Faculty of Computers and Information
Kafr El-Sheikh University

PROJECT TITLE

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Abstract

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Appendix A

An Example Appendix

As an appendix, this should contain some content that's not really required for the argument in the main body of the thesis, but is clearly relevant and supports the work.

A.1 Code Listings

The `listings` package allows you to include code listings or other formatted text with some parsing to make them more readable than simply calling `\input{}` on the code file.

Listing A.1 – MATLAB script for interactive radians to degrees converter

```
from __future__ import print_function
import argparse
import torch
import torch.nn as nn
import torch.nn.functional as F
import torch.optim as optim
from torchvision import datasets, transforms
from torch.optim.lr_scheduler import StepLR


class Net(nn.Module):
    def __init__(self):
        super(Net, self).__init__()
        self.conv1 = nn.Conv2d(1, 32, 3, 1)
        self.conv2 = nn.Conv2d(32, 64, 3, 1)
        self.dropout1 = nn.Dropout(0.25)
        self.dropout2 = nn.Dropout(0.5)
```

```
        self.fc1 = nn.Linear(9216, 128)
        self.fc2 = nn.Linear(128, 10)

    def forward(self, x):
        x = self.conv1(x)
        x = F.relu(x)
        x = self.conv2(x)
        x = F.relu(x)
        x = F.max_pool2d(x, 2)
        x = self.dropout1(x)
        x = torch.flatten(x, 1)
        x = self.fc1(x)
        x = F.relu(x)
        x = self.dropout2(x)
        x = self.fc2(x)
        output = F.log_softmax(x, dim=1)
        return output


def train(args, model, device, train_loader, optimizer, epoch):
    model.train()
    for batch_idx, (data, target) in enumerate(train_loader):
        data, target = data.to(device), target.to(device)
        optimizer.zero_grad()
        output = model(data)
        loss = F.nll_loss(output, target)
        loss.backward()
        optimizer.step()
        if batch_idx % args.log_interval == 0:
            print('Train Epoch: {} [{}/{} ({:.0f}%)]\tLoss: {:.6f}'.format(
                epoch, batch_idx * len(data), len(train_loader.dataset),
                100. * batch_idx / len(train_loader), loss.item()))
            if args.dry_run:
                break


def test(model, device, test_loader):
    model.eval()
    test_loss = 0
    correct = 0
    with torch.no_grad():
        for data, target in test_loader:
            data, target = data.to(device), target.to(device)
            output = model(data)
            test_loss += F.nll_loss(output, target, reduction='sum').item()  # sum up batch loss
```

```
            pred = output.argmax(dim=1, keepdim=True)  # get the index of the max log-probability
            correct += pred.eq(target.view_as(pred)).sum().item()

    test_loss /= len(test_loader.dataset)

    print('\nTest set: Average loss: {:.4f}, Accuracy: {}/{} ({:.0f}%)\n'.format(
        test_loss, correct, len(test_loader.dataset),
        100. * correct / len(test_loader.dataset)))


def main():
    # Training settings
    parser = argparse.ArgumentParser(description='PyTorch MNIST Example')
    parser.add_argument('--batch-size', type=int, default=64, metavar='N',
                        help='input batch size for training (default: 64)')
    parser.add_argument('--test-batch-size', type=int, default=1000, metavar='N',
                        help='input batch size for testing (default: 1000)')
    parser.add_argument('--epochs', type=int, default=14, metavar='N',
                        help='number of epochs to train (default: 14)')
    parser.add_argument('--lr', type=float, default=1.0, metavar='LR',
                        help='learning rate (default: 1.0)')
    parser.add_argument('--gamma', type=float, default=0.7, metavar='M',
                        help='Learning rate step gamma (default: 0.7)')
    parser.add_argument('--no-cuda', action='store_true', default=False,
                        help='disables CUDA training')
    parser.add_argument('--no-mps', action='store_true', default=False,
                        help='disables macOS GPU training')
    parser.add_argument('--dry-run', action='store_true', default=False,
                        help='quickly check a single pass')
    parser.add_argument('--seed', type=int, default=1, metavar='S',
                        help='random seed (default: 1)')
    parser.add_argument('--log-interval', type=int, default=10, metavar='N',
                        help='how many batches to wait before logging training status')
    parser.add_argument('--save-model', action='store_true', default=False,
                        help='For Saving the current Model')
    args = parser.parse_args()
    use_cuda = not args.no_cuda and torch.cuda.is_available()
    use_mps = not args.no_mps and torch.backends.mps.is_available()

    torch.manual_seed(args.seed)

    if use_cuda:
        device = torch.device("cuda")
    elif use_mps:
        device = torch.device("mps")
```

```
    else:
        device = torch.device("cpu")

    train_kwargs = {'batch_size': args.batch_size}
    test_kwargs = {'batch_size': args.test_batch_size}
```

A number of languages are supported with basic syntax highlighting and formatting.

A.2 Multi-Page Tables

The `supertabular` package allows tables to span multiple pages using the `supertabular` environment (in place of `tabular`). This has already been used in the Nomenclature Section in the front matter, allowing the notation to span multiple pages if necessary. Table A.1 shows an example of a table spanning two pages. Note that such tables are no longer floating elements (i.e. there's no `table` environment anymore), and the header/footer for the whole table, and ones repeated on each new page, can be defined through `supertabular` macros rather than as part of the table to copy headers across each page.

