

# DANSKE KRÆFTFORSKNINGSDAGE 2023

## Muligheder og barrierer for kunstig intelligens i hæmatologien – implementering i sundhedsplatformen.

**Carsten Utoft Niemann, MD, PhD, associate professor**

**Head of CLL Lab, Chair of Nordic CLL study group, board of Danish Data Science Academy**

**Department of Hematology, Rigshospitalet, Copenhagen, Denmark**

**[Carsten.utoft.niemann@regionh.dk](mailto:Carsten.utoft.niemann@regionh.dk); [www.rigshospitalet.dk/CLL-lab](http://www.rigshospitalet.dk/CLL-lab)**

## Disclosures:

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## Collaborators:

HOVON, Arnon Kater, Amsterdam

GCLLSG, Michael Hallek, Barbara Eichhorst, Köln

Nordic CLLSG, Anders Österborg, Richard Rosenquist, Karolinska, Stockholm

ERICLL.org, Paolo Ghia

EuroMRD, Christiane Pott

CLL-CLUE, Sigrid Skånland, Rikshospitalet, Oslo

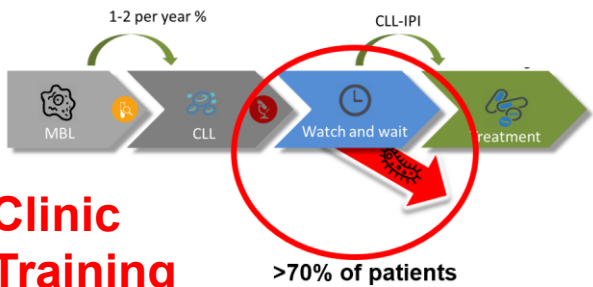
Mathew Davids, DFCI, Boston

Adrian Wiestner, NHLBI, NIH

PERSIMUNE, Jens Lundgren, Rigshospitalet

Genetics, COVID, Sisse Ostrowski, Rigshospitalet, Henrik Hjalgrim, Danish Cancer Society

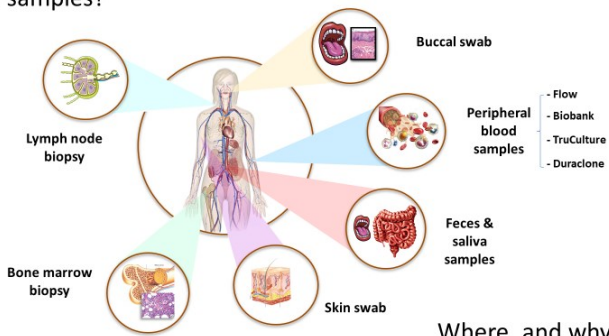
# life cycle of mAI – for Physicians? Just hot air?



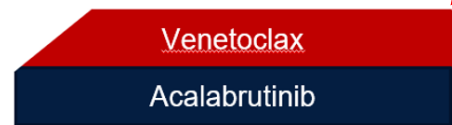
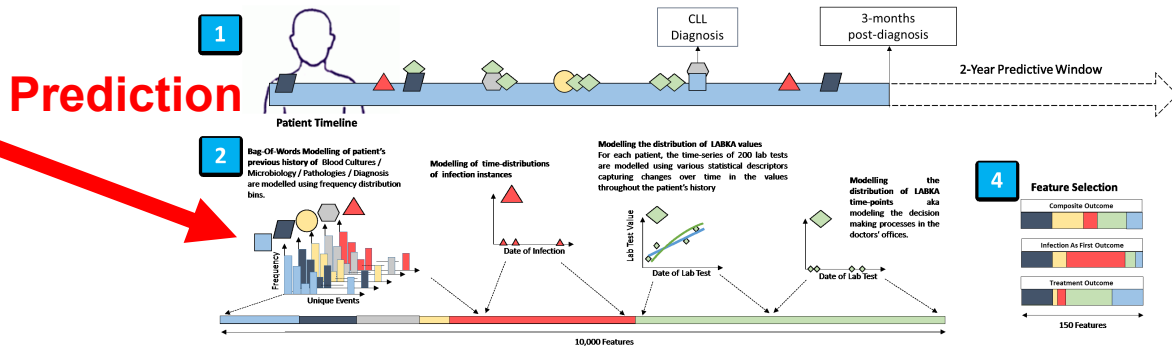
Clinic Training

Translational studies

What samples?



