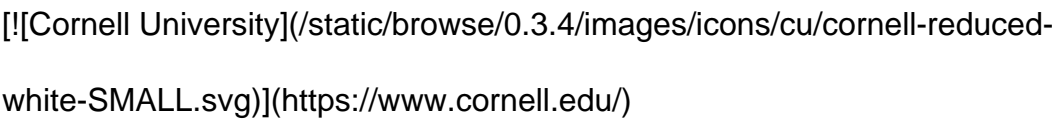


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- > batching sufficiently many requests at a time. However, existing systems
- > struggle because the key-value cache (KV cache) memory for each request is
- > huge and grows and shrinks dynamically. When managed inefficiently, this
- > memory can be significantly wasted by fragmentation and redundant
- > duplication, limiting the batch size. To address this problem, we propose
- > PagedAttention, an attention algorithm inspired by the classical virtual
- > memory and paging techniques in operating systems. On top of it, we build
- > vLLM, an LLM serving system that achieves (1) near-zero waste in KV cache
- > memory and (2) flexible sharing of KV cache within and across requests to

> further reduce memory usage. Our evaluations show that vLLM improves the  
> throughput of popular LLMs by 2-4 $\times$  with the same level of latency  
> compared to the state-of-the-art systems, such as FasterTransformer and  
> Orca. The improvement is more pronounced with longer sequences, larger  
> models, and more complex decoding algorithms. vLLM's source code is publicly  
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