



This Test has 116 attempts. For information on editing questions, click **More Help** below.



Test Canvas: COMP34212 Exam 2020/21

The Test Canvas lets you add, edit and reorder questions, as well as review a test. [More Help](#)

Question Settings

You can edit, delete or change the point values of test questions on this page. If necessary, test attempts will be remarked after you submit your changes.

Description	COMP34212 Exam Summer 2021
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Instructions	This is the COMP34212 online examination that will begin on 21 May 2021.
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	The exam consists of 15 Multiple Choice Questions (2 marks each) and of 3 Essay Questions (different marks for each essay question).
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	You have 2.5 hours to complete the test.
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Total Questions	18
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Total Points	70
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Number of Attempts	116
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Select: All None Select by Type: - Question Type - ▼

Delete and Remark


Points

Update and Remark

Hide Question Details

☐ 1. Multiple Choice: Android and Humanoid Robots: Choose the correct explanation descri...

Points: 2

Question	Choose the correct explanation describing the relationship between Android and Humanoid robots
Answer	<p>A. Android robots run on android middleware software, Humanoid robots run on other middleware software</p> <hr/> <p> B. Android robots are meant to be indistinguishable from humans, Humanoid robots are meant to be partially similar to humans</p> <hr/> <p>C. Android robots look like animals, Humanoid robots look like humans</p> <hr/> <p>D. Android robots look like humans, Humanoid robots look like animals</p>

☐ 2. Multiple Answer: NAO Robot.: What type of robot is the NAO?

Points: 2

Question	What type of robot is the NAO?
Answer	<p>The NAO is an android robot</p> <hr/> <p>The NAO is a soft robot</p>

☒ The NAO is a humanoid robot

The NAO is a swarm robot



Points: 2

3. Multiple Answer: Developmental robotics principle: Select the TWO answers which correspo...

Question	Select the TWO answers which correspond to two developmental robotics principles
Answer	<p><input checked="" type="checkbox"/> Dynamical system</p> <p><input checked="" type="checkbox"/> Non-linear stages</p> <p>Linear stages</p> <p>One-shot learning</p> <p>SLAM</p>



Points: 2

4. Multiple Answer: Cognitive Robotics and Intelligent Robotics: What is the difference between Cognit...

Question	What is the difference between Cognitive Robotics and Intelligent Robotics
Answer	<p>Cognitive robotics studies cognition, Intelligent robotics studies intelligence</p> <p>.....</p> <p>Cognitive robotics studies intelligence, Intelligent robotics studies cognition</p> <p>.....</p> <p>✔ Cognitive robotics takes inspiration from psychology, Intelligent robotics takes inspiration from engineering</p> <p>.....</p> <p>Cognitive robotics takes inspiration from engineering, Intelligent robotics takes inspiration from psychology</p>

☐ **5. Ordering: Marr's Abstraction Hierarchy: Order the levels of the Marr's Abstra...**

Points: **2**

Question	Order the levels of the Marr's Abstraction Hierachy from low level to higher level of abstraction	
Answer	<p>Display Order</p> <p>1. Algorithmic level</p> <p>2. Implementation level</p> <p>3. Computational level</p>	<p>Correct Order</p> <p>2. Implementation level</p> <p>1. Algorithmic level</p> <p>3. Computational level</p>

☐ **6. Multiple Choice: Grey Walter's Tortoises: Which of the following mechanisms did...**

Points: **2**

Question	Which of the following mechanisms did Grey Walter use to control his Tortoise robots?
Answer	

Behaviour-Based Robotics

Swarm robotics

☒ Neuro-robotics

Developmental robotics

☐ 7. Multiple Choice: Uncanny Valley: Which of the following robots can cau...

Points: 2

Question

Which of the following robots can cause a reaction of eeriness and lack of affinity, as in the Uncanny Valley phenomenon

Answer

iCub

NAO

☒ Geminoid

iRoomba

☐ 8. Multiple Choice: Passive Actuators: How are passive actuators activated?

Points: 2

Question

How are passive actuators activated?

Answer

Electrical energy

Pneumatic energy

Solar energy

☒ Gravity force

☐ 9. Multiple Choice: Robotics middleware: Select the correct description of rob...

Points: 2

Question

Select the correct description of robotics middleware

Answer

Robotics middleware controls the learning algorithm


Robotics middleware controls the ethics rules

☒ Robotics middleware is a layer between the hardware and software

Robotics middleware is a layer between the sensors and actuators


☐ 10. Multiple Choice: Extended Kalman Filters: For which robot skills are Extended K...

