Vel Tech Multi Tech

Dr.Rangarajan Dr.Sakunthala Engineering College

AnAutonomousInstitution
ApprovedbyAICTE,AffiliatedtoAnna University,Chennai
ISO9001:2015CertifiedInstitution,AccreditedbyNBA(BME,CSE,ECE,EEE,IT&MECH),
AccreditedbyNAACwith'A'GradewithCGPAof3.49
#42,Avadi-VelTechRoad, Avadi,Chennai-600062,TamilNadu,India.

DEPARTMENT OF INFORMATION TECHNOLOGY

191ITV17 / KNOWLEDGE ENGINEERING LABORATORY

NAME :

REGISTER NO :

ROLL NO :

BRANCH :

YEAR : III

SEMESTER : V

DEPARTMENT OF INFORMATION TECHNOLOGY

VISION

- To emerge as centre for academic eminence in the field of information technology through innovative learning practices.

MISSION

- M1-To provide good teaching and learning environment for quality education in the field of information technology.
- M2-To propagate lifelong learning.
- M3-To impart the right proportion of knowledge, attitudes and ethics in students to enable them take up positions of responsibility in the society and make significant contributions.

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DEPARTMENT OF INFORMATION TECHNOLOGY

CERTIFICATE

Name: ……

Year: ……..……, Semester: …….., B.Tech: INFORMATION TECHNOLOGY

University Register No.: | | College Roll No.: | |

Certified that this is the bonafide record of work done by the above student in the **191ITV17 / KNOWLEDGE ENGINEERING LABORATORY** during the academic year……

Signature of Head of the Department **Signature of Staff- Incharge**

Submitted for the University Practical Examination held on …… at VELTECH MULTITECH DR.RANGARAJAN DR.SAKUNTHALA ENGINEERING COLLEGE, #42, AVADI – VELTECH ROAD, AVADI, CHENNAI – 600062.

Signature of Examiners:

INTERNAL EXAMINAR **EXTERNAL EXAMINAR**

Date: ……

DEPARTMENT OF INFORMATION TECHNOLOGY

PROGRAMMED EDUCATIONAL OUTCOMES (PEOS)

PEOs	PROGRAMME EDUCATIONAL OBJECTIVES(PEOs)
PEO1	Graduates will demonstrate technical competency and leadership skills to lead a successful career in the field of IT&ITES.
PEO2	Graduate will exhibit a commitment to communicate effectively in diverse environment and apply proficiency towards societal issue with human values.
PEO3	Graduates will pursue lifelong learning in generating innovative solutions to the changing industrial needs using research and problem-solving skills.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

PSO's	PROGRAMME SPECIFIC OUTCOMES(PSOs)
PSO1	An ability to apply design and development principles in the construction of software systems of varying complexity.
PSO2	The use of current application software, the design and use of operating systems and the analysis, design, testing and documentation of computer programs for the use in the information engineering technologies.
PSO3	The design techniques, analysis and the building, testing, operation and maintenance of networks, databases, security and computer systems. (both hardware and software).

PROGRAMME OUTCOMES (POs)

PO's	PROGRAMMEOUTCOMES(POs)
PO1	Apply knowledge of mathematics, natural science, engineering fundamentals, software development, Database management, computer networking, data communication, and information security to the solution of complex engineering problems in Information Technology.
PO2	Ability to identify, formulate and analyze complex technical problems in there cent cutting edge areas of hardware and software applications to reach significant conclusions by applying Mathematics, Natural sciences.
PO3	Ability to analysis, design, test and documentation of computer programs, maintenance of networks, databases, security and computer systems (both hardware and software) and providing optimum design solutions to meet specified needs of the recent trends.
PO4	Ability to use research based knowledge and research methods to perform literature survey,designexperimentsforcomplexproblemsindesigning,developingandmaintainingacomputingsystem,collectdatafromtheexperimentaloutcome,analyzeandinterpretvalid/interesting Patterns and conclusions from the data points.
PO5	Ability to create, select and apply state of the art tools and techniques in designing, developing and testing a computing system with the help of latest application software, operating systems, simulation and databases tools.
PO6	Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice in system development and solutions to complex engineering problems related to Information technologies.
PO7	Understand and evaluate the sustainability and impact of professional engineering work in the solution of complex engineering problems related to societal and environmental contexts with full responsibilities.
PO8	An understanding of professional and ethical responsibility and commitment to them.
PO9	Ability to function effectively to strive towards achieving a common goal as an individual in a group and with the capacity to be a team leader.
PO10	Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation make effective presentations and give and receive clear instructions.
PO11	Ability to function on multi-disciplinary teams, apply engineering and management knowledge and techniques to estimate time and resources needed to complete a computer engineering projects.
PO12	Recognize the need for and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

Vel Tech Multi Tech Dr.Rangarajan Dr.Sakunthala Engineering College		
Department of Information technology		
Year/Semester : III/V		**Regulation2019**
Sub.Code/Sub.Name: 191ITV17 / KNOWLEDGE ENGINEERING		**LTPC: 2023**

S. No	List of Experiments	CO
1	Perform operations with Evidence Based Reasoning.	CO1
2	Perform Evidence based Analysis.	CO1
3	Perform operations on Probability Based Reasoning.	CO2,3
4	Perform Believability Analysis.	CO2
5	Implement Rule Learning and refinement	CO3
6	Perform analysis based on learned patterns.	CO4
7	Construction of Ontology for a given domain	CO4

Course Objectives

The student should be made to:

- To discuss methodologies and modeling for Agent Design and Development.
- To design and develop Ontologies.
- To apply reasoning with Ontologies and rules.
- To understand learning and rule learning.

COURSE OUTCOME On completion of the course, students will be able to	
CO1	Understand the basics of Knowledge Engineering.
CO2	Apply methodologies and modeling for Agent Design and Development.
CO3	Design and develop ontologies.
CO4	Apply reasoning with ontologies and rules.
CO5	Understand learning and rule learning.

CO-PO & PSO MAPPING

Course Outcome	Mapping CO's with PO's											
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PO12**
CO1	3	3	3	2	2	-	-	-	1	-	1	1
CO2	3	3	3	2	1	-	-	-	1	-	1	1
CO3	3	3	2	2	1	-	-	-	1	-	1	1
CO4	3	3	2	2	1	-	-	1	1	-	1	1
CO5	3	3	3	2	1	-	-	-	-	-	1	1
CO	**3**	**3**	**3**	**2**	1	**-**	**-**	**1**	**1**	**-**	**1**	**1**

1 – Low **2 – Medium** **3 – High**

INDEX

S.NO	DATE	LIST OFEXPERIMENTS	PAGE NO	MARKS	FACULTY SIGN
1		Perform operations with Evidence Based Reasoning.			
2		Perform Evidence based Analysis.			
3		Perform operations on Probability Based Reasoning.			
4		Perform Believability Analysis.			
5		Implement Rule Learning and refinement			
6		Perform analysis based on learned patterns.			
7		Construction of Ontology for a given domain			

EX.NO:1

PERFORM EVIDENCE BASEDANALYSIS

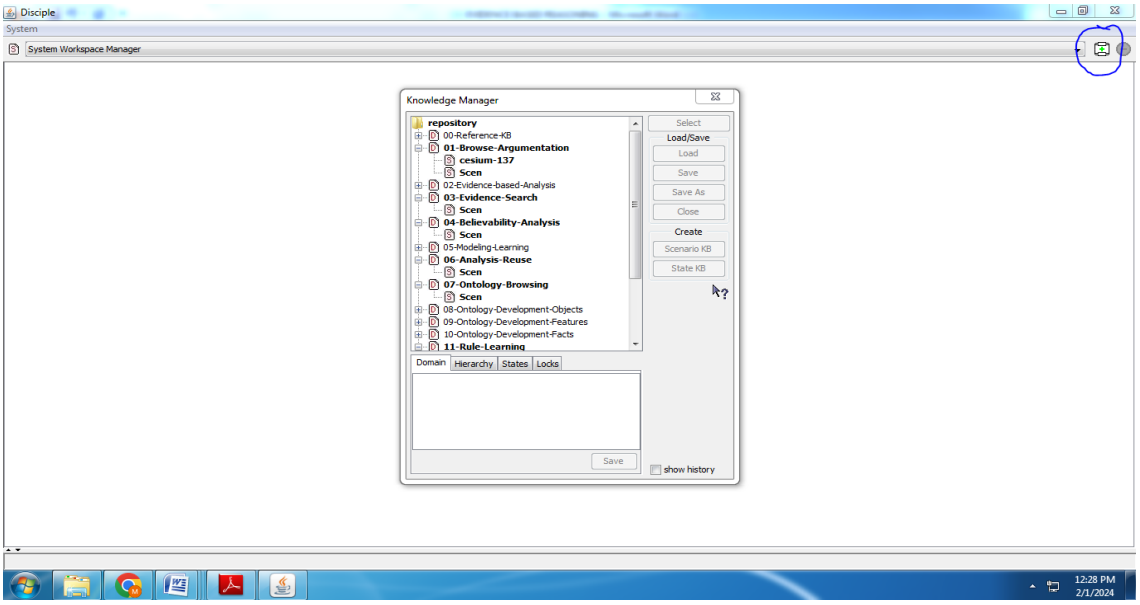
AIM:

To Perform evidence based reasoning using Disciple-EBR.

