

LSTM practical intuition

# LSTM Practical Intuition

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## Long Short-Term Memory

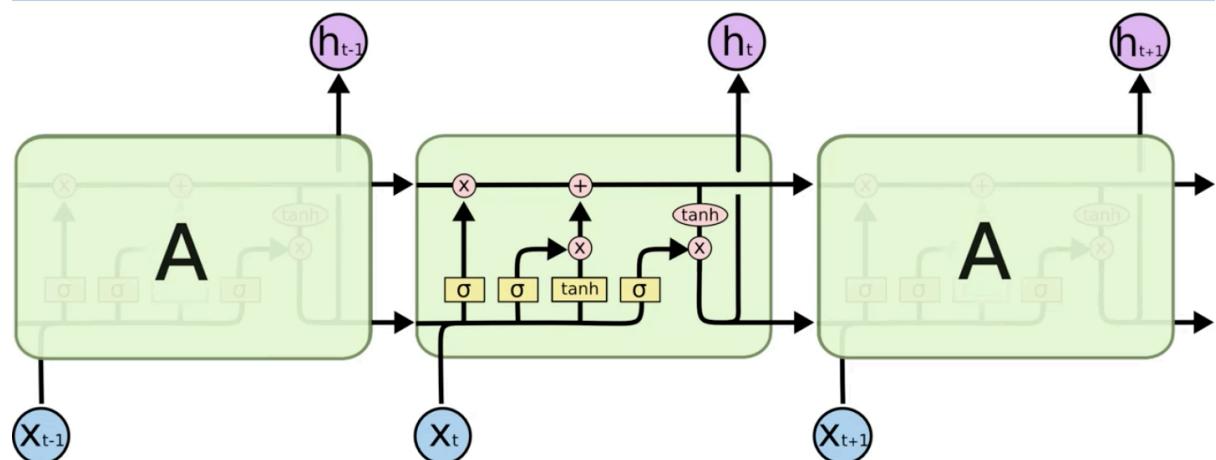


Image Source: colah.github.io

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# Long Short-Term Memory

Cell sensitive to position in line:

```
The sole importance of the crossing of the Berezina lies in the fact  
that it plainly and indubitably proved the fallacy of all the plans for  
cutting off the enemy's retreat and the soundness of the only possible  
line of action--the one Kutuzov and the general mass of the army  
demanded--namely, simply to follow the enemy up. The French crowd fled  
at a continually increasing speed and all its energy was directed to  
reaching its goal. It fled like a wounded animal and it was impossible  
to block its path. This was shown not so much by the arrangements it  
made for crossing as by what took place at the bridges. When the bridges  
broke down, unarmed soldiers, people from Moscow and women with children  
who were with the French transport, all--carried on by vis inertiae--  
pressed forward into boats and into the ice-covered water and did not,  
surrender.
```

Cell that turns on inside quotes:

```
"You mean to imply that I have nothing to eat out of.... On the  
contrary, I can supply you with everything even if you want to give  
dinner parties," warmly replied Chichagov, who tried by every word he  
spoke to prove his own rectitude and therefore imagined Kutuzov to be  
animated by the same desire.
```

```
Kutuzov, shrugging his shoulders, replied with his subtle penetrating  
smile: "I meant merely to say what I said."
```

Image Source: [karpathy.github.io](https://karpathy.github.io)

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# Long Short-Term Memory

Cell that robustly activates inside if statements:

```
static int __dequeue_signal(struct sigpending *pending, sigset_t *mask,  
                           siginfo_t *info)  
{  
    int sig = next_signal(pending, mask);  
    if (sig) {  
        if (current->notifier) {  
            if (sigismember(current->notifier->mask, sig)) {  
                if (!!(current->notifier)(current->notifier_data)) {  
                    clear_thread_flag(TIF_SIGPENDING);  
                    return 0;  
                }  
            }  
        }  
        collect_signal(sig, pending, info);  
    }  
    return sig;  
}
```

Cell that is sensitive to the depth of an expression:

```
#ifdef CONFIG_AUDITSYSCALL  
static inline int audit_match_class_bits(int class, u32 *mask)  
{  
    int i;  
    if (classes[class]) {  
        for (i = 0; i < AUDIT_BITMASK_SIZE; i++)  
            if (mask[i] & classes[class][i])  
                return 0;  
    }  
    return 1;  
}
```

Image Source: [karpathy.github.io](https://karpathy.github.io)

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# Long Short-Term Memory

A large portion of cells are not easily interpretable. Here is a typical example:

