An MLOps Solution Framework for NCKUH: empowering the application of clinical data with technologies

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A Practical Case of MLOps Solution Framework

A practical case

- This is a practical case of this framework for predicting risk of work overtime for nurses.
- The model was built by our nurses through the QOCA® aim system.
- Users provide nursing workload data to the inference platform, the model receives data, can output predictions and probabilities, and these results can be returned to a customized dashboard.
- The supervisors can understand who has high risk of work overtime, and make timely work assignments.

班別	單位屬性	護理師	層級	照護總床數	是否延遲下班機率>50%	延遲機率	總分	A. 緊急疏散1級	B. 轉運分級1級	C. 病危註記	D. 手術中/恢復室	E. 泛抗藥性	F. O2 Device: BIPAP/Ventilator	G. 新病人	H. ICU轉入(三日內)	I. MEWS>6分
D	內科	張庭祥	N	7	✓	76%	1	1	0	0	0	0	0	0	0	0
D	內科	周詩雅	N	6	✓	84%	3	1	0	0	0	0	0	0	2	0
D	內科	張婉慈	AHN	7	×	26%	2	1	0	0	0	0	0	0	1	0

Two Components of MLOps Solution Framework

- **Cheng Kung University Hospital Archive of Medical Record Data (CARD) Platform (成大醫院病歷資料整合平台)**

- **QOCA ® aim system for automated machine learning platform**

The Cheng Kung University Hospital Archive of Medical Record Data (CARD) Platform

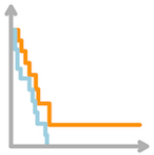
Integrate medical records for research purposes

Features of CARD

- The features of CARD:

Big data on electronic medical records over a 14-year period (2011 to 2024).

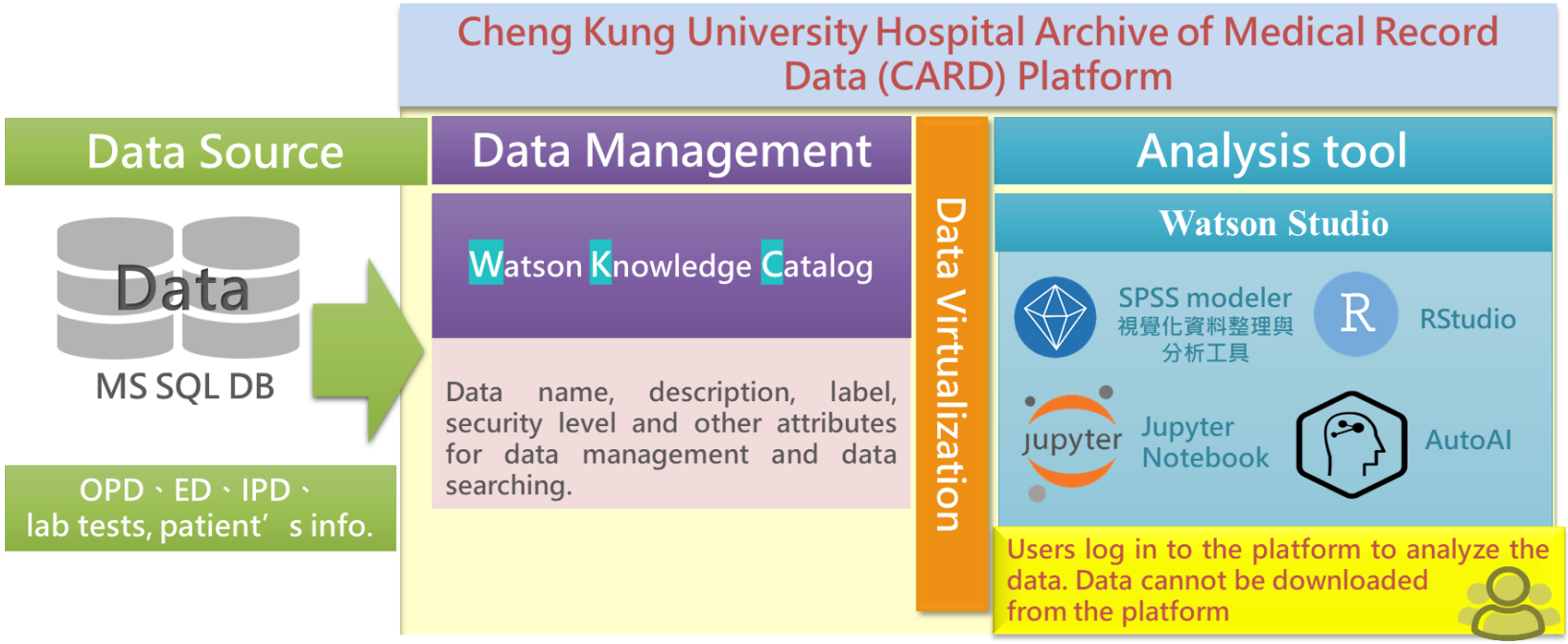
Covers outpatient, emergency, inpatient, lab tests, and other equipment (e.g., DXA, hemodialysis) data.



