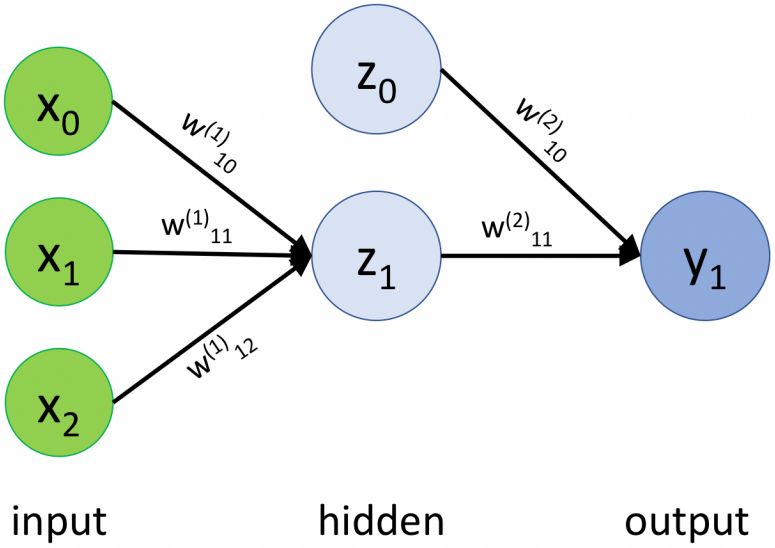
Computing activations

- In all examples, x = [x0 x1 x2], where $x_0=1$, $z_0=1$
- Assume sigmoid activation in the hidden and output layers
- Initialize all weights to 0.1
- First example: x = [1 1 0]
- Second example: x = [1 0 1]
- Third example: x = [1 1 1]



Compute the output value

Computing activations (answers)

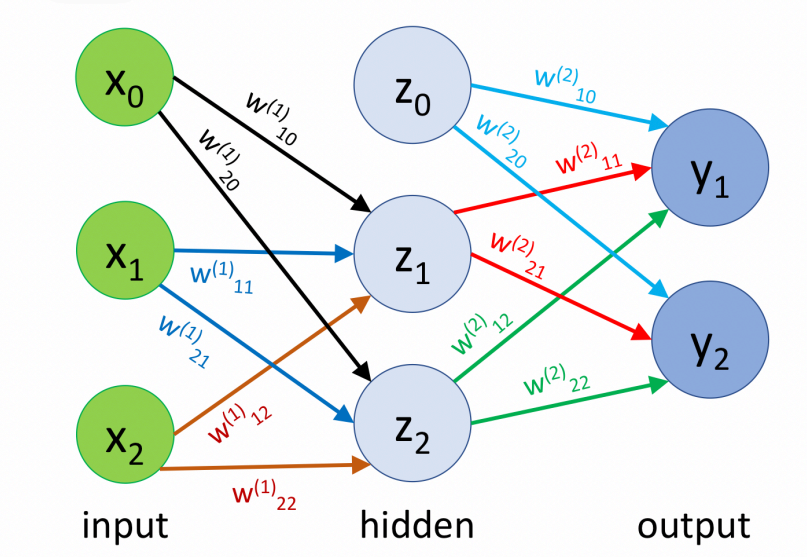
- First example:
  - At hidden: $z_1 = 1 / [1 + \exp(-(x_0 * w^{(1)}_{10} + x_1 * w^{(1)}_{11} + x_2 * w^{(1)}_{12}))]$
  - $= 1 / [1 + \exp(-(1*0.1+1*0.1+0*0.1))] = 0.5498$
  - At output: $y_1 = 1 / [1 + \exp(-(z_0 * w^{(2)}_{10} + z_1 * w^{(2)}_{11}))]$
  - $= 1 / [1 + \exp(-(1*0.1+0.5498*0.1))] = 0.5387 \rightarrow y_{pred} = 1$
- Second example:
  - At hidden: $z_1 = 1 / [1 + \exp(-(x_0 * w^{(1)}_{10} + x_1 * w^{(1)}_{11} + x_2 * w^{(1)}_{12}))]$
  - $= 1 / [1 + \exp(-(1*0.1+0*0.1+1*0.1))] = 0.5498$
  - At output: $y_1 = 1 / [1 + \exp(-(z_0 * w^{(2)}_{10} + z_1 * w^{(2)}_{11}))]$
  - $= 1 / [1 + \exp(-(1*0.1+0.5498*0.1))] = 0.5387 \rightarrow y_{pred} = 1$

Computing activations (answers)