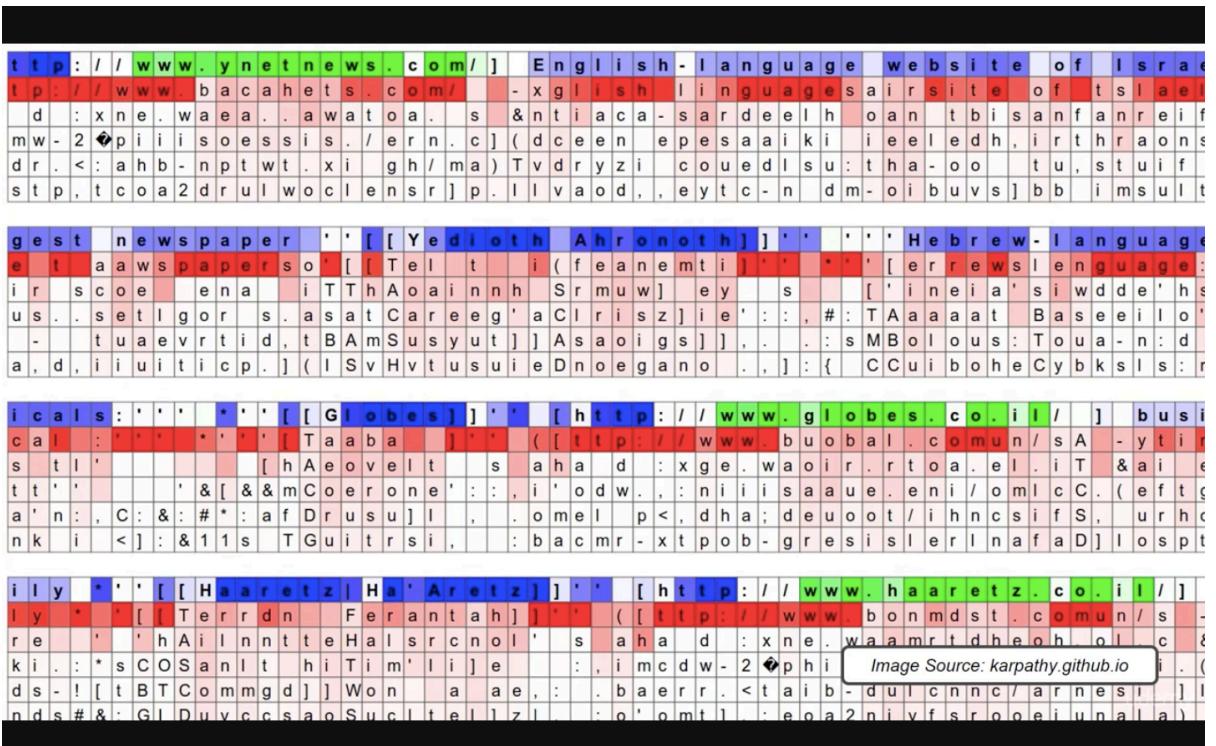
```
/* Unpack a filter field's string representation from user-space
 * buffer. */
char *audit_unpack_string(void **bufp, size_t *remain, size_t len)
{
    char *str;
    if (!*bufp || (len == 0) || (len > *remain))
        return ERR_PTR(-EINVAL);
    /* of the currently implemented string fields, PATH_MAX
     * defines the longest valid length.
    */
}
```

Image Source: [karpathy.github.io](https://karpathy.github.io)

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Sometimes the RNN doesn't make sense to us. Even though it does to the RNN.



This is a RNN that predicts next letters. There are 4 rows. The very red means the highest likeliest prediction.

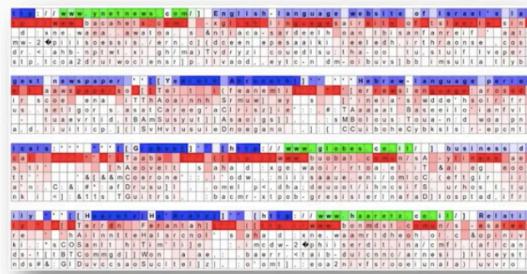
Image Source: [karpathy.github.io](https://karpathy.github.io)

# Additional Reading

Additional Reading:

*The Unreasonable Effectiveness  
of Recurrent Neural Networks*

By Andrej Karpathy (2015)



Link:

<http://karpathy.github.io/2015/05/21/rnn-effectiveness/>

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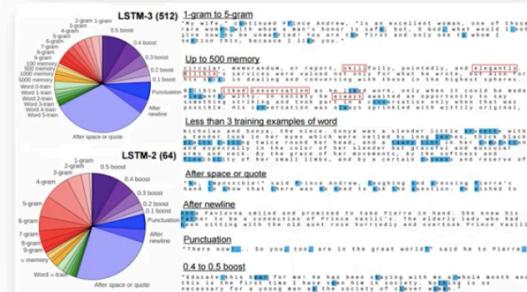
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# Additional Reading

Additional Reading:

*Visualizing and Understanding  
Recurrent Networks*

By Andrej Karpathy et al. (2015)



Link:

<https://arxiv.org/pdf/1506.02078.pdf>

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