Integrates Health and Welfare Death Data to provide complete all-cause survival analysis.

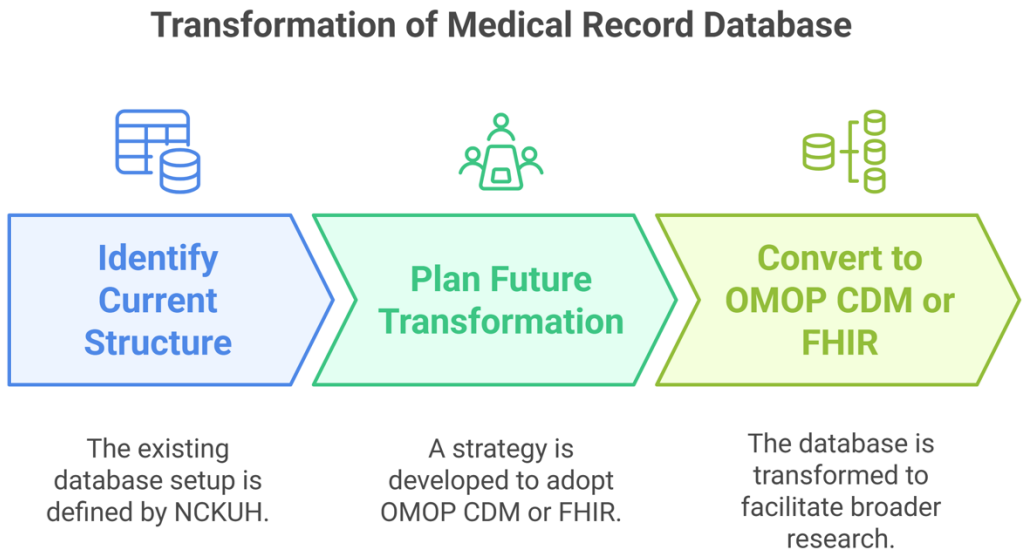
Architecture of CARD

- We use **cloud computing platforms** to manage data.
- It adopts **data virtualization** technology to enable users to process and analyze data without copying or moving the raw data.
- Due to personal data protection, data cannot be downloaded from the platform.



Data standardization

- Currently, the CARD is structured as defined by the National Cheng Kung University Hospital. It is customized data structure.
- The future plan is going to convert the CARD into a common data structure, specifically either the Observational Medical Outcomes Partnership (**OMOP**) Common Data Model (CDM) or Fast Healthcare Interoperability Resources (**FHIR**).
- This standardization is intended to facilitate cross-institutional and cross-national research collaboration.



Quanta for Medical Care AI: AI Medical Platform (QOCA® aim)

Quanta for Medical Care AI: AI Medical Platform (QOCA ® aim)

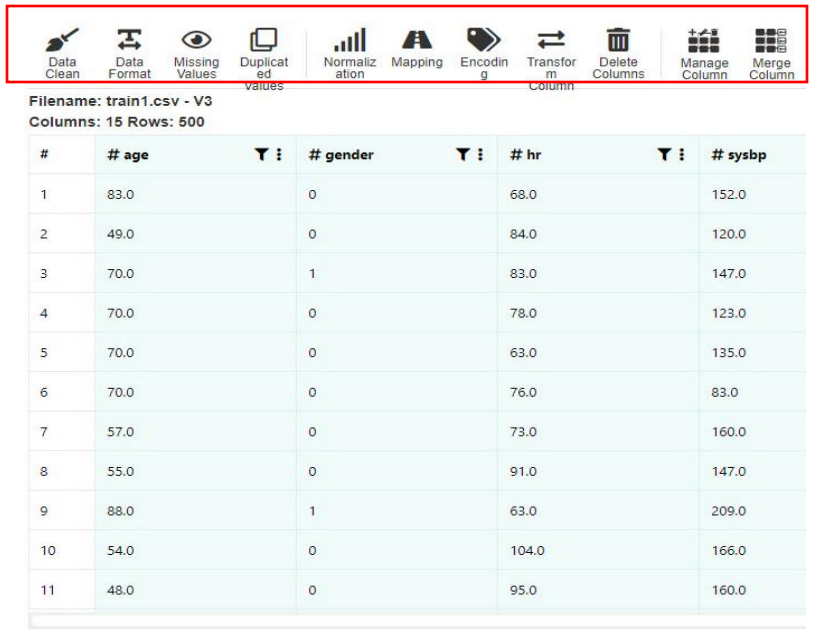
- QOCA® aim is a no-code automated machine learning platform.
- Clinicians can use its graphical user interface (GUI) to build machine learning models by themselves with clicking menus without writing any code.

