

## A Appendices

Six appendices follow.

- Appendix [A.1](#) provides additional background on the nearly one-to-one relationship between the modern Hawaiian orthography and a phonemic analysis of Hawaiian.
- Appendix [A.2](#) details the missionary-to-modern FSTs  $C$  and  $C_{wb}$ .
- Appendix [A.3](#) gives pseudocode describing train-time and test-time for the FST-only approach.
- Appendix [A.4](#) describes the algorithm for approximately composing a FST with an RNNLM in the hybrid approach.
- Training details and results for the language models are given in Appendix [A.5](#).
- Finally, Appendix [A.6](#) provides example predictions from our best model on samples from the real parallel corpus, which was based on 19th century newspapers and hand-transliterated modern Hawaiian equivalents.

## A.1 Phonemes and the modern orthography

Ignoring case, there is a neat mapping between the modern Hawaiian orthography and the Hawaiian phonemic inventory. The phonemic inventory contains eight consonants /h k l m n p v ʔ/ and ten vowels, of which five are short /a e i o u/ and five are long /a: e: i: o: u:/ (Parker Jones, 2018). The consonants map onto the orthographic symbols ⟨H h K k L l M m N n P p W w ʻ⟩, where we give the upper- and lower-case variants in adjacent pairs: ⟨H h⟩ for /h/, ⟨K k⟩ for /k/, . . . , ⟨W w⟩ for /v/. An exception, ⟨ʻ⟩ has only one variant which maps to /ʔ/. The vowels map onto the symbols ⟨A a E e I i O o U u Ā ā Ē ē Ī ī Ō ō Ū ū⟩. Note that vowel length is denoted by the absence or presence of a macron (e.g. ⟨A⟩ and ⟨a⟩ map onto short /a/ and ⟨Ā⟩ and ⟨ā⟩ map onto long /a:/). The Hawaiian conventions for capitalization, numbering, and punctuation are analogous to those in English, except again that there is no upper-case variant of ⟨ʻ⟩, so the following vowel is capitalized instead (e.g. ‘*Apelila* ‘April’). In foreign words one finds the additional consonants ⟨B b C c D d F f G g J j Q q R r S s T t V v X x Y y Z z⟩, as in *kolorofolorokalapona* ‘chlorofluorocarbon’.

## A.2 Figures showing missionary-to-modern FSTs

Here, we show a simplified graph of the missionary-to-modern FST  $C$  described in Section 4.1. For brevity, we only show the vowels  $\langle A a \bar{A} \bar{a} \rangle$ , the other vowels are analogous. Arcs for other symbols are obvious (punctuation, spaces, digits, consonants, etc.), and hence are omitted for brevity.

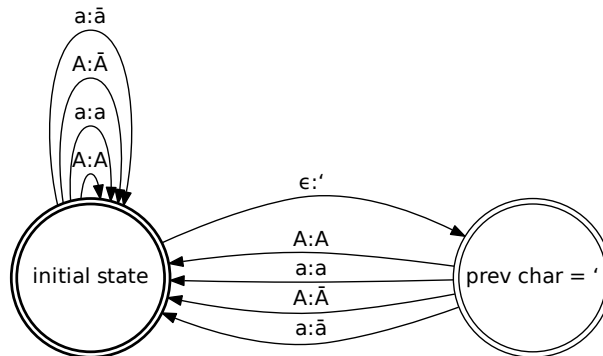


Figure 3:  $C$  missionary-to-modern FST, some arcs omitted.

In the main text we also describe an extension to this FST that re-inserts word boundaries into missionary text, called  $C_{wb}$ . Again we omit many arcs for brevity (punctuation, spaces, digits, uppercase letters, etc.).

