Linear Classification and Computation Graphs
Linear Classification
Linear Classification

- **Input:** \( x \in \mathbb{R}^d \)
- **Output:** \( y \in \{1, 2, \ldots, k\} \)
- **Parameters:** \( W \in \mathbb{R}^{k \times d}, b \in \mathbb{R}^k \)

\[
s = Wx + b
\]

\[
\hat{y} = \arg\max_i s_i \quad P(y) = \text{softmax}(s)_y
\]
Linear Classification
Softmax

- Turn scores into a distribution

\[
P(y) = \text{softmax}(s)_y = \frac{e^{s_y}}{\sum_i e^{s_i}}
\]

Loss: \(-\log P(y)\)
Computation Graphs

- Arrange the operations of a network as a graph"
Computation Graphs - Abstraction

- Group tensors and operations into repeatable layers

```
torch.nn.Linear
```

```
x
```

```
W
```

```
Matrix Multiply
```

```
Add
```

```
Softmax
```

```
x
```

```
b
```

```
p
```