FINAL PORTFOLIO—ITAI 2376

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GitHub: https://github.com/JudithBarrios/ITAI2376_Portfolio_JudithBarrios.git

Course Overview

- Explored core AI concepts including Neural Networks, NLP, Transformers, VAEs, GANs, and Agents
- Project-Based learning reinforced with real world applications and creative assignments
- Hands on work with deep learning models and GitHub portfolio development

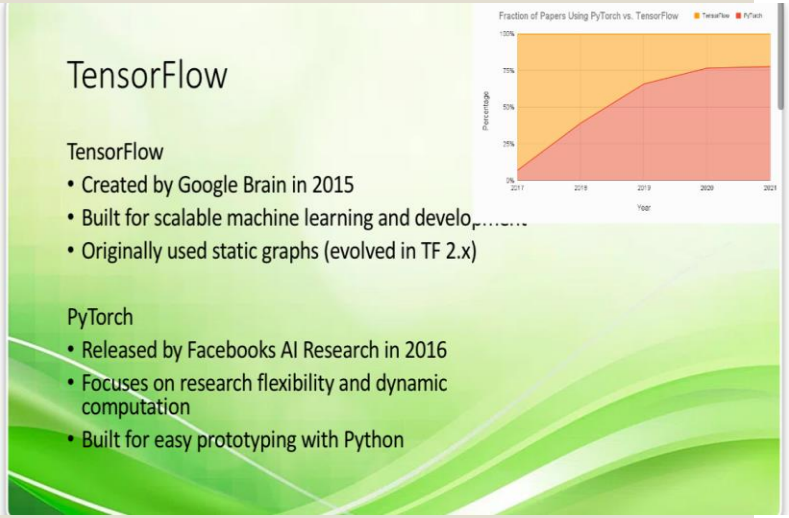
A02 – Framework Comparison

- Compared TensorFlow and PyTorch
- Assessed usability, documentation, and performance
- Learned how framework choice impacts AI development
- Gained experience navigating different APIs and community ecosystems

Key Resource Highlights:

- ITAI2376_L02.ipynb – hands on setup using both frameworks
- Daniel Bourkes Code-First TensorFlow – showed practical model implementation - https://www.youtube.com/watch?v=tpCFfeUEGs8&utm_source=chatgpt.com

Relevance: Helped build foundational knowledge of tools before modeling



A03 – Neural Network Zoo

- Explored different architectures: CNN, RNN, GAN, etc.
- Submitted creative infographic visualizing network types
- Gained deeper understanding of model capabilities
- Recognized how architecture choice relates with specific AI tasks

Key Resource Highlights:

- Neural Network Basics.pptx – explained architecture functions - https://www.ibm.com/think/topics/neural-networks
- Media Gallery support videos – animated network flows - https://www.youtube.com/watch?v=JRwTCKjc37o

Relevance: Strengthened ability to map models to real world problems

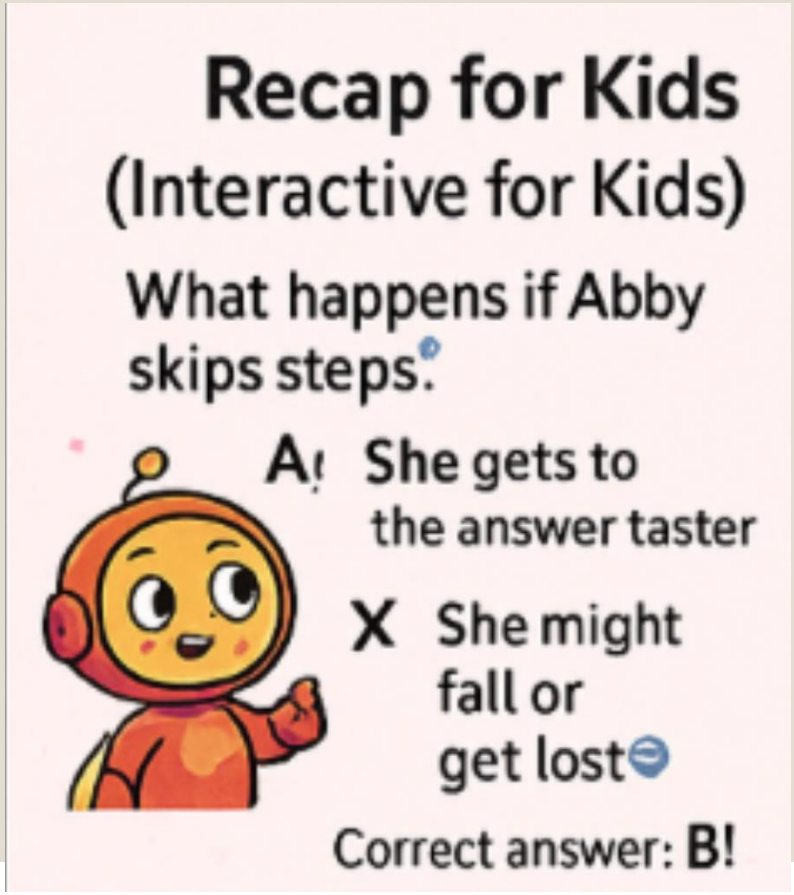
A04 – Teaching Deep Learning to an 11-Year-Old

