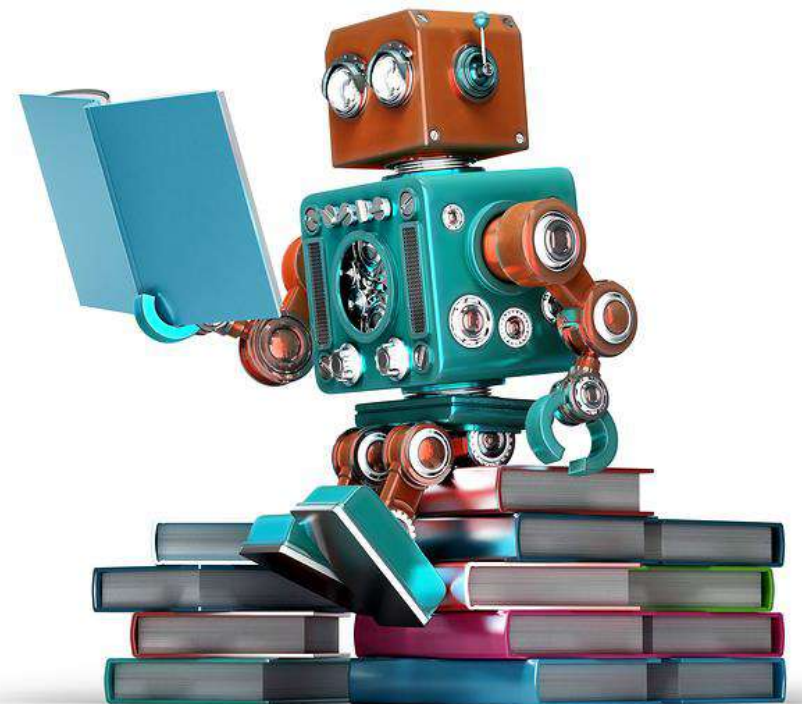


MACHINE REASONING

DAY 4



<https://robohub.org/wp-content/uploads/2016/11/bigstock-Retro-Robot-Reading-A-Book-Is-110707406.jpg>

DAY 4 AGENDA

4.1 Contemporary Reasoning Systems

4.2 Course Review

4.3 { Course **Assessment 2** }

4.4 Creating Reasoning System **Workshop**
(Graded workshop & project deliverables)

DAY 4 TIMETABLE

No	Time	Topic	By Whom	Where
1	9 am	4.1 Contemporary Reasoning Systems	GU Zhan (Sam)	Class
2	10.10 am	Morning Break		
3	10.30 am	4.2 Course Review	GU Zhan (Sam)	Class
4	10:45 am	4.3 { Course Assessment 2 }	All	Class
5	12.10 pm	Lunch Break		
6	1.30 pm	4.4 Creating Reasoning System Workshop Tutorial	GU Zhan (Sam) All	Class
7	3.10 pm	Afternoon Break		
8	3.30 pm	4.4 Workshop: Creating Reasoning System	All	Class
9	4.50 pm	Summary and Review	All	Class
10	5 pm	End		