Where, and why?



Trial or follow up

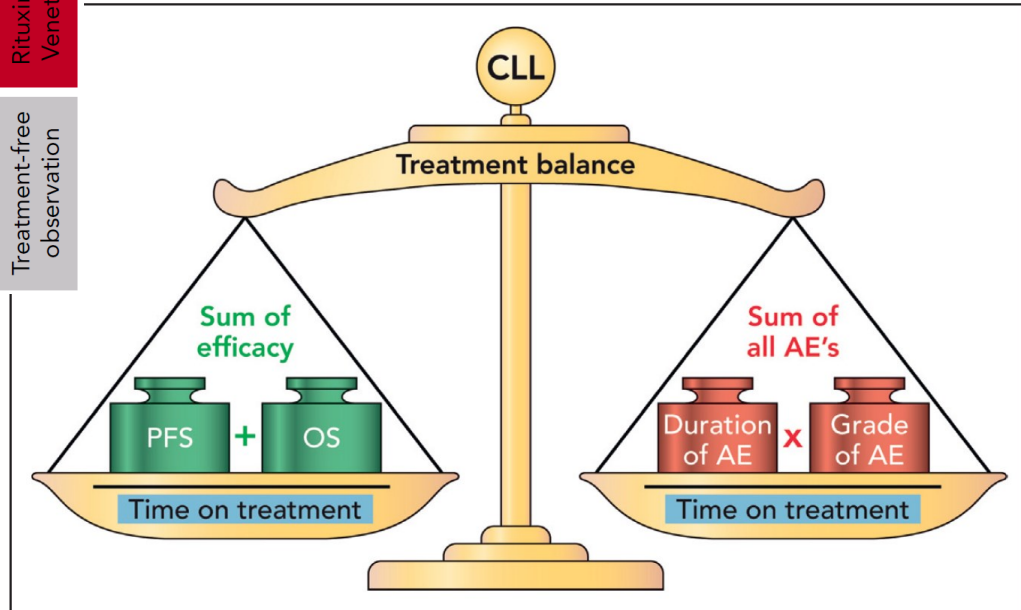
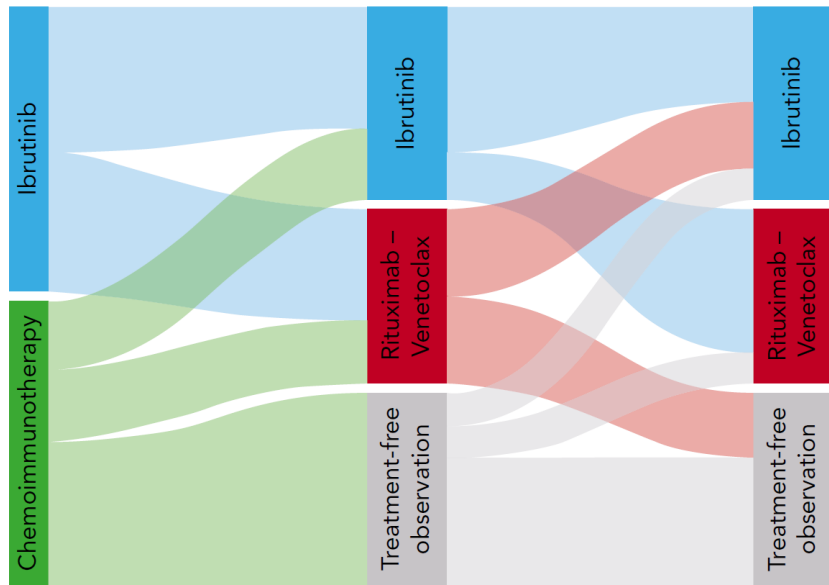
Randomization

