

Hybrid Modeling vs Natural Language Processing

While related, Hybrid modeling and Natural Language Processing (NLP) are not the same aspect of Artificial Intelligence. Hybrid modeling: Using two or more machine learning/Deep learning models together for better performance. But NLP is one of the branches of AI which can help the computer to understand, analyse, interpret and generate human language like speech and written text (Stryker & Holdsworth, 2024).

It is good that hybrid modeling is useful as one model might not be sufficient to solve a complex problem. Some CNN-LSTM hybrid models utilize both Convolutional Neural Networks and Long Short-Term Memory networks, for instance. CNN is good at picking out the salient features or patterns, and LSTM is good at interpreting sequences and long-term relationships. For NLP, it can be helpful to use it to analyze customer reviews, social media comments, or online feedback. A hybrid CNN-LSTM model to analyse customer sentiment and satisfaction in e-commerce platforms (Koufi, et al., 2024).

Natural Language Processing is specifically about tasks related to language. They can be used in chatbots, Google Translate, speech recognition, email spam detection, summarisation of text, sentiment analysis, and more. NLP systems can determine the positive, negative and neutral nature of a sentence. For instance, if a customer says, "The delivery time was quick but the quality of the product was not good," NLP system can identify both positive and negative opinion. IBM describes NLP as a blend of computational linguistics, machine learning and deep learning techniques that are applied to human language (Stryker & Holdsworth, 2024).

The difference is that hybrid modeling is a technique, NLP is a field or application area. NLP doesn't always need hybrid models, and hybrid modeling can be used in NLP. For instance, BERT is a well-known NLP model which is based on transformer architecture, which understands the meaning of a word, based on the context on the left side as well as the right side of the sentence. It's been applied in question answering, language understanding, and text classification (Devlin, et al., 2019).

There are numerous examples of practical use. Hybrid CNN-LSTM model can be employed for sentiment analysis task by capturing text features using CNN and word order using LSTM. A multimodal hybrid approach can also be used to analyse public sentiment during health

crises, by using text, image, audio and video information. Recently, one such example is a hybrid sentiment analysis model using RoBERTa, BiGRU and attention mechanisms to fine-tune the accuracy of text classification (Khan, et al., 2025).

Hybrid modeling offers an advantage for enhancing the capabilities of AI and NLP helps in grasping human language. They are frequently employed in conjunction in contemporary AI systems like chatbots, sentiment analysis, translation services, and applications in the healthcare sector for making decisions.

References

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