

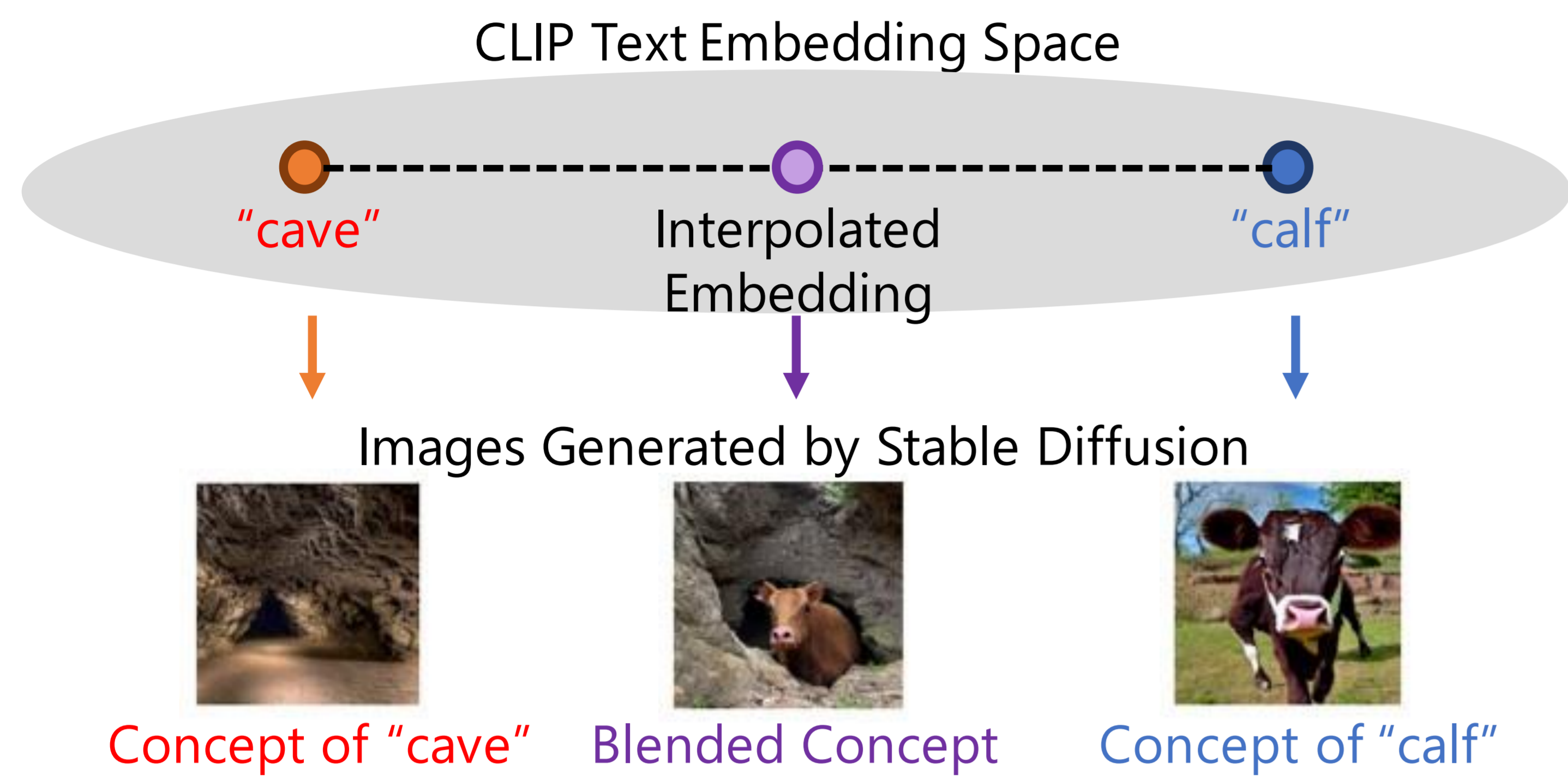


Conceptual Blending

■ Diffusion models blend concepts in images^[3]