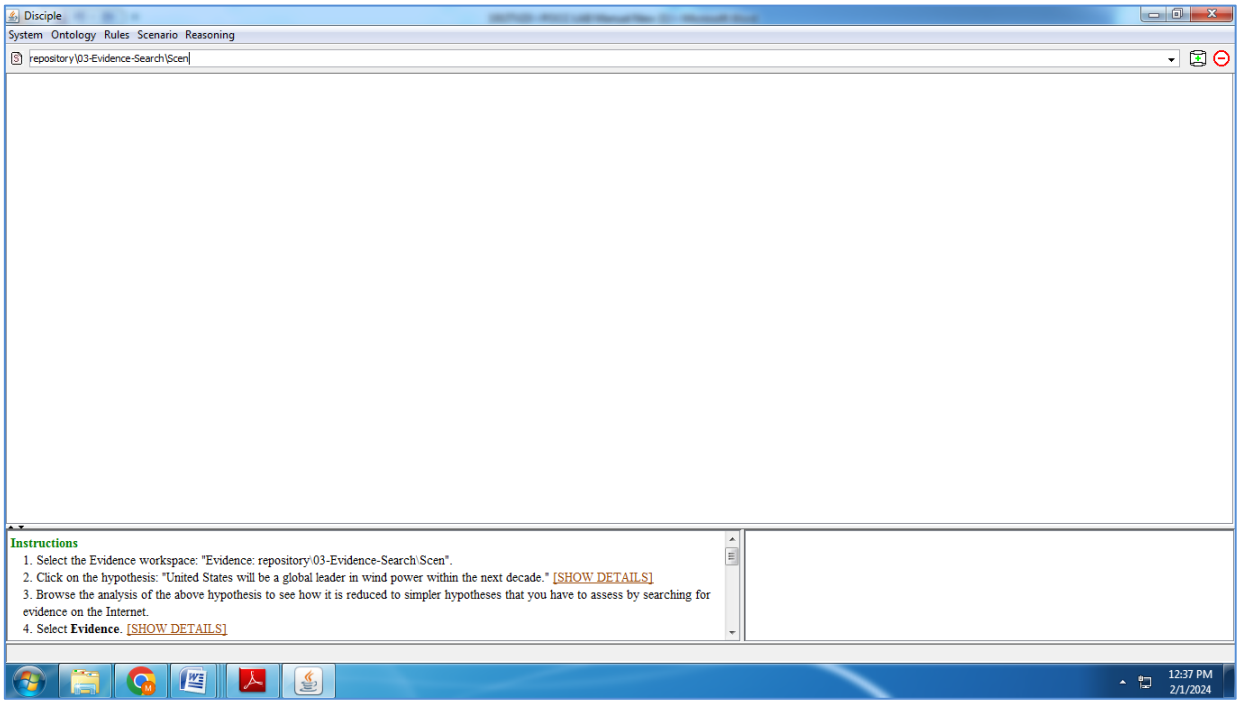
PROCEDURE:

Disciple-EBR (Disciple, for short) is a learning agent shell for evidence-based reasoning. It is a research prototype implemented in Java and tested on PC. Disciple-EBR is a standalone system that needs to be installed on the user's computer

1. Start Disciple-EBR
2. In the System Workspace Manager, click on the knowledge base icon containing the plus sign (+).
3. The Knowledge Manager window opens, showing all the knowledge bases from the repository



4. Click on the plus sign (+) of the case study domain knowledge base to be run. This will display one or several scenario knowledge bases.
5. Click on the scenario knowledge base corresponding to the case study to be run.
6. Click on the Select button. This will both load the case study knowledge bases in memory (i.e., the domain KB and the scenario KB) and select them as the current ones to work with. Because they are loaded in memory, their names will be shown in bold in the Knowledge Manager window
7. Follow the instructions at the bottom of the displayed window and run the case study



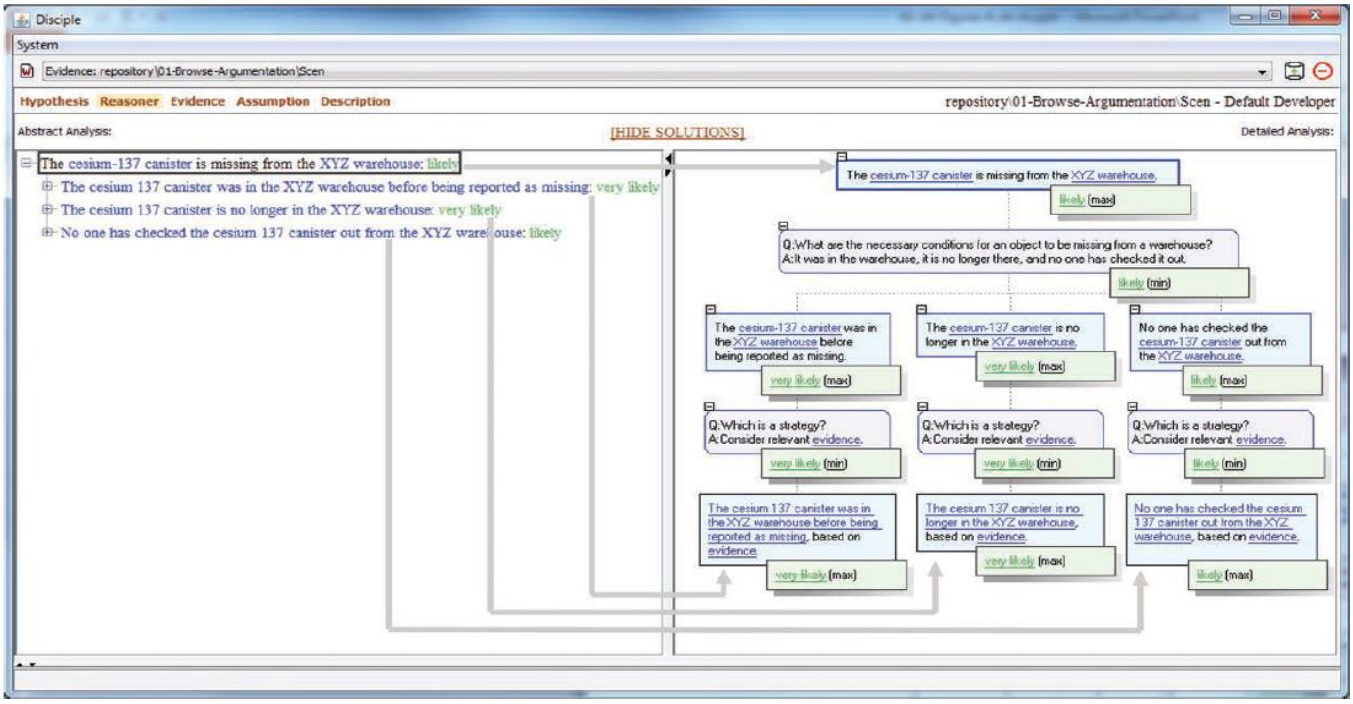
After running the case study, you have to close the corresponding knowledge base, as instructed in the following steps.

8. Close all the workspaces open on the current knowledge base (case study) by selecting one of them and clicking on the minus sign (–) to the right of the knowledge base icon containing the plus sign (+).
9. Click on the knowledge base icon containing the plus sign (+) situated at the right of the workspace selector
10. The Knowledge Manager window will be opened, showing all the knowledge bases.
11. Click on the Scen node corresponding to the case study knowledge base that was run.
12. Click on the Close button in the right side of the window.
13. Click on the X button to close the Knowledge Manager window.

