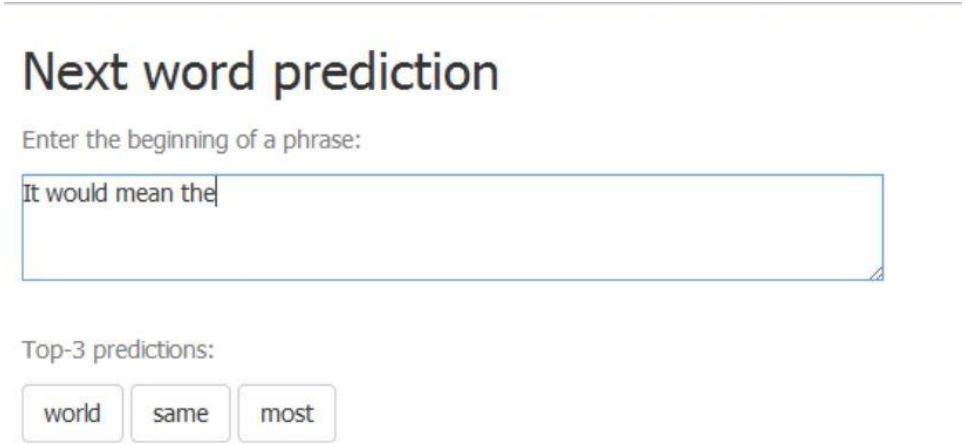
Recurrent Neural Networks (RNN)

Intuition

Previous frames

Current frame

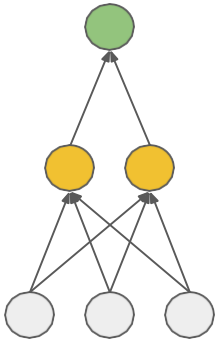
Sequence Modeling Problem



RNN Architecture

y_1= would

$\hat{y}_1$



1 0 0

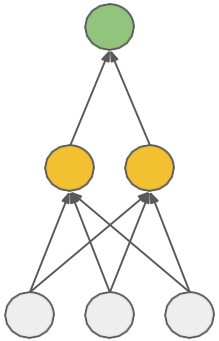
input 1 = It

timestep 1

RNN Architecture

y_1= would

$\hat{y}_1$



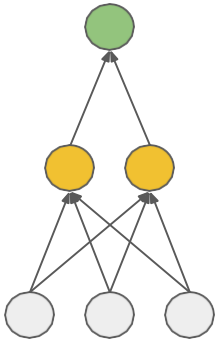
1 0 0

input 1 = It

timestep 1

y_2= be

$\hat{y}_2$



0 1 0

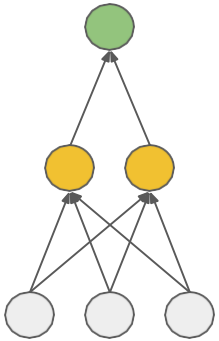
input 2 = would

timestep 2

RNN Architecture

y_1= would

$\hat{y}_1$



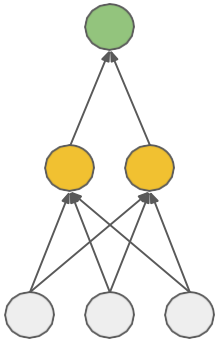
1 0 0

input 1 = It

timestep 1

y_2= be

$\hat{y}_2$



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…

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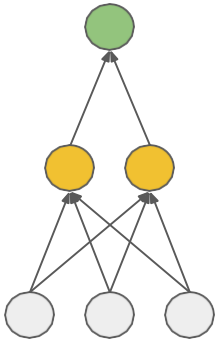

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input 1 = It

timestep 1

y_2= be

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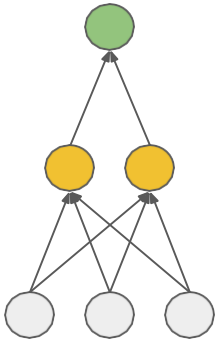