- When interpolated embedding is input

■ **Problem: Only qualitatively studied**



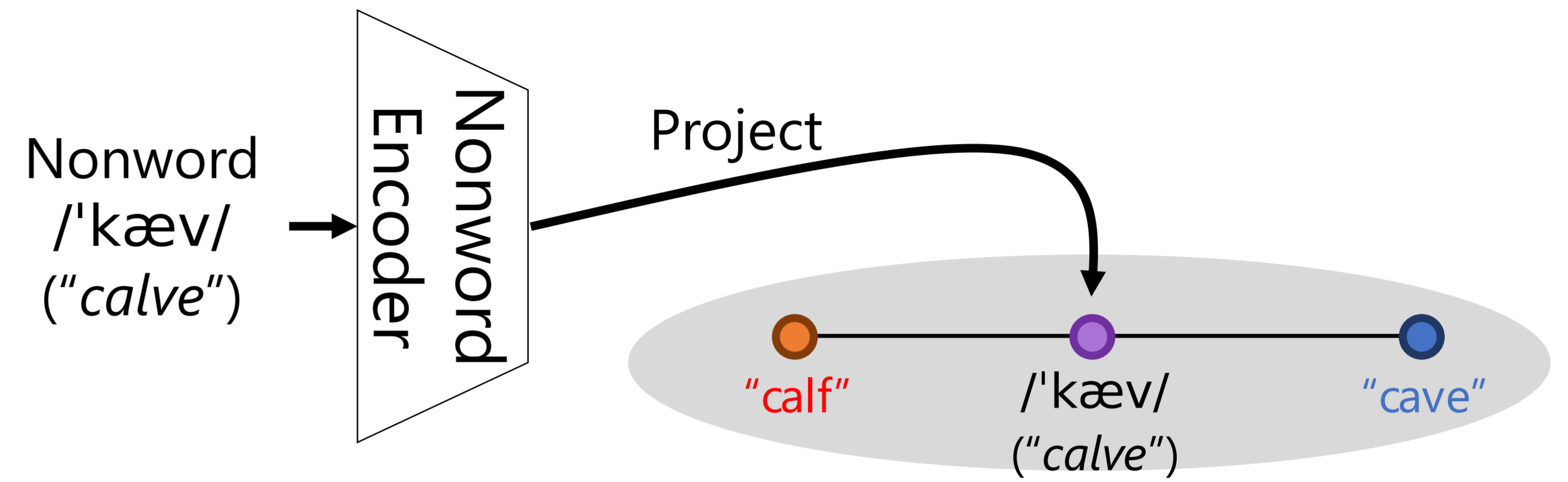
Nonword-to-Image Generation

■ Generate intuitive images for **nonwords**^[1]

- Nonwords := Non-existing words (e.g., "flike"^[2])
- For better language understanding
 - Nonwords can evoke impressions in humans

■ **Idea: Associate with similar-sounding words**

- Conceptual blending could improve intuitiveness



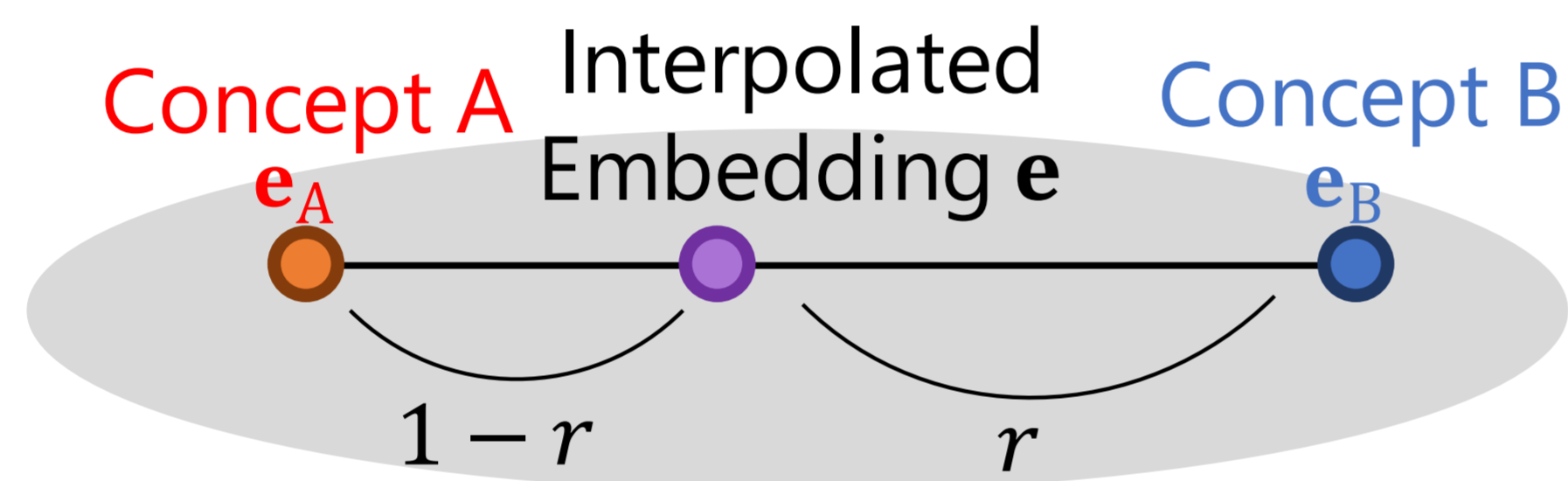
■ **Aim: Investigate conceptual blending for more intuitive nonword-to-image generation**