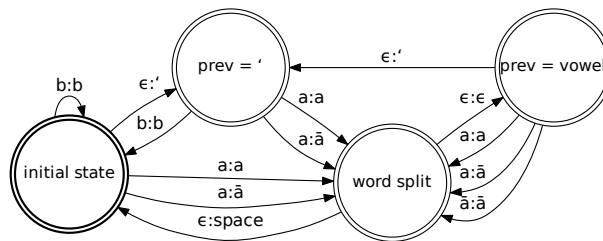


Figure 4:  $C_{wb}$  missionary-to-modern FST, some arcs omitted. Introduces optional spaces after vowels.

### A.3 Pseudocode of FST-NGRAM construction and search

The transducers and acceptors in Figure 5 are all defined over the modern Hawaiian alphabet, which includes A-Z, a-z, the ‘okina symbol (glottal stop), and vowels with macrons. The missionary-era alphabet is a subset of this alphabet, so no separate symbol set is necessary.

**Train-time (once only):**

1. Count character  $n$ -grams in a modern-orthography corpus.
2. Construct an WFST  $G$  representing a character  $n$ -gram language model, which may optionally include backoff/smoothing.
3. Construct  $C$ , a hand-designed (W)FST representing all candidate mappings one expects to encounter in this corpus.

**Test-time (for each input string):**

1. Given a missionary-era Hawaiian string, construct an acceptor  $I$  that accepts only this string (using a stick-shaped graph).
2. Compose the three FSTs to form the search graph,  $S = I \circ C \circ G$ .
3. Compute the shortest path through  $S$ , resulting in a tuple of the form (missionary-era orthography string, modern orthography string, score). The shortest  $k$  paths can also be efficiently be computed if desired.

Figure 5: Pseudocode for pure-FST search approach, with n-gram language model.

The two FST primitive operations required, composition and shortest-path, are standard algorithms. We use the tropical semiring for arc weights. The method was implemented using OpenFST<sup>2</sup>. Details for these algorithms, as well as a thorough presentation of FSTs, can be found in (Mohri, 1997).

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<sup>2</sup><http://www.openfst.org/>

#### A.4 Pseudocode of FST-RNNLM approximate composition procedure

Let  $F$  denote the FST, and  $s_0$  its initial state. Each beam element is a 4-tuple: (fst-state, rnn-state, output token sequence, score). The score is a negative log probability, so adding them multiplies the probabilities.

