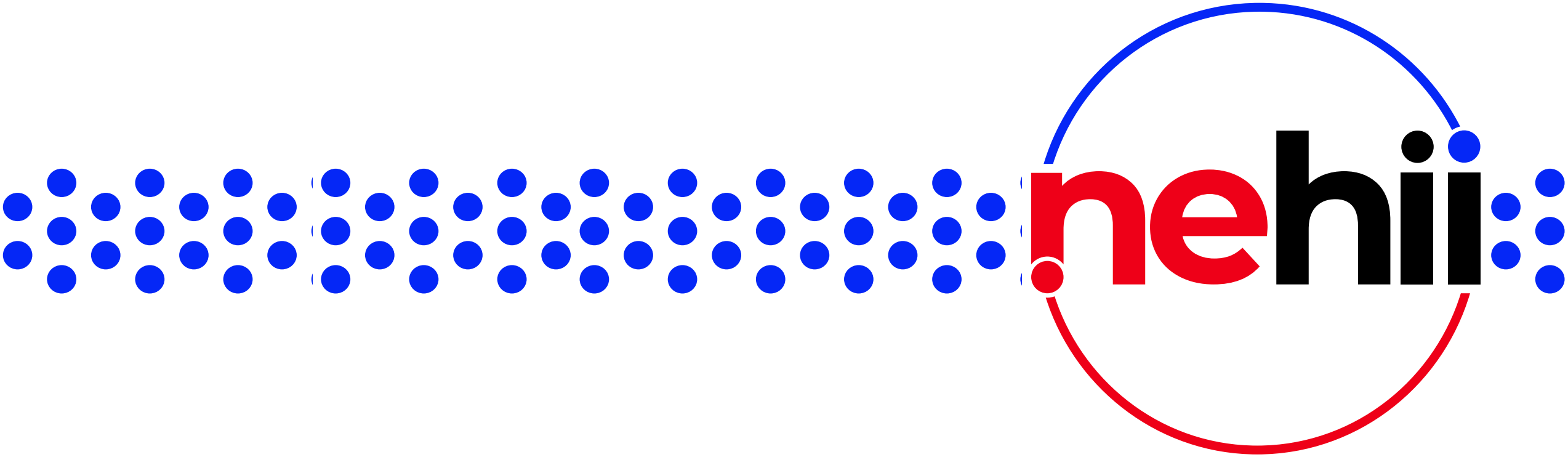
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PDMP Patient Matching Challenges and Opportunities

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Present: Interim – CTIO, & Senior Director,
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Patient Matching – Perspective

- Universal problem – Many solutions
  - *"No single solution to patient matching" – GAO, Jan. 2019 Report to Congress*
- Challenge: Identifying the best rules/algorithm for your data
- Department of Health MPI (DOHMPI) (Probabilistic/Manually Curated)
    - Create a gold-standard MPI by linking different data sources across Utah, Vital Records, Cancer Registry, Controlled Substance Database, All-Payer Claims Database and etc.
- Utah Health Information Network (UHIN) – MPI (Referential)
    - A RESTful MPI Service to search patients across Utah's population.
    - Authorized organizations can search using: Name, Gender, DOB, Address, Phone (Home, Work and Mobile) and SSN
    - Migrating to NextGate (third-party solution)