- Experiment 1: Evaluate **quantitatively** how often **conceptual blending** emerges in diffusion models
- Experiment 2: Exploit **conceptual blending** for generating intuitive images for **nonwords**

Exp. 1: Conceptual Blending in Stable Diffusion-v1.4

■ **Preparation: 1,000 interpolated embeddings**

- Created by interpolating the embeddings of two concepts



- Seed concepts: Highly-imageable English nouns
- 10 images generated for each interpolated embedding

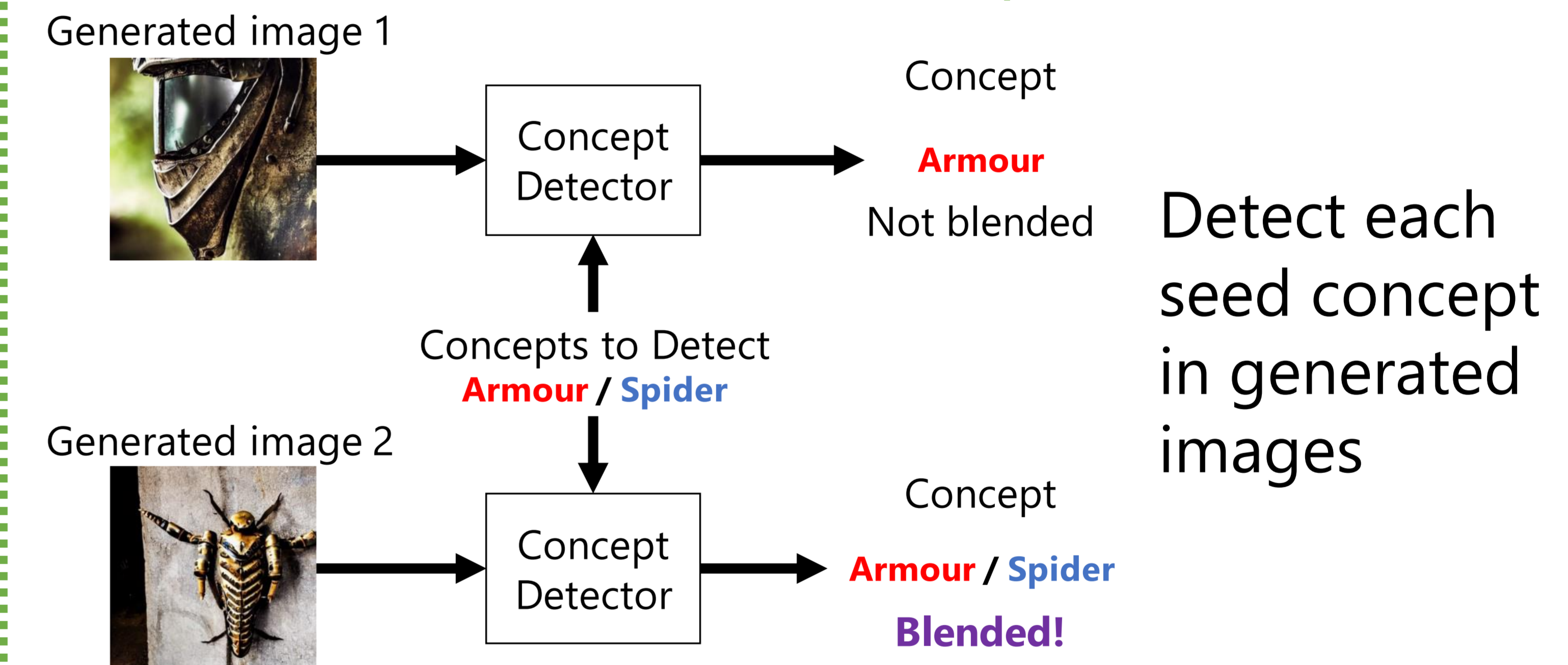
■ **Metric: Concept Depiction Probability**

