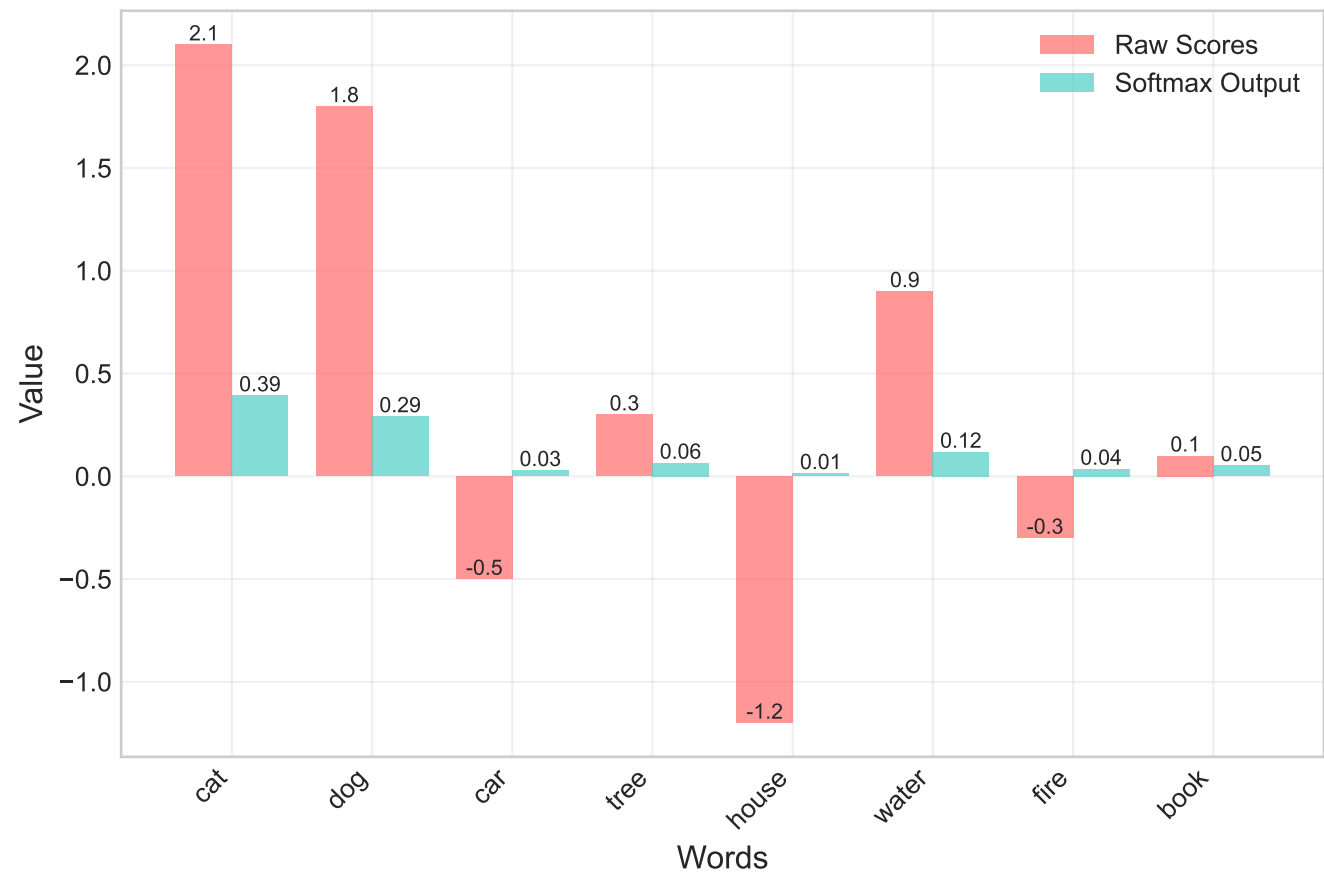
