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NPTEL

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Courses » Machine Learning for Engineering and Science Applications

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Unit 15 - Week 12

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- Introduction to Week 12
- Application 1 description - Fin Heat Transfer
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Assignment 12

The due date for submitting this assignment has passed. **Due on 2019-04-24, 23:59 IST.**
As per our records you have not submitted this assignment.

This week's assignments are all based on reading and understanding some application-based papers which we discussed during the lectures.

Download <https://arxiv.org/pdf/1711.10561.pdf> and answer the following questions (1-5)

1) In the paper what does MSE_U refer to? 1 point

- The mean squared error for the boundary data
- The mean squared error of the differential equation's residual
- The mean squared error of the initial data
- The mean squared error of the boundary and initial data combined

No, the answer is incorrect.

Score: 0

Accepted Answers:

The mean squared error of the boundary and initial data combined

2) In the paper what does MSE_f refer to? 1 point

- The mean squared error for the boundary data
- The mean squared error of the differential equation's residual
- The mean squared error of the initial data
- The mean squared error of the boundary and initial data combined

No, the answer is incorrect.

Score: 0

Accepted Answers:

The mean squared error of the differential equation's residual

3) We wish to solve Laplace's equation $\frac{\partial^2 T}{\partial x^2} + \frac{\partial^2 T}{\partial y^2} + \frac{\partial^2 T}{\partial z^2} = 0$ using the PINN approach. 1 point

The appropriate neural network structure would be

- A CNN, as it is in 3D
- An ANN with 3 inputs and 3 outputs and one hidden layer
- An ANN with 3 inputs and 1 output and one hidden layer
- An ANN with 3 inputs and 1 output and as many hidden layers as we want

No, the answer is incorrect.

Score: 0

Accepted Answers:

An ANN with 3 inputs and 1 output and as many hidden layers as we want

4) Which of the following is true of PINN? 1 point

Computational Fluid Dynamics

- Application 2 solution
- Application 3 description - Topology Optimization
- Application 3 solution
- Application 4 - Solution of PDE/ODE using Neural Networks
- Summary and road ahead
- Quiz : Assignment 12
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TEXT TRANSCRIPTS

Interaction session

- The boundary conditions are satisfied exactly
- The boundary conditions are satisfied only approximately
- The PDE/ODE is converted to an optimization problem
- It uses automatic differentiation in order to compute the derivatives in the ODE/PDE

No, the answer is incorrect.

Score: 0

Accepted Answers:

The boundary conditions are satisfied only approximately

The PDE/ODE is converted to an optimization problem

It uses automatic differentiation in order to compute the derivatives in the ODE/PDE

- 5) Suppose our differential equation had the term $\frac{\partial u}{\partial x \partial t}$ as well. Within the code snippet for **1 point**

“def f(t,x)” given in the paper, which of the following would compute the term $\frac{\partial u}{\partial x \partial t}$ for the neural network?

- u_xt = tf.gradient(u_x, t)[0]
- u_xt = tf.gradient(u_t, x)[0]
- u_xt = tf.gradient(u, x, t)[0]
- u_xt = tf.gradient(u_xt)[0]

No, the answer is incorrect.

Score: 0

Accepted Answers:

u_xt = tf.gradient(u_x, t)[0]

u_xt = tf.gradient(u_t, x)[0]

Download <https://www.autodeskresearch.com/sites/default/files/ADSK-KDD2016.pdf> and answer the following questions (6-10)

- 6) The learning approach utilized in this paper is **1 point**

- Supervised learning
- Semi-supervised learning
- Unsupervised learning
- Reinforcement learning

No, the answer is incorrect.

Score: 0

Accepted Answers:

Supervised learning

- 7) The authors tried which of the following experiments in the paper (Mark all that are true) **1 point**

- Single encoder with separate decoders for each velocity component
- Separate decoders for each velocity component
- The input layer being defined by a binary pixel value (0 inside the body and 1 outside)
- The input layer being defined by a signed distance function

No, the answer is incorrect.

Score: 0

Accepted Answers:

Single encoder with separate decoders for each velocity component

Separate decoders for each velocity component

The input layer being defined by a binary pixel value (0 inside the body and 1 outside)

The input layer being defined by a signed distance function

- 8) Why do the authors perform a patch-wise linear regression computation? **1 point**

- For hyperparameter optimization
- For improving their predictions via boosting
- In order to see if their architecture is better than a simple locally linear interpolation

- In order to reduce their computational expense on GPUs

No, the answer is incorrect.

Score: 0

Accepted Answers:

In order to see if their architecture is better than a simple locally linear interpolation

9) Which of the following is true of the 2D geometries in the paper?

1 point

- The stride in the first layer is 16x8
- There is a single loss function for both the velocity components
- The strides are the same size as the horizontal and vertical filter sizes
- There is a separate loss function for each velocity component

No, the answer is incorrect.

Score: 0

Accepted Answers:

The stride in the first layer is 16x8

There is a single loss function for both the velocity components

The strides are the same size as the horizontal and vertical filter sizes

10) Which of the following is true of the CNN based solution used in this paper?

1 point

- Could be used for initial design of shapes of cars as it is faster
- It is more accurate than traditional solutions
- It requires a large database of existent CFD solutions
- All of the above

No, the answer is incorrect.

Score: 0

Accepted Answers:

Could be used for initial design of shapes of cars as it is faster

It requires a large database of existent CFD solutions

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