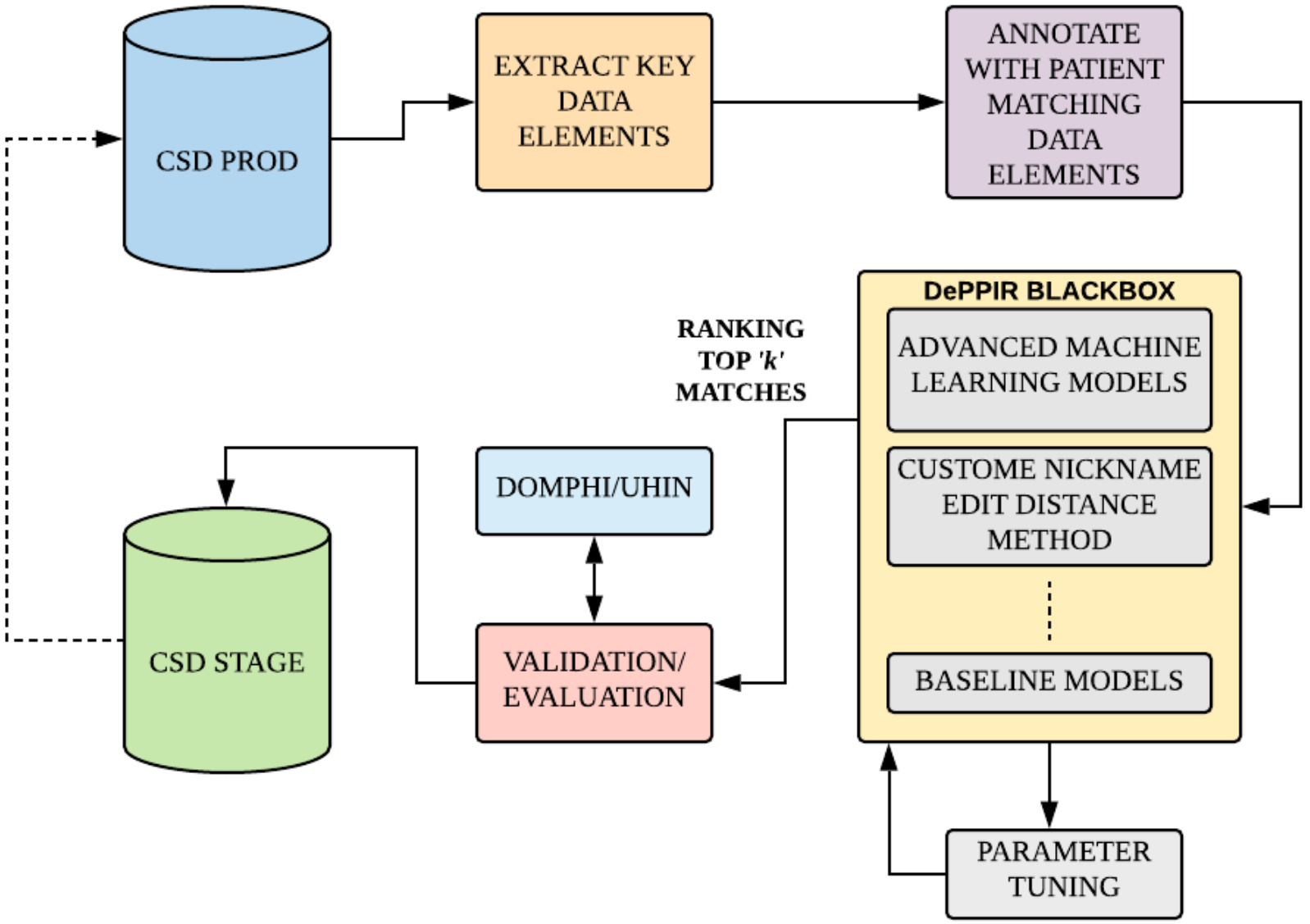
PDMP – Data Elements for Patient Matching

- Demographics (PATIENT TABLES)
  - First Name **(required)**
  - Last Name **(required)**
  - DOB **(required)**
  - Address **(required)**
  - City **(required)**
  - Zip-code **(required)**
  - Gender (optional)
  - Middle Name (optional)