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B ← {(fst-state =  $s_0$ , rnn-state =  $\mathbf{0}$ , tokens = [], score = 0)}      ▷ single initial beam element
while  $\exists b \in B : b$ .fst-state is not final do
     $B' = \{\}$                                                          ▷ child beam elements
    for each beam element  $b \in B$  that is not in a final state do
        for each arc leaving  $b$ .fst-state (new state  $s'$ , output  $c$ , weight  $w$ ) do
            ▷ Note that we do not need to use the input symbol for our purposes, but in some
            settings it may be useful to keep track of it.
            if  $b$ .tokens[-1]  $\neq \epsilon$  then
                ( $h'$ ,  $p(y)$ ) = run RNN one timestep with input ( $b$ .rnn-state,  $c$ )
                rnncost =  $-\log p(b$ .tokens[-1])
                ▷ denotes the negative log probability of the RNN's discrete distribution output at
                this timestep
            else
                 $h' = b$ .rnn-state
                rnncost = 0
            end if
             $b' = \text{copy}(b)$ 
             $b'$ .score =  $b'$ .score + rnncost +  $w$ 
             $b'$ .tokens.append( $c$ )
             $b'$ .rnn-state =  $h'$ 
             $B' = B' \cup \{b'\}$ 
        end for
    end for
     $B' = B' \cup \{b \in B : b \text{ is in a final state}\}$ 
    Sort  $B'$  by score, put best (lowest score)  $K$  into  $B$ 
end while

```

Figure 6: Algorithm for approximately composing an FST with a RNN LM.

Conceptually, this algorithm performs the same operation as the n-gram language model version, except the n-gram language model FST is replaced with an RNN language model. However, here the composition is approximate: we search over the FST graph, with scores being provided by both the FST weights and the RNN's outputs. Note that the algorithm is implemented slightly differently than how it is presented in the pseudocode, as we group RNN operations into batches for computational efficiency.

## A.5 Training details for language models

The numbers shown are validation set character perplexities. The best models in **bold** were reported in Table 1. The n-gram models were trained using `opengrm-ngram`.

- 7-gram Katz backoff (3.15)
- 7-gram Kneser-Ney (3.07)
- 7-gram Kneser-Ney with backoff (3.15)
- 9-gram Katz backoff (3.15)
- **9-gram Kneser-Ney (2.95)**
- 9-gram Kneser-Ney with backoff (3.24)
- 11-gram Katz backoff (3.39)
- **11-gram Kneser-Ney (2.94)**
- 11-gram Kneser-Ney with backoff (3.67)
- 13-gram and higher performed far worse.

We also trained two character-level RNN language models, with the following configurations:

- 2 layers  $\times$  200 unit LSTM (2.70)
- **3 layers  $\times$  200 unit LSTM (2.65)**

