

Event Report: “AI with Python” Value Added Course

Event Name: AI with Python

Organized By: IBM in collaboration with Reacha Foundation

Location: Old Seminar Hall, F.E.T, G.K(D. U)

Date: 18-23 March, 2024

Day 1: Introduction and Basic PyTorch, Tensors, and Device Agnostic Codes

Date: 18 March, 2024

Instructors: Mr. Arjun Bahuguna and Mr. Vasu Sethia

Special Guest: Mr. Nikhil Pant, CEO, Reacha Foundations and Mr. Lalit Pant, IITD (Online)

Anchor: Dr. Mayank Aggarwal, HOD, CSE Department, F.E.T, G.K(D.U)

The event started by **Dr. Mayank** introducing us all to the course. After which Dean, FET **Dr. Vipul** inspired students and motivated them to go through the entire course, then we were joined with an online session by **Mr. Lalit Pant**, an IITD alumnus and founder of Kojo. There, we were also briefly greeted by the CEO of Reacha Foundations, **Mr. Nikhil Pant**. We were physically joined by **Mr. Arjun Bahuguna** and **Mr. Vasu Sethia**, the instructors from Reacha. Mr. Lalit introduced us to the basics of tensors, their uses, and gave us an introduction to the Kojo environment.

Mr. Vasu and Mr. Arjun then introduced us to the structure of the entire course:

1. Introduction to AI and PyTorch Fundamentals
2. PyTorch Workflow fundamentals
3. PyTorch Neural Networks Classification
4. Computer Vision and Custom Dataset
5. Transfer Learning

Day 1 began as planned, with learning about:

- PyTorch
- Cuda Toolkit
- Tensors
- Tensor operations
- Tensor algebra
- Vector, scalar, matrix operations
- Concept of shapes and reshaping
- GPU and CPU computations

Quiz and Assignment

A quiz was conducted based on what was taught, and all students gave their best efforts to attempt each question set in the quiz. An assignment about basic tensor manipulations was also provided that students had to complete as homework. This helped in reinforcing the concepts learned during the session.



Day 2: PyTorch Workflow Fundamentals

Instructors: Mr. Vasu Sethia, Mr. Arjun Bahuguna

Date: 19 March, 2024

Day 2 started with a quick recap and then delved into the basics of how PyTorch actually works, based on dynamic computational graphs. The instructors followed this pattern for the day:

1. Data (prepare and load)
2. Build model
3. Fitting the model to data (training)
4. Making predictions and evaluating a model (inference)
5. Saving and loading a model
6. Putting it all together

The instructors showed us what weights and biases are, how they can be randomly initialized, and more. We delved deeper into the inference mode or `no_grad` of PyTorch. We also learned how to define our own model with `nn.Module`, and how to write the training loop with epochs, loss functions, metrics, etc.

We learned about several functions of PyTorch, like `l1loss`, `mse_loss`, etc., and about various optimizers under `torch.optim` like `adam`, `adagrad`, `rmsprop`, `sgd`, etc., and how they work.

We learned about the steps in the training loop: first train, then predict on training, then calculate loss, reset the optimizer's gradient, backpropagate the loss, and step. Then we learned to predict on test data.

A quiz was also held at the end of the day, based on all the concepts learned during the day. This helped reinforce the knowledge gained and provided a measure of understanding for the students.



Day 3: PyTorch Neural Network Classification and How It Functions

Instructors: Mr. Arjun Bahuguna, Mr. Vasu Sethia

Special Instructor: Mr. Lalit Pant, IITD

Date: 20 March, 2024

Day 3 started with an online session by **Mr. Lalit Pant**, who went over understanding neural networks and activation functions. He gave us the intuition of why classical algorithms aren't learning more complex boundaries in a proper manner. He also introduced us to how the human brain inspired the neural networks.

Then, **Mr. Vasu Sethia** and **Mr. Arjun Bahuguna** took the same concept and delved deeper. We first made a synthetic random dataset. We basically made circles in space which we had to differentiate using classification.

Mr. Arjun specifically dealt with learning about loss functions, activation equations, and classification formulas. We were visually and graphically shown how the different optimizers took steps while computing the gradient and reaching optimality. SGD used the momentum concept, while AdaGrad learned by accumulating previous gradients.

Mr. Vasu covered data collection, using losses, optimizers, model building, training, and testing. Then, we built some linear neural network models using Sequential model in a class with base class `nn.Module`, gave initializer with `super` keyword, etc. We used losses like `BCELoss`, etc. First, it wasn't able to learn complex boundaries, then we tried `ReLU` activation function, which much better found complex boundaries.

Here, we were shown interactive websites like Playground TensorFlow, where we can literally visualize everything for better understanding. This hands-on approach helped in reinforcing the concepts learned during the session.