20%



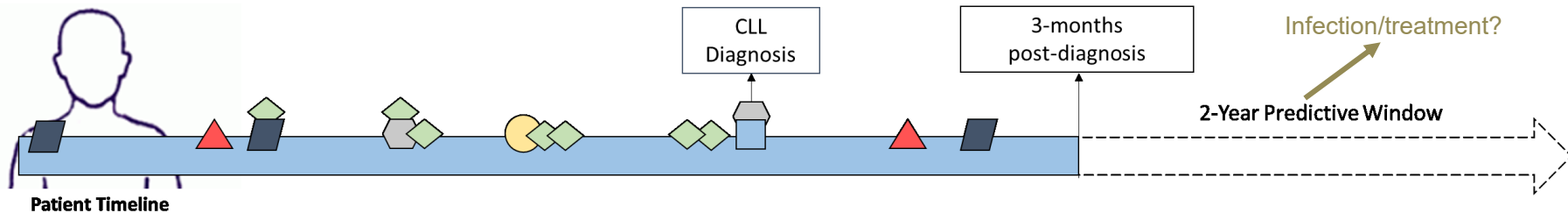
80%

# Pattern recognition needed for medical art!



# Pattern recognition – behind the scenes 1

1



2

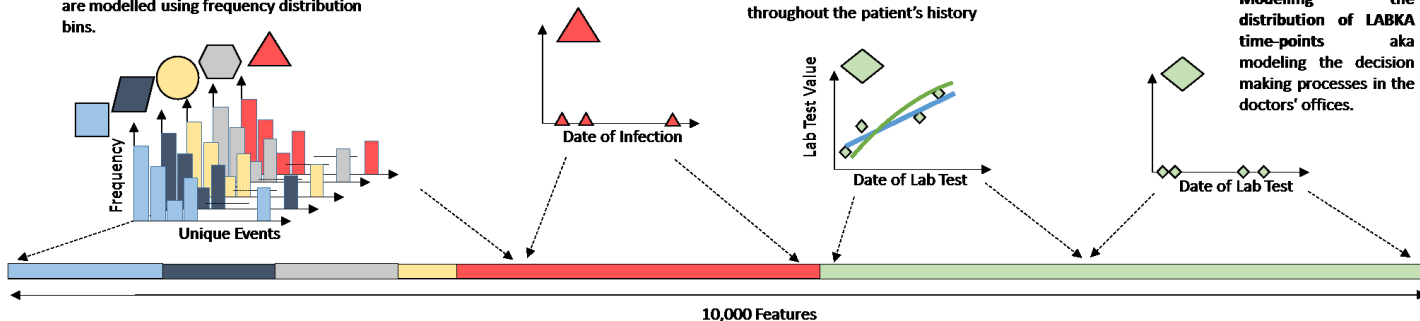
**Bag-Of-Words Modelling of patient's previous history of Blood Cultures / Microbiology / Pathologies / Diagnosis are modelled using frequency distribution bins.**

**Modelling of time-distributions of infection instances**

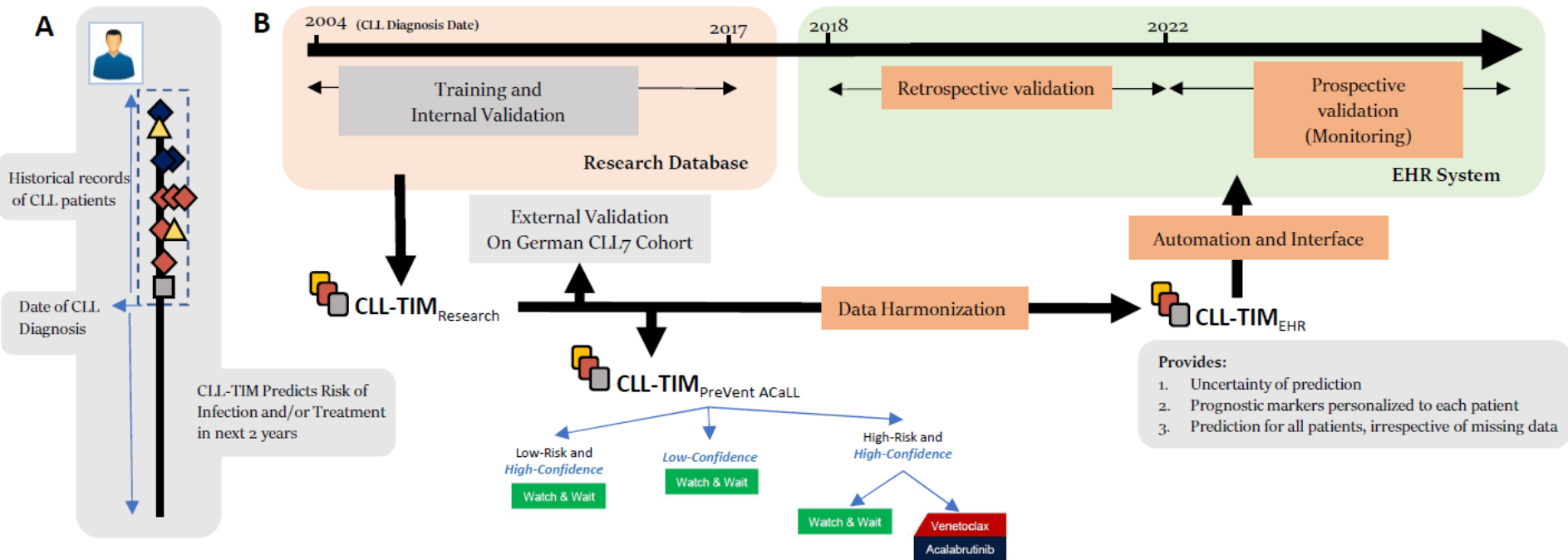
**Modelling the distribution of LABKA values**