Both RNNs were trained with plain SGD and a batch size of 30, learning rate of 10, 45 unrolling steps of truncated backpropagation through time, and the gradient renormalized to norm 1 if it exceeds 1. Both models used a dropout rate of 0.2 at the input, between RNN layers, and after the last RNN layer.

## A.6 Sample predictions from newspaper data

Each block of three lines shows the input, followed by the prediction, followed by the ground-truth. Characters omitted by the model as compared to the ground-truth are denoted by *blue and in italics*, whereas characters that are erroneously inserted or substituted for another character are denoted by *red and underlined*. When the incorrect character is a space, the space is replaced with ‘\_’.

### First 10 sentences in Newspaper 1:

*Input 1:* Weheia ka Malapua Alii a Kanuia na Uluwehi no ia Wao.

*Prediction 1:* Wehe ‘ia ka Māla pua Ali‘i a Kanu\_‘ia na Uluwehi nō ia Wao.

*Ground-truth 1:* Wehe ‘ia ka Māla Pua Ali‘i a Kanu ‘ia nā Uluwehi no ia Wao.

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*Input 2:* E like no hoi me ka mea i hoike akea ia ae no ka manawa a me ka la e weheia ai a e kanuia ai hoi o na pua a me na mea ulu e ae ma kahi nona ka inoa kilakila maluna ae, pela no i hoea io mai ai i ka Poaha iho la, hora 9 A. M. a mahope mai. Mamua ae o ia manawa, ua lehulehu na poe i pii aku me na mea kanu, maluna o na kaa a malalo no hoi.

*Prediction 2:* E like nō ho‘i me ka mea i hō‘ike ākea ‘ia a‘e no ka manawa a me ka lā e wehe ‘ia ai a e kanu ‘ia ai ho‘i ‘o nā pua a me nā mea ulu ‘ē a‘e ma kahi nona ka inoa kilakila ma luna a‘e, pēlā nō i hō‘ea ‘i‘o mai ai i ka Po‘ahā iho la, hora 9 A. M. a ma hope mai. Ma mua a‘e o ia manawa, ua lehulehu nā po‘e i pi‘i aku me nā mea kanu, ma luna o nā ka‘a a ma lalo nō ho‘i.

*Ground-truth 2:* E like nō ho‘i me ka mea i hō‘ike ākea ‘ia a‘e no ka manawa a me ka lā e wehe ‘ia ai a e kanu ‘ia ai ho‘i o nā pua a me nā mea ulu ‘ē a‘e ma kahi nona ka inoa kilakila ma luna a‘e, pēlā nō i hō‘ea ‘i‘o mai ai i ka Pō‘ahā ihola, hola 9 A. M. a ma hope mai. Ma mua a‘e o ia manawa, ua lehulehu nā po‘e i pi‘i aku me nā mea kanu, ma luna o nā ka‘a a ma lalo nō ho‘i.

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*Input 3:* Hoomakaia ke Kanu Ana.

*Prediction 3:* Ho‘omaka ‘ia ke Kanu ‘Ana.

*Ground-truth 3:* Ho‘omaka ‘ia ke Kanu ‘Ana.

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*Input 4:* Ua hoea ae no ilaila ka Pualī Puhiohe Lahui, a i ka aneane ana ae i ka manawa, a i ole ia, ua hala no paha he hapalua hora mahope iho o ka hora 9, ua uhene mai la lakou i ke mele Liliuokalani, a o ka wa no ia o Kamalii Kawanakoa, ma ka aoao o ke Aliiaimoku, i kanu iho ai i kekahi kumu lehua o Mokaulele iwaenakonu, i hoopuniia ae me na ohawai a me kekahi mau mea kanu Hawaii e ae iloko o kekahi ponaha poepoe, a makai iho hoi o ia wahi i kanu ai o Kamalii Kalanianaole i kekahi kumu lehua ahihi ma ka aoao o ke Alii ka Moiwahine Kanemake. Pau keia mau hana ae la, ua noa i na mea a pau, a ua hele no hoi ia wahi a eeu i na oiwi palupalu o kakou, e kanu ana i kela a me keia mea, a he mau oiwi oolea no hoi kekahi malaila e kokua ana. He mea makehewa paha ke helupapa aku i na pua i kanuia. Hookahi a makou mea i mahalo, oia no kekahi wahi i kanu mua e ia no makai iki mai o ka puka komo, me ka inoa o ia kihapai e kau ae la maluna, a he ku maoli no i ka nani.

