Chinese Song Iambics Generation with Neural Attention-based Model

Qixin Wang, Tianyi Luo, Dong Wang, Chao Xing
虞美人 · 春花秋月何时了
李煜

春花秋月何时了？
往事知多少。
小楼昨夜又东风，
故国不堪回首月明中。
雕栏玉砌应犹在，
只是朱颜改。
问君能有几多愁？
恰似一江春水向东流。

To the Tune of Beauty Yu
Yu Li

There is no end to moonlit autumns or flowery springs,
And I have known so very many things.
From my turret the wind was in the east again last night.
A lost land was too much to bear: I turned from the moonlight.
The cavern rail and jade work wall are as they were before,
Those rosy cheeks alone are there no more.
Tell me, what is the uttermost extent of pain, you say?
Mine is a river swollen in spring and welling east away.

(Translated by Hsien-yi Yang & Gladys Yang)
Challenges

• Up to 240 words an iambic
• 1000+ genres with their own unique structure
• Rhythmical pattern for almost every last word
• Tonal pattern for almost every word
静夜思
李白
床前明月光，
疑是地上霜。
举头望明月，
低头思故乡。

Thoughts in the Silent Night
Bai Li
Beside my bed a pool of light,
Is it hoarfrost on the ground?
I lift my eyes and see the moon,
I bend my head and think of home.

(Translated by Hsien-yi Yang & Gladys Yang)
Related works

- SMT model by Ming Zhou (2012)
- RNNs model by Xingxing Zhang (2014)
- RNNs model by Rui Yan (just now)
Attention-based Encoder-Decoder

\[ a(s_{i-1}, h_j) = v^T_a \tanh(W_a + U_a h_j) \]
Attention-based Encoder-Decoder

- Word vector

Gigaword, 1.12 billion
Song, 1.22 million

(Chinese characters)
Attention-based Encoder-Decoder

- Global information
Attention-based Encoder-Decoder

- Tune indicator
- SVD
- Orthogonal Vectors
Dataset

• **15,001 + 688** famous Song iambics

• **3,718** Song iambics in 11 tunes

• **441 + 34** in tune ”Partridge Sky”

• **403 + 31** in tune ”Pusaman”
Experiments settings

• Three aspects:
  • Poeticness (tone, rhyme and style)
  • Fluency (fluent and reasonable)
  • Meaningfulness (theme and semantic meaning)

• Three ways:
  • Pairwise human voting
  • BLEU score
  • 0-5 human rating

• SMT and LSTM language model
• 24 best experts in China
• Double blind tests
## Evaluation results

<table>
<thead>
<tr>
<th>Methods</th>
<th>Human voting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Song-fixV:Song-adaptV</td>
<td>285:269</td>
</tr>
<tr>
<td>Song-fixV:Giga-fixV</td>
<td>299:279</td>
</tr>
<tr>
<td>Song-fixV+Global:Song-fixV</td>
<td>305:273</td>
</tr>
<tr>
<td>Song-fixV+Global+Hybrid11:Song-fixV+GO</td>
<td>445:416</td>
</tr>
</tbody>
</table>

**Table 1**, improvements pairwise human voting

<table>
<thead>
<tr>
<th>Model</th>
<th>BLEU</th>
</tr>
</thead>
<tbody>
<tr>
<td>SMT</td>
<td>0.0598</td>
</tr>
<tr>
<td>RNNLM</td>
<td>0.0330</td>
</tr>
<tr>
<td>Attention-1</td>
<td>0.0645</td>
</tr>
<tr>
<td>Attention-11</td>
<td>0.0742</td>
</tr>
<tr>
<td>Attention-All</td>
<td><strong>0.1482</strong></td>
</tr>
</tbody>
</table>

**Table 2**, BLEU score

<table>
<thead>
<tr>
<th>Model</th>
<th>Poeticness</th>
<th>Fluency</th>
<th>Meaningfulness</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Partridge Sky</td>
<td>Pusaman</td>
<td>Partridge Sky</td>
<td>Pusaman</td>
</tr>
<tr>
<td>SMT</td>
<td>2.96</td>
<td>3.96</td>
<td>2.05</td>
<td>2.85</td>
</tr>
<tr>
<td>RNNLM</td>
<td>3.19</td>
<td>3.88</td>
<td>2.50</td>
<td>3.02</td>
</tr>
<tr>
<td>Attention-1</td>
<td>4.68</td>
<td><strong>4.98</strong></td>
<td>3.00</td>
<td>3.40</td>
</tr>
<tr>
<td>Attention-11</td>
<td><strong>4.71</strong></td>
<td>4.80</td>
<td>3.27</td>
<td>3.06</td>
</tr>
<tr>
<td>Attention-All</td>
<td>4.68</td>
<td>4.92</td>
<td>3.52</td>
<td>3.88</td>
</tr>
<tr>
<td>Human</td>
<td>4.31</td>
<td>4.77</td>
<td><strong>4.67</strong></td>
<td><strong>4.23</strong></td>
</tr>
</tbody>
</table>

**Table 3**, human evaluation
菩萨蛮

哀筝一弄湘江曲，
风流水上人家绿。小艇子规啼，
不堪春去时。花前杨柳下，
红叶满庭洒。月落尽成秋，
愁思欲寄留。

To the tune of Pusaman

A sad melody flows with the wave,
But still everything seems to thrive.
A cuckoo sings over my little boat,
Hard to let spring go.
Blossoms and green willows we found,
Soon will be maple leaves red on the ground.
The moon is setting, the fall is coming,
But my longing for the past lingers around.

(Translated by Bingjie Liu)
Thank you!

qixinw@usc.edu (wqx@cslt.riit.tsinghua.edu.cn)