

1. TASKS

- Chinese Whispers, noiseless channel, 1 player
- Chinese Whispers, noiseless channels, 2 players
- Chinese Whispers, noiseless channels, n players
- Chinese Whispers, noisy input channel 10%, 1 player
- ...

2. INPUT STRINGS

Length of strings and number of characters must be specified.

- iid (uniformly distributed)
- iid (non-uniformly distributed)
- n-grams
- other distributions?
- English words/text?

3. INTERMEDIATE STRINGS

Length of strings and number of characters must be specified.

4. REWARD FUNCTIONS FOR THE LAST AGENT

Let n be the length of strings, I be the input string to the first agent, O be the output string of the last agent. Was Skalierung angeht bin ich mir nicht ganz sicher...

- "Hamming reward": $r(I, O) = n - \text{Hamming}(I, O)$
- Levenshtein reward
- ...

5. REWARD FUNCTIONS FOR INTERMEDIATE AGENTS

Scale of this reward must be specified.

Let n be the length of strings, O be the output string of one intermediate agent.

- Zero: $r(O) = 0$
- Shortness: $r(O) = \#\text{NULLTOKENS}(O)$

6. NEURAL NETWORK BLOCKS

Intermediate dims etc. should be specified.

- 1-Convolution
- n-Convolution
- Fully Connected
- Self Attention

7. RL ALGORITHMS

Learning rates, batch size etc. should be specified.

- Policy Gradients (REINFORCE)
- Deep Deterministic Policy Gradient ?
- Actor Critic ?

8. LIST OF EXPERIMENTS

8.1. Experiment 1.

Chinese Whispers, noiseless channel, 1 player

Length 5, Number of characters 2, iid (uniformly distributed)

(No intermediate strings)

Hamming reward, mean-std-normalized as batch

(No intermediate agents)

Embedding / 1-Convolution; Total params: 10

REINFORCE, SGD(lr=0.01, momentum=0), batch size 64

Code: <https://github.com/Pausau/StillePost/blob/main/Experiment1.ipynb>

Results: Task fully solved once after ~ 6.26 parameter updates.

8.2. Experiment 2.

Chinese Whispers, noiseless channel, 1 player

Length 5, Number of characters **5**, iid (uniformly distributed)

(No intermediate strings)

Hamming reward, mean-std-normalized as batch

(No intermediate agents)

Embedding / 1-Convolution; Total params: 55

REINFORCE, SGD(lr=0.01, momentum=0), batch size 64

Code: <https://github.com/Pausau/StillePost/blob/main/Experiment2.ipynb>

Results: Task fully solved once after ~ 22.62 parameter updates.

8.3. Experiment 3.

Chinese Whispers, noiseless channel, **2 players**

Length 5, Number of characters **2**, iid (uniformly distributed)

Intermediate: Length 5, Number of characters **2**

Hamming reward, mean-std-normalized as batch

Intermediate: No reward

Embedding / 1-Convolution; Params: 10 per player, total params: 20

REINFORCE, SGD(lr=0.01, momentum=0), batch size 64

Code: <https://github.com/Pausau/StillePost/blob/main/Experiment3.ipynb>

Results: Task fully solved once after ~ 18.52 parameter updates.

8.4. Experiment 4.

Chinese Whispers, noiseless channel, 2 players

Length 5, Number of characters **3**, iid (uniformly distributed)

Intermediate: Length 5, Number of characters **3**

Hamming reward, mean-std-normalized as batch

Intermediate: No reward

Embedding / 1-Convolution; Params: 21 per player, total params: 42

REINFORCE, SGD(lr=0.01, momentum=0), batch size 64

Code: <https://github.com/Pausau/StillePost/blob/main/Experiment4.ipynb>

Results: 66% of the time, the task cannot be fully solved within 100 parameter updates. For the times where it was fully solved, the task was fully solved once after ~ 35.65 parameter updates.