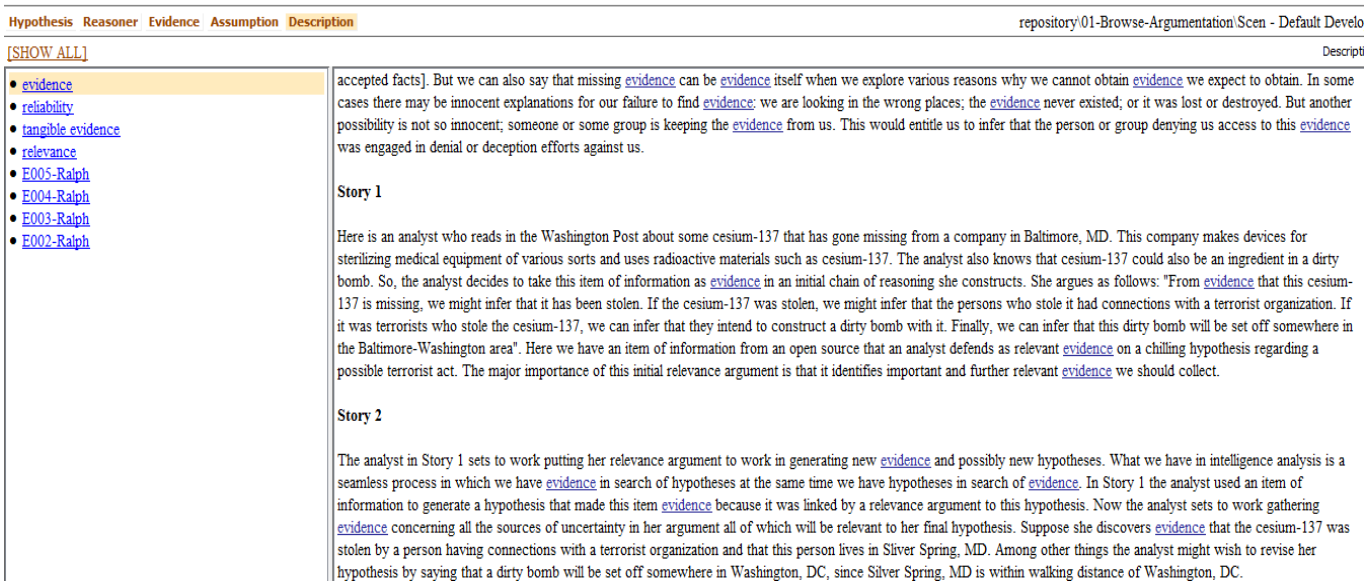
OPERATION 1: BROWSE THE ANALYSIS OF A HYPOTHESIS

In the Hypothesis module, select a hypothesis.

1. The Reasoner module will be automatically selected, showing the corresponding reasoning tree



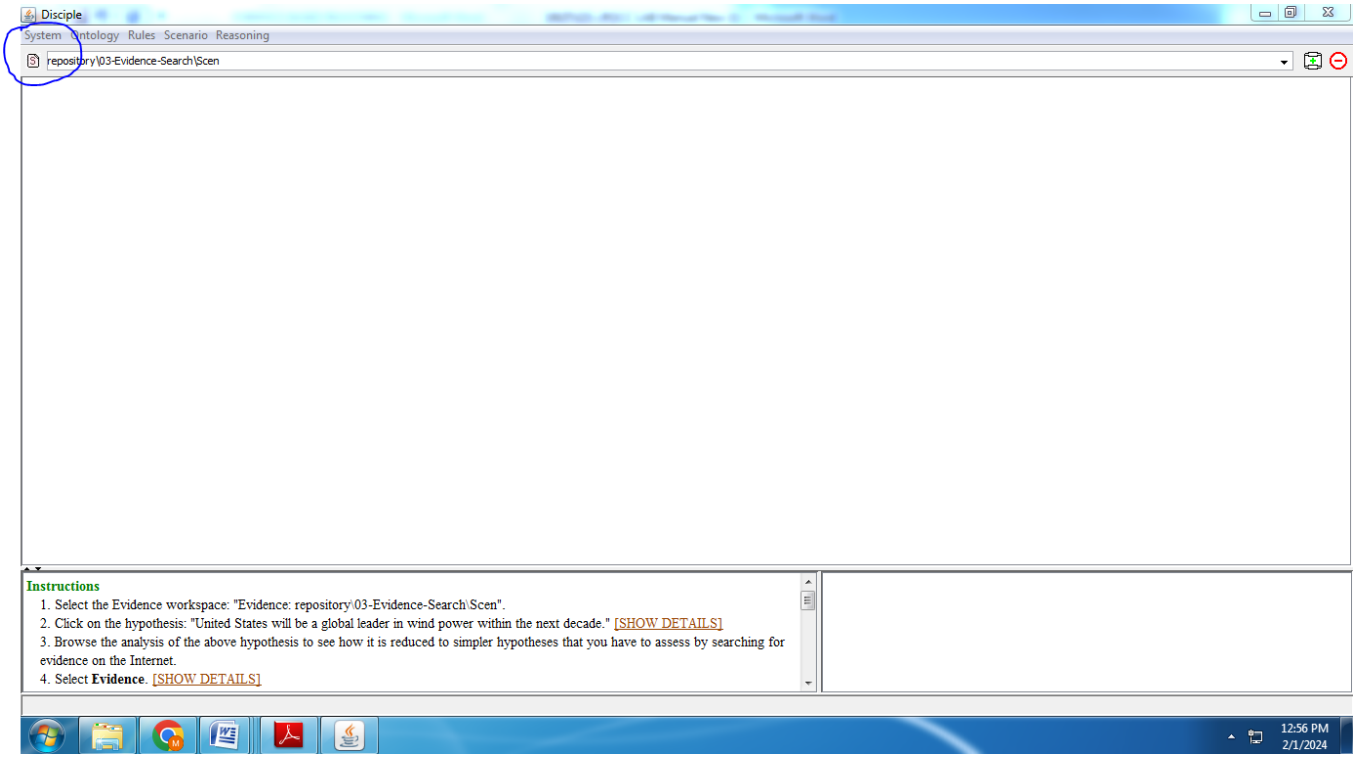
2. To browse the entire reasoning tree, step by step, click on the hypotheses in the left panel, or one of the + and – signs preceding them.
3. To expand or collapse the entire subtree of a hypothesis, right-click on it and select the corresponding action.
4. To view the detailed description of an abstract decomposition of a hypothesis in the left panel, click on the hypothesis, and the detailed decomposition will be displayed in the right panel.



5. To browse a detailed reasoning tree in the right panel click on the + and – sign

OPERATION 2: END A CASE STUDY

1. Select the Scenario workspace (repository\KB-name\Scen)
2. From the System menu, select Save All to save the knowledge bases Close all the workspaces open on the current knowledge bases (case studies) by clicking on the minus sign (–) to the right of the knowledge base icon containing the plus sign (+).
3. Close the opened knowledge bases corresponding to the case study



RESULT:

Using Disciple –EBR, found the evidences that are related to the hypothesis cesium-137 and obtained there is a possibility of terrorist attack.

EX.NO:2	PERFORM EVIDENCE BASED ANALYSIS

AIM:

To perform evidence based analysis for any hypothesis using Disciple-EBR

PROCEDURE:

The objective of this case study is to learn how to use Disciple-EBR to analyze hypotheses based on evidence retrieved from the Internet, by associating search criteria with elementary hypotheses, invoking various search engines (such as Google, Yahoo!, or Bing), identifying relevant information, extracting evidence from it, and using the evidence to evaluate the hypotheses

OPERATION 1: ASSOCIATE SEARCH CRITERIA WITH HYPOTHESIS

1. Start Disciple-EBR, select the case study knowledge base "03-Evidence-Search/Scen,"

2.This case study concerns the hypothesis that the United States will be a global leader in wind power within the next decade.

3.In the Evidence workspace, click on the Evidence menu and then click on [COLLECTION GUIDANCE]

4.The left panel shows the leaf hypotheses and their evidential support In the left panel, select a hypothesis.

5.In the right panel, after Search criterion, click on [NEW] to define a new criterion.

6.Type the search criterion and click on [SAVE].

7.You may define additional criteria by repeating the preceding two steps.

8.Select one of the search criteria by clicking on it.

9.After Search with, click on one of the available search engines (i.e., [BING], [GOOGLE], [YAHOO]) to search the Internet with the selected criterion.

10.Browse the documents returned by the search engine, select the relevant ones, and define items of evidence based on them

Defining an item of evidence.

RESULT:

Thus analysed the evidence that access from the internet that related to the hypothesis using Disciple-EBR.

EX.NO:3

PERFORM OPERATIONS ON PROBABILITY BASED REASONING

AIM:

To perform a scenario about a probability of success for the new smartphone launch using probability based reasoning.

PROCEDURE:

Evidence-Based Reasoning involves making decisions or drawing conclusions based on available evidence

Steps for Evidence-Based Reasoning:

1. **Gather Relevant Evidence:**
   - Identify the available information or evidence related to the problem or decision.
   - Consider both qualitative and quantitative data.
2. **Evaluate the Credibility of Evidence:**
   - Assess the reliability and credibility of each piece of evidence.
   - Consider the source, context, and potential biases.
3. **Weighting the Evidence:**
   - Assign weights or importance to different pieces of evidence based on their relevance and reliability.
   - Some evidence may carry more significance than others.
4. **Combine Evidence:**
   - Use a systematic approach to combine different pieces of evidence.
   - Consider methodologies like Bayesian reasoning or Dempster-Shafer theory for combining evidence.
5. **Analyze Uncertainty:**
   - Acknowledge and analyze uncertainties associated with each piece of evidence.
   - Consider the impact of uncertainties on the overall conclusion.
6. **Formulate Hypotheses:**
   - Develop hypotheses or potential conclusions based on the combined evidence.
   - Ensure that hypotheses are consistent with the available information.