4.1

CONTEMPORARY REASONING SYSTEMS

4.1 CONTEMPORARY REASONING SYSTEMS

- Question Answering System: IBM Watson



4.1 CONTEMPORARY REASONING SYSTEMS

• Image Object Recognition: Google Vision


Labels

Web

Properties

Safe Search

JSON



SamShirt.jpg

Dog Like Mammal97%

Black95%

Dog93%

Vertebrate90%

Dog Breed90%

Scottish Terrier83%

Carnivoran80%

Puppy57%


Labels

Web

Properties

Safe Search

JSON



SamShirt_org.jpg

Red98%

Black95%

Pink94%

Sky59%

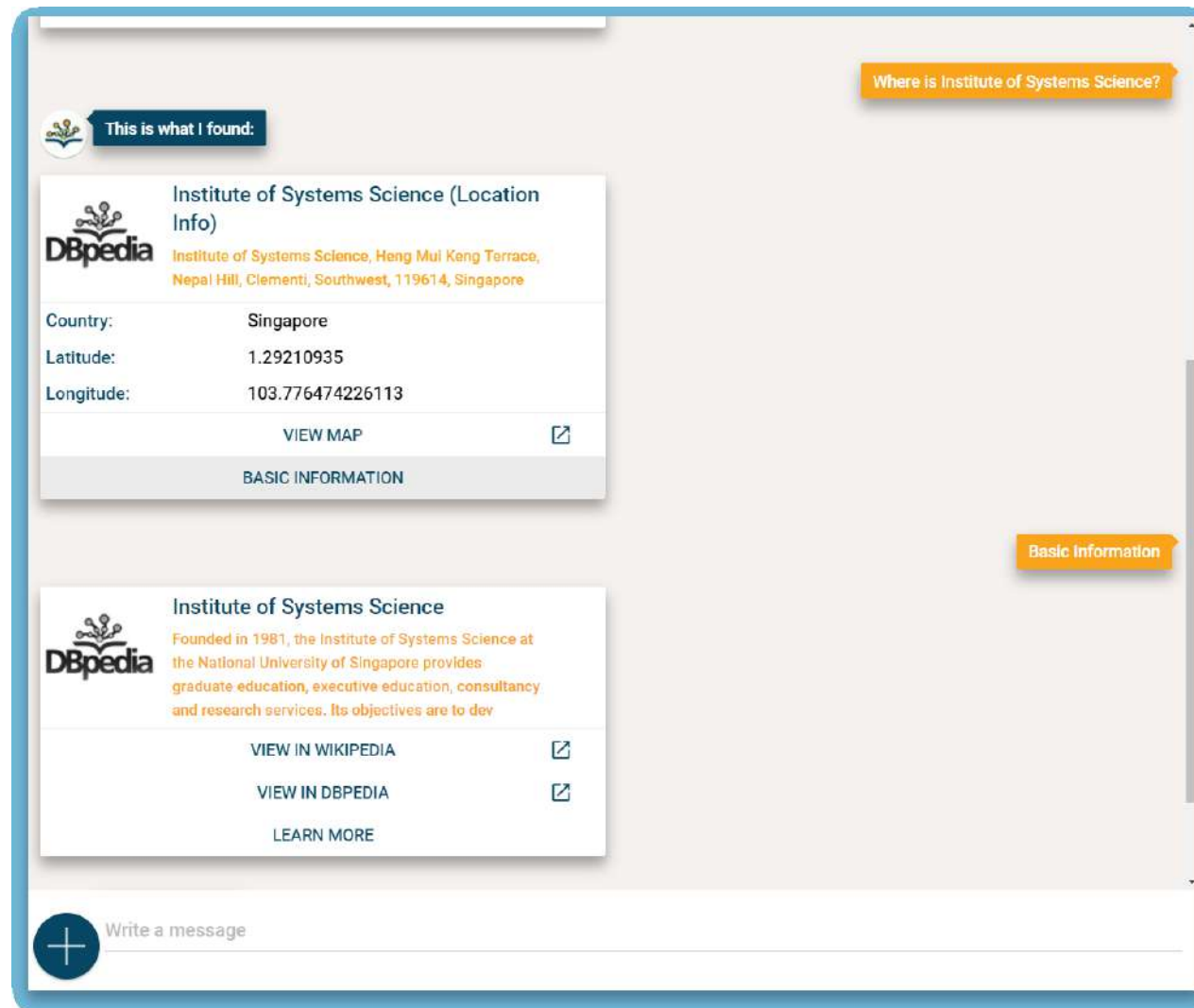
Font53%

Shadow50%

Magenta50%

4.1 CONTEMPORARY REASONING SYSTEMS

- Chat-Bot: DBpedia

A screenshot of the DBpedia chatbot interface. At the top right, an orange button asks "Where is Institute of Systems Science?". Below this, a dark blue button says "This is what I found:". The main content area shows two search results. The first result, titled "Institute of Systems Science (Location Info)", includes a DBpedia logo, the full name, address ("Institute of Systems Science, Heng Mui Keng Terrace, Nepal Hill, Clementi, Southwest, 119614, Singapore"), country ("Singapore"), latitude ("1.29210935"), and longitude ("103.776474226113"). It has a "VIEW MAP" button with an external link icon and a "BASIC INFORMATION" tab. The second result, titled "Institute of Systems Science", includes a DBpedia logo, the full name, and a description: "Founded in 1981, the Institute of Systems Science at the National University of Singapore provides graduate education, executive education, consultancy and research services. Its objectives are to dev". It has "VIEW IN WIKIPEDIA" and "VIEW IN DBPEDIA" buttons with external link icons, and a "LEARN MORE" button. At the bottom, there is a text input field with a plus icon and the placeholder "Write a message". On the right side of the interface, there are two orange tabs: "Where is Institute of Systems Science?" and "Basic Information".