*Prediction 4:* Ua hō‘ea a‘e nō i laila ka Pū‘ali Puhi ‘ohe Lāhui, a i ka ‘ane‘ane ‘ana a‘e i ka manawa, a i ‘ole ia, ua hala nō paha he hapalua hora ma hope iho o ka hora 9, ua ‘uhene mai la lākou i ke mele Lili‘uokalani, a ‘o ka wā nō ia o Kāmali‘i Kawānanakoa, ma ka ‘ao‘ao o ke Ali‘i ‘ai moku, i kanu iho ai i kekahi kumu lehua o Mōkaulele i waenakonu, i ho‘opuni ‘ia a‘e me nā ‘ohā wai a me kekahi mau mea kanu Hawai‘i ‘ē a‘e i loko o kekahi pōnaha poepoe, a ma kai iho ho‘i o ia wahi i kanu ai ‘o Kamāli‘i Kalaniana‘ole i kekahi kumu lehua ‘āhihi ma ka ‘ao‘ao o ke Ali‘i, ka Mō‘i\_wahine Kāne make. Pau kēia mau hana a‘e lā, ua noa i nā mea a pau, a ua hele nō ho‘i ia wahi a ‘e\_‘eu i nā ‘oiwi palupalu o kākou, e kanu ana i kēlā a me kēia mea, a he mau ‘oiwi ‘o‘ole‘a nō ho‘i kekahi ma laila e kōkua ana. He mea makehewa paha ke helu papa aku i nā pua i kanu ‘ia. Ho‘okahi a mākou mea i mahalo, ‘o ia nō kekahi wahi i kanu mua ‘e ‘ia nō ma kai iki mai o ka puka komo, me ka inoa o ia kīhāpai e kau a‘e lā ma luna, a he kū maoli nō i ka nani.

*Ground-truth 4:* Ua hō‘ea a‘e nō i laila ka pū‘ali puhī ‘ohe lāhui, a i ka ‘ane‘ane ‘ana a‘e i ka manawa, a i ‘ole ia, ua hala nō paha he hapalua hola ma hope iho o ka hola 9, ua ‘uhene maila lākou i ke mele

Lili‘uokalani, a ‘o ka wā nō ia o kamāli‘i Kawānanakoa, ma ka ‘ao‘ao o ke ali‘i ‘ai moku, i kanu iho ai i kekahi kumu lehua o Mokaulele i waenakonu, i ho‘opuni ‘ia a‘e me nā ‘ōhāwai a me kekahi mau mea kanu Hawai‘i ‘ē a‘e i loko o kekahi pōnaha poepoe, a ma kai iho ho‘i o ia wahi i kanu ai ‘o kamāli‘i Kalaniana‘ole i kekahi kumu lehua ‘āhihi ma ka ‘ao‘ao o ke ali‘i, ka mō‘ī wahine kāne make. Pau kēia mau hana a‘ela, ua noa i nā mea a pau, a ua hele nō ho‘i ia wahi a ‘e‘eu i nā ‘ōiwi palupalu o kākou, e kanu ana i kēlā a me kēia mea, a he mau ‘ōiwi ‘o‘ole‘a nō ho‘i kekahi ma laila e kōkua ana. He mea makehewa paha ke helu papa aku i nā pua i kanu ‘ia. Ho‘okahi a mākou mea i mahalo, ‘o ia nō kekahi wahi i kanu mua e ia nō ma kai iki mai o ka puka komo, me ka inoa o ia kīhāpai e kau a‘ela ma luna, a he kū maoli nō i ka nani.

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*Input 5:* Ka Lanai Pea Ahaaina.

*Prediction 5:* Ka Lāna‘i Pe‘a ‘Aha‘aina.

*Ground-truth 5:* Ka Lānai Pe‘a ‘Aha‘aina.

