

NLP ASSIGNMENT – 01

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Medical Diagnosis with Attention Mechanism Background: A healthcare provider wants to build an NLP model that identifies critical symptoms in medical reports to assist in disease diagnosis. • Develop a Transformer model that highlights key symptoms from patient records using attention scores. • Visualize the attention heatmap to identify critical terms.

Questions:

1. For the medical note: "Patient reports persistent cough, high fever, and difficulty breathing for the past three days." o Visualize the attention map. Which symptoms receive the highest scores? Why?
2. Modify the note to: "Mild headache and occasional dizziness, but no fever or cough." o How does the attention distribution change?
3. Visualize the model's behavior when rare but important symptoms are introduced.

1. For the medical note:

"Patient reports persistent cough, high fever, and difficulty breathing for the past three days."

Attention Map Analysis:

- The highest attention scores are given to **"cough," "fever," and "difficulty breathing."**
 - These symptoms are well-known indicators of respiratory infections, including **COVID-19, pneumonia, or bronchitis.**
 - The model focuses on these terms because they have strong associations with critical medical conditions in training data.
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2. Modified Medical Note:

"Mild headache and occasional dizziness, but no fever or cough."

Attention Distribution Changes:

- The highest attention scores are on **"headache" and "dizziness."**
 - **"No fever" and "no cough" receive lower attention** because they indicate the absence of critical symptoms.
 - The model distributes attention more evenly since these symptoms are less severe than respiratory distress indicators.
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3. Rare but Important Symptoms:

"Patient exhibits cyanosis and severe chest pain, indicative of a critical condition."

Model Behavior:

- **"Cyanosis" and "severe chest pain" receive the highest attention scores.**
 - Cyanosis (bluish skin discoloration) is a rare but **life-threatening symptom** of oxygen deprivation, possibly indicating **pulmonary embolism or heart failure**.
 - The model prioritizes these terms due to their strong correlation with emergencies in medical literature.
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Conclusion:

- The Transformer model effectively identifies **critical symptoms** based on attention scores.
- The **attention distribution adapts** based on symptom severity, focusing more on life-threatening conditions.
- **Rare but serious symptoms receive high attention**, ensuring that the model does not overlook critical cases.

Collab Link:

<https://colab.research.google.com/drive/1jn458vFW7t0nQGibwor9KpeEwXnAzwRa#scrollTo=Zkyd37U0NT8b>

Github Link:

<https://github.com/dhinakar1533sece/NLP>