4.1 CONTEMPORARY REASONING SYSTEMS

- **Vehicle Scheduling: Delivery routing**

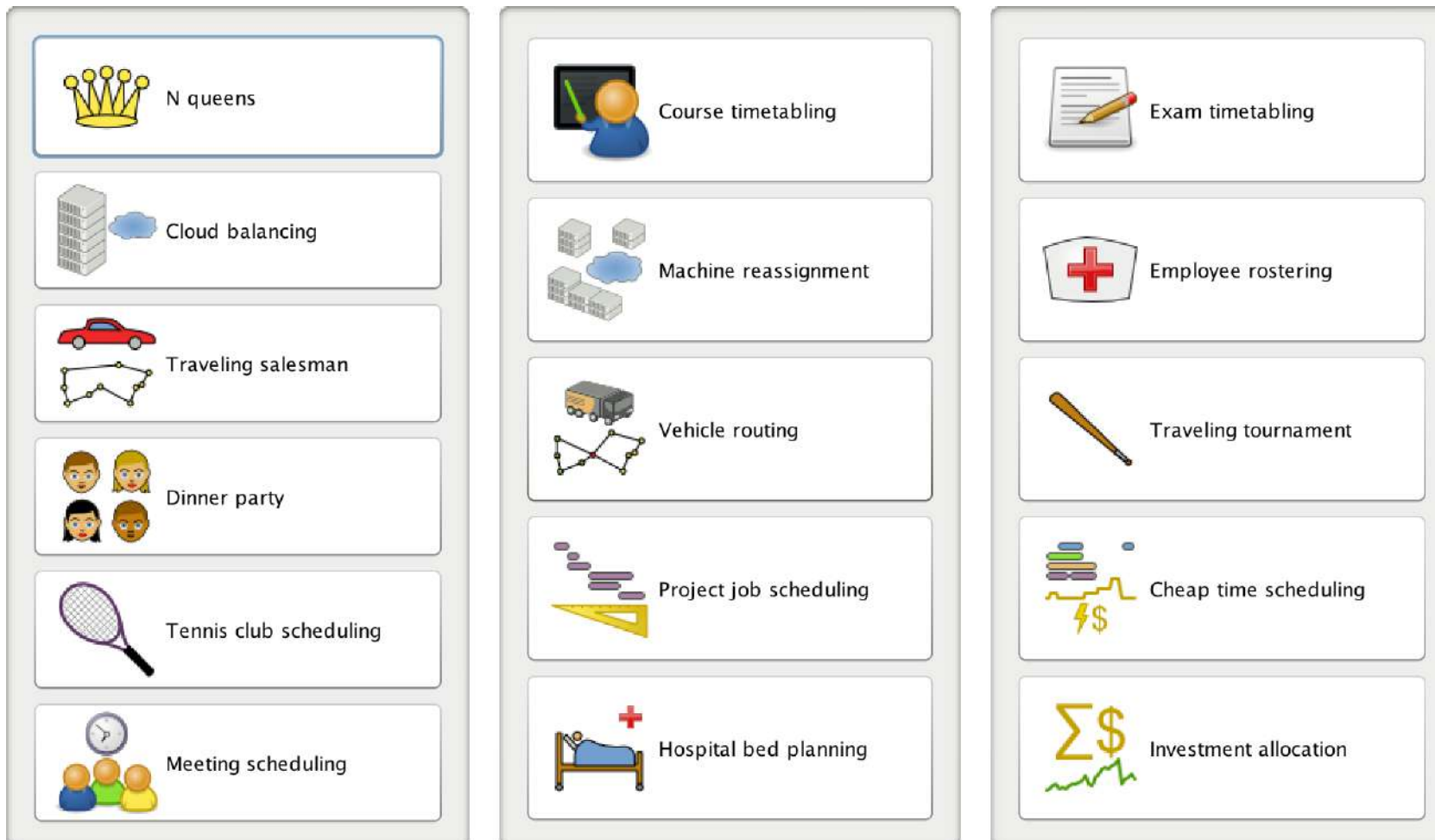


<https://routific.com/>

Routific Solutions

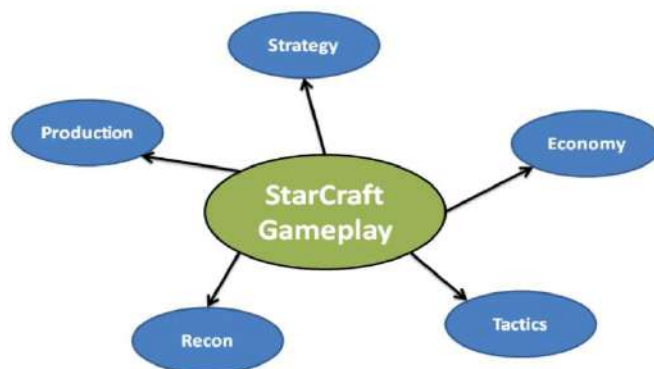
4.1 CONTEMPORARY REASONING SYSTEMS

• Constrain Satisfaction: Business Task Optimizer



4.1 CONTEMPORARY REASONING SYSTEMS

- Finite state machines
- Scripting
- Dynamic scripting
- Probabilistic inference
- Influence maps
- Neural networks
- Swarm intelligence
- Potential fields
- Genetic programming



Bot vs. Bot Results - (Row,Col) = Row Wins vs. Col

	Win %	IceBo	Ximp	LetaB	Alur	Skyne	Xelna	UALbe	MaasC	Moose	BTHAI	Terra	NUSBo	Nova	HITA	CruzB	BonJw	Onta	Yarmo
IceBot	85.86	-	61/67	42/67	30/67	39/67	28/67	62/67	64/67	65/67	67/67	67/67	67/67	55/67	63/67	67/67	67/67	67/67	67/67
Ximp	84.64	6/67	-	30/67	51/67	62/67	49/67	64/67	50/67	67/67	67/67	66/67	62/67	56/67	67/67	67/67	67/67	66/67	67/67
LetaBot	82.09	25/67	37/67	-	65/67	67/67	51/67	46/67	15/67	65/67	60/67	62/67	63/67	58/67	59/67	67/67	63/67	67/67	65/67
Alur	70.94	37/67	16/67	2/67	-	56/67	45/67	49/67	41/67	46/67	64/67	59/67	38/67	57/67	50/67	55/67	67/67	63/67	63/67
Skyne	68.74	28/67	5/67	0/67	11/67	-	44/67	31/67	63/67	66/67	67/67	67/67	15/67	51/67	67/67	67/67	67/67	67/67	67/67
Xelna	68.31	39/67	18/67	16/67	22/67	23/67	-	13/67	56/67	31/67	49/67	66/67	67/67	56/67	62/67	66/67	66/67	61/67	67/67
