

Homework 9: Text Generation & HuggingFace Spaces Deployment

Points: 20 | Due: See WebCampus for deadline

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Compute: GPU recommended for generation — Spaces deployment is free

Learning Objectives

1. **Use** HuggingFace Transformers for text generation
 2. **Understand** generation parameters (temperature, top-k, top-p)
 3. **Build** an interactive demo with Gradio
 4. **Deploy** your application to HuggingFace Spaces
 5. **Share** a working AI application with the world
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Why This Matters for Business

Product Demos: YC startups report that having a live demo on HuggingFace Spaces significantly improves investor meetings. It's one thing to describe your AI; it's another to let them try it.

Rapid Prototyping: Notion's AI team uses Gradio demos to test features with internal stakeholders before engineering investment. Bad ideas die in demos; good ideas get built.

Portfolio Building: Data scientists with deployed HuggingFace Spaces get 3x more recruiter interest than those with just GitHub repos. Employers want to see working applications, not just code.

Customer Feedback: Hugging Face itself uses Spaces to get user feedback on new models within hours of release. Real users find real problems faster than any test suite.

Grading

Component	Points	Effort	What We're Looking For
Text Generation	4	*	Generate coherent text with Transformers
Parameter Exploration	4	**	Understand temp, top-k, top-p effects
Gradio Interface	5	**	User-friendly interactive demo
Spaces Deployment	5	**	Working public deployment
Documentation	2	*	Clear README and usage instructions
Total	20		

Effort Key: * Straightforward | ** Requires thinking | *** Challenge

The Big Picture

This homework takes you from local experimentation to public deployment:

Local Development · Gradio Demo · HuggingFace Spaces · Public URL
 (Colab) (app.py) (git push) (Share!)

By the end, you'll have a live AI application that anyone can use.

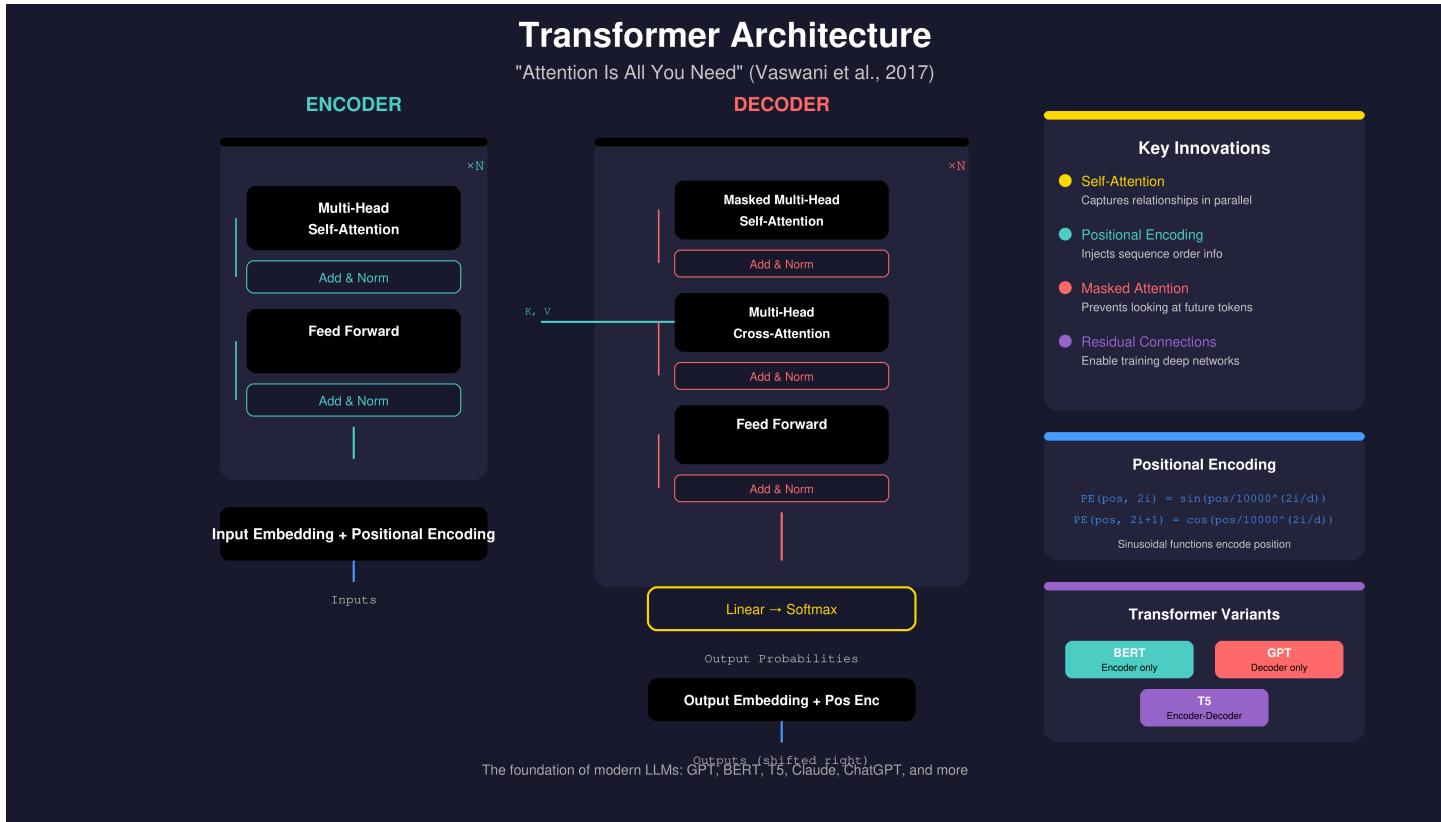


Figure 1: Transformer Architecture

Instructions

1. Open MIS769_HW9_Text_Generation.ipynb in Google Colab
 2. Load a text generation model from HuggingFace
 3. Experiment with generation parameters
 4. Build a Gradio interface for your model
 5. Create a HuggingFace Space and deploy your app
 6. Share the public URL in your submission
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What Your Output Should Look Like

Text Generation:

TEXT GENERATION

Model: gpt2

Prompt: "The future of artificial intelligence"

Temperature 0.3 (Conservative):

"The future of artificial intelligence is likely to be shaped by advances in machine learning and neural networks. Research institutions are investing heavily in..."