Points: 2

Question	For which robot skills are Extended Kalman Filters typically used?
Answer	<div>For embodiment</div> <div>For manipulation</div> <div> For localisation</div> <div>For mission planning</div>

☐ 11. Multiple Choice: Activation functions: Which of the following activation fun...

Points: 2

Question	Which of the following activation functions is typically used for the neural network output layer in a categorisation task
Answer	<div>Logistic</div> <div>Sigmoid</div> <div>ReLU</div> <div> Softmax</div>

☐ 12. Multiple Choice: Inverse Kinematics: Select the correct description of Inv...

Points: 2

Question	Select the correct description of Inverse Kinematics
Answer	<p>Inverse Kinematics predicts the position of the joint given its angles</p> <p>.....</p> <p>✓ Inverse Kinematics predicts the angle of the joint given its position</p> <p>.....</p> <p>Inverse Kinematics predicts both the angle and position of the joint given its energy</p> <p>.....</p> <p>Inverse Kinematics predicts both the angle and position of the joint given its SLAM</p>

☐ 13. Multiple Answer: Theory of Mind (ToM): Select the TWO statements that best d...

Points: 2

Question	Select the TWO statements that best describe the role of Theory of Mind (ToM) in human-robot interaction
Answer	<p>✓ ToM is important for establishing trust</p> <p>.....</p> <p>ToM is important for language</p> <p>.....</p> <p>ToM is important for navigation</p> <p>.....</p> <p>✓ ToM is important for intention reading</p> <p>.....</p> <p>ToM is important for vision</p>

☐ 14. Multiple Answer: Robots in education: Tick the TWO primary roles that the r...

Points: 2

Question	Tick the TWO primary roles that the robot can play in an education application, as per current literature
Answer	<div>Robot as headteacher</div> <div>.....</div> <div><input checked="" type="checkbox"/> Robot as teacher</div> <div>.....</div> <div><input checked="" type="checkbox"/> Robot as peer</div> <div>.....</div> <div>Robot as parent</div> <div>.....</div> <div>Robot as examiner</div>


☐ 15. Multiple Choice: Ethical Machine: Choose the correct description of an ...

Points: 2

Question	Choose the correct description of an Ethical Machine
Answer	<div>An Ethical Machine learns using deep learning</div> <div>.....</div> <div>An Ethical Machine learns using reinforcement learning</div> <div>.....</div> <div><input checked="" type="checkbox"/> An Ethical Machine uses own fairness rules to decided what to do</div> <div>.....</div>

An Ethical Machine uses legal fairness rules to decided what to do

☐ 16. Essay: Essay: Deep neural networks: (i) Explain the difference between a ...

Points: **10** 

Question

(i) Explain the difference between a Feature Map Layer and a Pooling Layer in a Convolutional Neural Network (CNN) [4 marks]

(ii) Discuss the main differences between the LeNet and the ResNet in terms of number of layers and the type of connection between layers, and how these affect the performance of the network [3 marks]

(iii) Discuss which network topology/architecture you will typically use for a time series problem (e.g. sentiment analysis) and explain why [3 marks]

Answer

(i) Explain the difference between a Feature Map Layer and a pooling Layer in a Convolutional Neural Network (CNN) [4 marks]

The full answer should contain a clear description and differentiation between the two layers:

Feature Map Layer details (expect to mention 1-2 of the ones below)

- Simple neurons use local receptive fields to filter
- elementary features (e.g. edges, end-points, corners...)
- layer with output of each filter, organised in 2D
- convolution mechanism with different stride/spatial_extent_padding

Pooling layer (student can mention:)

- To reduce spatial resolution of feature maps
- Locally invariant: Reduces the sensitivity of the output to shifts and distortions
- Max pooling (take max value from the receptive field values)
- alternative such as average pooling

4 marks will be incrementally added for the completeness of the response details.

(ii) Discuss the main differences between the LeNet and the ResNet in terms of number of layers and of the type of connection between layers and how these affect the performance of the network [3 marks]

LeNet(5) has few layers (< 10) and all fully connected (with filter/pooling structure)

ResNet(50) has 50+ layers and residual connections

1 mark for each explanation as above and 1 extra mark for additional details on the performance differences.

(iii) Discuss which network topology/architecture you will typically use for a time series problem (e.g. sentiment analysis) and explain why [3 marks]

Explain you would need a Recurrent network (though modern approaches use feedforward Transformer and Attention mechanisms)

Typically mention LSTM as this was used in the labs

3 marks will be incrementally added for the completeness of the response details/justifications.

