

«IRCCS Istituto Oncologico
'Giovanni Paolo II'»

istituto tumori



Giovanni Paolo II - Bari

IRCCS

«VALIDAZIONE DI ARGO (GENERATORE AUTOMATICO DI RECORD IN ONCO-EMATOLOGIA), UNA NUOVA APP PER CONVERTIRE IN AUTOMATICO REFERTI CARTACEI DI ANATOMIA- PATOLOGICA IN ECRFS STANDARDIZZATE»

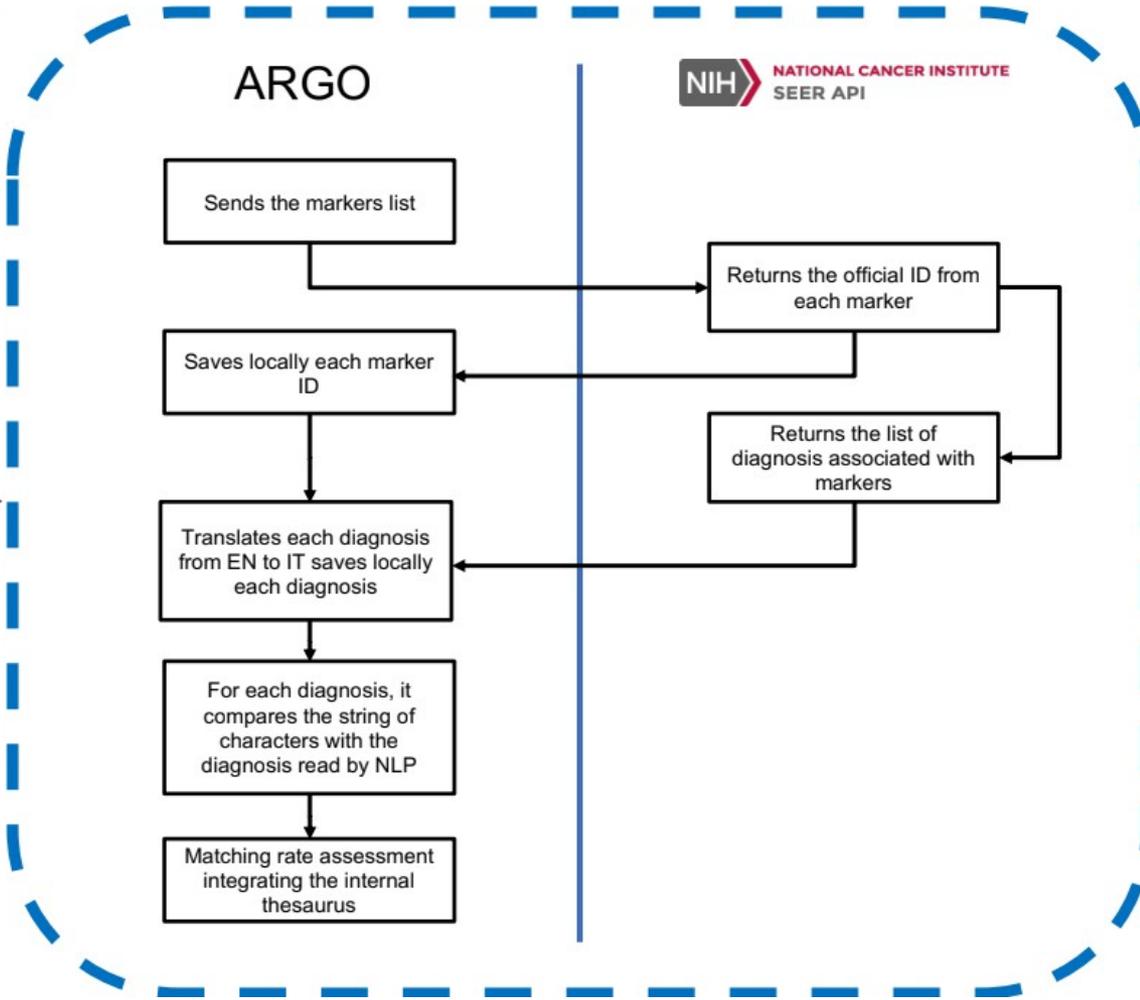
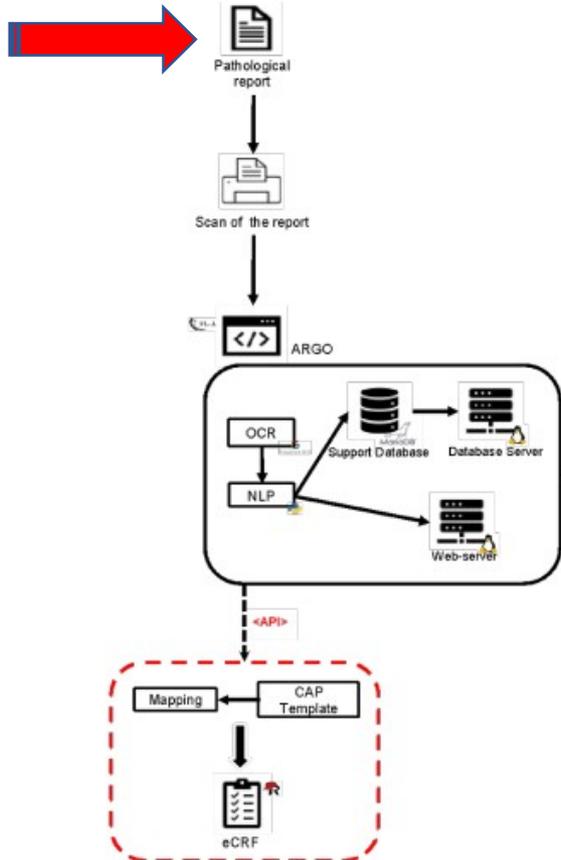


E' possibile identificare in modo del tutto automatico i dati dei pazienti di pratica clinica per supportare la ricerca traslazionale di un laboratorio di onco-ematologia ?