7. **Iterative Refinement:**
    - If needed, iteratively refine hypotheses based on additional evidence or feedback.
    - Update conclusions as more information becomes available.
8. **Documentation:**
    - Document the entire process, including the evidence considered, weights assigned, reasoning steps, and final conclusions.
    - This documentation is crucial for transparency and reproducibility

Scenario: A company is planning to launch a new smartphone, and an intelligent agent is tasked with evaluating the probability of the product's success. The agent considers evidence from market research, social media sentiment analysis, competitor analysis, and expert opinions.

I. EVIDENCE SOURCES

1. Market Research (MR):
    - Positive findings: High demand for smartphones with specific features.
    - Negative findings: Intense competition in the market.
    - Weight: High (0.8)
2. Social Media Sentiment Analysis (SMSA):
    - Positive sentiment: Positive discussions about the product on social media.
    - Negative sentiment: Negative reviews and concerns.
    - Weight: Medium (0.6)
3. Competitor Analysis (CA):
    - Positive findings: Competitors facing challenges or gaps in their product offerings.
    - Negative findings: Strong competition with innovative products.
    - Weight: Medium (0.5)
4. Expert Opinions (EO):
    - Positive opinions: Industry experts expressing confidence in the product.
    - Negative opinions: Concerns raised by experts about potential challenges.
    - Weight: High (0.7)

II. BAYESIAN APPROACH

1. Assign Weights:
    - MR Weight: 0.8, SMSA Weight: 0.6, CA Weight: 0.5, EO Weight: 0.7
2. Prior Probability:
    - Estimate an initial probability based on prior knowledge (e.g., 0.4 for a competitive market).
3. Update Probabilities:
    - Use Bayes' Theorem to update the probabilities based on the evidence.
4. For MR:
   (Success/MR)=P(MR/Success)×P(Success)+P(MR/Failure)×P(Failure)P(MR/Success)× P(Success)
    - Similar calculations for SMSA, CA, and EO.
5. Combine Probabilities:
    - Combine the updated probabilities from each source using weighted averaging.

P(FinalSuccess)=(P(Success/MR)×MRWeight)+(P(Success/SMSA)×SMSAWeight)+(P(Success/CA)×CAWeight)+(P(Success/EO)×EOWeight)

6. Hypothesis:
    - Based on the combined evidence, the agent may conclude the likelihood of the product launch being successful.

RESULT:

Thus after performing the Bayesian calculations, suppose the agent determines that P(FinalSuccess) is 0.65 (65%). The agent might then conclude that there is a relatively high probability of success for the new smartphone launch, considering the combined evidence from various sources.

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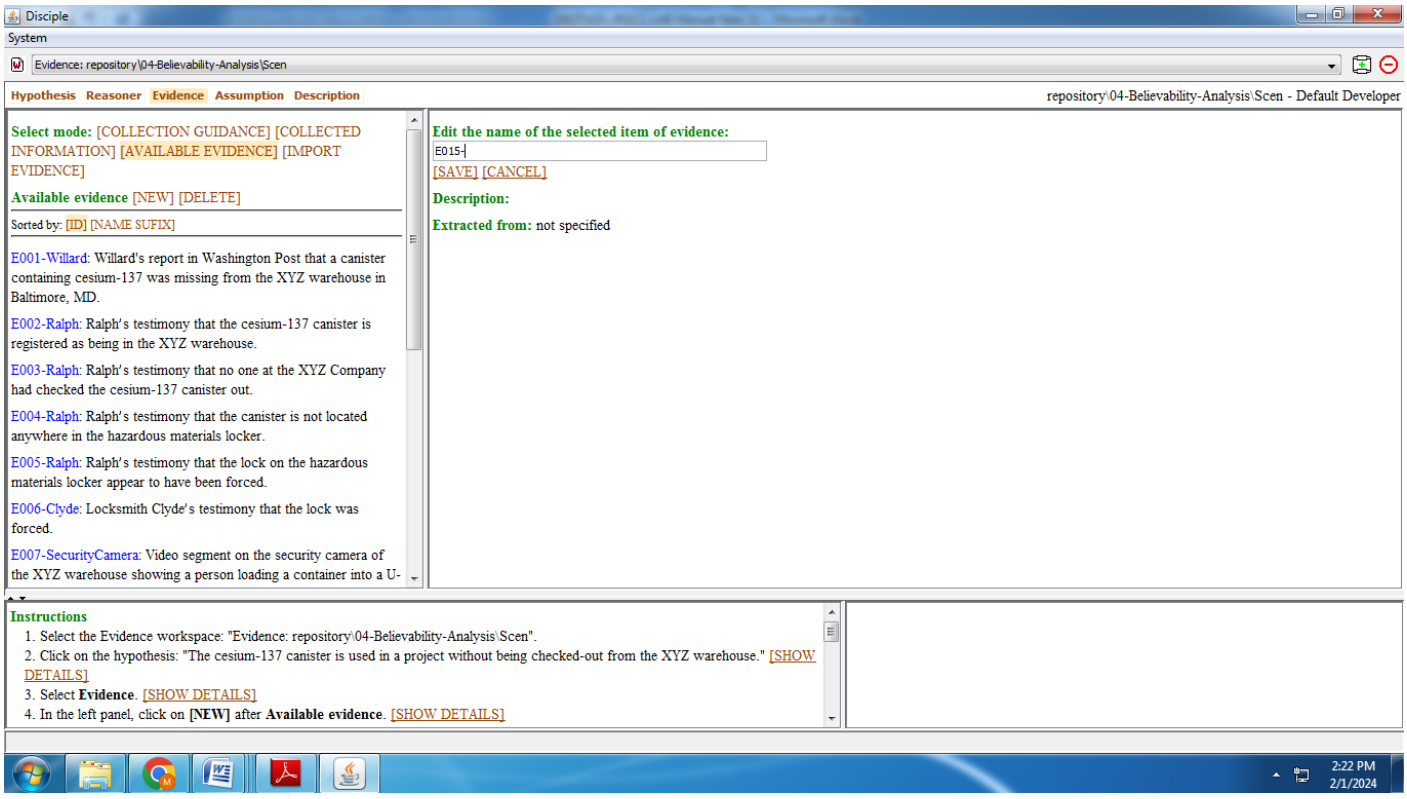
EX.NO:4	PERFORM BELIEVABILITY ANALYSIS

AIM:

To learn how to define a more detail representation of an item of evidence and better understanding the process of believability analysis

PROCEDURE:

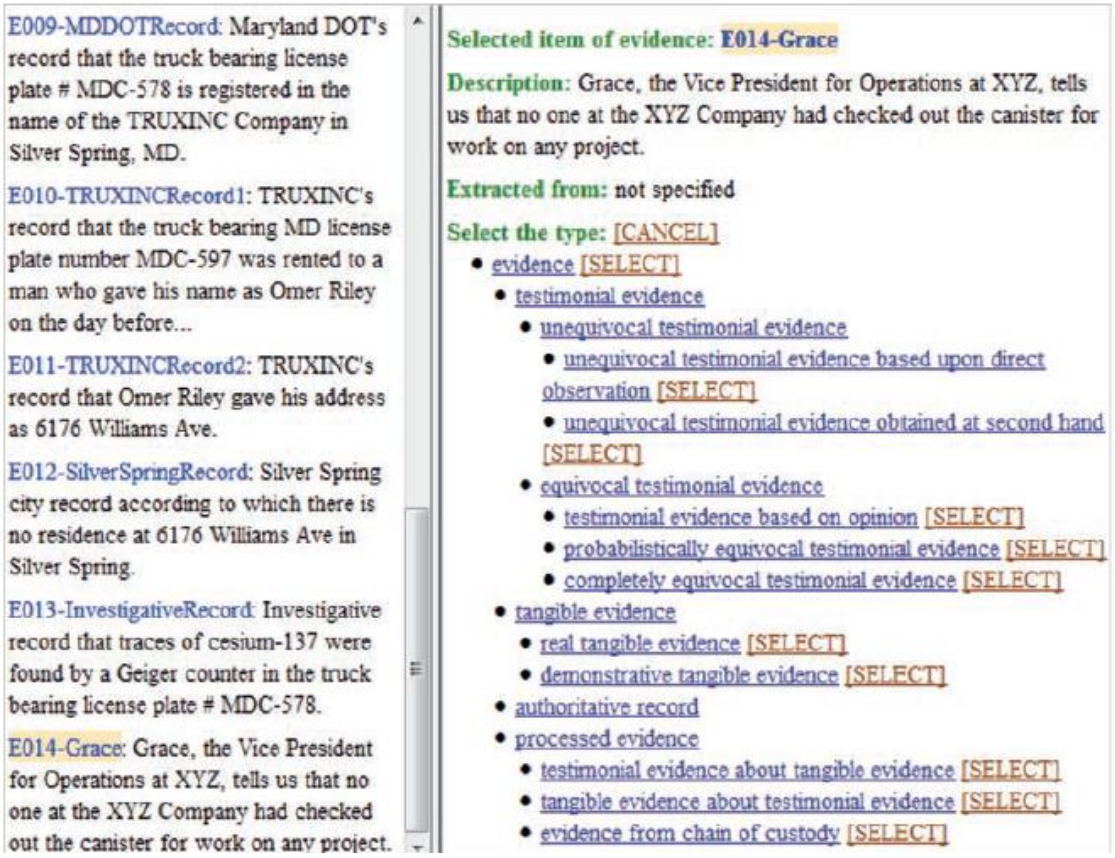
1. Start Disciple-EBR, select the case study knowledge base "04-Believability-Analysis/Scen,"continues the analysis of the hypothesis, "**The cesium-137 canister is used in a project without being checked-out from the XYZ warehouse**"
2. In the Evidence workspace, click on the Evidence menu at the top of the window.
3. Notice the four modes of operations from the top part of the left panel. Because the selected one is [AVAILABLE EVIDENCE], the left panel shows the current evidence (if any) from the knowledge base.



