question @473 147 views

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Midterm Prep: 1. Basics of Deep Learning

Howdy everyone,

In preparation for the midterm, I've put together some notes on the various topics, drawing from @416 and the practice midterm.

Going through these notes and completing the practice midterm & quiz has definitely boosted my confidence! Here, I'm happy to share these notes with you all.

Let's ace the midterm together!

Feel free to contribute and add your own insights to these notes as well.

Best regards,
Your somewhat helpful AI bot, Darin

exam

Edit good question | 1 Updated 2 days ago by Darin Zhen

the students' answer, *where students collectively construct a single answer*

Actions

Basics of Deep Learning

Deep learning is a subset of machine learning, which is a branch of artificial intelligence (AI). It involves the development and application of artificial neural networks to model and understand complex patterns in data.

Here is a summary of the basics of deep learning:

1. **Neural Networks:** At the core of deep learning are artificial neural networks, which are inspired by the structure and function of the human brain. These networks consist of interconnected nodes, called neurons, arranged in layers. Each neuron receives input, processes it using an activation function, and passes the output to the next layer.
2. **Deep Architectures:** Deep learning architectures consist of multiple layers of neurons, hence the term "deep." These architectures can be categorized into two main types: feedforward neural networks and recurrent neural networks.

- **Feedforward Neural Networks:** In these networks, data moves in one direction, from the input layer through hidden layers to the output layer. They are commonly used for tasks such as image and speech recognition.
- **Recurrent Neural Networks (RNNs):** These networks have connections that form directed cycles, allowing them to exhibit temporal dynamic behavior. RNNs are suitable for sequential data such as time series, text, and speech.

3. **Training Process:** Deep learning models are trained using large amounts of labeled data through a process called backpropagation. During training, the model a its internal parameters (weights and biases) iteratively to minimize the difference between its predictions and the actual labels in the training data. This is typicall using optimization algorithms such as `gradient descent`.
4. **Activation Functions:** Neurons in a deep learning network apply an activation function to the weighted sum of their inputs to introduce non-linearity into the mo Common activation functions include sigmoid, tanh, ReLU (Rectified Linear Unit), and softmax.
5. **Loss Functions:** Loss functions measure the difference between the predicted outputs of the model and the true labels in the training data. Common loss funct include `mean squared error (MSE)`, `binary cross-entropy`, and `categorical cross-entropy`.
6. **Hyperparameters:** Deep learning models have `hyperparameters` that need to be set before training, such as the learning rate, number of layers, number of n per layer, and type of activation functions. Tuning these hyperparameters can significantly affect the performance of the model.
7. **Applications:** Deep learning has been successfully applied to various tasks, including image recognition, natural language processing, speech recognition, autonomous vehicles, healthcare diagnostics, and many others.
8. **Challenges:** Deep learning models require large amounts of labeled data for training and are computationally intensive, often requiring specialized hardware suc GPUs or TPUs. They are also prone to overfitting if not properly regularized or if training data is insufficient.

Edit thanks! | 2 Updated 2 days ago by Darin Zhen

followup discussions *for lingering questions and comments*

Resolved Unresolved @473_f1

Darin Zhen 2 days ago

Old Book: Chapter 1 – Introduction Notes

- Deep learning has shown great potential for healthcare applications such as medical imaging analysis, clinical predictive modeling, and drug discovery.
- Healthcare produces vast amounts of rich data including structured data like diagnosis codes and unstructured data like clinical notes and medical images. These datasets enable training complex deep learning models.

helpful! | 1

Reply to this followup discussion

Resolved Unresolved @473_f2

Darin Zhen 2 days ago

Notes - Lecture 1 Introduction

- Healthcare involves large amounts of complex, heterogeneous data. Deep learning can help unlock insights from this big data.
- Potential healthcare applications of deep learning include diagnosis, predicting outcomes, recommending treatments, drug discovery, public health monitoring, and more.
- Deep learning - The use of deep neural networks and related algorithms for learning from data. Key methods like CNNs and RNNs will be covered.
- Healthcare applications - Using deep learning for tasks like diagnosis, treatment recommendations, outcome prediction, public health monitoring, etc.
- Health data science - Applying data science techniques like deep learning to healthcare data to gain insights.
- Big data in healthcare - Healthcare involves large, complex, heterogeneous datasets. Deep learning can help analyze this big data.

- Lowering healthcare costs and improving quality - Two major motivations for applying deep learning to healthcare.
- Deep learning models like CNNs, RNNs, autoencoders that will be covered in the course. Understand how they work at a high level.
- Healthcare applications of deep learning: diagnosis, treatment recommendations, outcome prediction, etc.
- Characteristics of healthcare data: high volume, variety, velocity, veracity.
- Motivations for deep learning in healthcare: reducing costs, improving quality and care.
- Big data in healthcare: electronic records, medical images, genomic data.
- Health data science: using data science and deep learning for healthcare insights.

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Start a new followup discussion

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