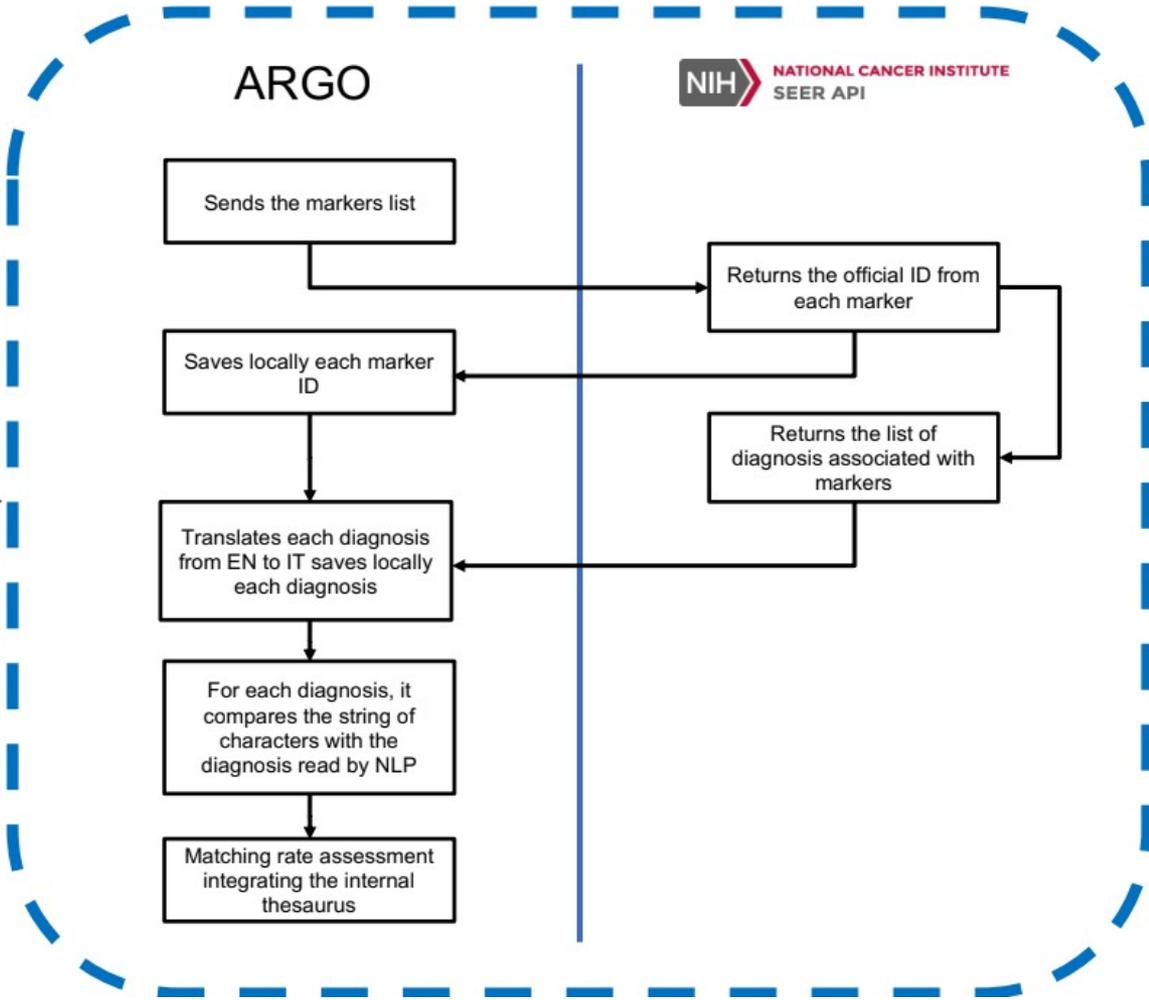
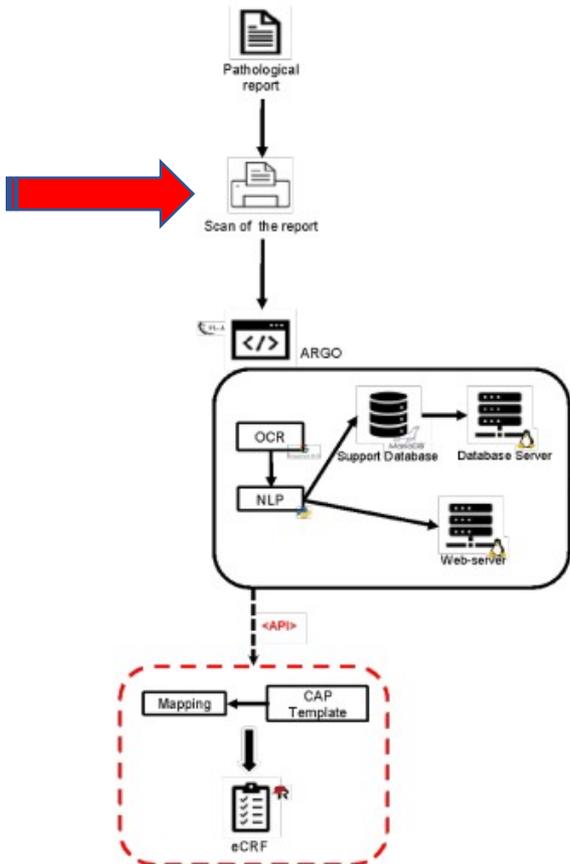
Sì, anche se in mancanza di sistemi informativi integrati, al fine di:

- Accelerare i processi di data-entry
- Migliorare l'organizzazione dei dati clinicamente "rilevanti"
- Standardizzare l'informazione clinica estratta dai referti cartacei
- Creare una piattaforma digitale orientata a validare nuovi biomarcatori per scopi di ricerca