8.5. Experiment 5.

Chinese Whispers, noiseless channel, 2 players

Length 5, Number of characters **5**, iid (uniformly distributed)

Intermediate: Length 5, Number of characters **5**

Hamming reward, mean-std-normalized as batch

Intermediate: No reward

Embedding / 1-Convolution; Params: 55 per player, total params: 110

REINFORCE, SGD(lr=0.01, momentum=0), batch size 64

Code: <https://github.com/Pausau/StillePost/blob/main/Experiment5.ipynb>

Results: 100% of the time, the task cannot be fully solved within 150 parameter updates.

8.6. Experiment 6.

Chinese Whispers, noiseless channel, **3 players**

Length 5, Number of characters **2**, iid (uniformly distributed)

Intermediate: Length 5, Number of characters **2**

Hamming reward, mean-std-normalized as batch

Intermediate: No reward

Embedding / 1-Convolution; Params: 10 per player, total params: 30

REINFORCE, SGD(lr=0.01, momentum=0), batch size 64
 Code: <https://github.com/Pausau/StillePost/blob/main/Experiment6.ipynb>
 Results: Task fully solved once after ~ 26.82 parameter updates.

8.7. Experiment 7. (like Nr.3).

Chinese Whispers **with parallel agents**, noiseless channel, **1 + 2** players
 Length 5, Number of characters 2, iid (uniformly distributed)
 Intermediate: Length 5, Number of characters 2
 Hamming reward, mean-std-normalized as batch
 Intermediate: No reward
 Embedding(2) / 1-Convolution; Params: 10 per player, total params: 30
 REINFORCE, SGD(lr=0.01, momentum=0), batch size 64
 Code: <https://github.com/Pausau/StillePost/blob/main/Experiment7.ipynb>
 Results: Task fully solved once after ~ 16.52 parameter updates.

8.8. Experiment 8. (like Nr.4).

Chinese Whispers **with parallel agents**, noiseless channel, **1 + 2** players
 Length 5, Number of characters **3**, iid (uniformly distributed)
 Intermediate: Length 5, Number of characters **3**
 Hamming reward, mean-std-normalized as batch
 Intermediate: No reward
 Embedding(3) / 1-Convolution; Params: 10 per player, total params: 30
 REINFORCE, SGD(lr=0.01, momentum=0), batch size 64
 Code: <https://github.com/Pausau/StillePost/blob/main/Experiment8.ipynb>
 Results: 84% of the time, the task cannot be fully solved within 100 parameter updates. For the times where it was fully solved, the task was fully solved once after ~ 36.25 parameter updates.

8.9. Experiment 9. (like Nr.4).

Chinese Whispers, noiseless channel, 2 players
 Length 5, Number of characters **3**, iid (uniformly distributed)
 Intermediate: Length 5, Number of characters **3**
 Hamming reward, mean-std-normalized as batch
 Intermediate: No reward
 Embedding(**64**) / 1-Convolution; Params: 387 per player, total params: 774
 REINFORCE, SGD(lr=0.01, momentum=0), batch size 64
 Code: <https://github.com/Pausau/StillePost/blob/main/Experiment9.ipynb>
 Results: 22% of the time, the task cannot be fully solved within 100 parameter updates. For the times where it was fully solved, the task was fully solved once after ~ 23.56 parameter updates.

8.10. Experiment 10. (like Nr.4).

Chinese Whispers, noiseless channel, 2 players
 Length 5, Number of characters **3**, iid (uniformly distributed)
 Intermediate: Length 5, Number of characters **6**
 Hamming reward, mean-std-normalized as batch
 Intermediate: No reward
 Embedding(**3**) / 1-Convolution; Params: 33, 30; total params: 60
 REINFORCE, SGD(lr=0.01, momentum=0), batch size 64
 Code: <https://github.com/Pausau/StillePost/blob/main/Experiment10.ipynb>
 Results: 66% of the time, the task cannot be fully solved within 100 parameter updates. For the times where it was fully solved, the task was fully solved once after ~ 43.41 parameter updates.

