

Implementing an Artificial Intelligence Assistant to Facilitate Data Collection for Cancer Registries: A Case-Based Approach

Michael Schnell^{*,1,2}, Jean Lieber², Catherine Goetzinger¹, Michel Untereiner¹, Valéry Bocquet¹, Stéphanie Saleh¹, Sophie Couffignal¹, Nicolas Jay^{2,3}

* Contact person: michael.schnell@lih.lu

¹ Department of Population Health, Luxembourg Institute of Health (Strassen, Luxembourg)

² Université de Lorraine, CNRS, Inria, Loria (Nancy, France)

³ Service d'évaluation et d'information médicales, Centre Hospitalier Régional Universitaire de Nancy (Nancy, France)

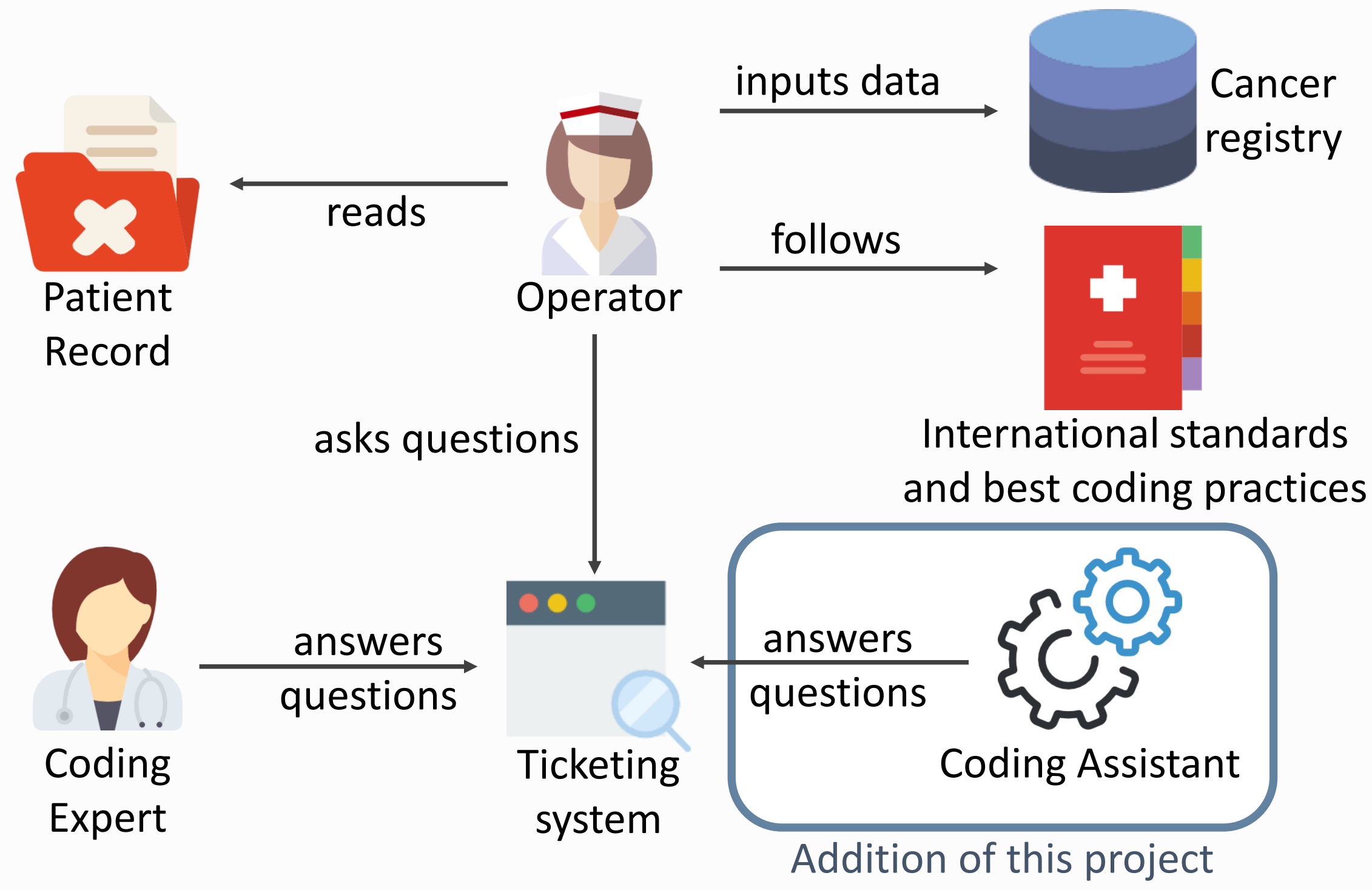
Goal

- Design and integrate a coding assistant for operators
- Reduce workload of operators and coding experts
- Improve coding consistency by facilitating question search