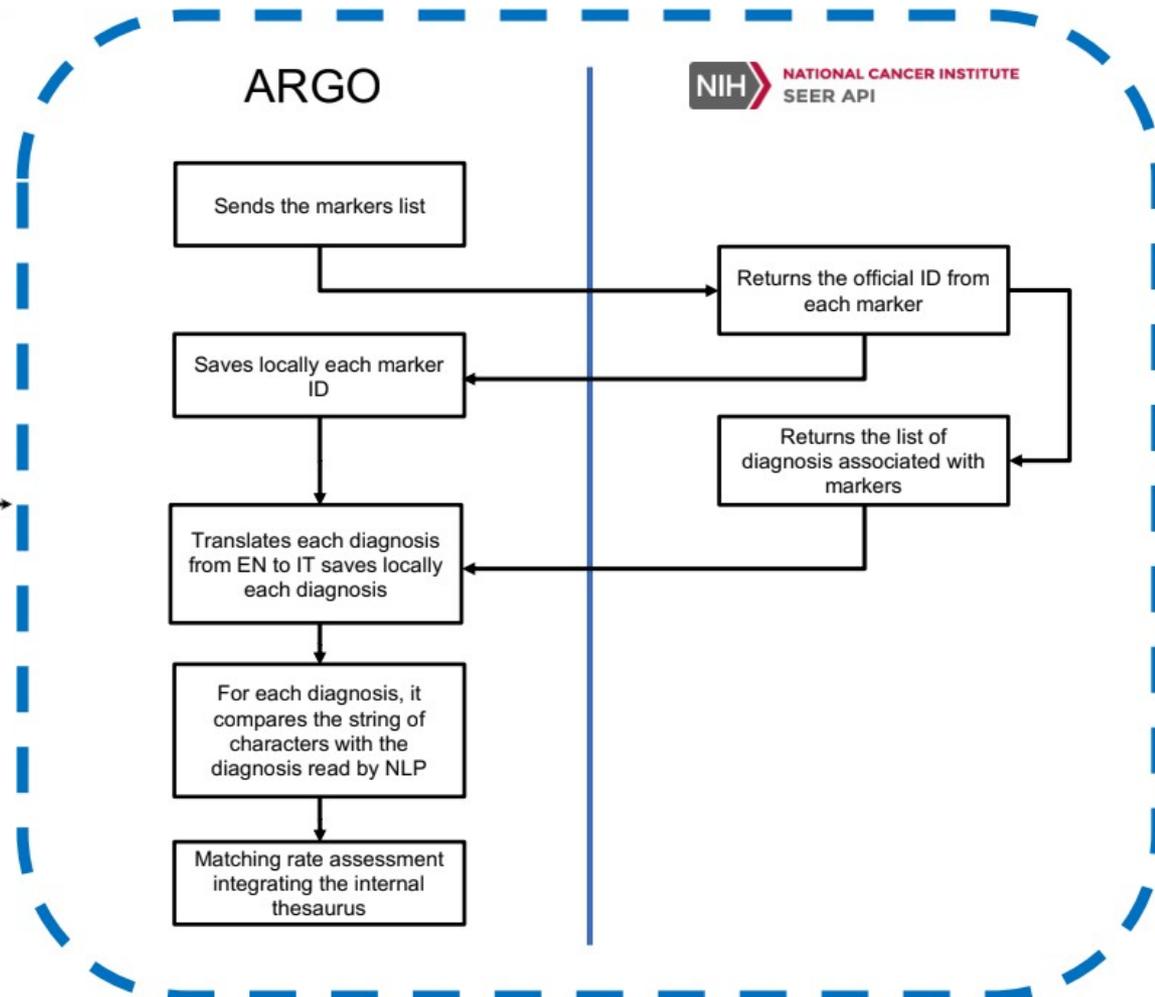
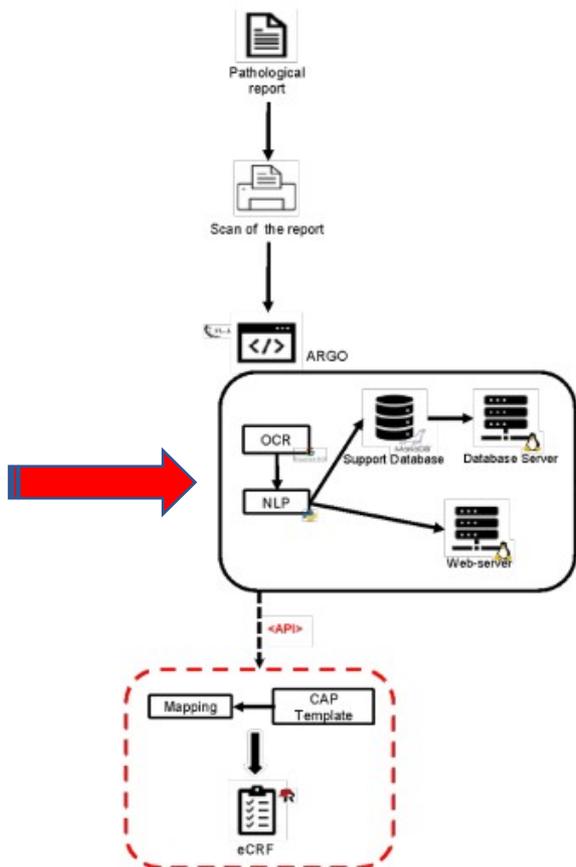
Descrizione