For each patient, the time-series of 200 lab tests are modelled using various statistical descriptors capturing changes over time in the values throughout the patient's history

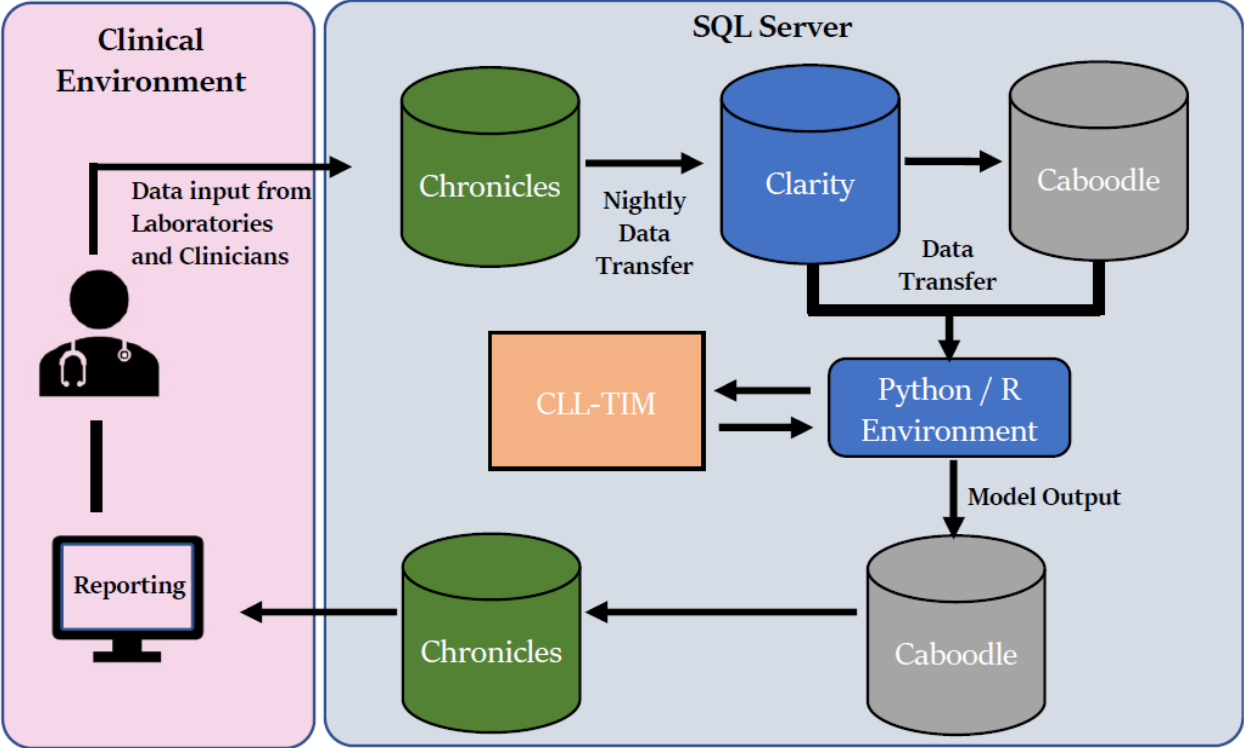
**Modelling the distribution of LABKA time-points aka modeling the decision making processes in the doctors' offices.**