4. In the left panel, click on [NEW]. The right panel now shows a partially defined item of evidence, such as E002-. You will complete the definition of this item of evidence.

5. Complete the name E. . .- at the top of the right panel and click on [SAVE].

6. Click on [EDIT] for Description, click inside the pane and type the description of the item of evidence.Click on [SAVE].
7. You may now provide additional information about the item of evidence (as indicated in the following steps) or define additional items of evidence (by repeating the preceding steps).
8. After "Type: evidence," click on [CHANGE] to specify the type of this item of evidence.



9. Inspect the different evidence types and click on [SELECT] following the type corresponding to the current item of evidence. Provide the additional, type-related information, requested by the system (e.g., the source in the case of a testimonial item of evidence).

More detailed believability analysis

RESULT:

Thus Reduced the hypothesis to simpler hypothesis based on the evidence and evaluated its believability by assessing its credentials.

EX.NO:5	**IMPLEMENT RULE LEARNING AND REFINEMENT**

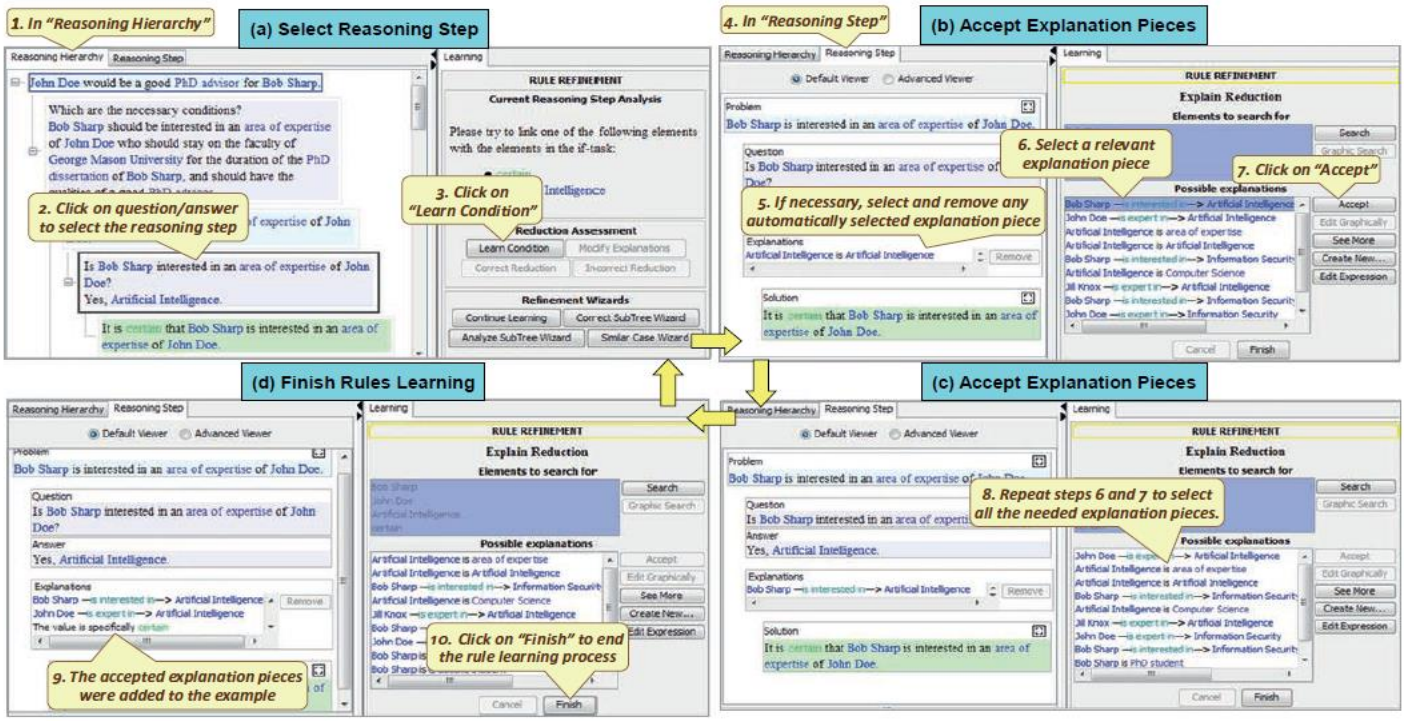
AIM:

To perform Disciple-EBR to invoke rule learning and refinement module to interact with agent to find the explanation of the example hypothesis

PROCEDURE:

