

# Homework 2

## Adder & Subtractor

### Practice

# Adder & Subtractor Practice

## ▷ Coding Part

1. Adder (A,B: 3 digits)
2. Subtractor (A-B,  $A \geq B$ )
3. Combine adder and subtractor

## ▷ Report Part

- Analyze the results under different number of digits, training epoch, training size, etc
- Can we apply the same training approach for multiplication?

▷ **Due: 4/30**

# Flow

- ▷ **Data Representation**
- ▷ **Data Generation**
- ▷ **Feature Engineering**
- ▷ **String Matching**

# Data Representation

- ▷ char vocabulary
  - “0, 1, 2, 3, 4, 5, 6, 7, 8, 9, +/-, ' ”
- ▷ length of the sequence
- ▷ one-hot encoding
- ▷ digital\_tokens decoding

# Data Generation

- ▷ Generate some question-answer pairs for training and validating

**question**      ['36+152 ', '8+2 ', '915+0 ', '144+7 ', '4+6 ']

**answer**                ['188 ', '10 ', '915 ', '151 ', '10 ']

# Feature Engineering

▷ Transfer the training sets to one-hot representation.

▷ “‘, +, 0, 1, 2, 3, 4, 5, 6, 7, 8, 9”

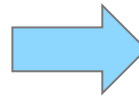
→ [[False False False False False False False False False False True False  
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False]]

# String Matching

- ▷ When we train our model with the generated datasets, the matching accuracy will gradually increase.

Q 560+517	T 1077	✗	1161
Q 916+58	T 974	✗	967
Q 720+161	T 881	✗	861
Q 859+28	T 887	✗	877
Q 625+3	T 628	✗	634
Q 434+818	T 1252	✗	1281
Q 562+136	T 698	✗	782
Q 941+93	T 1034	✗	1033
Q 384+43	T 427	✗	418
Q 767+75	T 842	✗	843

**Epoch 1**



Q 578+36	T 614	✓	614
Q 66+853	T 919	✗	929
Q 558+92	T 650	✓	650
Q 18+742	T 760	✓	760
Q 23+12	T 35	✓	35
Q 842+77	T 919	✗	929
Q 378+38	T 416	✓	416
Q 344+875	T 1219	✓	1219
Q 569+38	T 607	✓	607
Q 4+579	T 583	✓	583

**Epoch 98**

# Extension Problems

- ▷ More digits per number ?
- ▷ More numbers added ?
- ▷ .....

Sample code :

[https://github.com/IKMLab/Adder\\_practice](https://github.com/IKMLab/Adder_practice)