# Pattern recognition – behind the scenes 2



# Pattern recognition – behind the scenes 3



# Pattern recognition – at the scene for the Physician

The screenshot displays a medical software interface with a top navigation bar containing tabs for 'Vis journal', 'Notater', 'Konsul...', 'Detalje...', 'Behan...', 'Best./o...', 'Medd...', 'Komm...', 'Vaccin...', 'MDA', 'Journa...', and 'Stadie...'. Below this is a 'Show medical record' section with tabs for 'Treatment contacts', 'Notes', 'Laboratory Results', 'Radiology', 'Procedures', 'Medicine', 'Media', and 'Correspondance'. The main content area is divided into two columns. The left column is titled 'Prediction from CLL-TIM algorithm' and contains the following text:

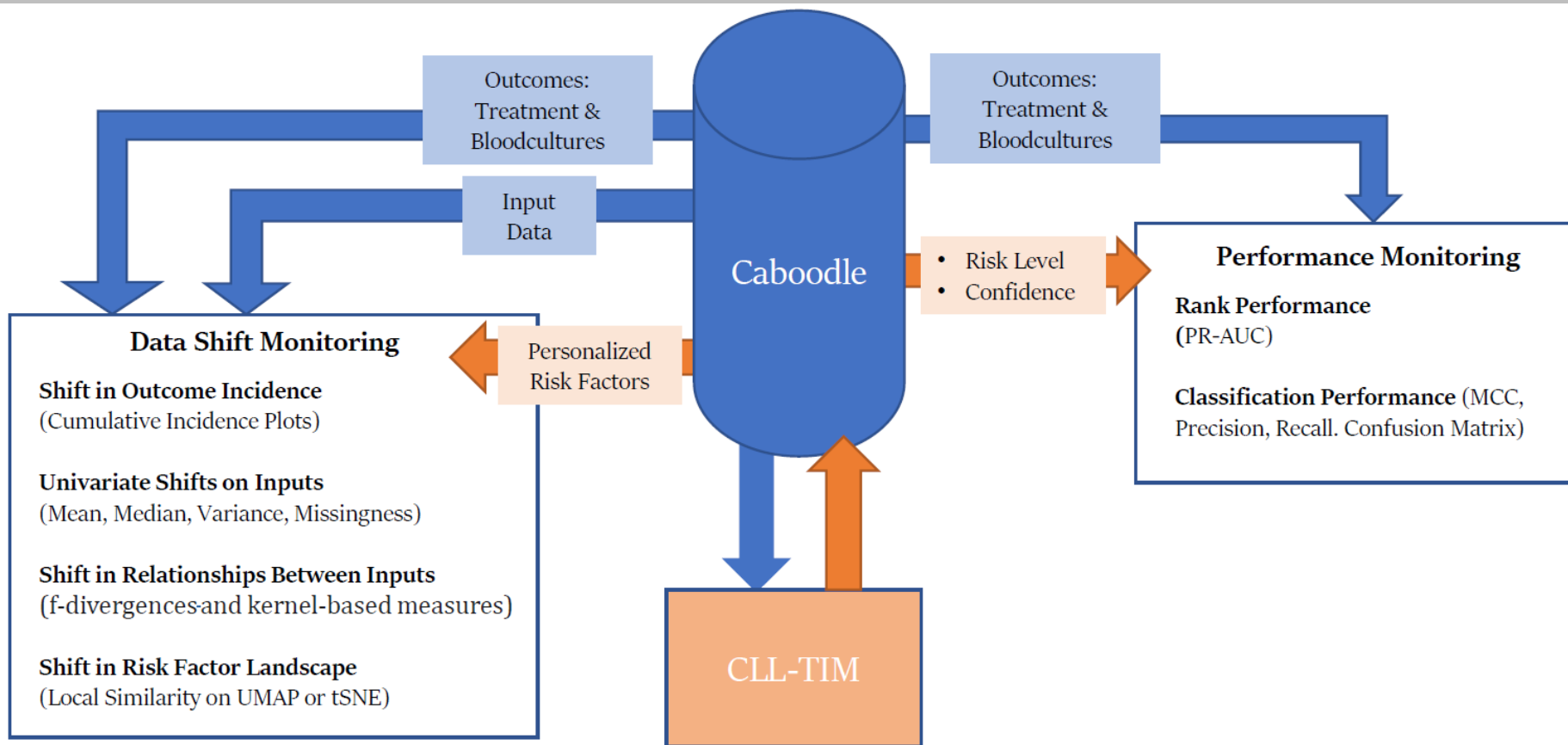
Risk assessment (low/high): Low  
Confidence of prediction (low/high): Low  
Date of prediction: 14JUN2022