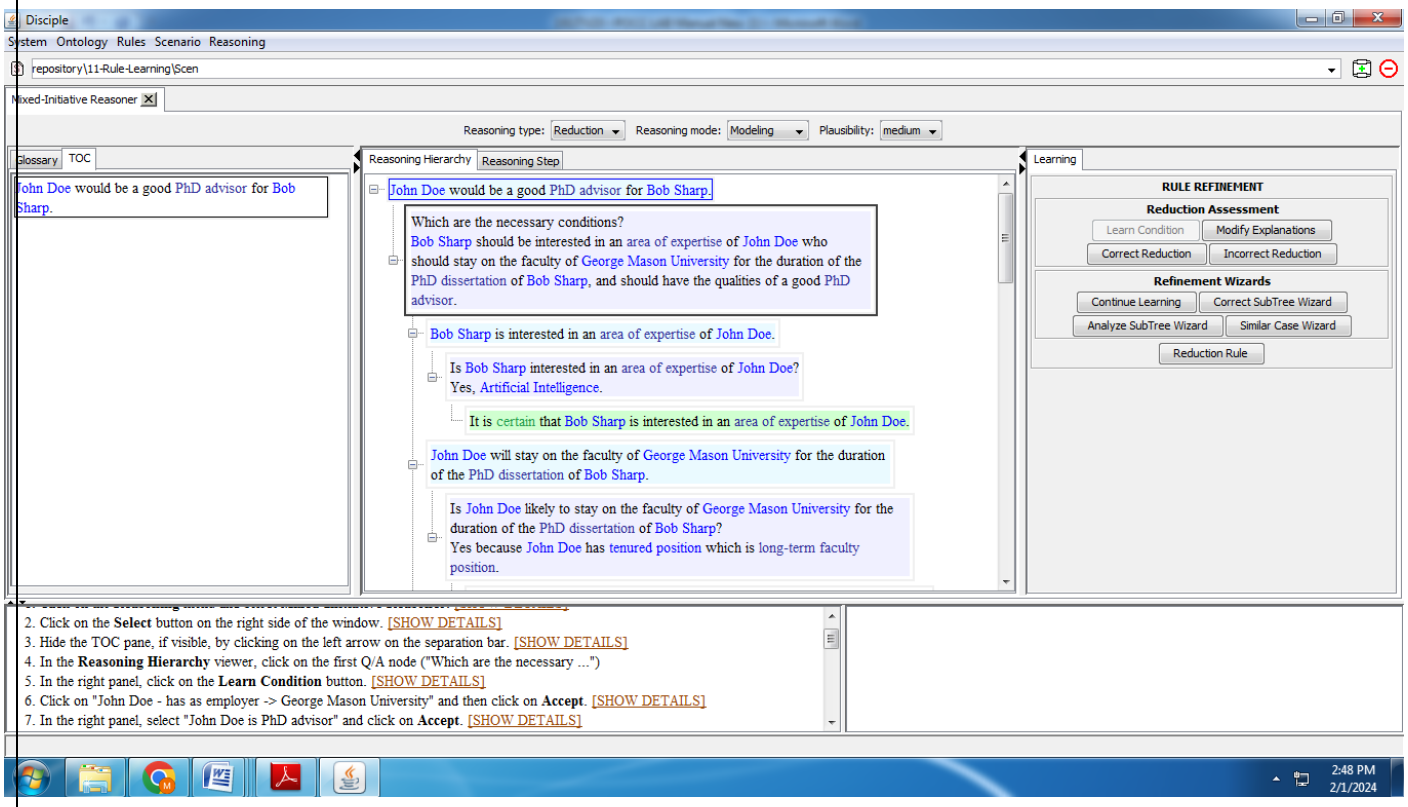
OPERATION 1: LEARN RULE

1. Start Disciple-EBR, select one of the case study knowledge bases (either “11-Rule-Learningshort/Scen” or “11-Rule-Learning/Scen”), and proceed as indicated in the instructions at the bottom of the opened window.
2. Click on the **Reasoning** menu and select **Mixed-Initiative Reasoner**.
3. Click on the **Select** button on the right side of the window.
4. Hide the TOC pane, if visible, by clicking on the left arrow on the separation bar.
5. In the **Reasoning Hierarchy** viewer, click on the first Q/A node ("Which are the necessary ...")
6. In the right panel, click on the **Learn Condition** button. Click on "John Doe - has as employer -> George Mason University" and then click on **Accept**.
7. In the right panel, select "John Doe is PhD advisor" and click on **Accept**.
8. At the top of the right panel, click on "John Doe" and "George Mason University" to deselect them. Then click on **Search**
9. Click on "Bob Sharp is person" and then click on **Accept**. At the bottom of the right panel, click on the **Finish** button. Continue with selecting another reasoning step and learning the corresponding rule.



OPERATION 2: DISPLAY A LEARNED RULE WITH THE RULE VIEWER

1. In the Scenario workspace, in the Reasoning Hierarchy viewer select a reasoning step for which a rule has already been learned by clicking on the corresponding Q/A node.



2. At the bottom of the right panel, click on the Reduction Rule button, to see the learned rule.

3. Click on the X button with red background in the upper right corner of the Rule Viewer to close it.

II. RULE REFINEMENT:

Start Disciple-EBR, select the case study knowledge base (either "13-Rule-Refinementshort/ Scen" or "13-Rule Refinement/Scen"), and proceed as indicated in the instruction at the bottom of the opened window. The following are the basic operations for rule refinement, as well as additional operations that are useful for knowledge base refinement, such as changing a generated reasoning step into a modeling step, visualizing a rule with the Rule Editor, and deleting a rule.

PROCEDURE:

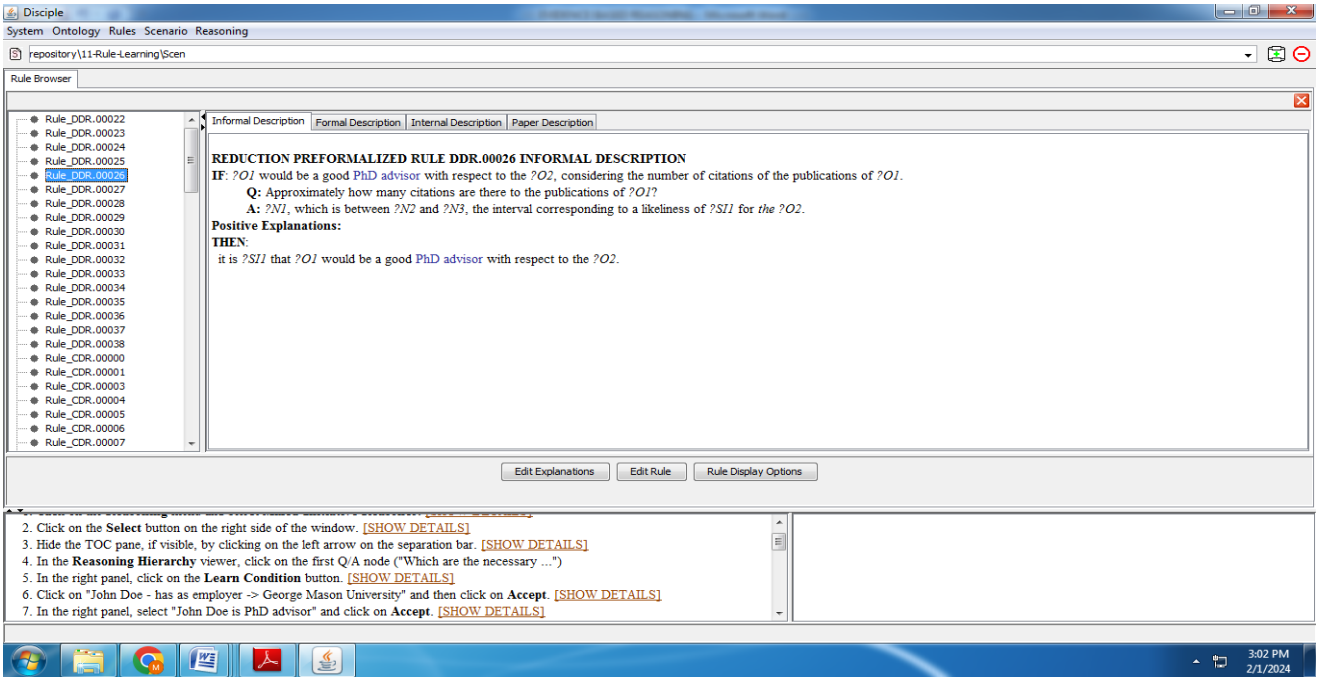
OPERATION 1: REFINE RULE WITH POSITIVE AND NEGATIVE EXAMPLE

1. Select the Evidence workspace: "Evidence: repository\13-Rule-Refinement\Scen" .Click on **[NEW]**.
2. Click on the pattern to instantiate: "?O1 would be a good PhD advisor for ?O2."
3. Click on the first "..." and select "Dan Smith". Click on the next "..." and select "Bob Sharp", Click on **[CREATE]**.
4. Select the Scenario workspace "repository\13-Rule-Refinement\Scen"
5. Click on the **Reasoning** menu and select **Mixed-Initiative Reasoner**. on the hypothesis "Dan Smith would be a good PhD advisor for Bob Sharp." Click on the **Select** button on the right side of the window.
6. Hide the TOC pane, if visible, by clicking on the left arrow on the separation bar. Click on the first Q/A node in the **Reasoning Hierarchy** viewer ("Which are the necessary ...")
7. At the bottom of the right panel, click on the **Reduction Rule** button, to see the applied rule. Click on the X button with red background in the upper right corner of the **Rule Viewer** to close it.
8. Click on the next Q/A node: "Is Bob Sharp interested in an area ..." . At the bottom of the right panel, click on the **Reduction Rule** button, to see the applied rule. Click on the X button with red background in the upper right corner of the **Rule Viewer** to close it.
9. In the right panel, click on the **Correct Reduction** button.

10. At the bottom of the right panel, click on the **Reduction Rule** button, to see the generalized rule.
11. Click on the X button with red background in the upper right corner of the **Rule Viewer** to close it.
12. Click on the next Q/A node: "Is Dan Smith likely to stay ..." . At the bottom of the right panel, click on the **Reduction Rule** button, to see the applied rule.
13. Click on the X button with red background in the upper right corner of the **Rule Viewer** to close it.
14. In the right panel, click on the **Incorrect Reduction** button. In the right panel, click on the **OK** button.
15. Click on "Dan Smith - plans to retire from -> George Mason University" and then click on **Accept**. At the bottom of the right panel, click on the **Finish** button.

OPERATION 2: VIEW A RULE WITH THE RULE BROWSER

1. Select the Scenario workspace.
2. Click on the Rules menu and select Rule Browser.
3. The left pane displays the names of the rules.
4. Click on one of these rules (e.g., DDR.00018) and the right pane displays its description in a given format (e.g., “Formal Description”) when you select it in the corresponding tab.