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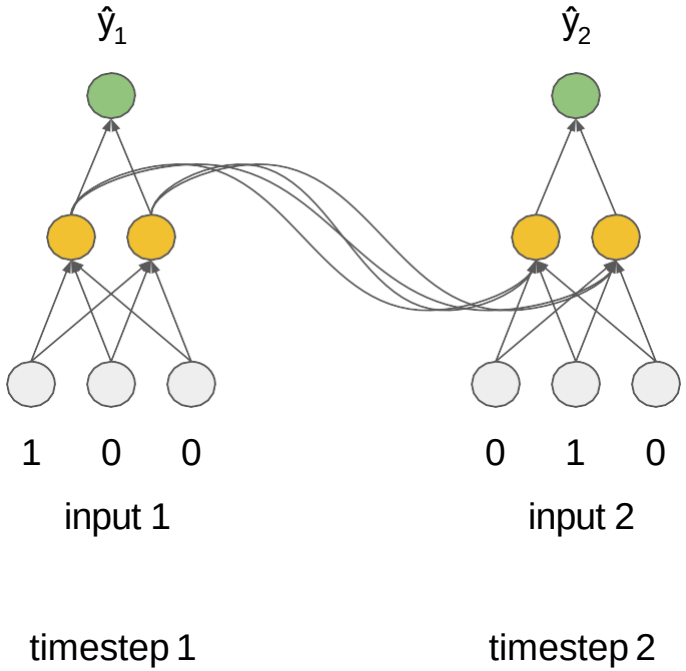
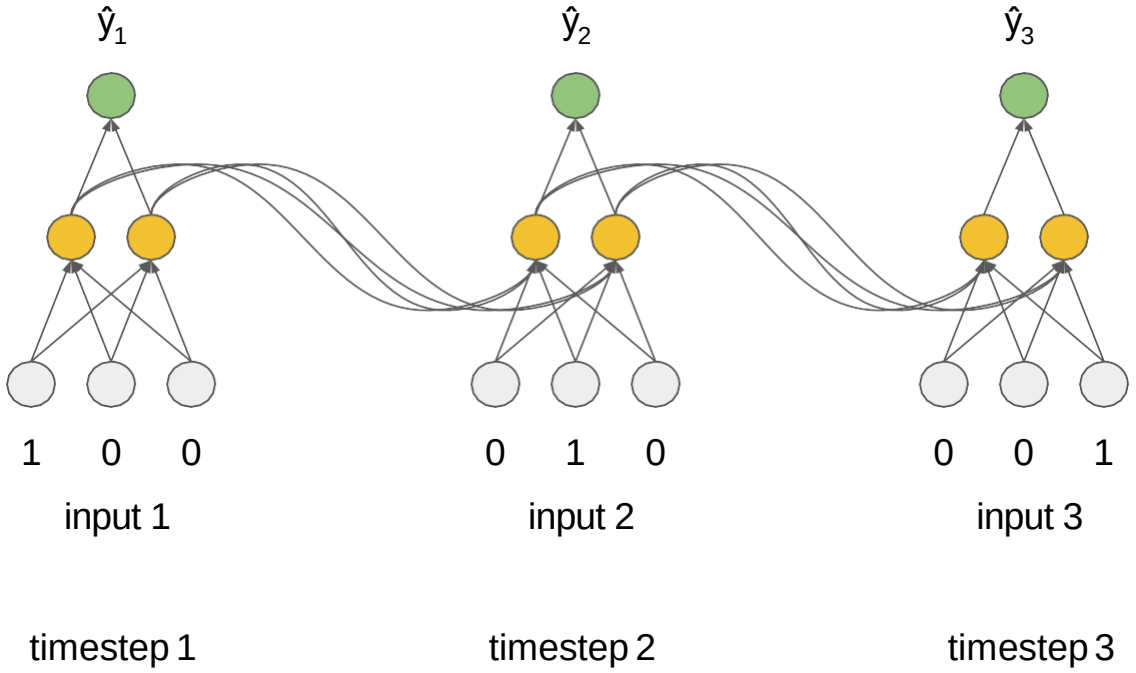
input 2 = would