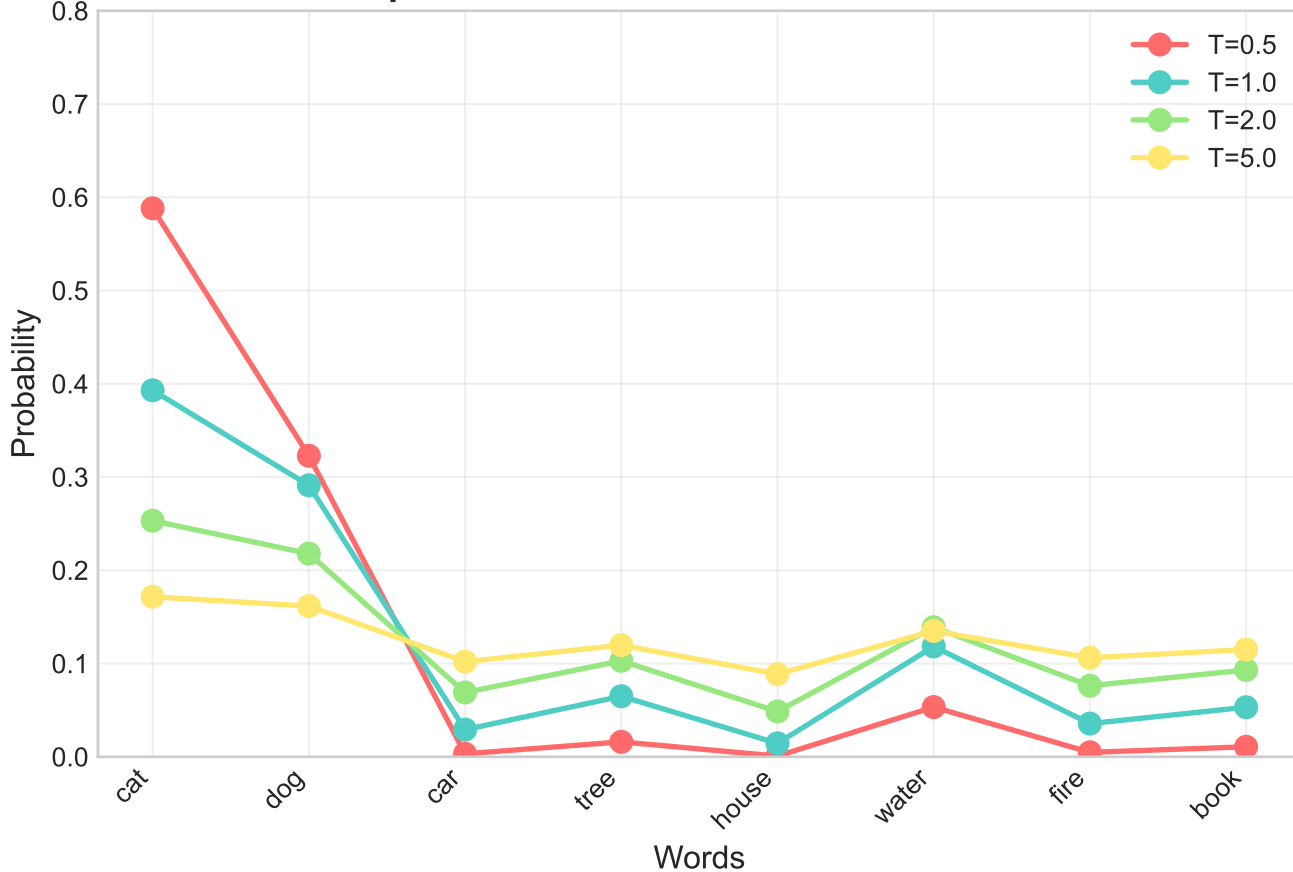


