# GenAI @ Adept (ATS) Inc.



## 8–Week Internship Plan

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**Week 1: Introductions and Overview [Done ✓]**

**Week 2: ML (From Scratch) [Done ✓]**

**Week 3: Introduction to PyTorch**
**(July 8 - July 14)**

Day 1-2 (July 8-11): PyTorch Basics

- Introduction to PyTorch: Tensors, automatic differentiation, building basic neural networks
- Assignment: Re-implement the 2-layer neural network (from Week 2) using PyTorch and compare the performance and ease of use

Day 3-4 (July 12-13): Linear and Logistic Regression in PyTorch

- Implementing Linear and Logistic Regression in PyTorch
- Compare and contrast with the from-scratch versions
- Assignment: Implement and train both linear and logistic regression models in PyTorch on the same datasets used in Week 2, comparing the results

Day 5 (July 14): Introduction to Convolutional Neural Networks (CNNs) in PyTorch

- Build and train a simple CNN for image classification
- Assignment: Build and train a CNN in PyTorch to classify images from the CIFAR-10 dataset

**Week 4: Generative Adversarial Networks (GANs)**
**(July 15 - July 21)**

Day 1-2 (July 15-18): Introduction to GANs

- Architecture, training dynamics, loss functions, and applications
- Assignment: Research and present on a recent GAN paper, explaining the architecture, innovations, and results

Day 3-4 (July 19-20): Basic GAN Implementation

- Implement a basic GAN (e.g., vanilla GAN) using PyTorch to generate simple images (e.g., MNIST digits)

- Assignment: Implement and train a vanilla GAN to generate MNIST-like digits. Evaluate the quality of generated images

Day 5 (July 21): GAN Variations

- Explore and implement different GAN variations: DCGAN, WGAN, or Conditional GANs

- Assignment: Choose one GAN variation (DCGAN, WGAN, or Conditional GAN), implement it, and compare its performance to the vanilla GAN on the same image generation task

## Week 5: Natural Language Processing (NLP) and Transformers (July 22 - July 28)

Day 1-2 (July 22-25): Introduction to NLP

- Text preprocessing, word embeddings (Word2Vec, GloVe), and recurrent neural networks (RNNs)

- Assignment: Implement a sentiment analysis model using pre-trained word embeddings and a simple RNN or feedforward network in PyTorch

Day 3-4 (July 26-27): Introduction to Transformers

- Architecture, attention mechanisms, and applications in NLP

- Assignment: Explore and present on a recent research paper related to Transformers in NLP, highlighting the key contributions and results

Day 5 (July 28): Text Generation with Transformers

- Implement a text generation task (e.g., character-level language model) using a simple transformer model in PyTorch

- Assignment: Implement a character-level language model using a transformer and train it on a text dataset (e.g., Shakespeare's works)

## Week 6: Diffusion Models & Project Introduction (July 29 - August 4)

Day 1-2 (July 29-August 1): Introduction to Diffusion Models

- Forward and reverse diffusion process, score matching, and applications in image generation

- Assignment: Research and summarize two different types of Diffusion Models, focusing on their differences and advantages

Day 3 (August 2): Basic Diffusion Model Implementation

- Implement a basic diffusion model (e.g., DDPM) in PyTorch for image generation

- Assignment: Implement a basic DDPM model in PyTorch and train it on a simple image dataset (e.g., CelebA)

Day 4-5 (August 3-4): Variations of Diffusion Models & Project Introduction

- Explore variations of diffusion models and their applications, such as text-to-image generation (e.g., DALL-E 2)

- Introduce Week 7 & 8 Project: Interns form groups and brainstorm project ideas based on the covered concepts.

- Assignment: Explore and discuss the ethical implications and potential biases in text-to-image generation models like DALL-E 2. Begin brainstorming project ideas and forming groups.

## Week 7-8: Project Weeks
### (August 5 - August 18)

- **August 5 - August 11:** Interns work in groups on a more extensive project that combines concepts learned throughout the internship

- **August 12 - August 16:** Continue Project work, focusing on implementation, experimentation, and preparing a final presentation

- **August 17-18:** Finalize projects and rehearse presentations.

- Project Ideas:

    - Image-to-image translation using GANs (e.g., Pix2Pix, CycleGAN)
    - Text-guided image generation using diffusion models
    - Music generation using RNNs or Transformers
    - Dialogue generation using seq2seq models or Transformers

- Assignment: Complete the chosen project, including implementation, experimentation, and a final presentation

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## Presentation and Wrap-Up



*Made by Muhammad Umer (and AI)*