UALbertaBot	67.25	5/67	3/67	21/67	18/67	36/67	54/67	-	63/67	36/67	30/67	40/67	67/67	62/67	65/67	65/67	67/67	67/67	67/67
MaasCraft	59	3/67	17/67	52/67	26/67	4/67	11/67	4/67	-	32/67	33/67	55/67	60/67	52/67	67/67	62/67	67/67	60/67	67/67
MooseBot	50.13	2/67	0/67	2/67	21/67	1/67	36/67	31/67	35/67	-	15/67	27/67	65/67	35/67	66/67	50/67	53/67	65/67	67/67
BTHAI	46.8	0/67	0/67	7/67	3/67	0/67	18/67	37/67	34/67	52/67	-	33/67	38/67	47/67	65/67	34/67	35/67	64/67	66/67
TerranUAB	42.93	0/67	1/67	5/67	8/67	0/67	1/67	27/67	12/67	40/67	34/67	-	33/67	46/67	45/67	60/67	55/67	61/67	61/67
NUSBot	37.23	0/67	5/67	4/67	29/67	52/67	0/67	0/67	7/67	2/67	29/67	34/67	-	35/67	31/67	16/67	60/67	60/67	60/67
Nova	32.4	12/67	11/67	9/67	10/67	16/67	11/67	5/67	15/67	32/67	20/67	21/67	32/67	-	17/67	41/67	44/67	38/67	35/67
HITA	32.13	4/67	0/67	8/67	17/67	0/67	5/67	2/67	0/67	1/67	2/67	22/67	36/67	50/67	-	39/67	49/67	65/67	66/67
CruzBot	29.15	0/67	0/67	0/67	12/67	0/67	1/67	2/67	5/67	17/67	33/67	7/67	51/67	26/67	28/67	-	61/67	32/67	57/67
BonJwa	16.51	0/67	0/67	4/67	0/67	0/67	1/67	0/67	0/67	14/67	32/67	12/67	7/67	23/67	18/67	6/67	-	43/67	28/67
Oritaka	14.4	0/67	1/67	0/67	4/67	0/67	6/67	0/67	7/67	2/67	3/67	6/67	7/67	29/67	2/67	35/67	24/67	-	38/67
Yarmouk	11.5	0/67	0/67	2/67	4/67	0/67	0/67	0/67	0/67	0/67	1/67	6/67	7/67	32/67	1/67	10/67	39/67	29/67	-