8.11. Experiment 11. (like Nr.4).

Chinese Whispers, noiseless channel, 2 players
 Length 5, Number of characters **3**, iid (uniformly distributed)
 Intermediate: Length 5, Number of characters **6**
 Hamming reward, mean-std-normalized as batch
 Intermediate: No reward
 Embedding(**64**) / 1-Convolution; Params: 582, 579; total params: 1161
 REINFORCE, SGD(lr=0.01, momentum=0), batch size 64
 Code: <https://github.com/Pausau/StillePost/blob/main/Experiment11.ipynb>
 Results: 6% of the time, the task cannot be fully solved within 100 parameter updates. For the times where it was fully solved, the task was fully solved once after ~ 28.04 parameter updates.

8.12. Experiment 12. (like Nr.9).

Chinese Whispers, noiseless channel, 2 players
 Length 5, Number of characters **3**, iid (uniformly distributed)
 Intermediate: Length 5, Number of characters **3**
 Hamming reward, mean-std-normalized as batch
 Intermediate: No reward
 Embedding(**256**) / 1-Convolution; Params: 1539 per player; total params: 3078
 REINFORCE, SGD(lr=0.01, momentum=0), batch size 64
 Code: <https://github.com/Pausau/StillePost/blob/main/Experiment12.ipynb>
 Results: 22% of the time, the task cannot be fully solved within 100 parameter updates. For the times where it was fully solved, the task was fully solved once after ~ 22.72 parameter updates.

8.13. Experiment 13. (like Nr.11).

Chinese Whispers, noiseless channel, 2 players
 Length 5, Number of characters **3**, iid (uniformly distributed)

Intermediate: Length 5, Number of characters **30**
 Hamming reward, mean-std-normalized as batch
 Intermediate: No reward
 Embedding(**256**) / 1-Convolution; Params: 8448, 8451; total params: 16,899
 REINFORCE, SGD(lr=0.01, momentum=0), batch size 64
 Code: <https://github.com/Pausau/StillePost/blob/main/Experiment13.ipynb>
 Results: 34% of the time, the task cannot be fully solved within 200 parameter updates (one above 100). For the times where it was fully solved, the task was fully solved once after ~ 56.73 parameter updates.

8.14. Experiment 14. (like Nr.11).

Chinese Whispers, noiseless channel, 2 players
 Length 5, Number of characters **3**, iid (uniformly distributed)
 Intermediate: Length 5, Number of characters **10**
 Hamming reward, mean-std-normalized as batch
 Intermediate: No reward
 Embedding(**256**) / 1-Convolution; Params: 3338, 3331; total params: 6669
 REINFORCE, SGD(lr=0.01, momentum=0), batch size 64
 Code: <https://github.com/Pausau/StillePost/blob/main/Experiment14.ipynb>
 Results: 4% of the time, the task cannot be fully solved within 100 parameter updates. For the times where it was fully solved, the task was fully solved once after ~ 32.63 parameter updates.

8.15. Experiment 15. (like Nr.11).

Chinese Whispers, noiseless channel, 2 players
 Length 5, Number of characters **3**, iid (uniformly distributed)
 Intermediate: Length 5, Number of characters **10**
 Hamming reward, mean-std-normalized as batch
 Intermediate: No reward
 Embedding(**64**) / 1-Convolution; Params: 842, 835; total params: 1677
 REINFORCE, SGD(lr=0.01, momentum=0), batch size 64
 Code: <https://github.com/Pausau/StillePost/blob/main/Experiment15.ipynb>
 Results: 4% of the time, the task cannot be fully solved within 100 parameter updates. For the times where it was fully solved, the task was fully solved once after ~ 35.87 parameter updates.

8.16. Experiment 16. (like Nr.5).

Chinese Whispers, noiseless channel, 2 players
 Length 5, Number of characters **5**, iid (uniformly distributed)
 Intermediate: Length 5, Number of characters **20**
 Hamming reward, mean-std-normalized as batch
 Intermediate: No reward
 Embedding(**64**) / 1-Convolution; Params: 1620, 1605; total params: 3225

REINFORCE, SGD(lr=0.01, momentum=0), batch size 64

Code: <https://github.com/Pausau/StillePost/blob/main/Experiment16.ipynb>

Results: 100% of the time, the task cannot be fully solved within 200 parameter updates.