Risk factor high 1: Beta-2-microglobulin, mean (1 year)	Risk factor low 1: Platelet count, change (1 year)
Risk factor high 2: Creatinine – date, mean (7 years)	Risk factor low 2: Leukocyte count, max (3 months)
Risk factor high 3: Absolute Lymphocyte Count, min (7 years)	Risk factor low 3: Binet stage A
Risk factor high 4: Leukocyte – last date (7 years)	Risk factor low 4: Hemoglobin, min (7 years)
Risk factor high 5: Hemoglobin, mean (7 years)	Risk factor low 5: IGHV: mutated or unknown

The right column contains three sections: 'Speciality comments', 'History', and 'Latest Out-patient note', each with a blue header and a white content area.



# Pattern recognition – monitoring ahead



# mAI – You are next to Implement

## Algorithm

- ✓ Reliable predictive confidence/uncertainty for trust in unseen conditions
- ✓ Sufficient dimensionality for missingness handling & re-training purposes in case of data shifts
- ✓ External validation benchmarks
- ✓ Personalized risk factors for explainability and monitoring
- ✓ Specification of inputs / outputs for harmonization
- ✓ Provisions of summary statistics on outcomes and input features for monitoring

## Harmonization

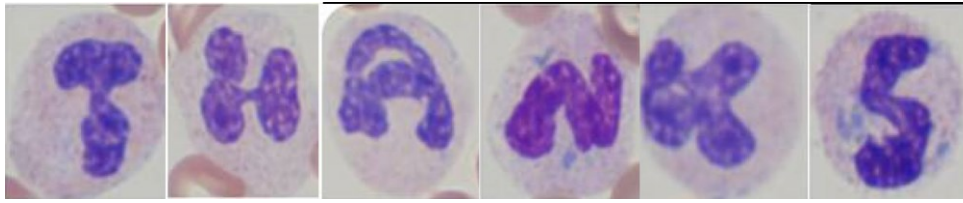
- ✓ Ascertain definitions of variables and outcomes are identical to those used in algorithm development
- ✓ Data dictionaries with many-to-one mappings of variables name and variable units
- ✓ Harmonization separate to and precedes the algorithm script/s

## EHR

- ✓ Decision in which view/context should the results from the algorithm be presented
- ✓ Process in place for presenting views from external/integrated algorithm
- ✓ Process for approval of content/presentation by clinical healthcare council implemented
- ✓ Process in place for copy/export of data in near real-time to environment where algorithm is running

## Monitoring

- ✓ Monitoring of performance degradation using appropriate ranking and discrimination metrics
- ✓ Monitoring of data shifts using appropriate metrics
- ✓ Forward-looking setup that allows for monitoring of multiple competing algorithms and the subsequent selection of algorithm with “highest-confidence” prediction for each individual patient.



## Nordic CLL Study Group

Ander Österborg  
Richard Rosenquist  
Vesa Lindström  
Mattias Mattsson  
Robert Schou Pedersen  
Hoa Tran  
Andrea Lenartova  
Sigrid Skånland  
Signý Sveinsdóttir

[Carsten.utoft.niemann@regionh.dk](mailto:Carsten.utoft.niemann@regionh.dk)  
[www.rigshospitalet.dk/CLL-lab](http://www.rigshospitalet.dk/CLL-lab)



## CLL Laboratory

*Combining translational, epidemiological and clinical research to develop individually tailored supportive care and CLL specific treatment*

Caspar da Cunha-Bang  
Casper M Frederiksen  
Christian Brieghel  
Emelie Rotbain  
Ernesto Gargiulo  
Esben M Packness  
Hanna Hassouneh  
Hashim Elhussein  
Laurent Tellier  
Lone Bredo Pedersen  
Mehdi Parviz  
Noomi Vainer  
**Rudi Agius**  
Rebecka Svanberg  
Tereza Faitova