timestep 2

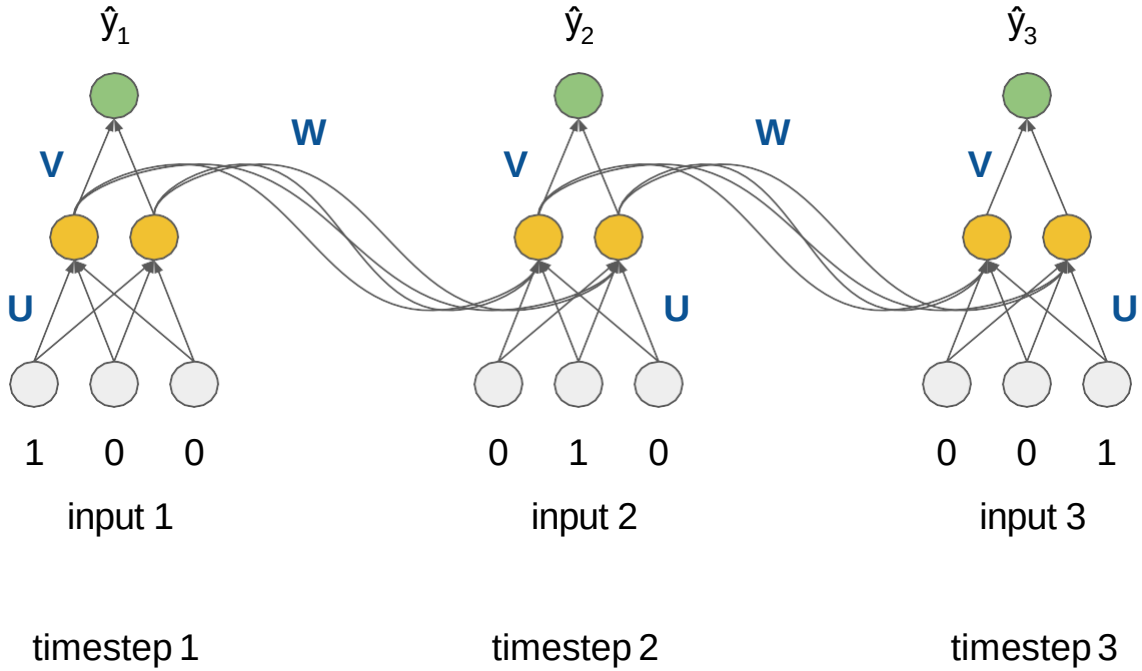
RNN Architecture



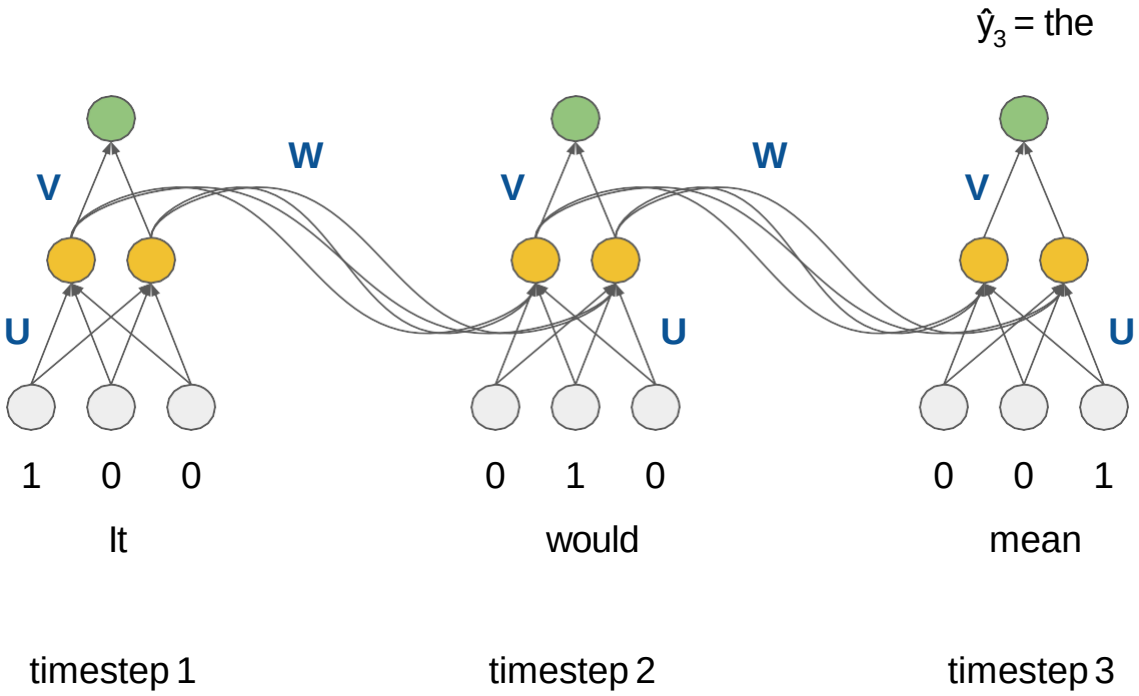
RNN Architecture



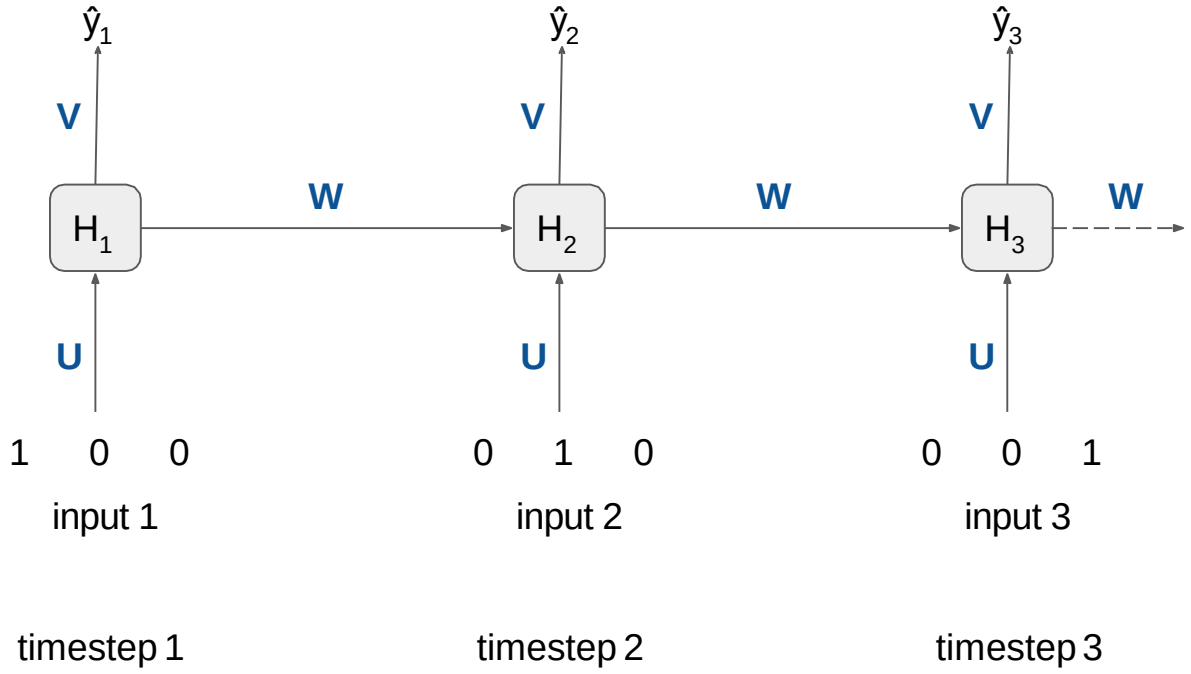
RNN Architecture



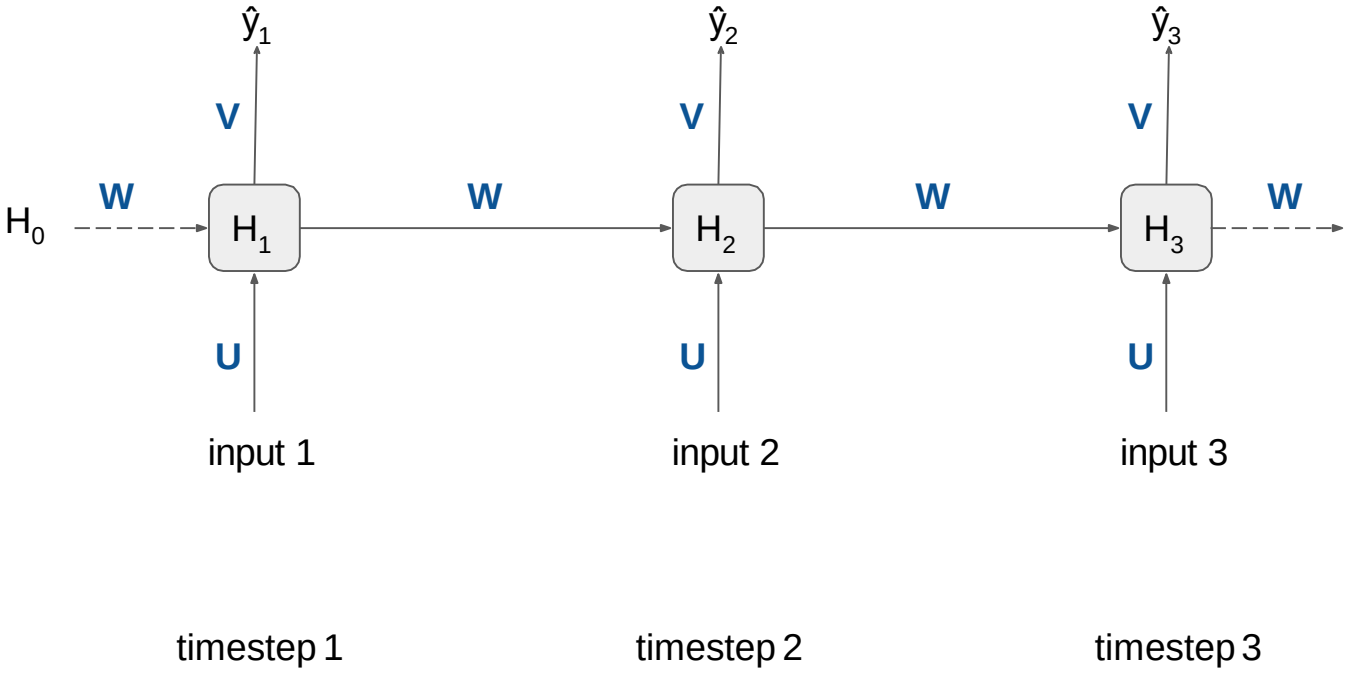
RNN Architecture



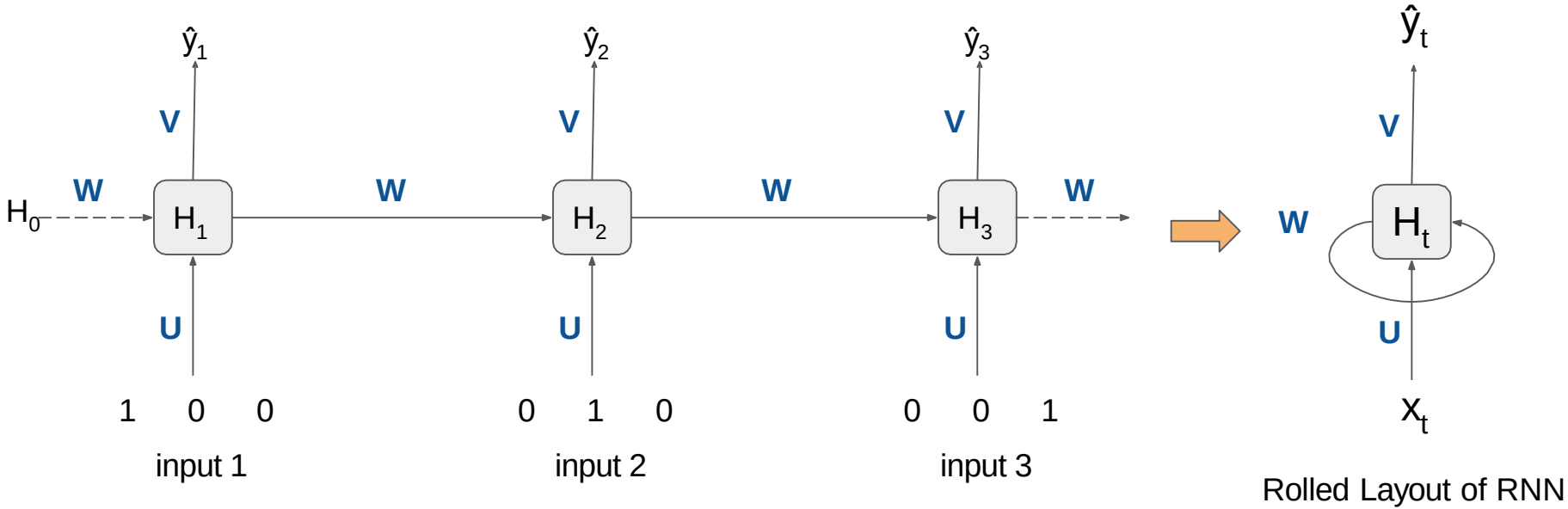
