

ONTOLOGICAL BASED CDSS IN THE MANAGEMENT OF BREAST CANCER

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Problem Statement

Accurate diagnosis is a key to ensure the most appropriate treatment. The diagnosis accuracy depends on physician's knowledge on the patient case. The ontological based CDSS is based on comprehending the diagnostic process and criteria to make accurate diagnosis and appropriate treatment plan.

Background

- Breast Cancer is the most common malignancy affecting women worldwide. When found and treated accurate and early, it is most often curable.
- With the rapid growth of IT, many applications have been developed to assist healthcare takers in their decision-making process.
- An ontological based CDSS has been developed to provide accurate diagnosis and treatment choices.

Aim

To build an ontological model by capturing and integrating breast cancer clinical information from various existing reliable knowledge sources reported in the historical literature.

Methods

Goal-To manage the breast cancer through a knowledge based CDSS. The approach relies on the use of ontological representation.

Data Collection

- Extensive literature analysis

Development of ontology model

Ontology software protégé 5.2 with OWL. Steps in the development process include:

- Determine the domain and scope of the ontology
- Consider Re-use existing ontology
- Enumerating important terms in the ontology
- Define the classes and the class hierarchy
- Define the properties of classes
- Create Instances

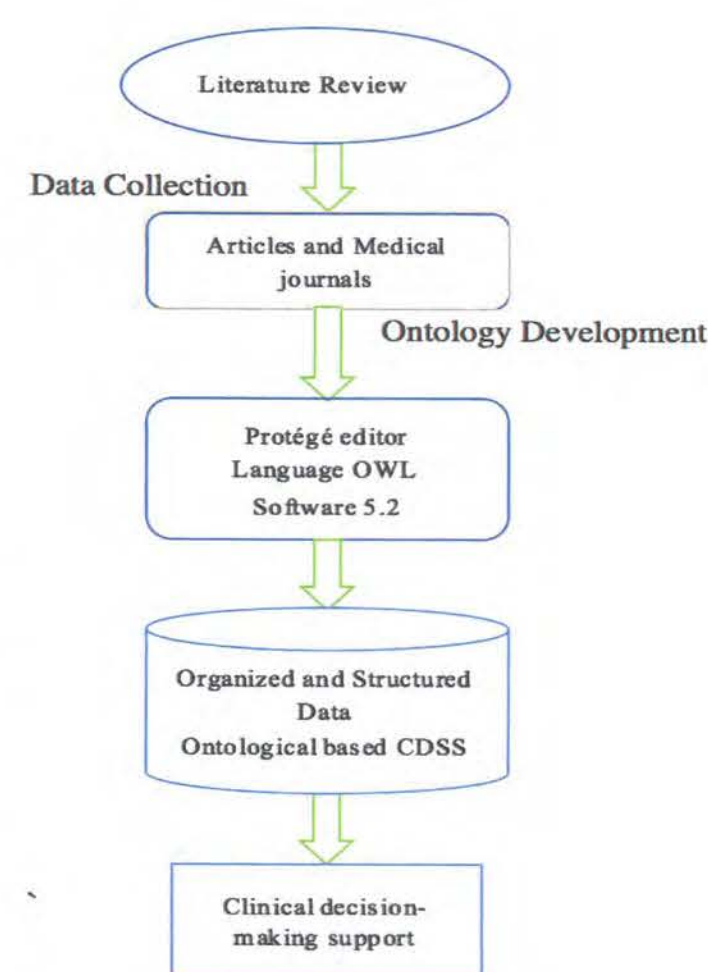
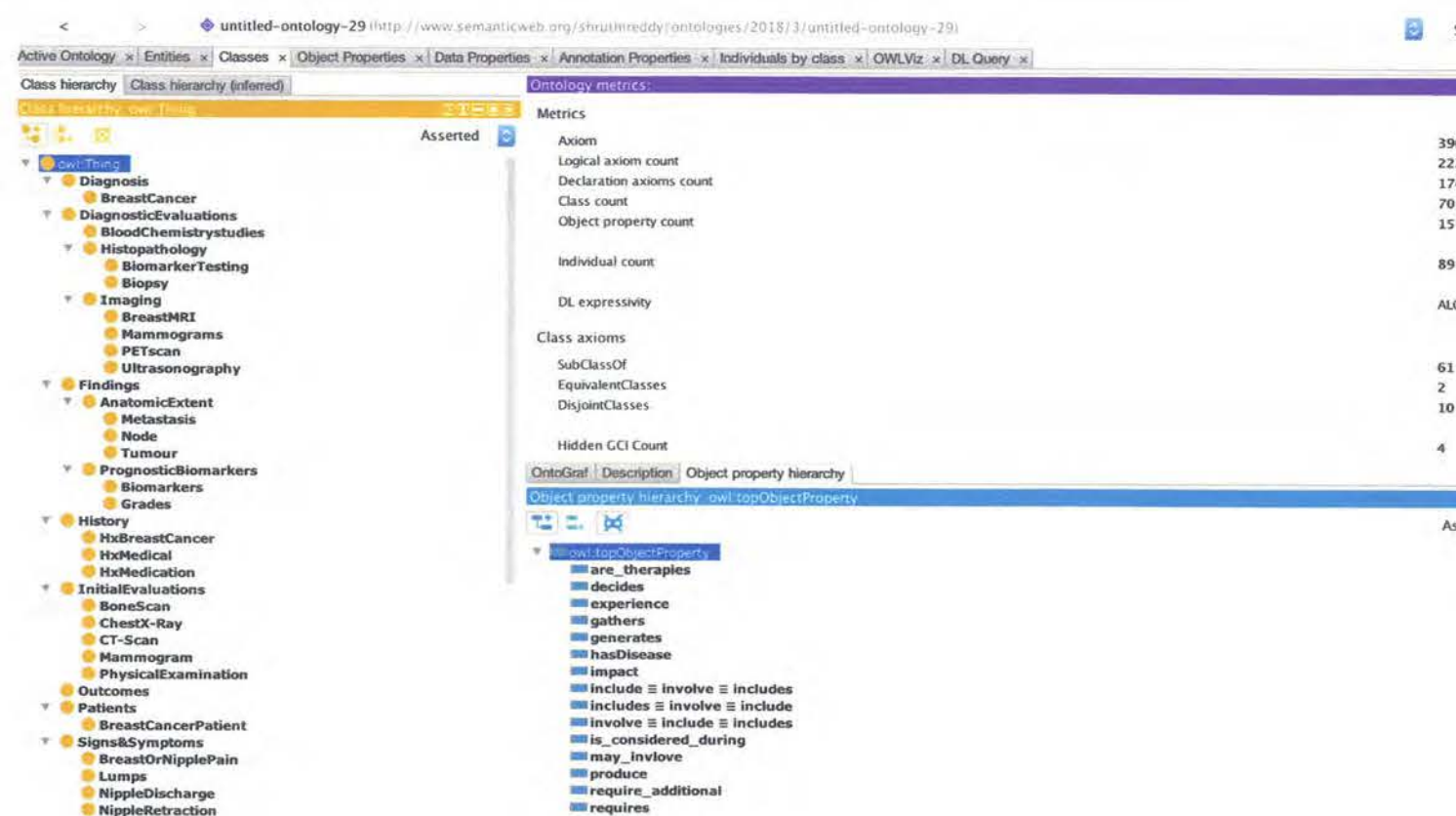
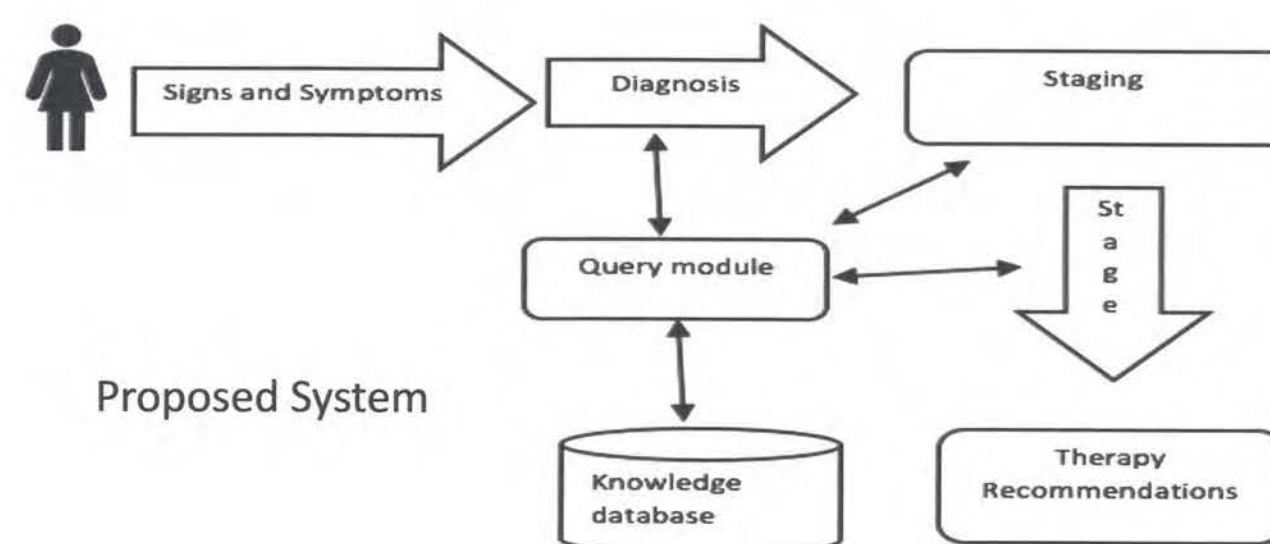