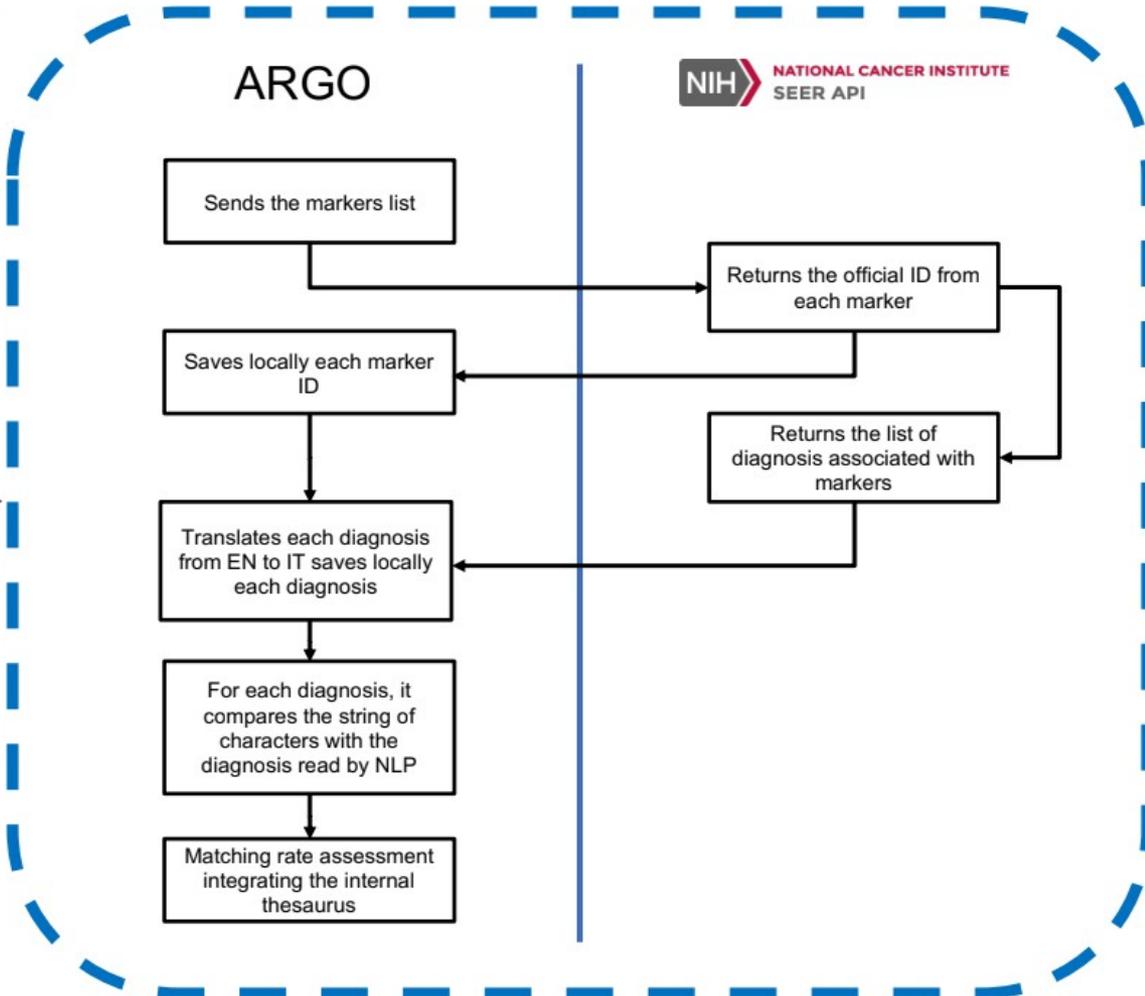
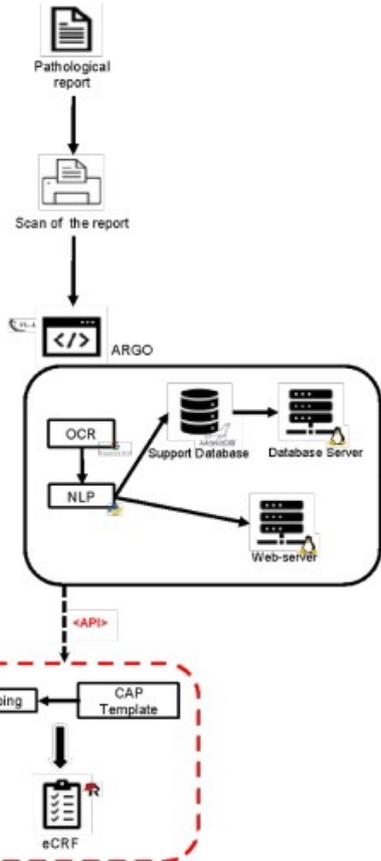
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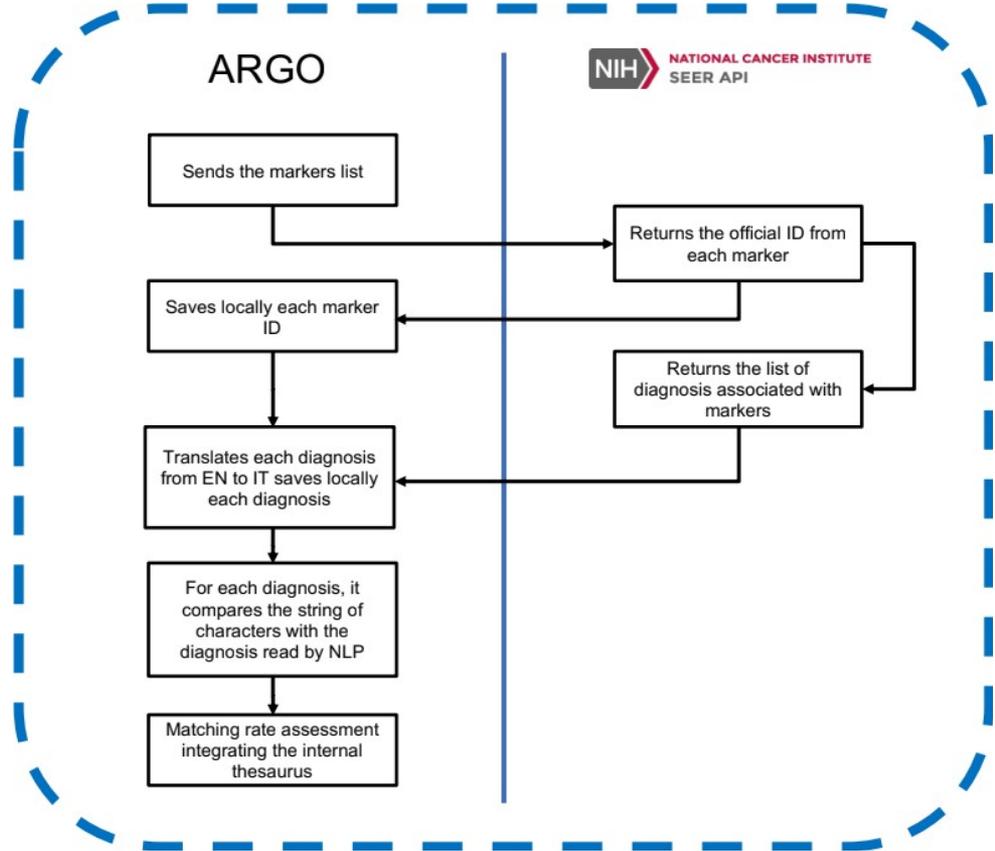
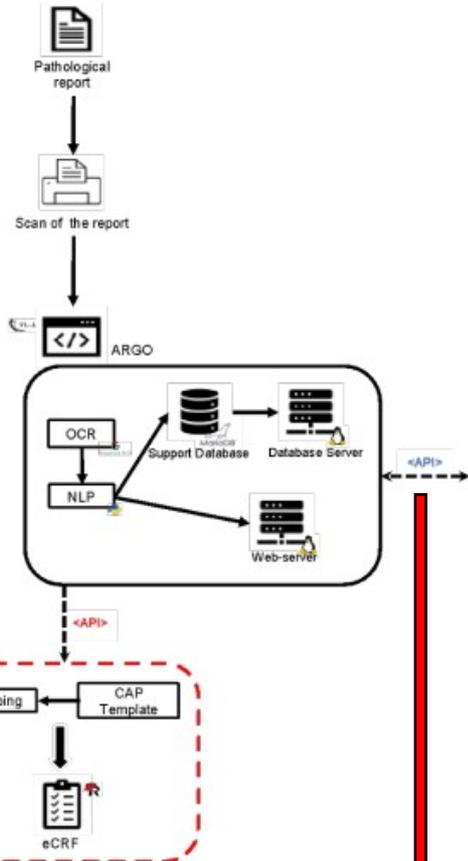
Descrizione



Descrizione



Descrizione



In caso di non connettività con i servizi API, il modello di Machine Learning permette la classificazione della diagnosi

Esempio di referto di anatomia-patologica

SERVIZIO DI ANATOMIA E ISTOLOGIA PATOLOGICA
 Direttore: Dott. Francesco A. Zito

Data Accettazione: 21/03/2019

N. Esame : 19-I-06023

I = Immunohistochemical
 M = Molecular

Cognome :	[REDACTED]	Nome :	[REDACTED]
Data di nascita :	[REDACTED]	Comune di Nascita :	[REDACTED]
Sesso :	[REDACTED]	Codice Fiscale :	[REDACTED]
Indirizzo :	[REDACTED]	Comune di Residenza :	[REDACTED]
Reparto :	[REDACTED]	Sanitario Richiedente :	[REDACTED]
Struttura :	[REDACTED]	Convenzione :	[REDACTED]
Modalità :	[REDACTED]	Regime :	INTERNO

Esame associato a :

Materiale Inviato
 A-Linfonodo regione sottomandibolare a sinistra

LN = e.g., "Lymph node sub-mandibular"
 EN = e.g., "Testicular"

Notizie Cliniche
 Linfoma?

COMUNICAZIONE DI DIAGNOSI ISTOLOGICO

Abb. LN: Lymph node; EN: Extranodal



Esempio di referto di anatomia-patologica II

Microscopica

Linfonodo occupato da una proliferazione linfoide a crescita diffusa o vagamente nodulare, costituita da elementi di piccola-media taglia con nucleo irregolare che risultano alla caratterizzazione immunohistochimica CD20+, CD5+, Ciclina D1+, BCL-2+, IgM+, IgD+, CD10-/bcl-6- (+ in centri germinativi residui), CD23- (+ cellule dendritiche residue), CD3- (+ in linfociti T), TdT-, con frazione di crescita Ki67/Mib 1 variabile dal 20 al 50% . Coesiste un modesto numero di plasmacellule con espressione policolonale delle catene leggere kappa e lambda.