RNN Architecture



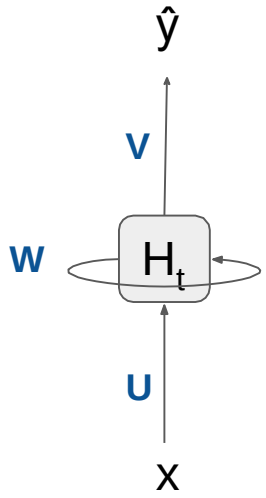
RNN Architecture



RNN Architecture

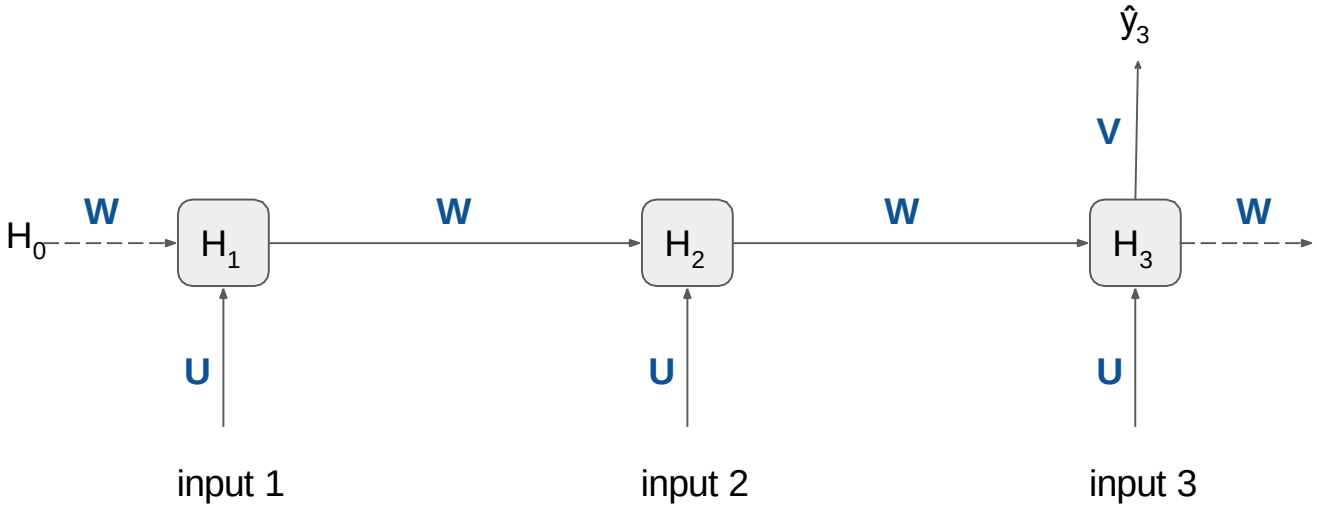


RNN Architecture



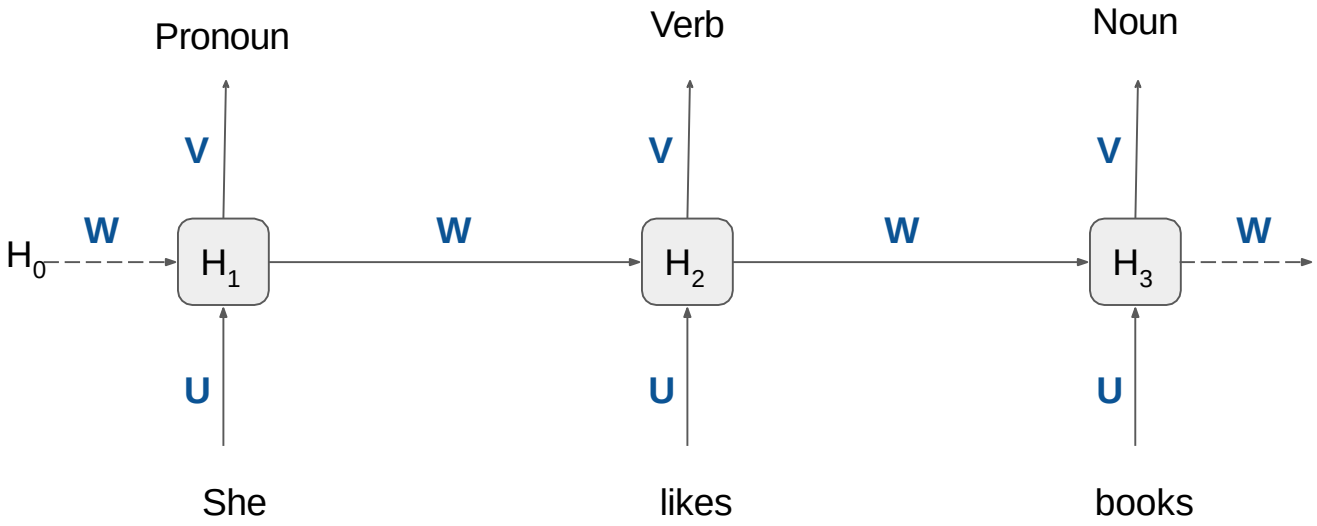
Rolled Layout of RNN

RNN Architecture Variants



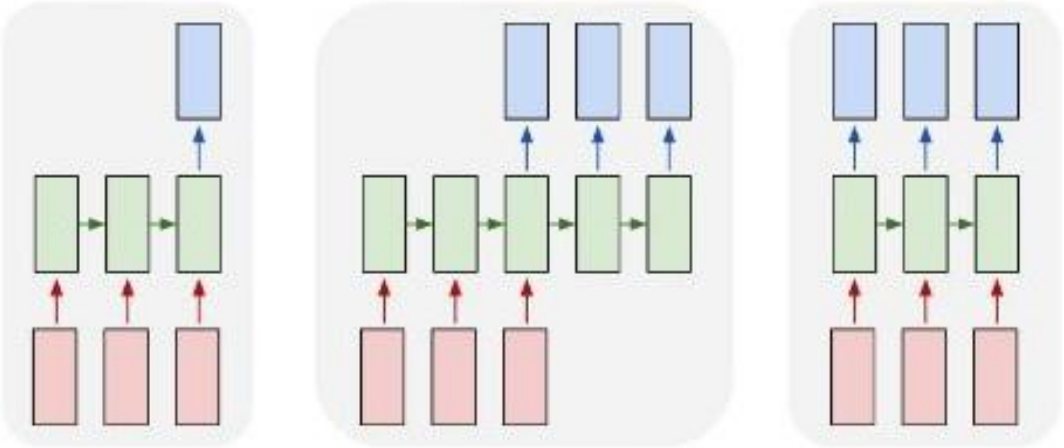
many-to-one