Fig: Development of ontological CDSS process



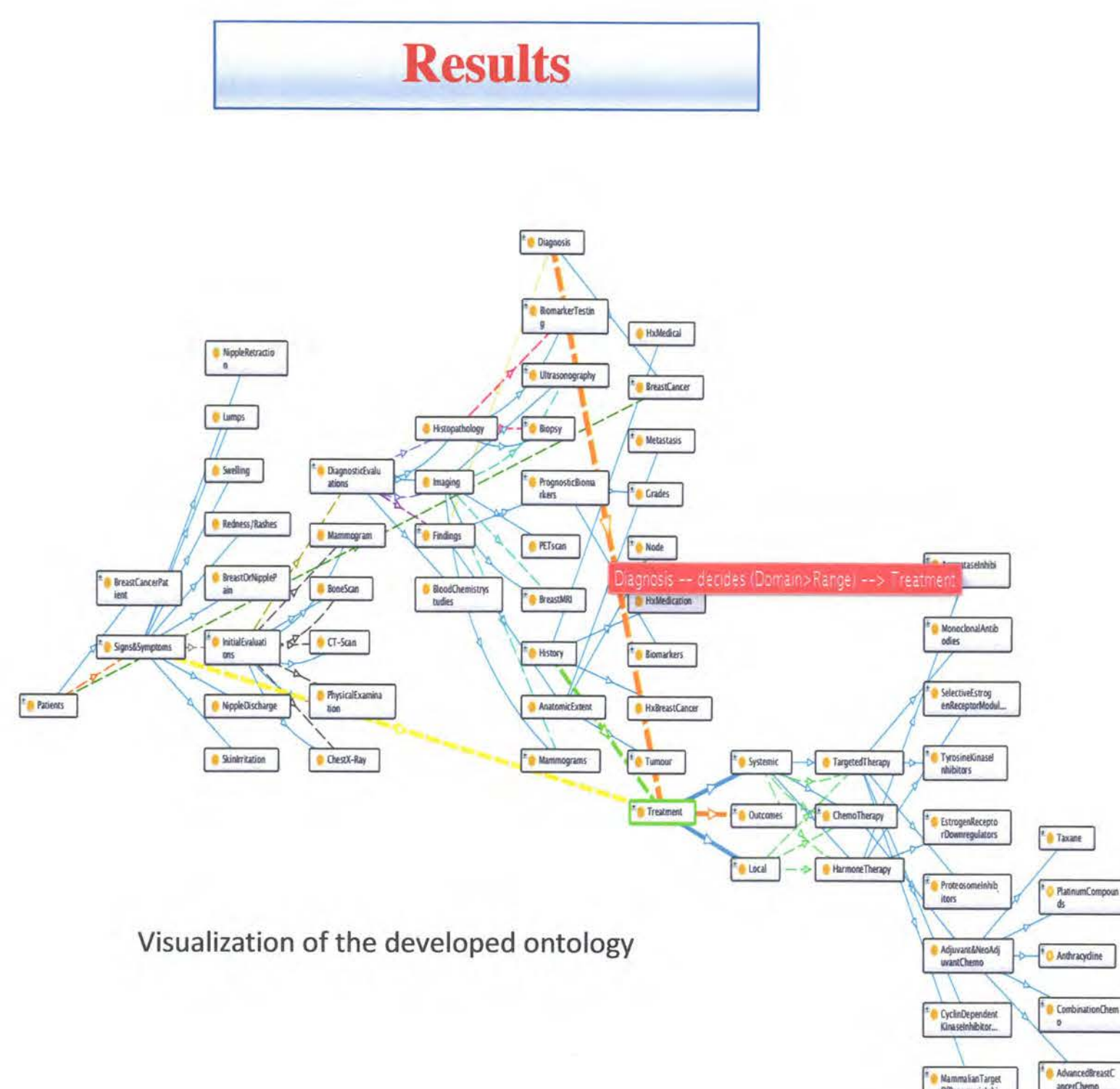
Protégé tool representing ontology metrics, direct classes, object property hierarchies



Proposed System

- Knowledge base in OWL format which is used for CDSS.
- Physicians can interact with the CDSS through an EHR system.
- Physician uses the patient profile to query ontology, which returns a suitable treatment plan

Results



Visualization of the developed ontology

Classes	Properties	Instances/Individuals
Patients	impact	XYZ
Diagnosis	decides	Stage II Breast Cancer
Diagnostic Evaluations	gathers	Core needle Biopsy
Treatment	produce	Paclitaxel
Findings	generates	HER2 positive

- Incorporates 89 instances, 71 subclasses with 9 direct classes linked by 15 object properties. A total of 396 axioms have been added into the ontology.
- The ontology is developed to aid patients, physicians and students to determine the diagnostic evaluations, stage of breast cancer and the treatment choices. Ontology stays open for any new, altered knowledge about breast cancer therapy

Discussions

- Represents a standard individualized treatment knowledge.
- Serves as a knowledge base integrating various aspects of knowledge from domain experts, the historical medical literature
- Supports semantic interoperability, data exchange, data integration, and automated reasoning
- Ontology needs to be evaluated for utility.
- Full testing of this ontology requires connections with electronic health record systems to populate the ontology with real world cases.

Conclusion

- This project should function as a knowledge base of an interoperable CDSS
- It is useful as it accurately matches the one that were expected by physician.
- Ontology can be used to power a CDSS as diagnostic tool for managing breast cancer in order to reduce diagnostic errors and improve the quality of care

References

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