Diagnosi

Linfoma non Hodgkin nodale di derivazione dagli elementi linfoidi B periferici del mantello, varietà comune.

Codice Snomed

M-96743

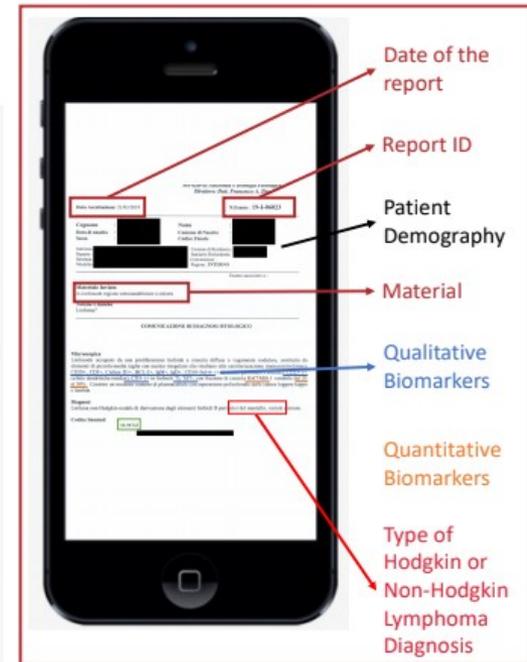
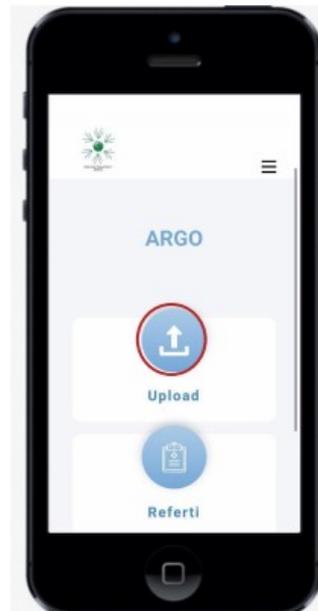
Abb. LN: Lymph node; EN: Extranodal



Caricamento di un nuovo referto

Users

 Medico Consente di caricare i referti su ARGO e visualizzare i dati.	 Data Manager Consente di caricare i referti su ARGO e visualizzare i dati.
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Accesso allo »storico« dei referti retrospettivi

1C

RETROSPECTIVE DATA-FILTERING

Search for Record ID
Search for Name
Search for Surname
Search for Diagnosis

Visualizza 10 o elementi
Cerca:

Record ID | Label | Value

1D

eCRF OUTPUT

Patient Demography

Date of the report

Type of Diagnosis e.g., DLBCL, MCL, FCL, HL, T-CELL

Material e.g., Lymphnode, extranodal

1E

eCRF OUTPUT

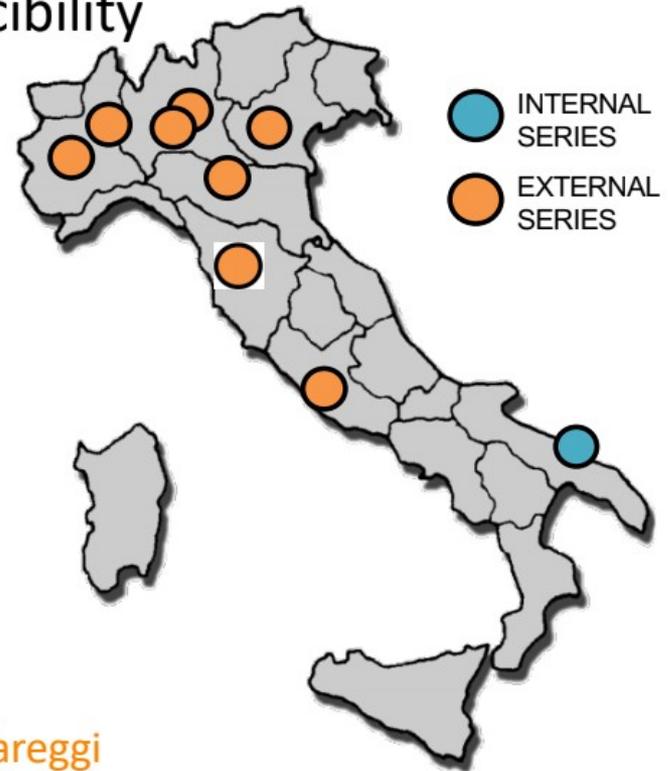
Report ID

Biomarkers by IHC or FISH: e.g., MYC, BCL2, BCL6, CD3, Cyclin D1, CD5, CD20, CD10, CD30, CD15, PAX, CD79a

Abb. ARGO: Automatic Record Generator for Onco-Hematology; ID: Identity; eCRF: electronic Case Report Forms; DLBCL: diffuse large B-cell lymphoma, MCL: mantle cell lymphoma; FCL: follicular lymphoma; HL: Hodgkin lymphoma; IHC: immunohistochemistry; FISH: fluorescent in situ hybridization.

➤ Involvement of several sites for reproducibility

1. Bari, IRCCS Istituto Tumori 'Giovanni Paolo II'
2. Torino, Università di Torino
3. Novara, AO-U Maggiore della Carità di Novara
4. Reggio Emilia, AUS Locale di Reggio Emilia
5. Milano, Istituto Europeo di Oncologia – IEO
6. Verona, AO Universitaria Integrata di Verona
7. Roma, AOU Policlinico Umberto I
8. Brescia, ASST degli Spedali Civili di Brescia
9. Firenze, AOUC Azienda Ospedaliero-Universitaria Careggi



Caratteristiche dei report raccolti

LEGEND
 C81.0 = Hodgkin's disease, lymphocytic predominance
 C81.1 = Hodgkin's disease, nodular sclerosis
 C81.2 = Hodgkin's disease, mixed cellularity
 C81.3 = Hodgkin's disease, lymphocytic depletion
 C82.1 = Mixed small cleaved and large cell follicular
 C83.0 = Diffuse non-Hodgkin's lymphoma, small cell (diffuse)
 C83.3 = Diffuse non-Hodgkin's lymphoma, large cell (diffuse)
 C83.4 = Diffuse non-Hodgkin's lymphoma, immunoblastic (diffuse)
 C83.8 = Other types of diffuse non-Hodgkin's lymphoma