4.2

COURSE REVIEW

4.2 COURSE REVIEW EXERCISE

- The following set of rules was designed to help a new zoo-keeper look after his animals:

IF feathers(x) THEN bird(x)

IF flies(x) AND lays_eggs(x) THEN bird(x)

IF gives_milk(x) THEN mammal(x)

IF eats_meat(x) THEN carnivore(x)

IF mamamal(x) AND sharp_teeth(x) THEN carnivore(x)

IF carnivore(x) THEN feed_meat(x)

IF bird(x) AND not_flies(x) THEN penguin(x)

IF penguin(x) THEN feed_fish(x)

IF carnivore(x) THEN dangerous(x)

- Initial facts:

sharp_teeth(Lucy), feathers(Penny), not_flies(Penny), gives_milk(Lucy), lays_eggs(Penny)

- Q3: What can be derived from the knowledge base by **forward chaining**? Explain your answer.
- Q4: How can **backward chaining** be used to determine which animals are known to be dangerous? Work through the details.

4.3

COURSE ASSESSMENT

(60 MINUTES)

ISY5001

Grad Cert in Intelligent Reasoning Systems (IRS-MR, IRS-RS, ...

[1920] 2019/2020 Semester 2

Owner

GENERAL

Module Overview

Module Settings

Module Details

Class & Groups

Attendance

Task Report

TOOLS

Announcements

Chat

Conferencing

Consultation

Files

Files > IRS-MR: Machine Reasoning

Search files

Folder Name	Opening Date	Expiry Date	Status
IRS-MR: Machine Reasoning Courseware			Open
IRS-MR: Machine Reasoning In-Class Workshop			Open
IRS-MR: Machine Reasoning In-Class Workshop Submission Submission			Open
IRS-MR: Machine Reasoning In-Class Assessment			Closed
IRS-MR: Machine Reasoning In-Class Assessment Submission			Open

Upload Files

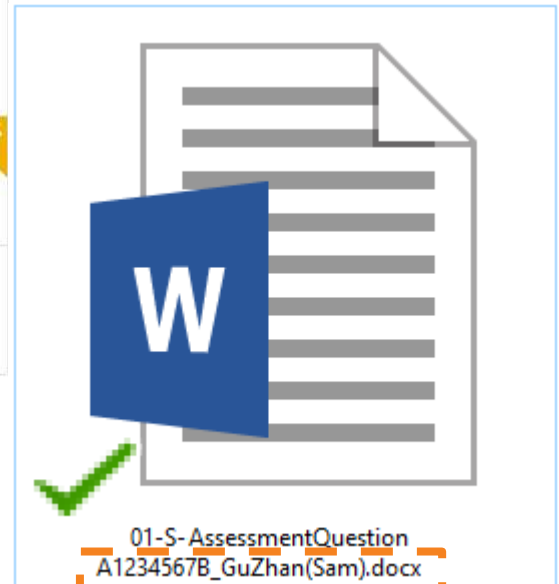
Rearrange

Create Folder

Folder Settings

Bulk Create Folders

Activity Report



Upload word, pdf or zip file to LumiNUS (one single file per participant)

