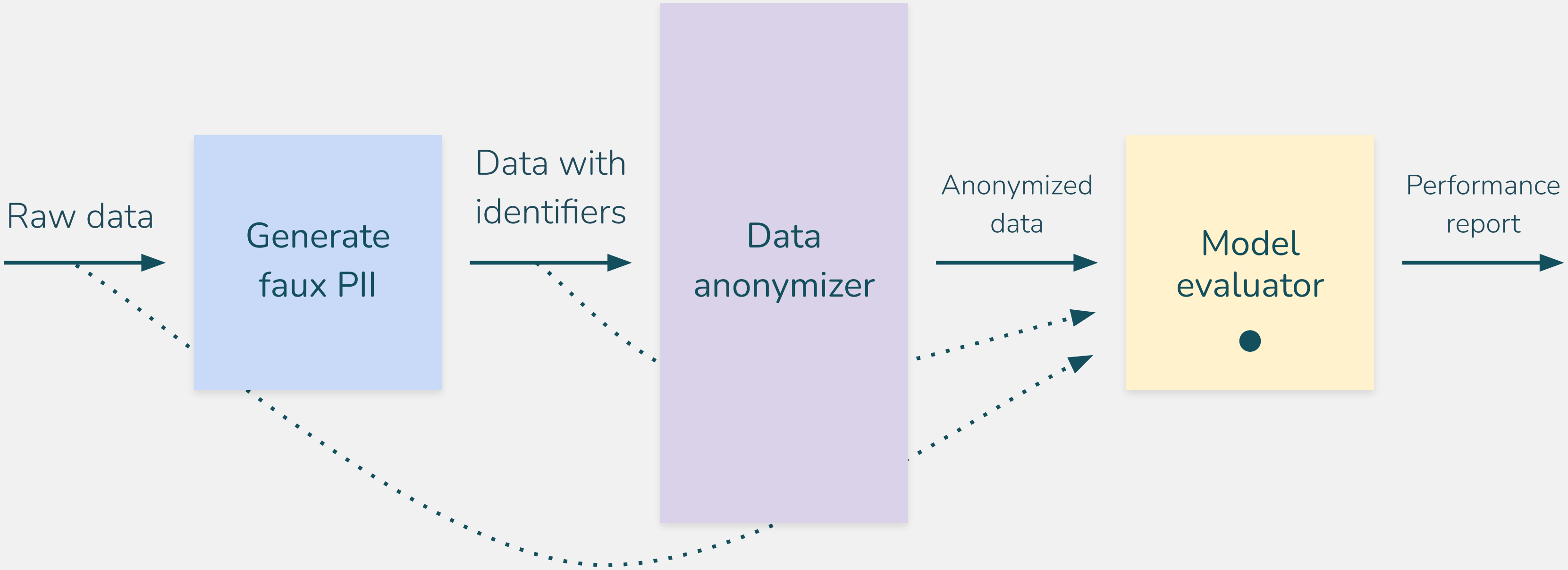
`^\d+\s+[a-zA-Z]+\s+(Avenue|Street|Way)$`

3. Predefined terms

I was with Stephen

“Stephen”, “Geoffrey”, “Samantha”

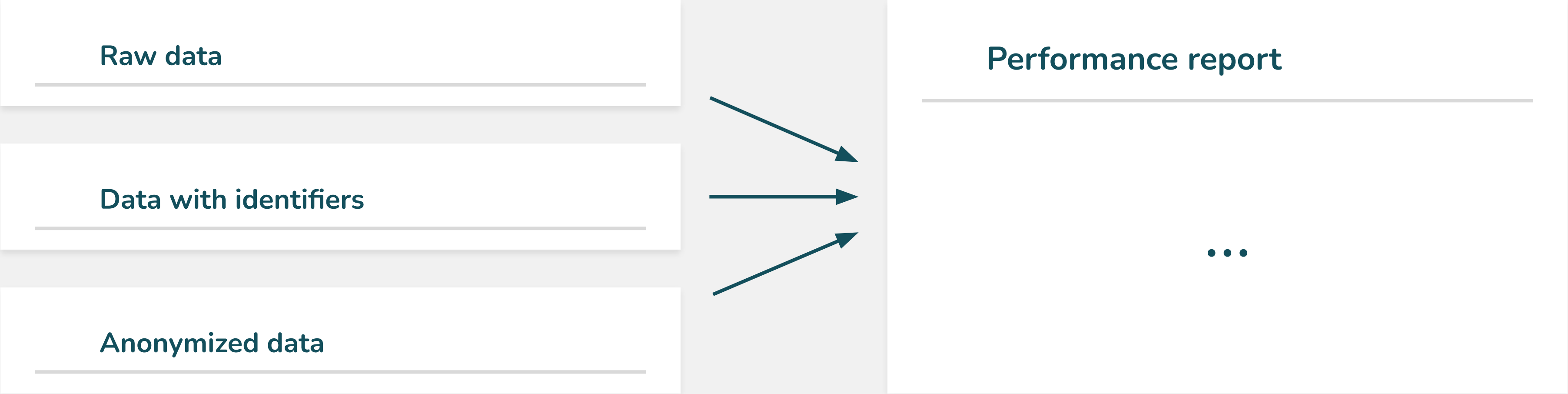
Methods – Anonymization script demo



Methods – Anonymization script demo

Model evaluator

Uses resulting data to evaluate model performance



Raw data

Data with identifiers

Anonymized data

Performance report

…

Results

Performance metrics (anonymized vs raw data)

Label	Recall	Precision
Name	0.92	0.39
Location	0.95	0.34
Date	1.0	0.04

Interpretation: Script correctly identifies most PII (high recall), but also classifies some non-PII as PII (low precision).

Discussion – Next steps

Findings:

- case narrative data anonymization is feasible with my script
  - 97.5% similarity between labeled datasets
  - PII removal is tricky with edge-cases

Future directions:

- lexical analysis – we can analyze the anonymized data for context
  - useful for understanding organization operations and impact

Acknowledgements

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Thank you to CAHOOTS for providing the platform for this research project

thank you for attending!

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