☐ **17. Essay: Developmental robotics: (i) Give a definition of Developmenta...**

Points: **10** 

Question

- (i) Give a definition of Developmental Robotics and explain how this relates to psychology [4 marks]
- (ii) Explain the Developmental Robotics principle of "Embodied and Situated Cognition" [3 marks]
- (iii) Choose an additional Developmental Robotics principle, and explain its meaning [3 marks]

Answer**(i) Give a definition of Developmental Robotics and explain how this relates to psychology [4 marks]**

Expect variation of definition based on the one given in the lecture/reading: Developmental Robotics is the interdisciplinary approach to the autonomous design of behavioral and cognitive capabilities in artificial agents (robots) that takes direct inspiration from the developmental principles and mechanisms observed in natural cognitive systems (children). (Cangelosi & Schlesinger 2015)

Clear mentioning of developmental psychology and its data/experiments/mechanisms

2 mark for minimalist/full definition, 2 for extra explanation on child psychology link

(ii) Explain the Developmental Robotics principle of Embodied and Situated Cognition [3 marks]

Embodiment: Body-Brain-Environment interaction (Wilson 2002; Ziemke 2003)

Situatedness: Learning in context (Clark 1997)

Additional details that student can mention:

Enaction: Own model of the world (Vernon, 2010)

Morphological computation (cf. robot lectures)

Grounding (cf. language lecture)

3 marks will be incrementally added for the completeness of the response details.

(iii) Choose a different Developmental Robotics principle, and explain its meaning [3 marks]

es. Principle Dynamcial Systems Decentralized system

Self-organization and emergence

Multicausality

Nested timescales - use child psychology examples (e.g. walking)

3 marks will be incrementally added for the completeness of the response details.

☐ **18. Essay: Cognitive robotics experiment: Choose one of the cognitive robotics ...**

Points: **20** 

Question

Choose one of the cognitive robotics approaches (e.g. Developmental, Evolutionary, Swarm robotics).

Describe the design and setup of an experiment utilising such an approach.

In particular discuss:

(i) the aim of your experiment and why the chosen cognitive robotics approach is relevant; [3 marks]

(ii) the cognitive/biology phenomenon/experiment/mechanism that you want to take inspiration from; [3 marks]

(iii) the task/behaviour that the robot will be doing and how the robot will interact with its environment [6 marks]

(iv) the choice of the machine learning algorithm to design the robot's cognitive architecture and the input and output data used by the robot; [8 marks]

You can use an example from the papers that you have read, or invent your own experiment.

Answer

Sample answer based on the Modi Experiment presented at lecture 1 + reaidng paper

(i) the aim of your experiment and why the chosen cognitive robotics approach is relevant; [3 marks]

- The aim of this example is to model the acquisition of the first words for visual objects
- Emphasis on visual grounding and on embodied approaches
- development important as incremental stages

3 marks will be incrementally added for the completeness of the response details.

(ii) the cognitive/biology phenomenon/experiment/mechanism that you want to take inspiration from; [3 marks]

- The Samuelson et al. child psychology study showing how posture and space strategies allow word learning in the absence of the visual objects. The student can mention the “modi” word and left/right location of the objects, and/or switch/no_switch conditions

3 marks will be incrementally added for the completeness of the experiment details.

(iii) the task that the robot will be doing and how it will interact with its environment [6 marks]

- Key features of the task include: Left/right location of the objects; hiding of target object when it is named; test with objects in the middle; child/robot interacting with object; left/right posture instead of simple eye tracking setup ...

6 marks will be incrementally added for the completeness of the task description details.

(iv) the machine learning algorithm used to design the robot's cognitive architecture and the input and output data used by the robot; [8 marks]

Marks for correctness/complexity of the explanation and details

- Details on the learning algorithms which the student will likely list as: (i) use of Kohonen SOM maps for body/colour/shape; (ii) hebbian connections between maps; (iii) speech recognition system; (iv) motion saliency map; (v) attention to moving/shaking objects; (vi) monocular vision; (vii) pretraining of SOMs; (viii) online training of Hebbian connections
- Mentioning the name of the model as “Epigenetic Robotics Architecture” shows generalisation to the

- ✓ mentioning the name of the model as 'Epigenetic Robotics Architecture' shows generalisation to the approach
- Input: posture + vision + speech
- Output word spoken + pointing

8 marks will be incrementally added for the completeness of the response details (4 on learning architecture, 2 on input details, 2 on output details).

Select:

Select by Type:

- Question Type - ▼

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Points

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