Temperature 0.9 (Creative):

"The future of artificial intelligence might include robot philosophers debating consciousness over quantum coffee while humans wonder if they're the NPCs now..."

Parameter Comparison:

GENERATION PARAMETERS

Prompt: "Once upon a time"

Setting	Output Preview
temp=0.1	"...there was a king who ruled"
temp=0.7	"...in a land of floating cities"
temp=1.2	"...quantum cats danced purple"
top_k=50	"...a brave knight set forth"
top_p=0.9	"...there lived a curious girl"

Gradio Interface:

GRADIO DEMO

[Screenshot of your interface]

Features:

- Text input for prompt
- Slider for temperature (0.1 – 1.5)
- Slider for max length (50 – 500)

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- Generate button
 - Output text area

Deployment Success:

HUGGINGFACE SPACES

Space URL: https://huggingface.co/spaces/YOUR_USERNAME/text-generator

Status: Running ✓

Visibility: Public

Common Mistakes (and How to Avoid Them)

Mistake	Symptom	Fix
Model too large for Spaces	Out of memory, crashes	Use gpt2 or distilgpt2 for free tier
No requirements.txt	Import errors on Spaces	Include all dependencies
Wrong file name	App doesn't load	Must be app.py
Missing HF token	Private model access fails	Add token in Space settings
GPU model on CPU Space	Very slow or crashes	Use CPU-compatible model
Infinite generation	Hangs forever	Set max_new_tokens limit

If your Space shows “Building”: - Check the Logs tab for errors - Verify requirements.txt has correct package names - Ensure app.py has no syntax errors

If generation is too slow: - Use smaller model (distilgpt2) - Limit max_new_tokens to 100-200 - Consider CPU-optimized models

Questions to Answer

- **Q1:** How do temperature and top-p affect output creativity?
 - **Q2:** What trade-offs did you make for Spaces deployment?
 - **Q3:** What would you add to make this production-ready?
 - **Q4:** Include your Spaces URL in your submission!
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Submission

Upload to Canvas: Your completed .ipynb notebook with all cells executed

A handwritten signature in black ink that reads "Richard Young". The signature is fluid and cursive, with "Richard" on the left and "Young" on the right, connected by a single continuous line.

· Richard Young, Ph.D.

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Challenge A: Model Comparison

Deploy a Space that lets users compare outputs from multiple models (GPT-2, DistilGPT-2, etc.) side by side.

Challenge B: Fine-Tuned Model

Fine-tune GPT-2 on a specific domain (poems, code, recipes) and deploy it. How does domain-specific training change outputs?

Challenge C: Streaming Output

Implement streaming text generation in your Gradio app so users see tokens appear one by one, like ChatGPT.

Quick Reference

```
# Install dependencies
!pip install transformers gradio torch

# 1. LOAD MODEL
from transformers import pipeline

generator = pipeline("text-generation", model="gpt2")

# 2. GENERATE TEXT
output = generator(
    "The future of AI",
    max_new_tokens=100,
    temperature=0.7,
    top_p=0.9,
    do_sample=True
)
print(output[0]['generated_text'])

# 3. BUILD GRADIO INTERFACE
import gradio as gr

def generate(prompt, temperature, max_length):
    result = generator(
        prompt,
        max_new_tokens=max_length,
        temperature=temperature,
        do_sample=True,
        pad_token_id=50256 # GPT-2 fix
    )
    return result[0]['generated_text']

demo = gr.Interface(
```

```

fn=generate,
inputs=[
    gr.Textbox(label="Prompt", placeholder="Enter your prompt..."),
    gr.Slider(0.1, 1.5, value=0.7, label="Temperature"),
    gr.Slider(50, 300, value=100, step=10, label="Max Length")
],
outputs=gr.Textbox(label="Generated Text"),
title="Text Generator",
description="Generate creative text with GPT-2"
)

demo.launch()

# 4. DEPLOY TO SPACES
# Create files: app.py, requirements.txt

# requirements.txt:
# transformers
# gradio
# torch

# Then:
# 1. Go to huggingface.co/spaces
# 2. Create new Space (Gradio SDK)
# 3. Upload app.py and requirements.txt
# 4. Wait for build to complete

```

Generation Parameters Explained: | Parameter | Effect | Typical Values | ---|---|---|---|---|---|---|---|---|

temperature	Randomness (higher = more random)	0.3-1.0	top_k	Consider only top K tokens
20-100			top_p	Consider tokens summing to P probability
0.8-0.95			max_new_tokens	Maximum tokens to generate
50-500			do_sample	Enable sampling (vs. greedy)
True			repetition_penalty	Penalize repeated tokens
1.0-1.5				

HuggingFace Spaces Structure:

```

your-space/
├── app.py          # Main application (required)
├── requirements.txt # Python dependencies (required)
└── README.md       # Space description (optional)

```

Going Deeper (Optional Challenges)