4.4 WORKSHOP

CREATING REASONING SYSTEM

(GRADED WORKSHOP & PROJECT DELIVERABLES)

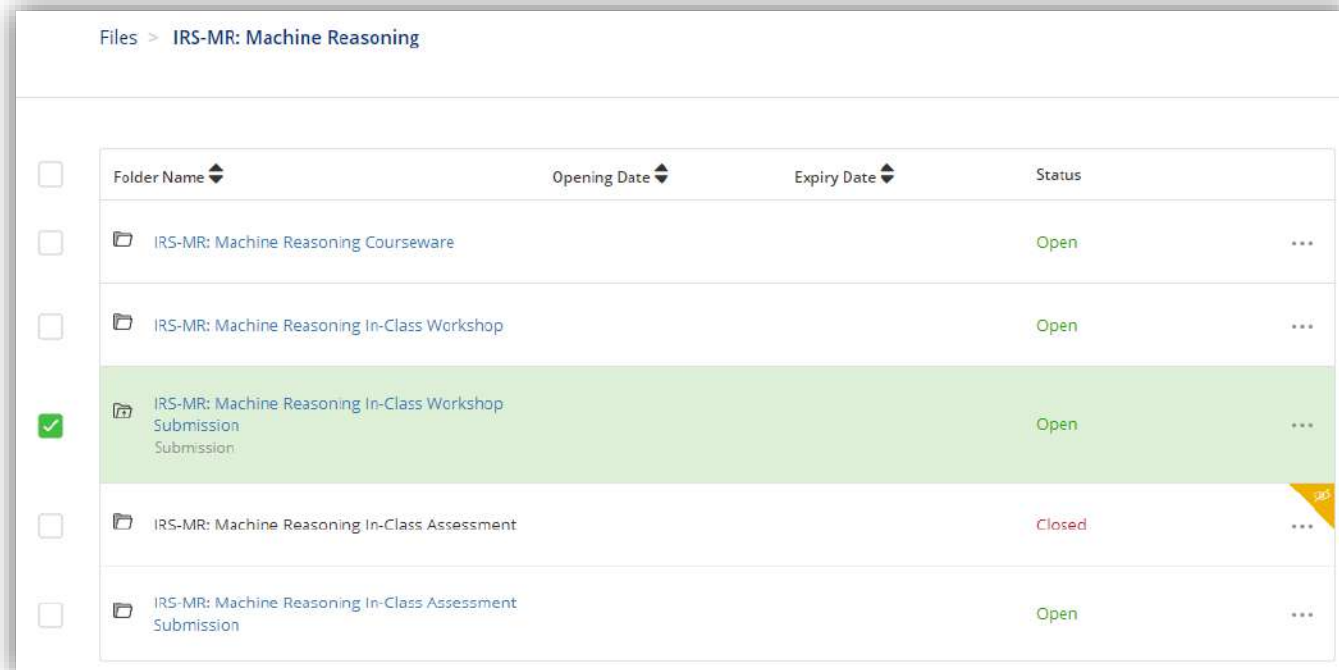
4.4 WORKSHOP CREATING REASONING SYSTEM

- **KIE BPMS/BRMS Business System Enhancement**
 - Access control [User/Group/Role]
 - Business system enhancement [Group]
 - Business system enhancement [Deploy] v7.0.0
 - Workshop project submission [Export/Import]

4.4 WORKSHOP CREATING REASONING SYSTEM

EEP & MTech Stackable

- **Individual Workshop Submission** due **16:30** last lecture day
- Prepare project deliverables, e.g. export enhanced system: ***Mortgage Approval***; Upload zip file to LumiNUS (one single file per participant);