Day 4: PyTorch Computer Vision

Instructors: Mr. Vasu Sethia, Mr. Arjun Bahuguna
Special Instructor: Mr. Kshitij Mathur

Date: 21 March, 2024

Day 3 was dedicated to the exploration of Convolutional Neural Networks (CNNs). The day kicked off with an online session by **Mr. Kshitij Mathur**, who introduced us to the concept of CNNs. He explained why conventional and simple Neural Networks (NNs) weren't sufficient for certain tasks and why CNNs were needed. He elaborated on the features of CNNs, including kernels, stride, padding, max pooling, and dropouts.

Following this, **Mr. Vasu Sethia** and **Mr. Arjun Bahuguna** took over and delved deeper into how CNNs actually work. They showcased easy-to-understand animations of CNNs and how they operate on 3D and 2D images. These animations greatly aided in understanding the core of how CNNs handle data.

The theoretical session was followed by hands-on training. We used the Fashion MNIST dataset and distributed it into batches using the dataloader. Initially, we applied linear models, which yielded a decent accuracy of 83%. However, upon applying non-linearity, the accuracy dropped to 75%.

The turning point came when we defined the `conv2D` layers, which significantly improved the accuracy, bringing it close to 90%. We also constructed a confusion matrix and visualized the correctly classified images. This practical approach provided a deeper understanding of the concepts and their applications.

The day concluded with a sense of accomplishment as we had successfully navigated through the complex world of CNNs and had a hands-on experience of working with them. The instructors' expertise and the interactive nature of the session made the learning process engaging and effective. The knowledge gained from this session forms a solid foundation for future exploration in the field of Computer Vision.

On this day, 2 quizzes were held, day-3 and day-4 quizzes which kept the students on toes and kept their excitement alive.



Day 5: PyTorch Transfer Learning, Opportunities, and Valedictory Ceremony

Date: 22 March, 2023

Instructors: Mr. Arjun Bahuguna, Mr. Vasu Sethia

Day 5 started off with a comprehensive quiz that greatly motivated the students. The instructors for the day, **Mr. Arjun Bahuguna** and **Mr. Vasu Sethia**, began the session by explaining what transfer learning is and why it is useful and needed. They also discussed where to find pretrained models and how the world of deep learning is an amazing place where many people around the world share their work.

The instructors then guided the students through the following steps:

1. **Getting setup:** Downloading the useful code written over the past few sections.
2. **Get data:** Using the pizza, steak, and sushi image classification dataset to try and improve the model's results.
3. **Create Datasets and DataLoaders:** Using the `data_setup.py` script to setup the DataLoaders.
4. **Get and customise a pretrained model:** Downloading a pretrained model from `torchvision.models` and customising it to the problem at hand.
5. **Train model:** Training the new pretrained model on the pizza, steak, sushi dataset using the training functions created in the previous chapter.
6. **Evaluate the model by plotting loss curves:** Evaluating the performance of the first transfer learning model.
7. **Make predictions on images from the test set:** Visualizing the model's predictions on test samples.

In the afternoon, the valedictory ceremony began with special guests including **Dean Dr. Vipul Sharma**, **Registrar Dr. Sunil Kumar**, **CEO of Reacha, Mr. Nikhil Pant**, and **HOD of CSE Department, Dr. Mayank Aggarwal** as the host of the event.

The ceremony began by formally welcoming the guests and presenting mementos to the instructors, Mr. Arjun and Mr. Vasu. Students gave their reviews on the entire value-added course and the instructors also gave their review on the students. A plan was proposed for further future interactions.

Special prizes were also announced by Mr. Nikhil for students who secured top 3 positions overall for all 5 days quizzes. The winners will be decided after considerations and review.

The event concluded with special thanks to:

1. **Dr. Vipul Sharma**, for his idea of the entire Value-Added Course (VAC).
2. **Dr. Mayank Aggarwal**, for his amazing anchoring and coordination of the entire event.
3. **Mr. Sumit Bansal**, for his complete coordination of the event by staying physically present the entire time.
4. **Dr. Suyash Bhardwaj**, for his backend work for the success of the event.

This marked the end of a successful and enriching event. The knowledge and skills gained from this course will undoubtedly prove beneficial for the students in their future endeavors. The event was a testament to the power of collaboration and the potential of AI and Python in shaping the future of technology.



Hardwar, Haridwar, 249407, UT, India

Latitude
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Local 03:14:34 PM
GMT 09:44:34 AM

Longitude
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Altitude 284.8 meters
Friday, 03/22/2024



Hardwar, Haridwar, 249407, UT, India

Latitude
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Altitude 284.4 meters
Friday, 03/22/2024