- Explained CNNs using simple visuals and metaphors
- Improved communication and presentation skills
- Highlighted ability to translate technical concepts
- Developed analogies to explain filters, layers, and feature extraction

Key Resources:

- NIPS 2012 AlexNet Paper- foundation of modern CNNs - https://proceedings.neurips.cc/paper/4824-imagenet-classification-with-deep-convolutional-neural-networks.pdf
- "An image is worth 16x16 Words" – Simplified transformer vision - https://arxiv.org/abs/2010.11929

Relevance: Improved ability to teach, explain and simplify deep learning



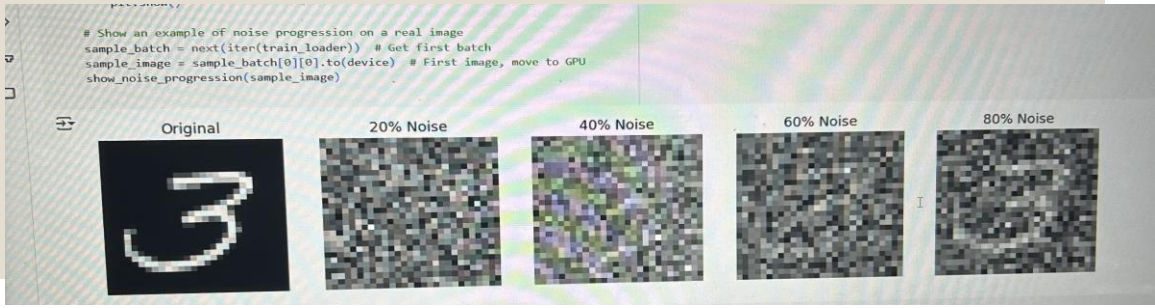
MidTerm – CIFAR-10 Diffusion Model

- Implemented U-Net based diffusion model
- Generated synthetic images and evaluated quality
- Included training results and image samples
- Tuned hyper parameters to balance training time and output quality

Key Resources:

- "Denoising Diffusion Probabilistic models" - Model architecture guide- https://arxiv.org/abs/2006.11239?utm_source=chatgpt.com
- "Diffusion for image segmentation"– explained conditional outputs - https://medium.com/@myschang/diffusion-models-for-image-to-image-and-segmentation-d30468114b27

Relevance: Hands-on experience with generative modeling and evaluation



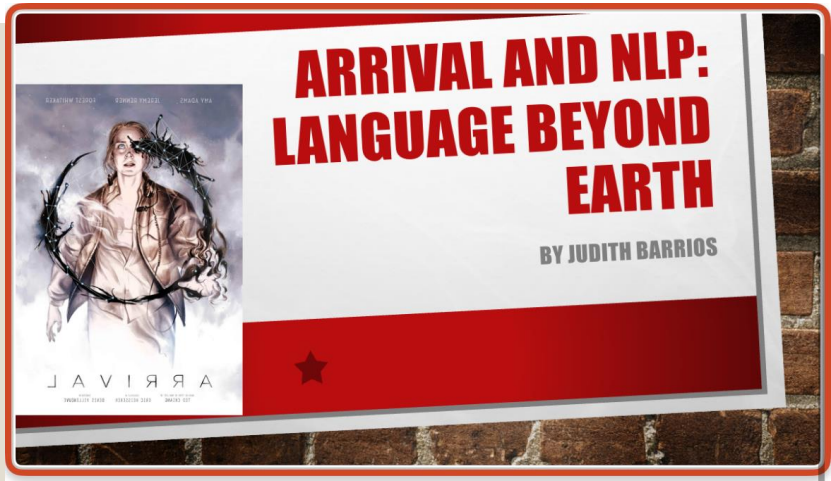
A05 – NLP and Arrival

- Analyzed film themes through AI concepts
- Connected RNNs and sequence modeling to communication barriers
- Reflected on the importance of language and intent in AI
- Explored emotional nuance and context in language modeling

Key Resources:

- "What BERT is Not"- Clarified model limitations - https://arxiv.org/abs/1907.13528?utm_source=chatgpt.com
- "VisualWord2Vec"- Grounded language in visual cues - http://satwikkottur.github.io/VisualWord2Vec/