RNN Architecture Variants



many-to-many

RNN Architecture Variants



many-to-one

many-to-many

Functioning of RNN

Task: Classify sentiment of the text as positive or negative

Functioning of RNN - Forward Propagation

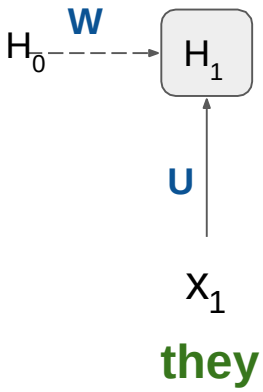
Task: Classify sentiment of the text as positive or negative

- Input sentence: “they are happy”

Functioning of RNN - Forward Propagation

Task: Classify sentiment of the text as positive or negative

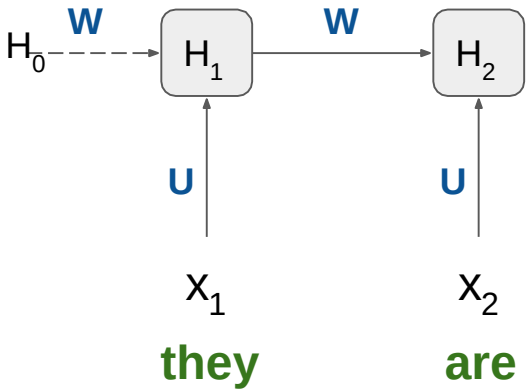
- Input sentence: “they are happy”
- First token, ‘they’, will be passed as input at timestep 1