Quanta for Medical Care AI: AI Medical Platform (QOCA® aim)

- GUI for building machine learning models.

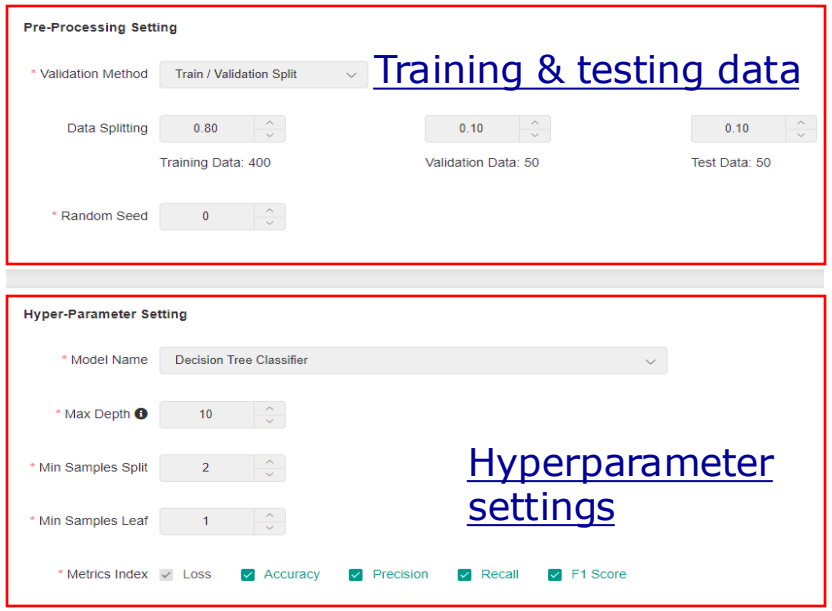
Data preprocessing

Toolbar

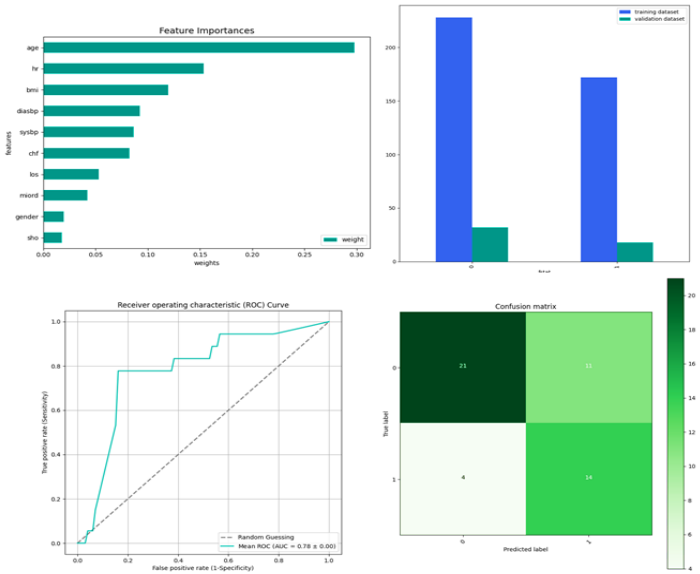


#	# age	# gender	# hr	# sysbp
1	83.0	0	68.0	152.0
2	49.0	0	84.0	120.0
3	70.0	1	83.0	147.0
4	70.0	0	78.0	123.0
5	70.0	0	63.0	135.0
6	70.0	0	76.0	83.0
7	57.0	0	73.0	160.0
8	55.0	0	91.0	147.0
9	88.0	1	63.0	209.0
10	54.0	0	104.0	166.0
11	48.0	0	95.0	160.0

