

CIS 5300: Team Project Proposal

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1 Motivation and Problem Definition

Haikus are known for their ability to paint a vivid picture in just a few words. A practice of artistic discipline, their minimal nature forces writers to pare down to only the essentials—making each word, or even syllable, count.

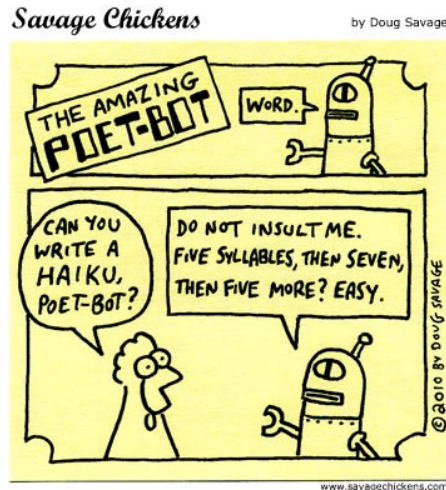


Figure 1: Poetry bot

However, Haiku generation is an example of a strictly constrained task. They are 3-line long structured poems and they comprise of a fixed syllable scheme. In addition, Haikus stand out amongst other poetry forms due to its flexibility in terms of topic, rhyme, and concise syntax. However, these poems, while being comprehensible and logical, are often not artistic, and can be easily distinguished from the poetry of an actual human poet.

Generally speaking, we are interested in exploring various Text Generation schemes and models like the famous GPT-2.

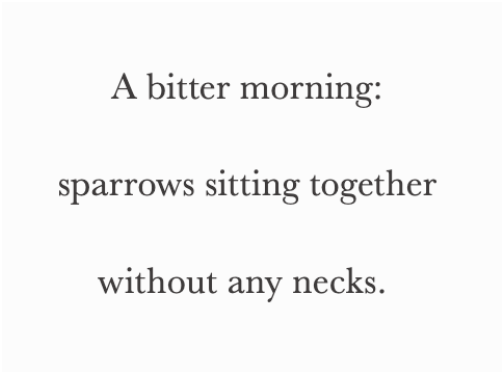
2 Methodology

2.1 Dataset

1. Haiku Generation with Deep Learning: <https://www.kaggle.com/datasets/hjhalani30/haiku-dataset>.

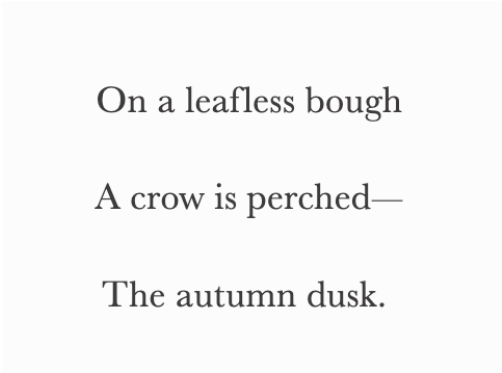
- As haiku data on the internet is scarce. To get a sufficient dataset, this dataset has included some of the three-line English poems. This can train the model to have a poetry perspective as well. Haiku are generally of three lines so the dataset conforms with this constraint.
- The dataset has 144123 unique Haiku poem examples which can be used to engineer features or directly use as inputs to our model.

2.2 Illustrative Example



A bitter morning:
sparrows sitting together
without any necks.

Figure 2: Haiku Example



On a leafless bough
A crow is perched—
The autumn dusk.

Figure 3: Haiku Example

2.3 Proposed Models

We plan on trying out at least three different deep learning architectures to understand the performance. Our baseline model would be a simple probabilistic model like HMM (Hidden Markov Models) to set a benchmark. We plan on trying out different state based deep learning architectures since they will help model understand the previous context based on which further words would be generated for the poem. For such specific tasks LSTMs (Long Short Term Memory) are known to perform well, since they ensure the model doesn't forget the previous words, we can tune the model for hyper-parameters. For the given model architecture we could also try GRUs, RNNs to get a performance comparison between these different models.

We also plan to learn about the Generative Pre-trained Transformer 2 (GPT-2) to be able to fine tune it. This will help us understand the power of transfer learning since the model will have a strong understanding of English as a language already. It is a unsupervised pre-trained transformer based model. It was developed by OpenAI back in February 2019 for the single purpose of predicting the next word(s) in a sentence.

If time permits we will also try to look into Recurrent Convolutional network since our dataset follows a strict structure for which convolution operations might learn better. We can also explore GAN-Bert which is an extension of BERT which uses a Generative Adversarial setting to implement an effective semi-supervised learning schema.

2.4 Milestones

A potential workflow of the project would be:

1. **Milestone 1.1:** Explore the literature on existing implementations of utilizing NLP models to generate Haiku such as HMM, RNN using LSTMs and GRUs, a recurrent convolutional neural network (RCNN).
2. **Milestone 1.2:** Build a data pipeline for the model and create train/validation/test sets.
3. **Milestone 2:** Explore the usage of a transformer-based model such as GPT-2 for generation of Haiku. Also, perform various data augmentation techniques to generate more haikus to finetune GPT-2.
4. **Milestone 3.1:** Experiment with various models, features and try to provide a novel extension to the existing methods. In addition, explore the models as described in Section 2.2.
5. **Milestone 3.2:** Draft reports and presentations including all the analysis and visualizations of our project.
6. **Milestone 4:** Final presentation and project submission

3 References

- 1 Generating Haikus with Natural Language Processing, Emily Bunnapradist et al, Stanford University, https://web.stanford.edu/class/cs224n/reports/custom_116767424.pdf
- 2 Haiku Generator That Reads Blogs and Illustrates Them with Sounds and Images, Rafal Rzepka and Kenji Araki, Proceedings of the Twenty-Fourth International Joint Conference on Artificial Intelligence (IJCAI 2015)
- 3 Automatic Haiku generation using vsm , Martin Tsan, Andy Hon https://www.researchgate.net/publication/229028573_Automatic_Haiku_generation_using_vsm
- 4 Autonomous Haiku Generation, Rui Aguiar and Kevin Liao <https://arxiv.org/pdf/1906.08733.pdf>
- 5 Haiku Generation Using Deep Neural Networks, Xianchao Wu, Momo Klyen, Kazushige Ito, Zhan Chen https://www.anlp.jp/proceedings/annual_meeting/2017/pdf_dir/B7-5.pdf
- 6 Traditional Japanese Haiku Generator using RNN Language Model, Guanming Shao, Hokkaido, Yosuke Kobayashi, Jay Kishigami, <https://ieeexplore.ieee.org/document/8574857>