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*Input 6:* Mauka iki aku hoi o keia mala, ma ka aoao maluna o ka hale noho o J. Mana, ua kukuluia ae la he lanai pea, a ilaila kahi i hoomakaukauia ai o kekahi papaaina. E houhene mau ana no hoi ka puali puhiohe i kela a me keia wa a hiki i ka wa ai, i ke kau pono o ka la i ka piko a mahope iho paha, me ka hoomau aku no i ka hoolealea ana a pau ka papaaina mua a ke Alii, o na Kamaliikane no ma kona a me ko kona kaikoeke wahi. Ekolu papaaina i hoonohoia ai a ua ai na poe a pau i hiki aku a lawa pono, me ka hoounaia o kahi mea-ai no kekahi poe i maopopo i hiki ole aku.

*Prediction 6:* Ma uka iki aku ho‘i o kēia māla, ma ka ‘ao‘ao ma luna o ka hale noho o J. Mānā, ua kūkulu ‘ia a‘e la he lānai pe‘a, a i laila kahi i ho‘omākaukau ‘ia ai ‘o kekahi papa‘aina. E ho‘uhene mau ana nō ho‘i ka pū‘ali puhi ‘ohe i kēlā a me kēia wā a hiki i ka wā ‘ai, i ke kau pono o ka lā i ka piko a ma hope iho paha, me ka ho‘omau aku nō i ka ho‘ole‘ale‘a ‘ana a pau ka papa ‘aina mua a ke Ali‘i, ‘o nā Kamāli‘i kāne nō ma kōna a me kō kōna kaiko‘eke wahi. ‘Ekolu papa ‘aina i ho‘onoho ‘ia ai a ua ‘ai nā po‘e a pau i hiki aku a lawa pono, me ka ho‘ouna ‘ia o kahi mea‘ai no kekahi po‘e i maopopo i hiki ‘ole aku.

*Ground-truth 6:* Ma uka iki aku hoi o kēia māla, ma ka ‘ao‘ao ma luna o ka hale noho o J. Mana, ua kūkulu ‘ia a‘ela he lānai pe‘a, a i laila kahi i ho‘omākaukau ‘ia ai o kekahi papa ‘aina. E hō‘uhene mau ana nō ho‘i ka pū‘ali puhi ‘ohe i kēlā a me kēia wā a hiki i ka wā ‘ai, i ke kau pono o ka lā i ka piko a ma hope iho paha, me ka ho‘omau aku nō i ka ho‘ole‘ale‘a ‘ana a pau ka papa ‘aina mua a ke ali‘i, o nā kamāli‘i kāne nō ma kōna a me kō kōna kaiko‘eke wahi. ‘Ekolu papa ‘aina i ho‘onoho ‘ia ai a ua ‘ai nā po‘e a pau i hiki aku a lawa pono, me ka ho‘ouna ‘ia o kahi mea‘ai no kekahi po‘e i maopopo i hiki ‘ole aku.

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*Input 7:* O na keiki puhiohe no hoi kekahi i kanu mau wahi mea kanu, a he mau mea ulu Hawaii wale no hoi ka lakou o ke ano papa kahuna. Mamuli o ka oluolu a me ka lokomaikai o kahi o lakou, ua loa mai ia makou ka papa hoike a me na wehewehe ana o ka lakou.

*Prediction 7:* ‘O nā keiki puhi ‘ohe nō ho‘i kekahi i ka nū mau wahi mea kanu, a he mau mea ulu Hawai‘i wale nō ho‘i kā lākou o ke ‘ano papa kahuna. Ma muli o ka ‘olu‘olu a me ka lokomaika‘i o kekahi o lākou, ua loa‘a mai iā mākou ka papa hō‘ike a me nā wehewehe ‘ana o kā lākou.

*Ground-truth 7:* ‘O nā keiki puhi ‘ohe nō ho‘i kekahi i kanu mau wahi mea kanu, a he mau mea ulu Hawai‘i wale nō ho‘i ka lākou o ke ‘ano papa kahuna. Ma muli o ka ‘olu‘olu a me ka lokomaika‘i o kekahi o lākou, ua loa‘a mai iā mākou ka papa hō‘ike a me nā wehewehe ‘ana o kā lākou.

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*Input 8:* Mau Mea Kanu Hookalakupua

*Prediction 8:* Mau Mea Kanu Ho‘okalakupua.

*Ground-truth 8:* Mau Mea Kanu Ho‘okalakupua.

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*Input 9:* o ke ano hookahuna oiaio maoli no. Eia iho no ia papa hoike:

*Prediction 9:* ‘o ke ‘ano ho‘okahuna ‘oia‘i‘o maoli nō. Eia iho nō ia papa hō‘ike:



*Ground-truth 9:* ‘O ke ‘ano ho‘okahuna ‘oia‘i‘o maoli nō. Eia iho nō ia papa hō‘ike:

*Input 10:* hala polapola. Ko puni e Kalani o ka lei e, leia hoi o Halaomapuana, onaona i ka ihu, huihui ke hanu iho.

*Prediction 10:* hala polapola. Kō puni ē Ka\_lani o ka lei ē, lei ‘ia ho‘i ‘o Hālaomapuana, onaona i ka ihu, hu‘ihu‘i ke hanu iho.

*Ground-truth 10:* hala polapola. Kō puni e Kalani o ka lei ē, lei ‘ia ho‘i ‘o Halaomāpuana, onaona i ka ihu, hu‘ihu‘i ke hanu iho.

### **First 10 sentences in Newspaper 2:**

*Input 1:* O Kahahana, he alii kapu ia no o Oahu.

*Prediction 1:* ‘O Kahahana, he ali‘i kapu ia nō o O‘ahu.

*Ground-truth 1:* ‘O Kahahana, he ali‘i kapu ia no O‘ahu.

*Input 2:* O Kaionuilalahai ka makuahine, ka moopuna a Kalaniomaiheuila, ke kaikamahine a Kalanikahi-makaialii, a laua o Kualu ke kaikuahine, a mua hoi o Kaulahea ka Moi o Maui.

*Prediction 2:* ‘O Ka‘i‘onuuilalahai ka makuahine, ka mo‘opuna a Kalani ‘o ma‘i he uila, ke kaikamahine a Kalani\_kahi\_maka‘i ali‘i, ‘ā lāua ‘o Kū‘alu ke kaikuahine, a mua ho‘i o Ka‘ula\_hea, ka Mō‘ī o Maui.

*Ground-truth 2:* ‘O Ka‘ionuilalahai ka makuahine, ka mo‘opuna a Kalani‘ōmaiheuila, ke kaikamahine a Kalanikahimaka‘iali‘i, a lāua ‘o Kūalu ke kaikuahine, a mua ho‘i o Ka‘ulahea, ka Mō‘ī o Maui.

*Input 3:* A o ka makuakane, oia hoi o Elani, no ka ohana a Kupanihi, a o Keopulani.

*Prediction 3:* A ‘o ka makua kāne, ‘o ia ho‘i ‘o ‘Elani, no ka ‘ohana a Kupanihi, a ‘o Keōpūolani.

*Ground-truth 3:* A ‘o ka makua kāne, ‘o ia ho‘i ‘o ‘Ēlani, no ka ‘ohana a Kūpānihi, a ‘o Keōpūolani.

*Input 4:* I ko Kahahana manawa kamalii, ua kii ia mai e Kahekili e lawe i Maui i keiki nana.

*Prediction 4:* I ko Kahahana manawa kamali‘i, ua ki‘i ‘ia mai e Kahekili e lawe i Maui i keiki nāna.

*Ground-truth 4:* I ko Kahahana manawa kamali‘i, ua ki‘i ‘ia mai e Kahekili e lawe i Maui i keiki nāna.

*Input 5:* Ua hanai kapu ia oia i Maui.

*Prediction 5:* Ua hānai kapu ‘ia ‘o ia i Maui.

*Ground-truth 5:* Ua hānai kapu ‘ia ‘o ia i Maui.

*Input 6:* A i kona lilo ana ae i kanaka makua, ua lilo oia i kanaka maikai, a ua nani hoi kona helehelena, a ua piipii maikai kona lauoho; a ua kapaia oia i kekahi wa, he piipii hahai moa.

*Prediction 6:* A i kona lilo ‘ana a‘e i kanaka mākua, ua lilo ‘o ia i kanaka maika‘i, a ua nani ho‘i kona helehelena, a ua pi‘ipi‘i maika‘i kona lauoho; a ua kapa ‘ia ‘o ia i kekahi wā, he pi‘ipi‘i hahai moa.

*Ground-truth 6:* A i kona lilo ‘ana a‘e i kanaka makua, ua lilo ‘o ia i kanaka maika‘i, a ua nani ho‘i kona helehelena, a ua pi‘ipi‘i maika‘i kona lauoho; a ua kapa ‘ia ‘o ia i kekahi wā, he pi‘ipi‘i hahai moa.

*Input 7:* I kona lilo ana i kanaka makua, hooipoipo aku la oia me na wahine kaukualii, nolaila, ua ali ia ke kapu, a ua kapa hou ia ka inoa o Walia, a ua hoopauia ka inoa Ahi, Wela, Hahana.