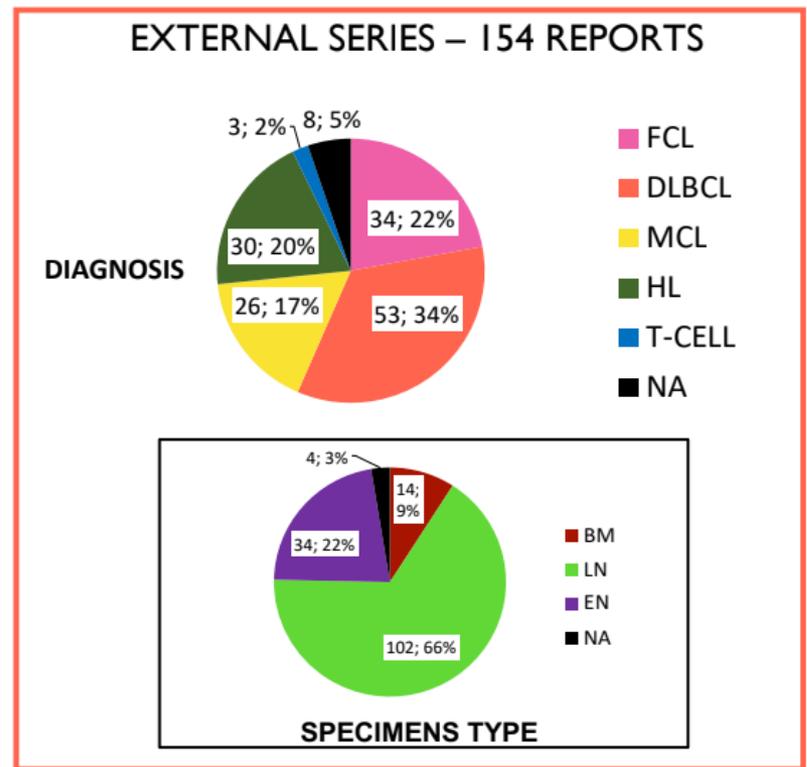
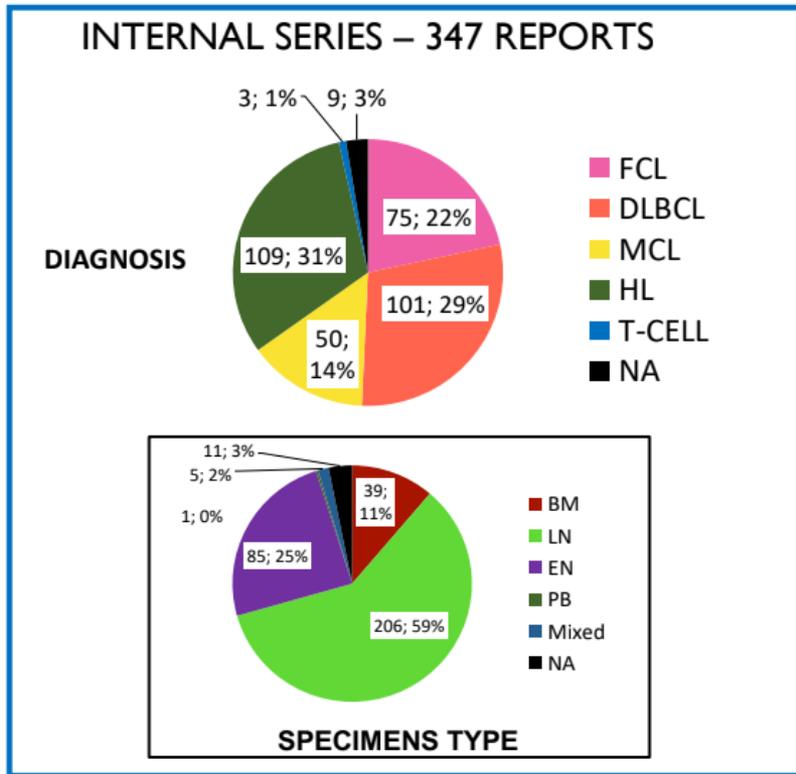


Abb. DLBCL: diffuse large B-cell lymphoma; MCL: mantle cell lymphoma; FCL: follicular lymphoma; HL: Hodgkin lymphoma; BM: bone marrow; LN: lymphnode; EN: extranodal; PB: peripheral blood; NA: not available

Caratteristiche dei report raccolti

	ACCURACY (%)			F1-SCORE (%)		
	Internal-set	External-set	Accuracy delta	Internal-set	External-set	F1-score delta
DIAGNOSIS	87.3	80.0	7.3	87.3	80.5	6.8
MYC	96.5	99.3	6.2	83.6	78.6	5.0
BCL2	70.6	72.3	-1.7	64.3	64.1	0.2
BCL6	65.3	71.0	-5.8	59.6	59.4	0.1
CD10	81.6	80.6	0.9	77.8	75.4	2.4
CD20	76.9	78.8	2.1	75.9	73.5	2.5
Cyclin D1	90.8	85.8	5.0	74.7	72.5	2.3
CD79a	93.9	96.1	-2.2	83.8	75.7	8.0
CD15	89.6	93.5	-3.9	79.0	79.9	-0.9
CD30	76.7	91.0	-14.3	68.9	80.0	-11.2
PAX5	85.6	87.7	-2.2	63.1	55.5	7.6
MUM1	96.2	71.0	-14.8	73.8	27.0	-3.2
EMA	93.7	99.4	-5.7	0.0	0.0	0.0
BCL2 FISH	94.5	92.9	1.6	72.4	15.3	57.1
IgD	96.0	99.4	-3.4	0.0	0.0	76.9
IgM	94.2	99.4	-5.1	66.4	0.0	66.4
EBV	91.9	97.4	-5.5	59.3	33.2	26.1
CD23	84.7	94.8	-10.1	73.5	85.5	-12.0
CD5	84.4	85.8	-1.4	75.9	75.5	-0.4
CD3	72.0	80.0	-8.0	68.0	70.8	-2.8
CD45/LCA	81.6	96.8	-15.2	11.3	0.0	11.3
Ki-67	90.2	85.8	4.4	85.9	81.5	4.5

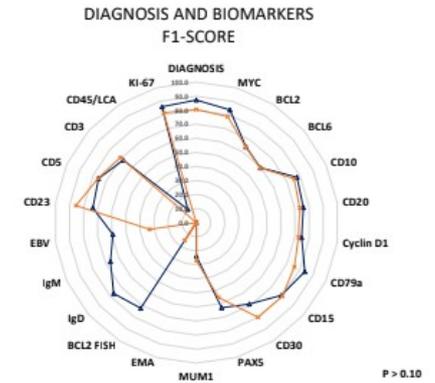
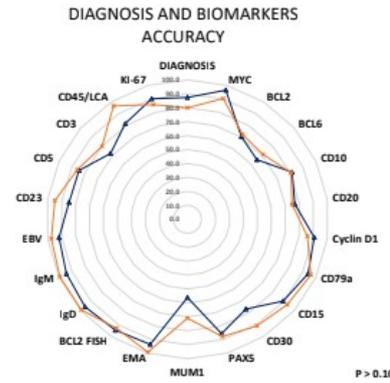


Abb. IHC: immunohistochemistry; FISH: fluorescent in situ hybridization.