Relevance: Deepened understanding of communication in AI systems



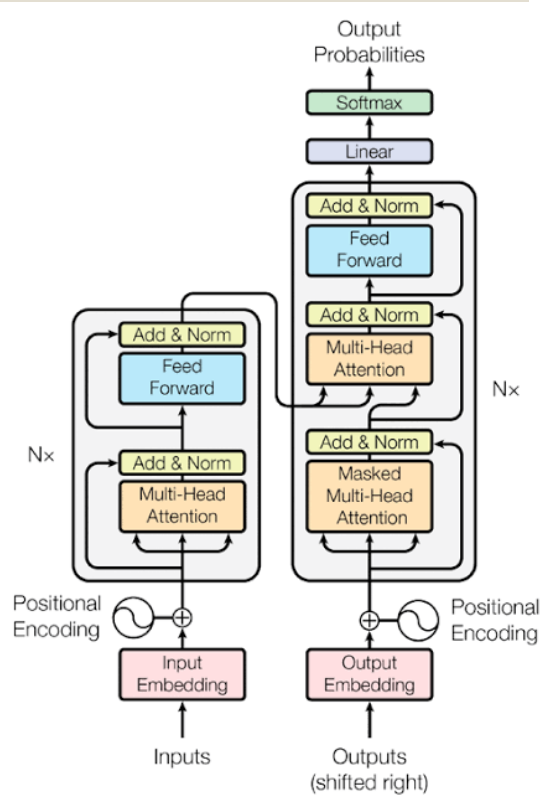
Advanced Topics – Transformers, VAEs, GANs

- Studied attention mechanisms and transformer models
- Learned how VAEs encode latent space for generative tasks
- Reviewed GANs adversarial training for realism
- Practiced explaining model trade-offs between creativity and control

Key Resources:

- "What is a Transformer?" (NVIDIA)- Simplified attention logic - https://blogs.nvidia.com/blog/what-is-a-transformer-model/#:~:text=A%20transformer%20model%20is%20a,the%20words%20in%20this%20sentence.
- "GANs (medium.com)- illustrated training challenges and realism - https://jonathan-hui.medium.com/gan-whats-generative-adversarial-networks-and-its-application-f39ed278ef09

Relevance: Connected model choices with creative, generative applications



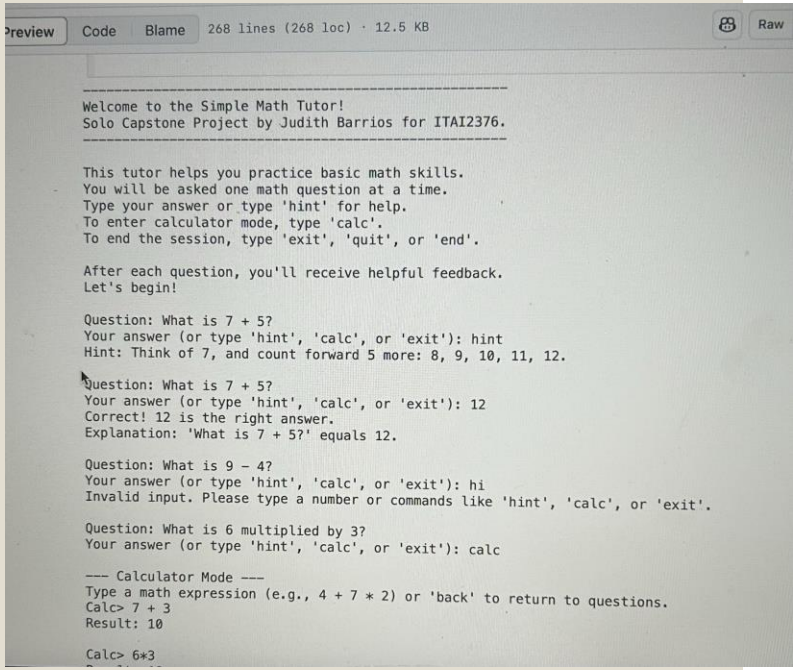
Capstone Foundations –AI Agents and Reasoning

- Modules 10-14 focused on AI agents, planning, and RAG
- Reviewed Lang chain, AutoGen, and multi agent orchestration
- Prepared foundational knowledge for Capstone AI Agent system
- Identified real world uses cases for agents in automation and decision making

Key Resources:

- "LLM-Based Agents Guide"- Explained agent structure - https://www.superannotate.com/blog/llm-agents#:~:text=LLM%20agents%20generally%20consist%20of%20four%20components%3A%20the%20agent%20or,ongoing%20discussions%20and%20long%2Dterm
- "Mastering RAG Architecture" - Enabled reliable multi step reasoning - https://www.signitysolutions.com/blog/mastering-rag-implementation

Relevance: Equipped you to build intelligent, autonomous AI systems



Final Reflections and GitHub

- Strengthened skills in AI theory and hands on modeling
- Improved project presentation and GitHub Organization
- Build confidence interpreting code, models, and documentation into a polished portfolio
- GitHub Repository: https://github.com/JudithBarrios/ITAI2376_Portfolio_JudithBarrios.git

Work Cited

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- Sharma, Ashwani. "Mastering Rag Implementation: Covering All the Basics." *We Help in The Digital Transformation of Businesses*, Signity Software Solutions Pvt Ltd, 23 Apr. 2025, www.signitysolutions.com/blog/mastering-rag-implementation.