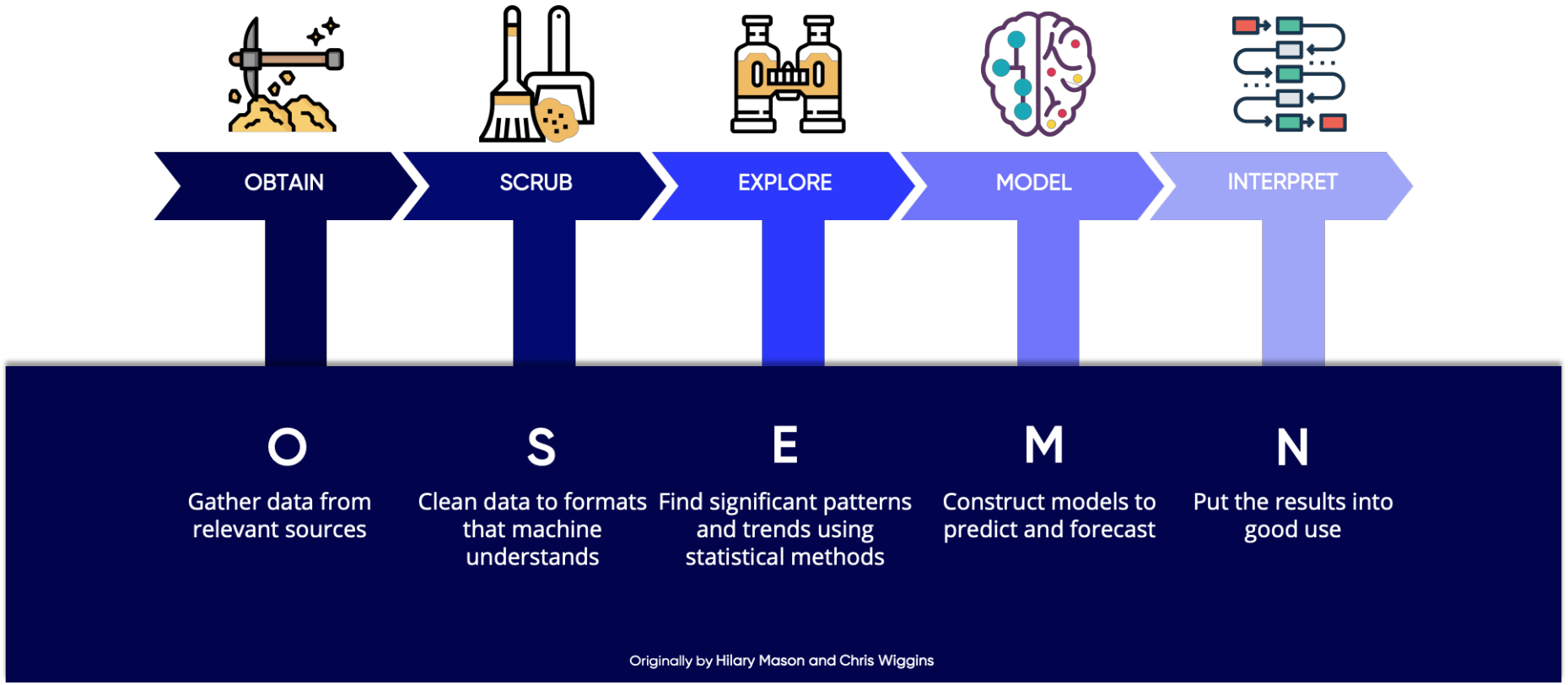
Deep Probabilistic Patient Identity Resolution (DePPIR) –towards a data science approach

- Patient matching problem as a data science challenge
- Open-source (Python, PySpark, TensorFlow) tools
- Supervised Machine Learning based methods and annotated ASAP 4.2 version data model
- Hybrid approaches for blocking data to reduced pair-wise comparison by a significant number
- DePPIR – Open-sourced

DePPIR – Architecture



Current Stage – Evaluation



Results

Demographics Data Elements
(PATIENT TABLES ASAP 4.2A)

First Name **(required)***
Last Name **(required)***
DOB **(required)***
Address **(required)***
City **(required)**
Zip-code **(required)***
Gender (optional)*
Middle Name (optional)

Compared against Department of Health MPI (current gold-standard)

Sample Size: 13 Million Records
Models Used: Deep Neural Networks

Algorithm	Precision Recall Gain	Area Under the Curve (AUC)	F1 Score
DePPIR	**99.68**	**99.84**	**95.84**

Current model winners:

Incorrect addresses
Swapped middle names
Nicknames
Abbreviated names and addresses

Next Steps

- Include more features to gain F1 Score
  - Phone Number
  - SSN
- Explore feasibility of exposing DePPIR as a service (FHIR endpoints)
- Enhancing interstate PDMP Patient Matching by providing **top-K matches for a given query**

Points to Ponder

- Comparative effectiveness of Algorithms
- Understanding the quality of data
- Lack of transparency
- Ways to reduce human errors, create standardized data capture methods, and validity checks at the point of data ingestion
- Improve matching by including external sources such as biometrics (FastID), and Internet of Things (IoT)

Questions

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