Model settings

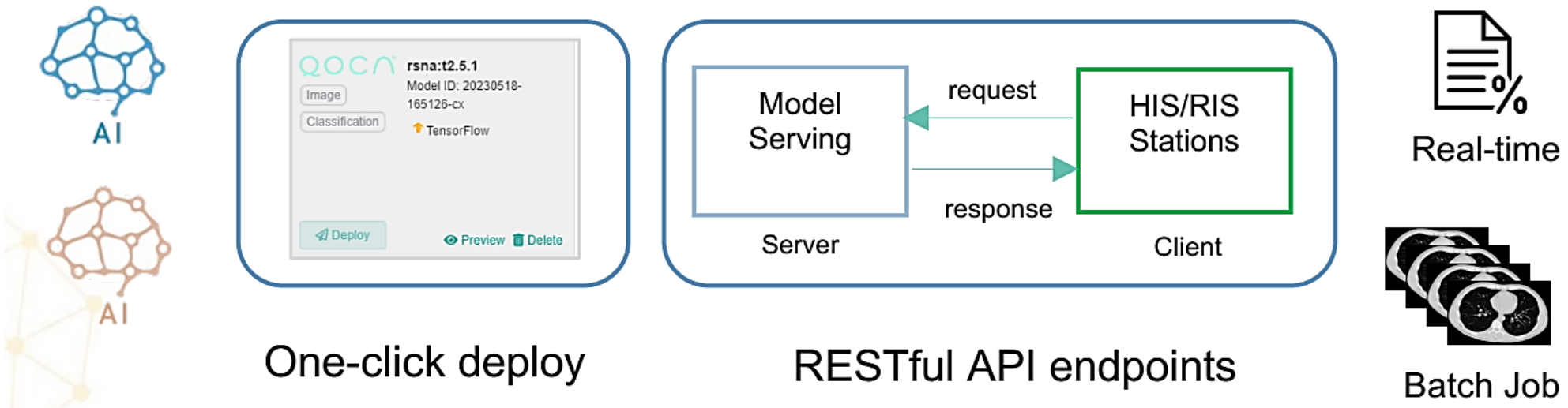


Model performance



QOCA® aim Inference Platform

- An important advantage of this inference platform is **user-friendly design**. Clients can trigger model inference with one click on the platform.
- QOCA® aim inference platform supports real-time and batch inference modes.
- Platform centralizes management of all inference tasks.



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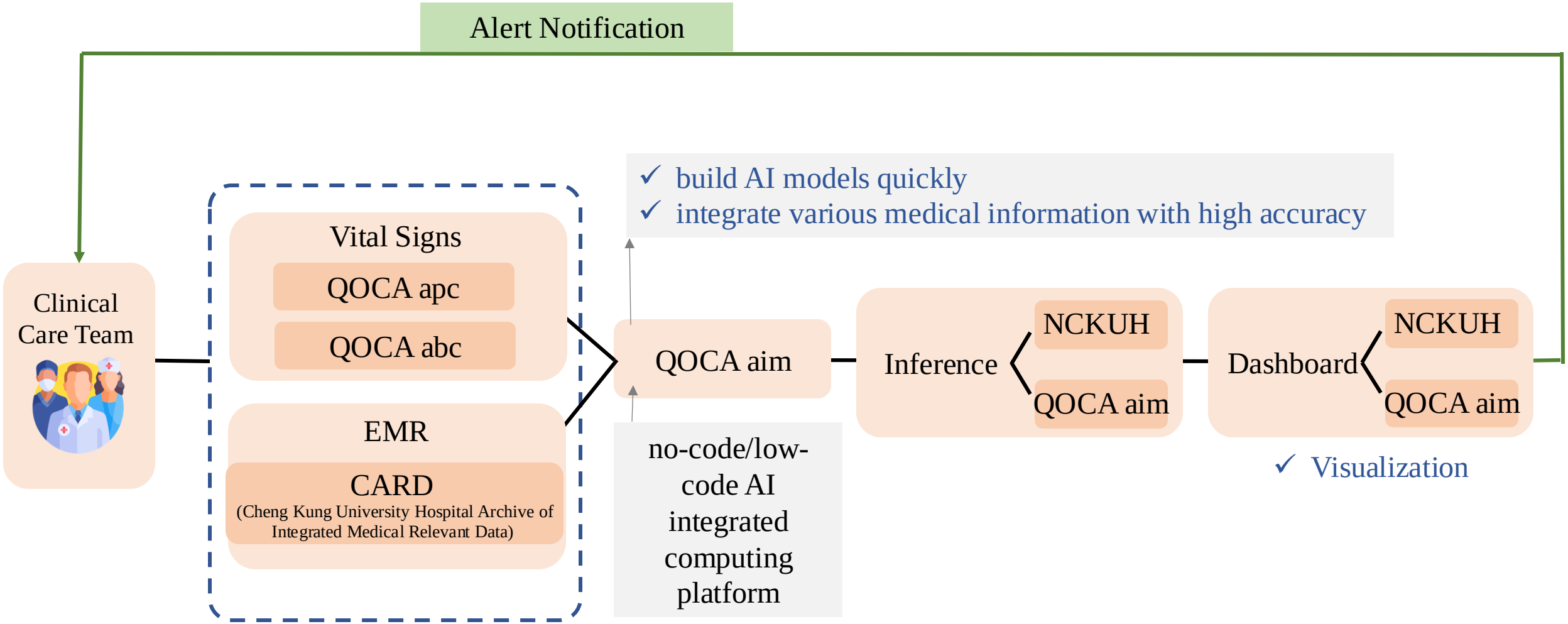

Thank you for your attention