Functioning of RNN - Forward Propagation

Task: Classify sentiment of the text as positive or negative

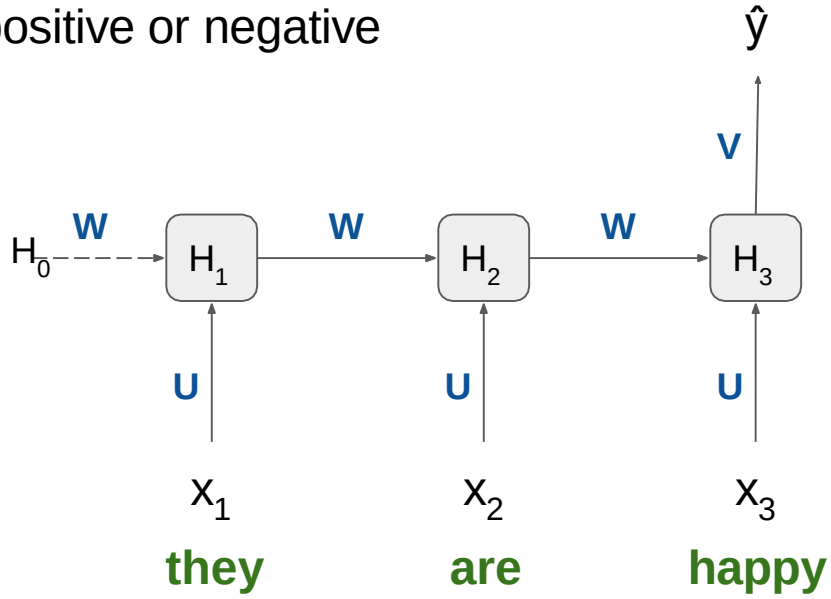
- Input sentence: “they are happy”
- First token, ‘they’, will be passed as input at timestep 1
- Second token, ‘are’, will be passed at timestep 2 and so on



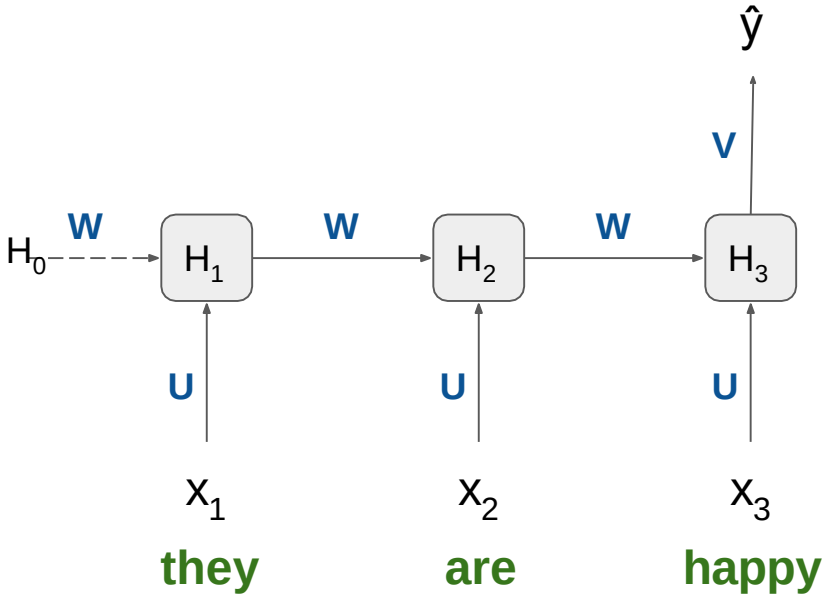
Functioning of RNN - Forward Propagation

Task: Classify sentiment of the text as positive or negative

- Input sentence: “they are happy”
- First token, ‘they’, will be passed as input at timestep 1
- Second token, ‘are’, will be passed at timestep 2 and so on
- Output obtained at last timestep.



