

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 (uniformely distributed)
- iid (non-uniformely 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 (uniformely 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 (uniformely 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 (uniformely 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 \sim 18.52 parameter updates.

8.4. Experiment 4.

Chinese Whispers, noiseless channel, 2 players

Length 5, Number of characters **3**, iid (uniformely 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 by fully solved within 100 parameter updates. For the times where it was fully solved, the task was fully solved once after \sim 35.65 parameter updates.

8.5. Experiment 5.

Chinese Whispers, noiseless channel, 2 players

Length 5, Number of characters **5**, iid (uniformely 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 by fully solved within 150 parameter updates.

8.6. Experiment 6.

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

Length 5, Number of characters **2**, iid (uniformely 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 (uniformely 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 (uniformely 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 by 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 (uniformely 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 by 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 (uniformely 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 by 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 (uniformely 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 by 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 (uniformely 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 by 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 (uniformely 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 \sim 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 \sim 32.63 parameter updates.