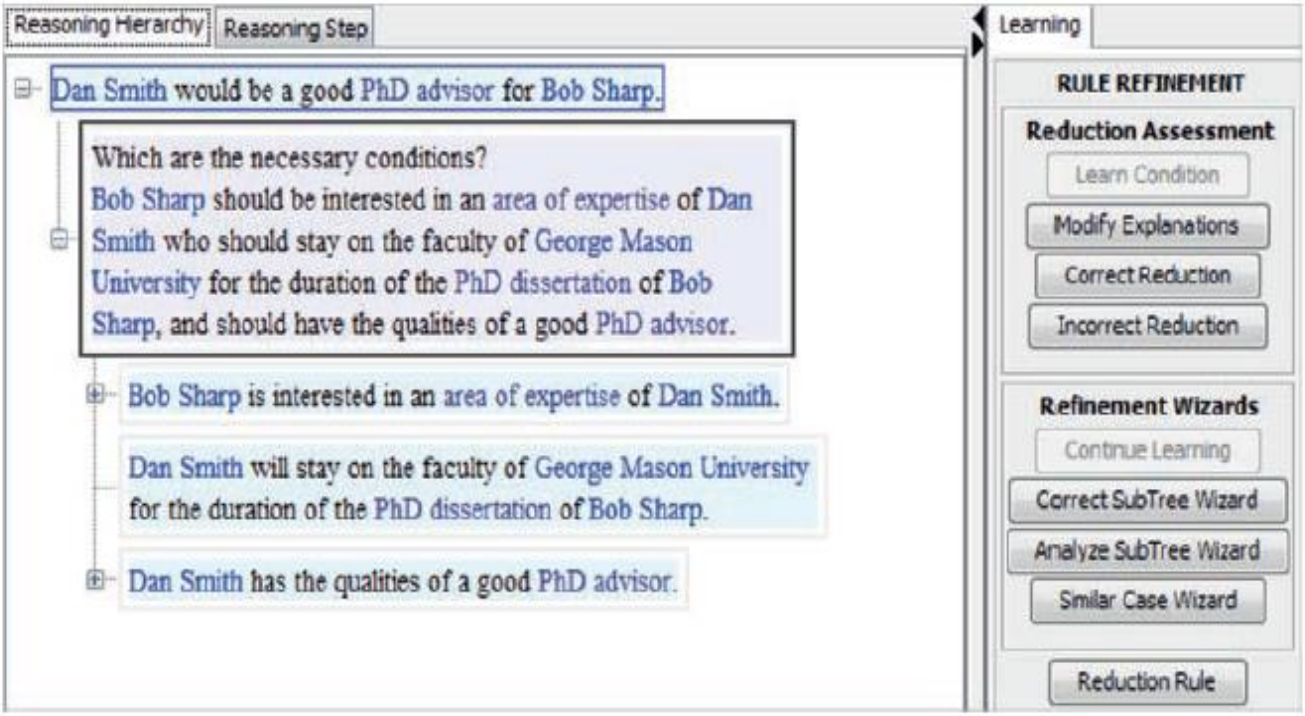
5. Generally, you would first find the name of a rule of interest from a reasoning tree (e.g.,DDR.00018) and then you can view or delete it with theRule Browser.
6. Click on the X button of the Rule Browser, to close it

OPERATION 3: DELETE A RULE WITH THE RULE BROWSER

Generally, you would first find the name of the rule to be deleted (e.g., DDR.00018) by inspecting the reasoning tree, as described in Operation 9.3.

1. In the Scenario workspace, click on the Rules menu and select Rule Browser.
2. The left pane displays the names of the rules.
3. Click on the name of the rule to be deleted (e.g., DDR.00018), and the right pane displays its description in a given format (e.g., “Formal Description”) when you select it in the corresponding tab.
4. At the bottom of the right pane, click on the Edit Rule button. As a result, new options are displayed.
5. At the bottom of the right pane, click on the Delete Rule button.
6. Click on the X button of the Rule Browser to close it

Rule refinement with a selected example



RESULT:

Thus after implementing rule learning and refinement it is conclude When the ontology is changed, the hypotheses can be automatically regenerated based on the associated generalized examples. They are actually regenerated when the corresponding rules are regenerated

EX.NO:6	PERFORM ANALYSIS BASED ON LEARNED PATTERNS

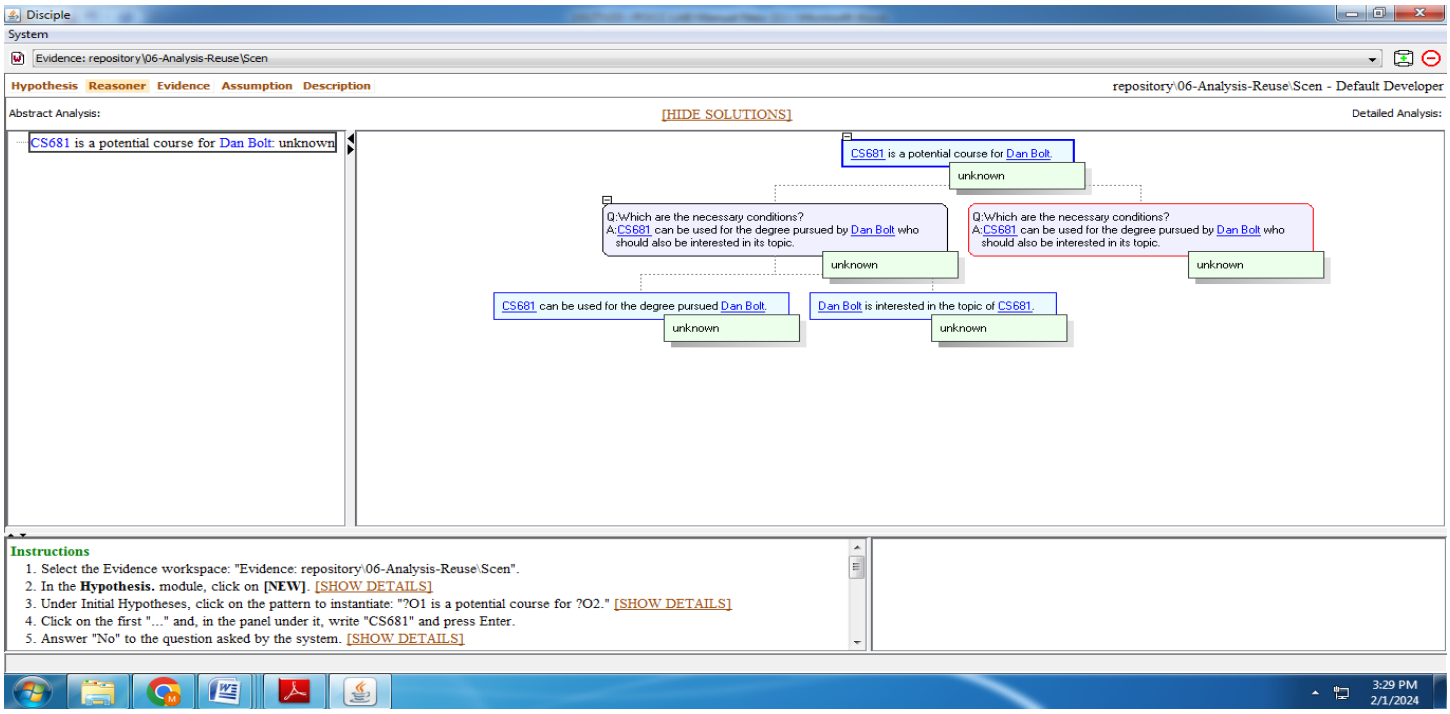
AIM:

To learn how to use Disciple-EBR to model the analysis of a hypothesis by reusing learned patterns

PROCEDURE:

You will first define the hypothesis by selecting an existing pattern and instantiating it to:"CS681 is a potential course for Dan Bolt." Then you will successively reduce it to simpler hypotheses by reusing learned patterns. This will include the instantiation of variables from the learned patterns. Start Disciple-EBR, select the case study knowledge base "06-Analysis-Reuse/Scen" and proceed as indicated in the instructions from the bottom of the opened window. This case study illustrates several important operations described in the following

1. Select the Evidence workspace: "Evidence: repository\06-Analysis-Reuse\Scen".
2. In the **Hypothesis.** module, click on **[NEW]**.
3. Under Initial Hypotheses, click on the pattern to instantiate: "?O1 is a potential course for ?O2."
4. Click on the first "..." and, in the panel under it, write "CS681" and press Enter. Answer "No" to the question asked by the system.
5. Click on the next "..." and, in the panel under it, write "Dan Bolt" and press Enter. Answer "No" to the question asked by the system. Click on **[CREATE]**.
6. Hide the left panel, if visible, by clicking on the left pointing arrow on the separation bar.
7. Right-click on the hypothesis and select "Generate suggestions".



8. Right-click on the Q/A box of the learned pattern and select "Accept Suggestion".
9. Right-click on the left-most leaf hypothesis and select "Generate Suggestions".
10. Click on "[O3]" and select "MSCS degree" from the list displayed by the system.
11. Click on "[SI1]" inside the left-most leaf hypothesis and select a specific probability (e.g. "very likely").
12. Right-click on the corresponding Q/A and select "Accept Suggestion" to use the instantiated pattern.
13. Right-click on the right-most leaf hypothesis "Dan Bolt is interested..." and select "New Assumption".
14. From the **System** menu select **Save All** to save the knowledge base. Close all the workspaces open on the current knowledge base (case study). Close the knowledge base

RESULT:

Understand how the solution composition functions from the employed patterns are automatically applied and successively reduce hypotheses to simpler hypothesis by reusing learned patterns

EX.NO:7

CONSTRUCTION OF ONTOLOGY FOR A GIVEN DOMAIN

AIM:

To construct an ontology for a given domain using knowledge engineering techniques, aiming to represent the domain's concepts, entities, relationships, and properties in a structured and formalized manner.