- Third example:
  - At hidden: $z_1 = 1 / [1 + \exp(-(x_0 * w^{(1)}_{10} + x_1 * w^{(1)}_{11} + x_2 * w^{(1)}_{12}))]$
  - $= 1 / [1 + \exp(-(1*0.1+1*0.1+1*0.1))] = 0.5744$
  - At output: $y_1 = 1 / [1 + \exp(-(z_0 * w^{(2)}_{10} + z_1 * w^{(2)}_{11}))]$
  - $= 1 / [1 + \exp(-(1*0.1+0.5744*0.1))] = 0.5393 \rightarrow y_{pred} = 1$

Computing activations

- In all examples, x = [x0 x1 x2], where $x_0=1$, $z_0=1$
- Assume sigmoid activation in the hidden and output layers
- Initialize all weights to 0.05
- First example: x = [1 1 0]
- Second example: x = [1 0 1]
- Third example: x = [1 1 1]



Computing activations (answers)

- First example:
  - At hidden:
    - $z_1 = 1 / [1 + \exp(-(x_0 * w^{(1)}_{10} + x_1 * w^{(1)}_{11} + x_2 * w^{(1)}_{12}))] = 1 / [1 + \exp(-(1*0.05+1*0.\ 05+0*0.\ 05))] = 0.5249$
    - $z_2 = 1 / [1 + \exp(-(x_0 * w^{(1)}_{20} + x_1 * w^{(1)}_{21} + x_2 * w^{(1)}_{22}))] = 1 / [1 + \exp(-(1*0.05+1*0.05+0*0.05))] = 0.5249$
  - At output:
    - $y_1 = 1 / [1 + \exp(-(z_0 * w^{(2)}_{10} + z_1 * w^{(2)}_{11} + z_2 * w^{(2)}_{12}))] = 1 / [1 + \exp(-(1*0.05+0.5249*0.05+0.5249*0.05))] = 0.5256$
    - $y_2 = 1 / [1 + \exp(-(z_0 * w^{(2)}_{20} + z_1 * w^{(2)}_{21} + z_2 * w^{(2)}_{22}))] = 1 / [1 + \exp(-(1*0.05+0.5249*0.05+0.5249*0.05))] = 0.5256 \rightarrow y_{pred} = [1\ 1]$

Computing activations (answers)

- Second example:
  - At hidden:
    - $z_1 = 1 / [1 + \exp(-(x_0 * w^{(1)}_{10} + x_1 * w^{(1)}_{11} + x_2 * w^{(1)}_{12}))] = 1 / [1 + \exp(-(1*0.05+0*0.\ 05+1*0.\ 05))] = 0.5249$
    - $z_2 = 1 / [1 + \exp(-(x_0 * w^{(1)}_{20} + x_1 * w^{(1)}_{21} + x_2 * w^{(1)}_{22}))] = 1 / [1 + \exp(-(1*0.05+0*0.05+1*0.05))] = 0.5249$
  - At output:
    - $y_1 = 1 / [1 + \exp(-(z_0 * w^{(2)}_{10} + z_1 * w^{(2)}_{11} + z_2 * w^{(2)}_{12}))] = 1 / [1 + \exp(-(1*0.05+0.5249*0.05+0.5249*0.05))] = 0.5256$
    - $y_2 = 1 / [1 + \exp(-(z_0 * w^{(2)}_{20} + z_1 * w^{(2)}_{21} + z_2 * w^{(2)}_{22}))] = 1 / [1 + \exp(-(1*0.05+0.5249*0.05+0.5249*0.05))] = 0.5256 \rightarrow y_{pred} = [1\ 1]$

Computing activations (answers)

- Third example:
  - At hidden:
    - $z_1 = 1 / [1 + \exp(-(x_0 * w^{(1)}_{10} + x_1 * w^{(1)}_{11} + x_2 * w^{(1)}_{12}))] = 1 / [1 + \exp(-(1*0.05+1*0.\ 05+1*0.\ 05))] = 0.5374$
    - $z_2 = 1 / [1 + \exp(-(x_0 * w^{(1)}_{20} + x_1 * w^{(1)}_{21} + x_2 * w^{(1)}_{22}))] = 1 / [1 + \exp(-(1*0.05+1*0.05+1*0.05))] = 0.5374$
  - At output:
    - $y_1 = 1 / [1 + \exp(-(z_0 * w^{(2)}_{10} + z_1 * w^{(2)}_{11} + z_2 * w^{(2)}_{12}))] = 1 / [1 + \exp(-(1*0.05+0.5374*0.05+0.\ 5374*0.05))] = 0.5259$
    - $y_2 = 1 / [1 + \exp(-(z_0 * w^{(2)}_{20} + z_1 * w^{(2)}_{21} + z_2 * w^{(2)}_{22}))] = 1 / [1 + \exp(-(1*0.05+0.\ 5374*0.05+0.\ 5374*0.05))] = 0.5259 \rightarrow y_{pred} = [1\ 1]$