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2025 USA-NA-AIO Round 2, Problem 1, Part 6

USAAIO May 2025

Part 6 (10 points, coding task)

In this part, you are asked to create the dataset $\mathcal{D}_{IC}$.

1. Define dataset $\mathcal{D}_{IC}$ in the way that for each $(t, x) \in \mathcal{D}_{IC}$, t is fixed at 0 and x is evenly sampled from $\{0, 0.01, 0.02, \cdots, 0.98, 0.99, 1\}$. Therefore, $|\mathcal{D}_{IC}| = 101$.
2. The dataset shall be a tensor with name `dataset_train_IC` and shape `(101,2)`.
3. Set `dataset_train_IC.requires_grad = True`.
4. Print `dataset_train_IC.requires_grad` and `dataset_train_IC.shape`.
5. Define tensor `u_IC` to be the groud-truth functional values of all data in $\mathcal{D}_{IC}$ (You can find the formula from Part 1).
6. Set `u_IC.requires_grad = True` and `u_IC.shape = (101,1)`.
7. Print `u_IC.requires_grad` and `u_IC.shape`.

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```
### WRITE YOUR SOLUTION HERE ###

num_samples = 101

dataset_train_IC = torch.stack([torch.zeros(num_samples), torch.linspace(0, 1, nu

print(dataset_train_IC.requires_grad)
```

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```
print(dataset_train_IC.shape)

u_IC = torch.sin(torch.pi * dataset_train_IC[:,1].view(-1,1))
u_IC.requires_grad_(True)

print(u_IC.requires_grad)
print(u_IC.shape)

""" END OF THIS PART """
```

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