# Softmax Function: Converting Scores to Probabilities

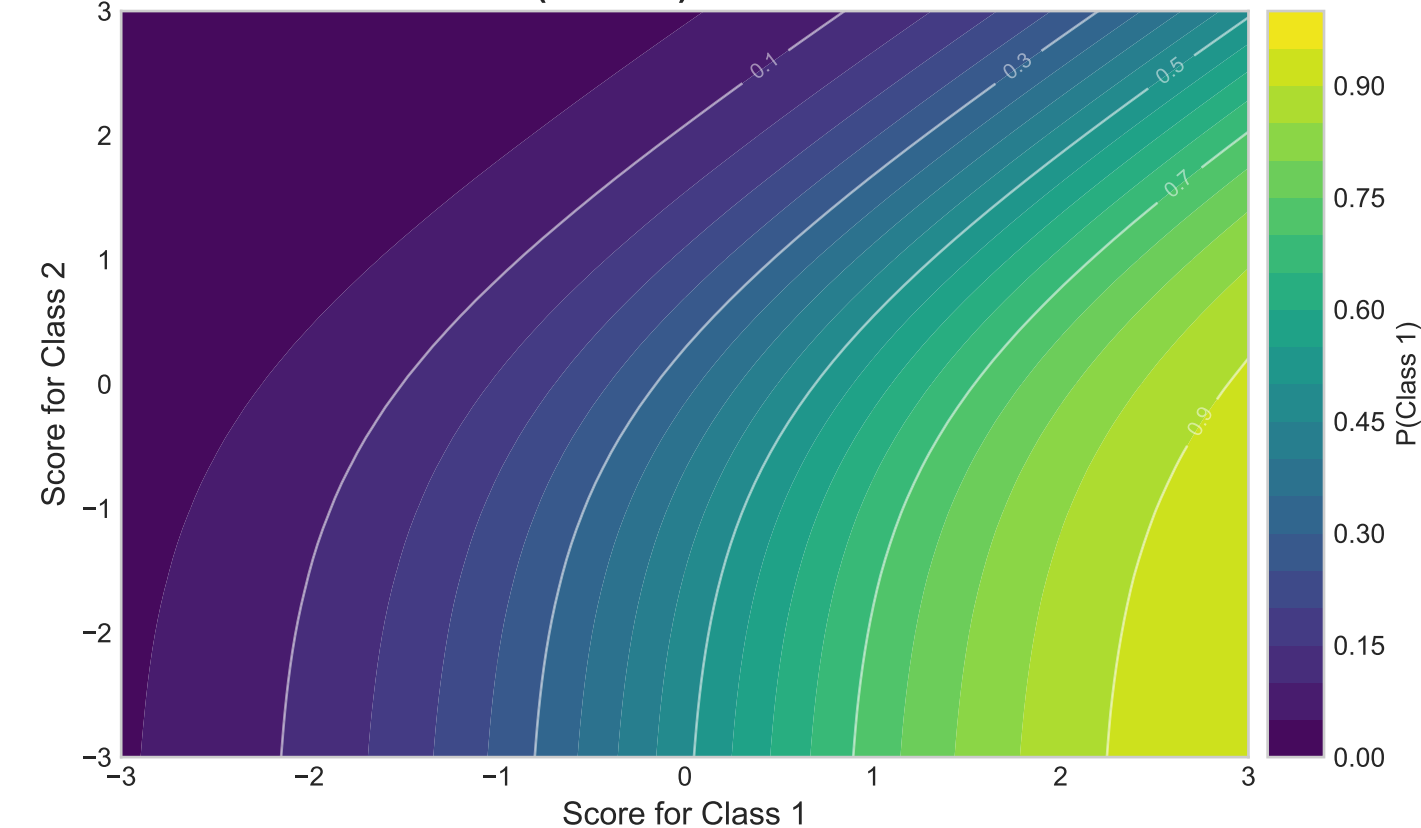
## Softmax Transformation: Scores → Probabilities



## Temperature Effect on Softmax Distribution



## 2D Softmax: P(Class 1) with Class 3 fixed at 0



## Softmax Formula:

$$\text{Softmax}(x_i) = \frac{e^{x_i}}{\sum_{j=1}^n e^{x_j}}$$

## Example Calculation:

Input scores: [2.0, 1.0, 0.1]

Step 1: Exponentiate

$\exp(2.0) = 7.39$

$\exp(1.0) = 2.72$

$\exp(0.1) = 1.11$

Step 2: Sum =  $7.39 + 2.72 + 1.11 = 11.22$

Step 3: Normalize

$P1 = 7.39/11.22 = 0.66$

$P2 = 2.72/11.22 = 0.24$

$P3 = 1.11/11.22 = 0.10$

Output: [0.66, 0.24, 0.10] (sum = 1.0)

## Key Properties:

- Output range: [0, 1]
- Sum to 1.0
- Preserves order
- Differentiable