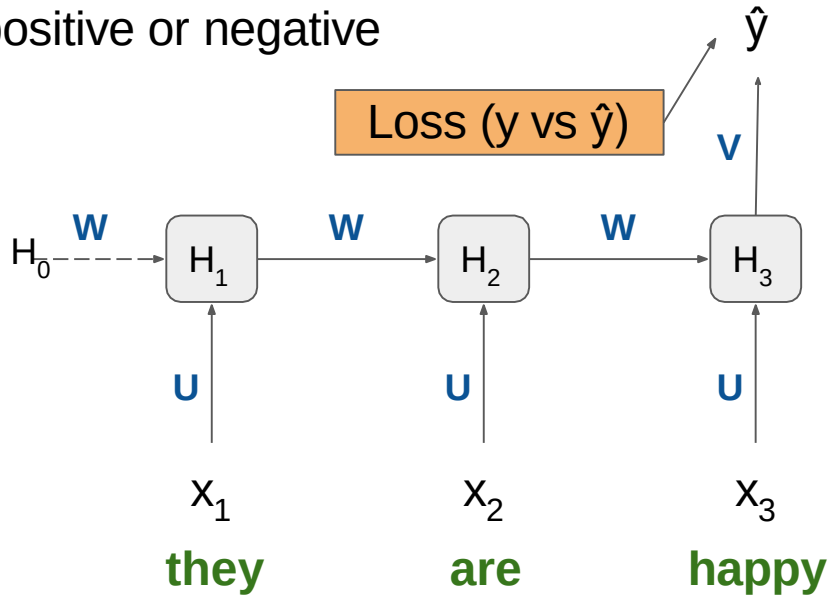
Functioning of RNN - Back Propagation



Functioning of RNN - Back Propagation

Task: Classify sentiment of the text as positive or negative

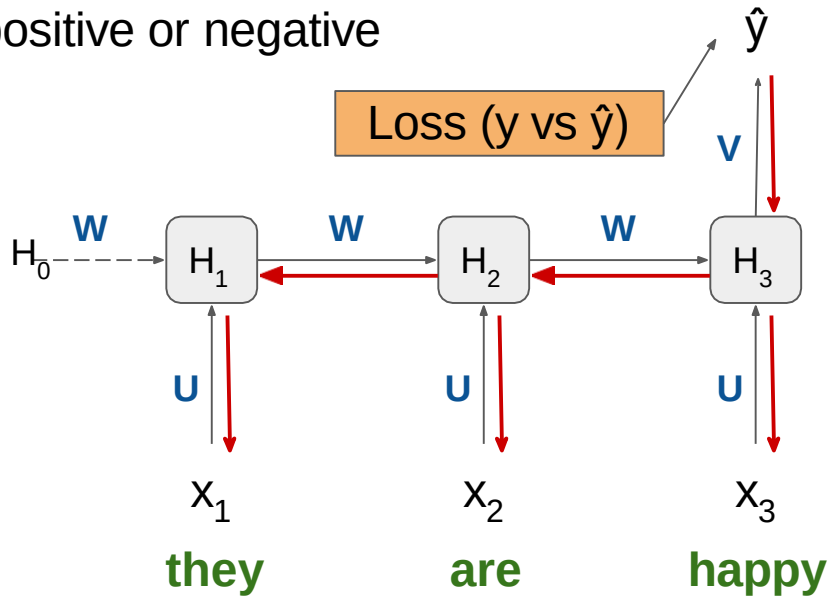
- Loss (L) is calculated at the final timestep



Functioning of RNN - Back Propagation

Task: Classify sentiment of the text as positive or negative

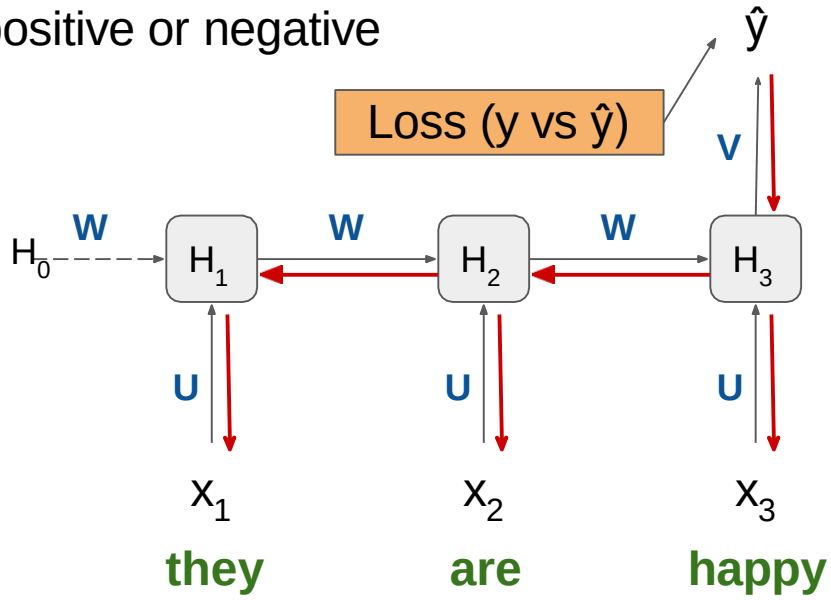
- Loss (L) is calculated at the final timestep
- ∂L/∂V, ∂L/∂W and ∂L/∂U are computed



Functioning of RNN - Back Propagation

Task: Classify sentiment of the text as positive or negative

- Loss (L) is calculated at the final timestep
- ∂L/∂V, ∂L/∂W and ∂L/∂U are computed
- Weight matrices W, U, and V are updated



Thank You