Caratteristiche dei report raccolti

	ACCURACY (%)			F1-SCORE (%)		
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MYC	96.5	90.3	6.2	83.6	78.6	5.0
BCL2	70.6	72.3	-1.7	64.3	64.1	0.2
BCL6	65.1	71.0	-5.8	59.6	59.4	0.1
CD10	81.6	80.6	0.9	77.8	75.4	2.4
CD20	76.9	74.8	2.1	75.9	73.5	2.5
Cyclin D1	90.8	85.8	5.0	74.7	72.5	2.3
CD79a	93.9	96.1	-2.2	83.8	75.7	8.0
CD15	89.6	93.5	-3.9	79.0	79.9	-0.9
CD30	76.7	91.0	-14.3	68.9	80.0	-11.2
PAX5	85.6	87.7	-2.2	63.1	55.5	7.6
MUM1	56.2	71.0	-14.8	23.8	27.0	-3.2
EMA	93.7	99.4	-5.7	0.0	0.0	0.0
BCL2 FISH	94.5	92.9	1.6	72.4	15.3	57.1
IgD	96.0	99.4	-3.4	76.9	0.0	76.9
IgM	94.2	99.4	-5.1	66.4	0.0	66.4
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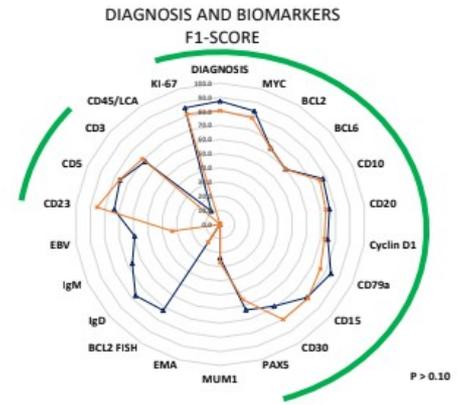
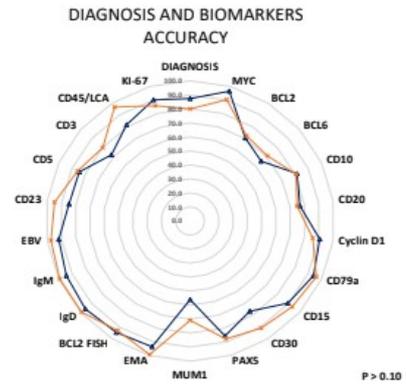


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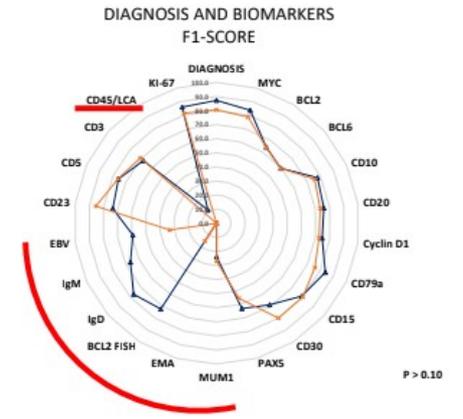
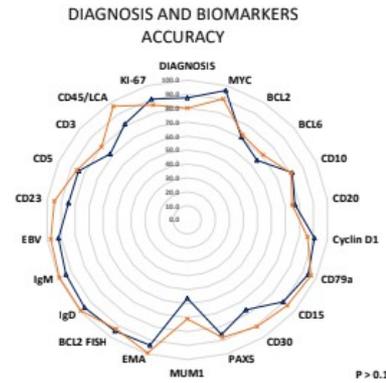
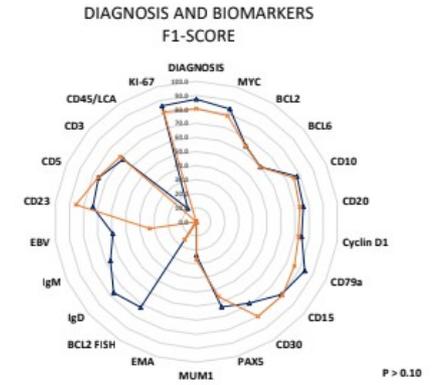
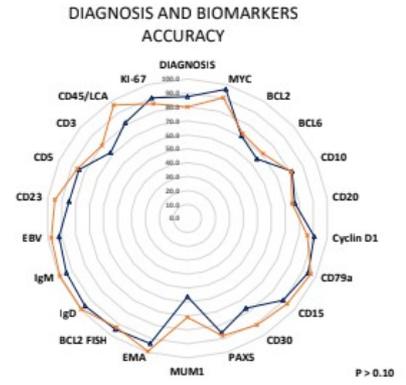


Abb. IHC: immunohistochemistry; FISH: fluorescent in situ hybridization.

Caratteristiche dei report raccolti

	ACCURACY (%)			F1-SCORE (%)		
	Internal-set	External-set	Accuracy delta	Internal-set	External-set	F1-score delta
DIAGNOSIS	87.3	80.0	7.3	87.3	80.5	6.8
MYC	96.5	90.3	6.2	83.6	78.6	5.0
BCL2	70.6	72.3	-1.7	64.3	64.1	0.2
BCL6	65.1	71.0	-5.8	59.6	59.4	0.1
CD10	81.6	80.6	0.9	77.8	75.4	2.4
CD20	76.9	74.8	2.1	75.9	73.5	2.5
Cyclin D1	90.8	85.8	5.0	74.7	72.5	2.3
CD79a	93.9	96.1	-2.2	83.8	75.7	8.0
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KI-67	90.2	85.8	4.4	85.9	81.5	4.5



	ACCURACY (%)			F1-SCORE (%)		
	Internal-set	External-set	Accuracy delta	Internal-set	External-set	F1-score delta
BIOPSY DATE	95.4	64.5	30.9	95.5	51.4	44.1
ID NUMBER	73.2	44.5	28.7	73.2	35.1	38.1
SPECIMEN TYPE	73.2	49.0	24.2	73.2	48.3	24.9
IHC EXECUTION	93.4	92.3	1.1	93.4	92.2	1.1
FISH EXECUTION	94.8	97.4	-2.6	94.8	97.4	-2.6
BM EXECUTION	91.1	77.4	13.6	91.1	77.3	13.7
COO	96.5	96.1	0.4	82.3	89.3	-6.9
Blastoid	93.7	86.5	7.2	93.7	86.4	7.3