Table A.1 – This table is especially long, so it's been turned into a `supertabular` environment allowing it to span multiple pages.

first	$\times$	**second**	$=$	**RHS**
1	$\times$	1	$=$	1
1	$\times$	2	$=$	2
1	$\times$	3	$=$	3
1	$\times$	4	$=$	4
1	$\times$	5	$=$	5
1	$\times$	6	$=$	6
1	$\times$	7	$=$	7
1	$\times$	8	$=$	8

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first	$\times$	**second**	$=$	**RHS**
2	$\times$	1	$=$	2
2	$\times$	2	$=$	4
2	$\times$	3	$=$	6
2	$\times$	4	$=$	8
2	$\times$	5	$=$	10
2	$\times$	6	$=$	12
2	$\times$	7	$=$	14
2	$\times$	8	$=$	16
3	$\times$	1	$=$	3
3	$\times$	2	$=$	6
3	$\times$	3	$=$	9
3	$\times$	4	$=$	12
3	$\times$	5	$=$	15
3	$\times$	6	$=$	18
3	$\times$	7	$=$	21
3	$\times$	8	$=$	24

A.3 Landscape Tables

If your table is especially wide, it may be better to switch it to the landscape orientation. One way of doing this is with the `rotating` package, which implements (among other things) two new environments: `sidewaystable` and `sidewaysfigure`[1]. The way this package achieves this is most useful for *printed results*, as it only rotates the environment on the page (but does not convert the page into landscape orientation)—for electronic viewing of a PDF, it may be useful to rotate the whole page since it's not often easy for the reader to rotate their screen (assuming the sideways content takes up the whole page). One advantage of this package's implementation of sideways

[1] I find `sidewaysfigure` less useful, as it tends to be easy enough to rotate the figure before inclusion, but if the caption/figure are complex it may be useful to have them oriented in the same way

environments is that it supports `twoside` page layout, and will rotate the sideways environment such that the bottom is towards the outside of the double-page layout in such cases.

An example of a `sidewaystable` is shown in Table A.2—if you're reading this as a PDF on your computer, you'll probably find it difficult to read as it's sideways on your screen.

Table A.2 – This table is so wide that I decided it should be in the landscape orientation to allow it to fit nicely on one page. You may of course find it easier (for the reader) to reconsider the content and layout of the table, or convert it to a graphical representation, as large walls of data tend to be hard to really interpret well. Almost certainly, you'd only have such large tables in an appendix.

Item	Total	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
SA Mission Distance (m)	1101.4	49.4	81.5	34.2	78.8	98.8	70.8	16.0	61.4	14.9	52.1	24.3	83.3	170.3	143.5	20.7	30.1	21.4	99.2
SA Traversed Distance (m)	3244.1	53.9	86.8	90.7	92.1	120.8	74.3	46.4	63.8	15.6	55.3	27.4	127.2	222.4	987.1	273.0	167.0	235.4	505.0
MA Mission Distance (m)	1083.9	59.1	81.5	34.2	78.8	98.8	70.8	16.0	61.4	14.9	52.1	24.3	83.3	170.3	143.5	20.7	30.1	21.4	81.8
MA Traversed Distance (m)	2343.1	61.8	84.6	70.7	84.6	116.6	72.5	46.3	62.6	15.5	53.5	25.8	129.4	213.4	147.1	268.2	174.5	233.8	482.3
Ratio (SA/MA)	1.38	0.872	1.03	1.28	1.09	1.04	1.03	1	1.02	1.01	1.03	1.06	0.983	1.04	6.71	1.02	0.957	1.01	1.05
SA Mission Est. Time (s)	734.3	32.9	54.4	22.8	52.5	65.9	47.2	10.7	40.9	9.9	34.8	16.2	55.5	113.5	95.7	13.8	20.1	14.3	66.2
SA Traversal Time (s)	2436.0	43.5	61.6	70.1	68.0	89.6	55.3	35.2	45.3	12.7	39.8	21.8	93.1	161.8	731.0	204.7	146.1	174.3	382.1
MA Mission Est. Time (s)	1083.9	59.1	81.5	34.2	78.8	98.8	70.8	16.0	61.4	14.9	52.1	24.3	83.3	170.3	143.5	20.7	30.1	21.4	81.8
MA Traversal Time (s)	2411.3	64.2	84.8	73.6	86.8	119.1	74.2	47.2	63.5	16.1	54.3	28.1	132.8	215.2	148.2	271.3	203.4	239.9	488.7
Ratio (SA/MA)	1.01	0.677	0.726	0.953	0.784	0.753	0.746	0.744	0.714	0.786	0.734	0.776	0.701	0.752	4.93	0.755	0.718	0.727	0.782
SA Cost (Exp. Map)	1019924.1	1540.6	49041.0	5094.7	86202.5	98847.3	0.0	7974.8	1773.9	459.0	7825.8	1120.0	4131.3	14618.2	447306.7	19380.5	109612.1	33188.1	131807.7
MA Cost (Exp. Map)	916661.5	6032.4	81939.1	7722.2	73856.9	198949.4	11654.8	6191.5	1398.9	564.8	13336.9	1123.8	6129.8	68857.2	39422.7	3213.2	172319.0	93562.5	130386.5
Ratio (SA/MA)	1.11	0.255	0.599	0.66	1.17	0.497	0	1.29	1.27	0.813	0.587	0.997	0.674	0.212	11.3	6.03	0.636	0.355	1.01
SA Cost (Ground Truth)	26891.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	26891.4	0.0	0.0
MA Cost (Ground Truth)	28400.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	28400.0	0.0	0.0
Ratio (SA/MA)	0.947	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.947	–	–

Map Configuration	SA Coverage (m^2)	MA Coverage (m^2)	Ratio (MA/SA)
Expanded Cost Map	28108	28229	1