*Prediction 7:* I kona lilo ‘ana i kanaka mākua, ho‘oipoipo aku\_la ‘o ia me nā wāhine kaukuali‘i, no laila, ua ‘ali ‘ia ke kapu, a ua kapa hou ‘ia ka inoa ‘o Wali‘a, a ua ho‘opau ‘ia ka ‘inoa a ‘Ahi, Wela, Hahana.

*Ground-truth 7:* I kona lilo ‘ana i kanaka makua, ho‘oipoipo akula ‘o ia me nā wāhine kaukuali‘i, no laila, ua ‘ali ‘ia ke kapu, a ua kapa hou ‘ia ka inoa ‘o Walia, a ua ho‘opau ‘ia ka inoa Ahi, Wela, Hahana.

*Input 8:* Lawe ae la o Kahahana i wahine nana, o Kekuapo ka inoa.

*Prediction 8:* Lawe a‘e\_la ‘o Kahahana i wahine nāna, ‘o Kekuapo‘i ka inoa.

*Ground-truth 8:* Lawe a‘ela ‘o Kahahana i wahine nāna, ‘o Kekuapo‘i ka inoa.

*Input 9:* Ua olelo ia no hoi kela wahine, aohe ona lua iloko o ke aupuni Hawaii nei, a ua kaulana kona inoa mai Hawaii a Kauai, a ua lilo hoi i kaa, a ua kiekie hanohano kona kino; aole no hoi i ike ia kahi kina mai luna o ke poo a hiki i na kapuai wawae; he mau maka manu nunu kona i like me ko ka mohoea; a ua like hoi na helehena o na hiohiona papalina me ka opuu rose i mohala maikai i ke kakahiaka; a ua nui na loli o kona mau hiohiona, i ke kakahiaka, i ke awakea, ahiahi a me ka po; o ka puo kelakela, oiaia oia iloko o ia manawa, ua kupono ke ali ana o ke kapu.

*Prediction 9:* Ua 'olelo 'ia nō ho'i kēlā wahine, 'a'ohē ona lua i loko o ke aupuni Hawai'i nei, a ua kaulana kona inoa mai Hawai'i a Kaua'i, a ua lilo ho'i i ka'ao, a ua ki'eki'e hanohano kona kino; 'a'ole nō ho'i i 'ike 'ia kahi 'kina mai luna o ke po'o a hiki i nā kapua'i wāwae; he mau maka manu nūnū kona i like me ko ka mohoe 'ā; a ua like ho'i nā helehena o nā hi'ohi'ona pāpālina me ka 'ōpu'u rose i mōhala maika'i i ke kakahiaka; a ua nui nā loli o kona mau hi'ohi'ona, i ke kakahiaka, i ke awakea, ahiahi a me ka pō; 'o ka pu o kelakela, 'oiaia 'o ia i loko o ia manawa, ua kūpono ke 'ali 'ana o ke kapu.

*Ground-truth 9:* Ua 'olelo 'ia nō ho'i kēlā wahine, 'a'ohē ona lua i loko o ke aupuni Hawai'i nei, a ua kaulana kona inoa mai Hawai'i a Kaua'i, a ua lilo ho'i i ka'ao, a ua ki'eki'e hanohano kona kino; 'a'ole nō ho'i i 'ike 'ia kahi kīnā mai luna o ke po'o a hiki i nā kapua'i wāwae; he mau maka manu nūnū kona i like me ko ka mohoea; a ua like ho'i nā helehena o nā hi'ohi'ona pāpālina me ka 'ōpu'u loke i mōhala maika'i i ke kakahiaka; a ua nui nā loli o kona mau hi'ohi'ona, i ke kakahiaka, i ke awakea, ahiahi a me ka pō; 'o ka pu'ō kelakela, 'oiaia 'o ia i loko o ia manawa, ua kūpono ke 'ali 'ana o ke kapu.

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*Input 10:* Ua uluhua na'lii, na kahuna a me na makaainana o ke aupuni o Oahu i ko lakou Moi ia Kumahana, i ke keiki a Peleioholani.

*Prediction 10:* Ua uluhua nā 'ali 'i, nā kāhuna a me nā maka'āinana o ke aupuni o O'ahu i ko lākou Mō'ī, iā Kūmahana, i ke keiki a Peleiōhōlani.

*Ground-truth 10:* Ua uluhua nā ali'i, nā kāhuna a me nā maka'āinana o ke aupuni o O'ahu i ko lākou Mō'ī, iā Kūmahana, i ke keiki a Peleiōhōlani.