STEPS TO CONSTRUCT AN ONTOLOGY:

1. Identify Domain:

- Begin by selecting a specific domain or subject area for which the ontology will be constructed. This could be any field of knowledge, such as medicine, finance, or manufacturing.

2. Gather Knowledge:

- Utilize various sources to collect relevant information and data pertaining to the chosen domain. Sources may include academic literature, textbooks, domain-specific databases, and expert opinions.
- Employ techniques like literature review, interviews with domain experts, and data mining to gather comprehensive knowledge about the domain.

3. Conceptualization:

- Define the key concepts and entities within the domain. This involves identifying the fundamental building blocks of knowledge relevant to the domain.
- Use domain analysis techniques to decompose complex concepts into simpler ones and to identify their interrelationships.

4. Relationship Establishment:

- Determine the relationships that exist between the identified concepts and entities. Relationships may include "is-a," "part-of," "causes," "treats," "precedes," etc.
- Establish both hierarchical (taxonomy) and non-hierarchical (associative) relationships between concepts.

5. Hierarchical Structuring:

- Organize the identified concepts and entities into a hierarchical structure, if applicable. This hierarchical structure provides a framework for understanding the domain's knowledge in a systematic manner.
- Employ techniques such as concept clustering and subsumption to organize concepts into meaningful categories and subcategories.

6. Define Properties:

- Specify the properties or attributes associated with each concept or entity. Properties describe the characteristics or qualities of concepts and entities within the domain.
- Identify both intrinsic properties (inherent to the concept) and relational properties (properties that describe relationships between concepts).

7. Formalization:

- Express the ontology using a formal ontology language such as OWL (Web Ontology Language) or RDF (Resource Description Framework).
- Define classes, subclasses, properties, relationships, and constraints using the syntax and semantics of the chosen ontology language.

8. Validation and Evaluation:

- Validate the constructed ontology against domain experts and relevant stakeholders to ensure its accuracy, completeness, and relevance.
- Evaluate the ontology's effectiveness in representing the domain knowledge, facilitating knowledge sharing, and supporting various applications within the domain.

9. Documentation:

- Document the constructed ontology comprehensively, including its purpose, scope, structure, and usage guidelines.
- Provide detailed documentation on the ontology's classes, properties, relationships, and constraints to facilitate its understanding and reuse by others.

EXAMPLE: MEDICAL DOMAIN

1. Identify Domain:

- Select the medical domain for ontology construction, focusing on areas such as disease diagnosis, treatment, and medical procedures.

2. Gather Knowledge:

- Collect a wide range of medical literature, textbooks, clinical guidelines, electronic health records (EHRs), medical databases, and expert consultations.
- Use techniques such as literature review, interviews with healthcare professionals, and data extraction from medical records to gather comprehensive knowledge about medical concepts and practices.

3. Conceptualization:

- Define key medical concepts such as diseases, symptoms, diagnoses, treatments, medications, anatomical structures, and medical procedures.
- Decompose complex medical concepts into simpler ones and identify their relationships based on medical ontology standards and guidelines.

4. Relationship Establishment:

- Determine relationships such as "is-a" (taxonomy), "part-of," "causes," "treats," "precedes," "located-in," etc., between medical concepts and entities.
- Establish hierarchical relationships between medical concepts to represent taxonomic structures (e.g., diseases categorized into classes and subclasses).

5. Hierarchical Structuring:

- Organize medical concepts into a hierarchical structure based on their taxonomic relationships and semantic similarities.
- Utilize medical classification systems (e.g., International Classification of Diseases, Clinical Terminology Systems) to structure medical concepts into meaningful categories and subcategories.

6. Define Properties:

- Specify properties or attributes associated with medical concepts and entities, such as disease severity, symptom duration, treatment efficacy, medication dosage, etc.
- Define both intrinsic properties (e.g., disease symptoms, treatment indications) and relational properties (e.g., drug interactions, anatomical relationships).

7. Formalization:

- Express the medical ontology using a formal ontology language like OWL or RDF, adhering to medical ontology standards and guidelines (e.g., OBO Foundry principles).
- Define classes, subclasses, properties, relationships, and constraints using the syntax and semantics of the chosen ontology language.

8. Validation and Evaluation:

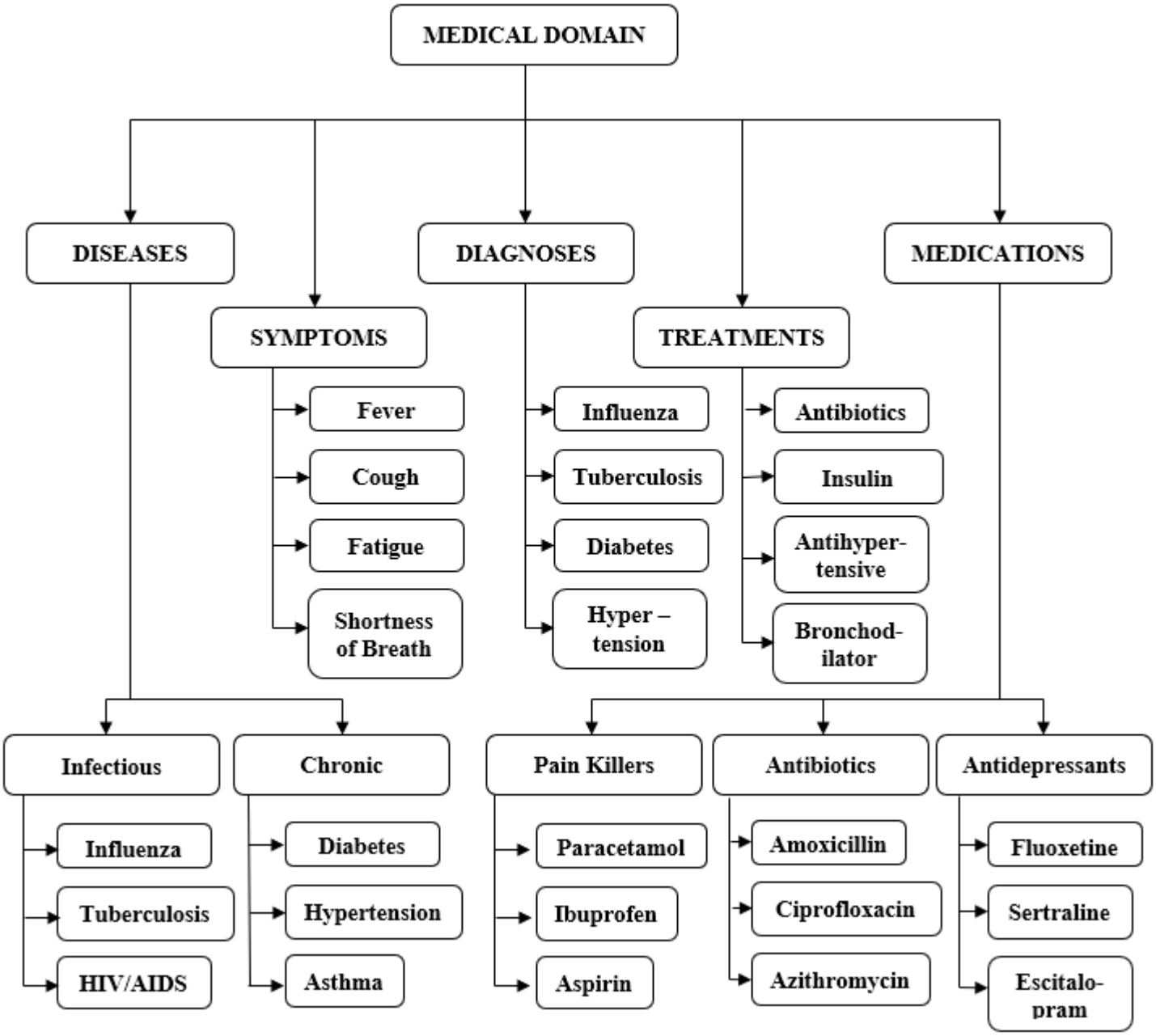
- Validate the medical ontology with domain experts, healthcare professionals, and medical informaticians to ensure its accuracy, completeness, and clinical relevance.
- Evaluate the ontology's utility in supporting medical knowledge representation, decision support, interoperability, and semantic integration across healthcare systems.

9. Documentation:

- Document the medical ontology comprehensively, including its purpose, scope, domain coverage, structure, and usage guidelines.
- Provide detailed documentation on medical classes, properties, relationships, and constraints to facilitate its understanding, adoption, and reuse by healthcare practitioners, researchers, and system developers.

ONTOLOGY DIAGRAM:

Below is an example ontology diagram for the medical domain, illustrating hierarchical relationships between medical concepts:



This diagram showcases a hierarchical structure within the medical domain, with diseases categorized into infectious and chronic diseases, symptoms associated with diseases, diagnoses resulting from symptoms, treatments for diagnosed conditions, and medications used in treatments.

Result:

Thus, the construct an ontology for a given domain using knowledge engineering techniques has been studied.