



What?

TensorFlow¹ is an open-source platform for machine learning and deep learning, which includes a text generation **recurrent neural network (RNN)** module. An RNN is a type of neural network that is well-suited for text generation tasks, as it is able to process sequences of words or characters and generate outputs based on the patterns it has learned in the training data. Here, **TensorFlow's text generation RNN** has been used to produce outputs based on a **training set** of previous Crystallise Ltd blogs². The outputs will be based on the patterns learned from the training data, and include the writing style, themes, and topics found in the **previous Crystallise Ltd blogs**².

Why?

Artificial intelligence (AI) driven text generation has become popular due to advances in deep learning and the availability of large amounts of training data. The ability to generate **human-like text** has numerous applications in various fields, including **pharmaceutical and medical research**. AI-driven text generation can be used for a variety of tasks such as: Drug discovery, Clinical trial summaries, Patient notes, Literature review, and Scientific articles. Overall, AI-driven text generation has the potential to significantly speed up and improve the efficiency of pharmaceutical and medical research by **automating repetitive tasks** and facilitating the generation of **new ideas and insights**.

TensorFlow RNN Outputs:

“A treatment for pre-symptomatic spinal malaria prevention and the role of targeted hygiene.”

“Left untreated, ND can carry on for decades, which can result in chronic sleep phenotypes or circadian phenotypes, only genetic loci previously associated with sleep phenotypes. The full study was not available open access, but the abstract is summarised below.”

“The use of equine-assisted learning involves a trained facilitator, who guides activities using horses to promote positive interventions to achieve a healthy brain temperature, with increases in affluence, not population growth²”

“However, the mental wellbeing of PhD students has been a matter of concern over the last years. The study abstract points out, randomised clinical trials would be needed to address the question of whether behavioural interventions of sleep timing have any effect on MDD incidence, and whether this effect is dependent on individual chronotype.”

“Researchers may be under pressure to produce “interesting” but poorly reproducible results. Particulates increase mortality rates well below international exposure standards.”

Who?

Despite the many advantages of AI in medical and pharmaceutical research, there are several reasons why humans are still needed in these fields. These include:

- **Ethics:** Many ethical and moral questions need to be considered in medical and pharmaceutical research, and it is the role of human researchers and ethicists to weigh the potential benefits and risks of new treatments and drugs.
- **Creativity:** Humans are still better at generating new and innovative ideas and hypotheses, which are essential for driving scientific and medical progress.
- **Contextual understanding:** AI models can generate text based on patterns in the data they have been trained on, but they lack the ability to understand context and provide nuanced interpretations. **Humans are still needed** to provide this context and interpretation, which is crucial in medical and pharmaceutical research.

Author Comments

- The TensorFlow model outputs are largely grammatically correct but are entirely nonsensical.
- More complex models trained on more data and subsequently reinforced by human feedback can produce meaningful outputs.
- As a demonstration of the impressive capabilities of a more complex model, each of the “What?”, “Why?”, and “Who?” sections in this blog were **written by OpenAI's ChatGPT**³.
- The most relevant sections of the ChatGPT outputs were selected with **little to no editing** for **inclusion in this blog** post according to the writer's preference and for the sake of brevity.
- Each section was written in response to the following prompts respectively:
 - "Explain briefly TensorFlow's text generation recurrent neural network and that I am using it to produce outputs based on a training set of previous Crystallise Ltd blogs“.
 - "Explain the popularity of AI driven text generation and its possible uses in pharmaceutical and medical research“.
 - "Explain why humans are still needed in medical and pharmaceutical research“.

References:

1. Text generation with an RNN, *TensorFlow*. TensorFlow Developers. (2022). TensorFlow (v2.9.3). Zenodo. <https://doi.org/10.5281/zenodo.7604251> (Accessed: January 27, 2023)
2. Various Authors. *Blogs, Crystallise*. Available at: <https://www.crystallise.com/blog/> (Accessed: January 27, 2023).
3. ChatGPT, *OpenAI*. Available at: <https://openai.com/> (Accessed: February 8, 2023).