Files >	IRS-MR: Machine Reasoning			
<input type="checkbox"/>	Folder Name ▾	Opening Date ▾	Expiry Date ▾	Status
<input type="checkbox"/>	IRS-MR: Machine Reasoning Courseware			Open ...
<input type="checkbox"/>	IRS-MR: Machine Reasoning In-Class Workshop			Open ...
<input checked="" type="checkbox"/>	IRS-MR: Machine Reasoning In-Class Workshop Submission			Open ...
<input type="checkbox"/>	IRS-MR: Machine Reasoning In-Class Assessment			Closed ...
<input type="checkbox"/>	IRS-MR: Machine Reasoning In-Class Assessment Submission			Open ...

4.1 Contemporary Reasoning Systems

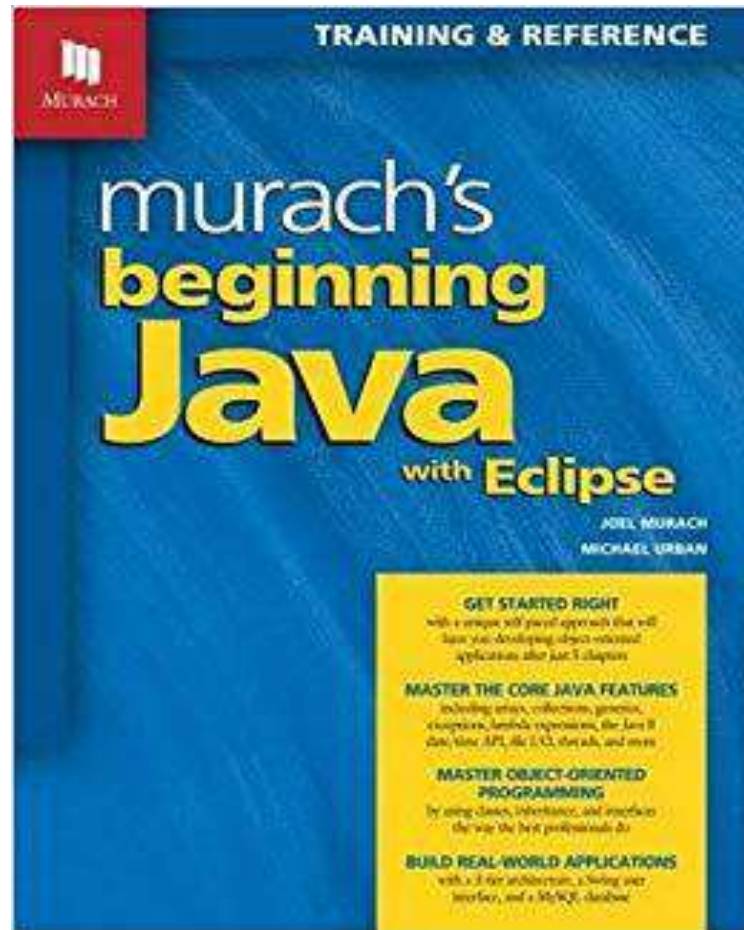
- Question & Answering
- Image Object Recognition
- Chat-Bot
- Business Resource Optimization
- Real Time Strategy (RTS) Game AI

4.2 Machine Reasoning Course Review

4.3 Machine Reasoning Assessment (Graded individual exam)

4.4 Creating Reasoning System Workshop

DAY 4 REFERENCE



1. CLIPS (C Language Integrated Production System) : A Tool for Building Expert Systems from NASA
<http://www.clipsrules.net/>
2. FuzzyCLIPS : A fuzzy logic extension of the CLIPS tool
<https://quentin.pradet.me/blog/fuzzyclips-downloads.html>
3. PyKnow: Expert Systems for Python (inspired by CLIPS)
<https://pyknow.readthedocs.io/en/stable/index.html>
4. Getting Started With Red Hat Business Optimizer (PAM / OptaPlanner)
https://access.redhat.com/documentation/en-us/red_hat_decision_manager/7.2/html-single/getting_started_with_red_hat_business_optimizer/
5. OptaPlanner constrain solver for business planning
<https://www.optaplanner.org/>

END OF LECTURE NOTES