**Temporal and Uncertainty-Aware Knowledge Graphs for Biomedical Literature: Toward Tracking Scientific Confidence**

**Introduction**

* Define the problem of overwhelming biomedical research.
* State limitations in existing KGs.
* Motivate the need for **temporal and uncertainty-aware representations**.

**Related Work**

* Summarize related biomedical KGs.
* Mention transformers like BioBERT for relationship extraction.
* Briefly touch on limitations in temporal and probabilistic modeling.

**Problem Statement**

* Explain:
  + Temporal flattening.
  + Certainty blindness.
  + Lack of contradiction modeling.

**Proposed Architecture / System Design**

Focus here:

* Input: Biomedical papers (abstracts/full-text).
* Transformer model (e.g., PubMedBERT) for extraction of relations + metadata.
* Time tagging from publication data and citation context.
* Confidence estimation using:
  + Citation frequency.
  + Modal verbs (e.g., “suggests”, “confirms”, “might”).
  + Sentiment and scientific certainty detection.
* Build a temporal knowledge graph (e.g., via tKGE or similar).

**Evaluation Plan / Case Study Idea**

Even if you don't build the full system:

* Propose evaluating a subset (e.g., Alzheimer’s-related literature from PubMed).
* Use gold-standard relations (if any).
* Evaluate:
  + Quality of relation extraction.
  + Accuracy of time-labeling.
  + Consistency of certainty scoring.

**Future Work**

* Interactive Visualization Layer.
* Scaling to full PubMed corpus.
* User-facing applications (e.g., hypothesis tracking tools).
* Real-time updating via continuous literature ingestion.

**Conclusion**

Summarize:

* Why temporal and uncertainty-aware modeling matters.
* What your approach changes in the landscape of biomedical KGs.
* Long-term vision of enabling **faster, more informed scientific discovery**.