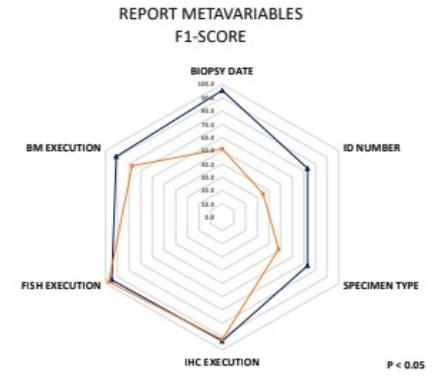
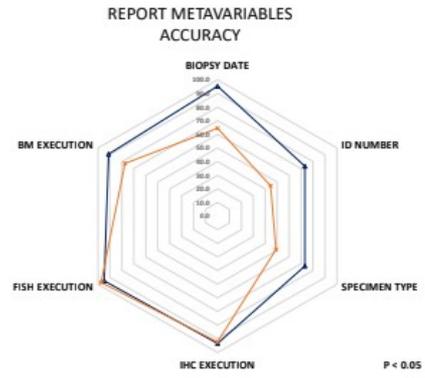
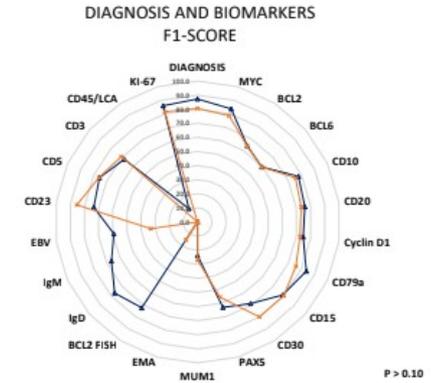
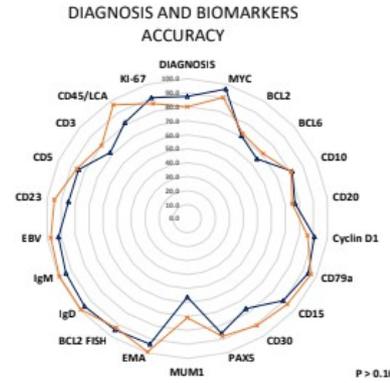


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Caratteristiche dei report raccolti



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BCL2 FISH	94.5	92.9	1.6	72.4	15.3	57.1
IgD	96.0	99.4	-3.4	76.9	0.0	76.9
IgM	94.2	99.4	-5.1	66.4	0.0	66.4
EBV	91.9	97.4	-5.5	59.3	33.2	26.1
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SPECIMEN TYPE	73.2	49.0	24.2	73.2	48.3	24.9
IHC EXECUTION	93.4	92.3	1.1	93.4	92.2	1.1
FISH EXECUTION	94.8	97.4	-2.6	94.8	97.4	-2.6
BM EXECUTION	91.1	77.4	13.6	91.1	77.3	13.7
COO	96.5	96.1	0.4	82.3	89.3	-6.9
Blastoid	93.7	86.5	7.2	93.7	86.4	7.3

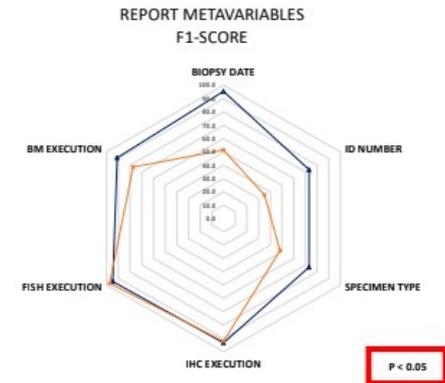
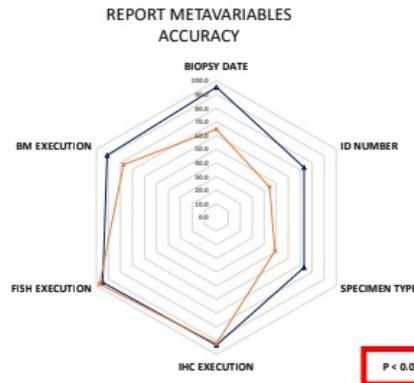


Abb. IHC: immunohistochemistry; FISH: fluorescent in situ hybridization, COO: cell of origin; ID: identifier; BM : bone marrow.

- Abbiamo garantito a medici e data-manager un sistema per per raccogliere facilmente dati di pazienti di pratica clinica
- ARGO standardizza l'estrazione di informazioni cliniche da referti patologici
- ARGO è semplice da usare e adattivo
- ARGO crea una piattaforma digitale orientata alla validazione di nuovi biomarcatori a supporto della ricerca traslazionale
- La qualità dell'OCR influisce negativamente sull'acquisizione automatica
 - **Inserimento manuale integrato da parte dei Data-Manager**
- Coinvolgimento di centri internazionali per la validazione multi-lingua

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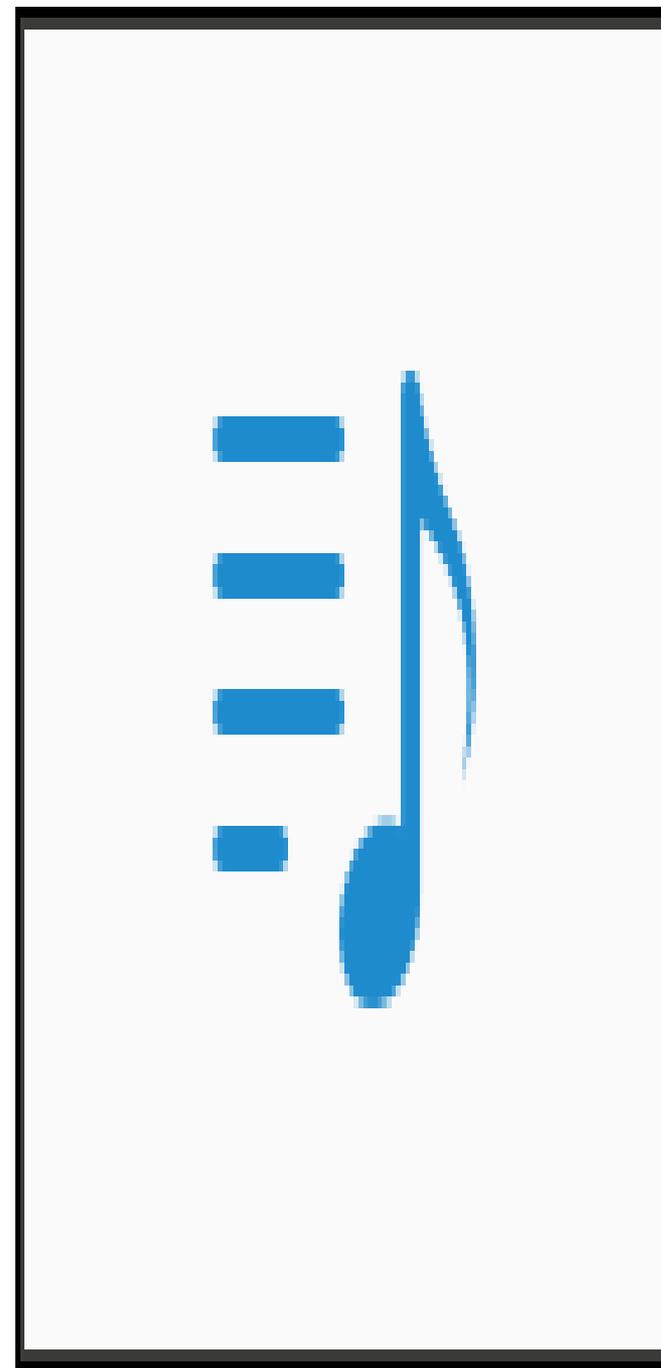
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Link DEMO della APP ARGO -
<https://youtu.be/-l6wYX5esNY>



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