Idea

- Similar solutions should have similar arguments
- Use arguments to find similar questions

Context



Arguments and Case-Based Reasoning

Example use case for the proposed method

1 Describe patient record and question

Target problem

- Female patient
- Imaging shows multiple pulmonary opacities
- CT Scan shows no mediastinal adenopathy
- Biopsy reveals the morphology to be an adenocarcinoma, TTF1 positive
- Further testing reveals a second tumor site in the ovaries

Which Topography?
Operator

2 To find a suitable case amongst those concerning the same subject, check the applicability of their arguments on the target problem and use this result to compare the cases

Comparing Case 1 and Case 2

- Case 1: no argument applies
- Case 2: 2 arguments apply one + argument in favor and one - argument against the answer of Case 2

In addition, the patient from the target problem resembles more closely the patient from Case 2

- Case 2 is preferred to Case 1
- Similarly, Case 2 is preferred to Case 3

3 Copy the solution of the preferred case (Case 2), removing arguments that do not apply to the target problem

Case 1 – Which topography?

- Male patient
- Exams show cervical and supraclavicular adenopathies
- PET scan confirms cervical and supraclavicular adenopathies, with a suspicion of axillary adenopathies
- Biopsy reveals the morphology to be an anaplastic lymphoma, ALK negative

Solution

→ Lymph nodes of multiple regions (C77.8)

Arguments

- + Exams show adenopathies in two different lymph node regions (region head, face, neck and region axilla or arm)
- The axillary adenopathy are only suspected (no confirmation)

Case 2 – Which topography?

- Exams show multiple pulmonary opacities of an adenocarcinoma, TTF1 positive
- PET scan confirms the pulmonary tumors
- CT scan show no ovarian lesions
- Multidisciplinary team (MDT) meeting concludes that the tumor is of unknown origin, possibly of gynecological origin

Solution

→ Unknown primary site (C80.9)

Arguments

- + Multiple pulmonary opacities are very indicative of a pulmonary metastasis
- + MDT meeting concludes that the original tumor site is unknown
- Primitive pulmonary adenocarcinoma are often TTF1 positive

Case 3 – Which topography?

- Male patient, aged 58
- CT scan shows a single tumor lesion on the pulmonary hilum with subcarinal and anterior mediastinal adenopathies
- Patient dies from lung cancer (clinician's conclusion)

Solution

→ Main bronchus (C34.0)

Arguments

- + A single pulmonary tumor lesion is indicative of a pulmonary origin
- + Clinician concludes that is the patient suffers from lung cancer
- + There are regional adenopathies for the pulmonary tumor site

Solution

→ Ovaries (C56.9) (Revised answer)

- + Multiple pulmonary opacities are very indicative of a pulmonary metastasis
- + Tumor site is found in the ovaries (Added)
- Primitive pulmonary adenocarcinoma are often TTF1 positive

4 Coding experts may revise the tentative solution, modify patient record, answer or arguments



Coding Expert

Solution

→ Unknown primary site (C80.9)

- + Multiple pulmonary opacities are very indicative of a pulmonary metastasis
- Primitive pulmonary adenocarcinoma are often TTF1 positive

Prototype

The screenshot shows the prototype interface. It includes a 'Nouvelle question' form with fields for patient information, question text, and answer. It also shows a 'Question 1001' form with a synthetic view of the patient record, answer, and arguments.

Dynamic forms guide the description of the patient record by an operator

Display of a solved case: synthetic view of the patient record, answer and arguments, and the case used to solve the new case

Publications

Schnell, M., Couffignal, S., Lieber, J. Saleh, S., Jay, N.: Case-based Interpretation of Best Medical Coding Practices – Application to Data Collection for Cancer Registries. In Conference Proceedings of ICCBR (2017)

Future work

- Deploy and evaluate the prototype
- Formalize reasoning process (add more complex arguments and reasoning)
- Expand coding assistant to more questions subjects (e.g. morphology, etc.)