- Inspect each set of 10 generated images
- Count how often 2 or more images depict seed concepts A, B, and blended concept

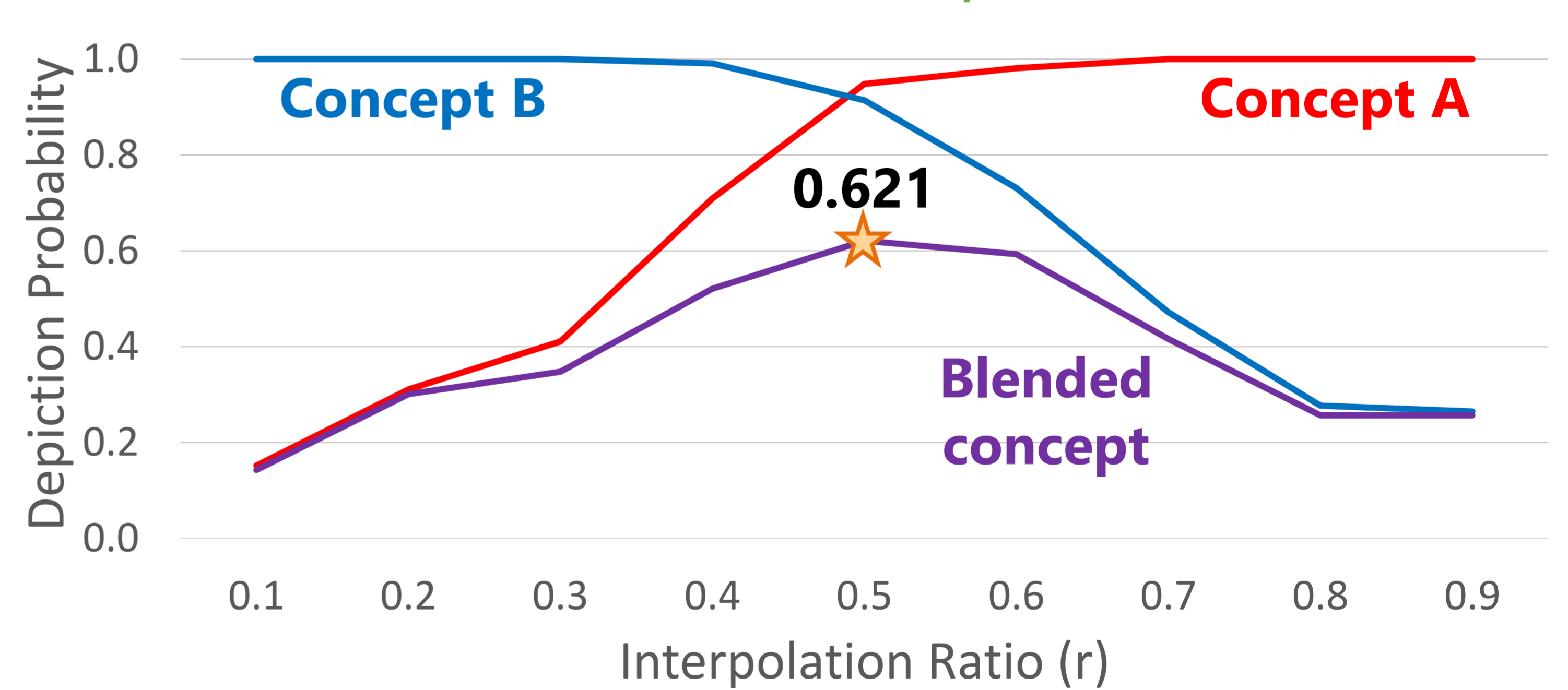
■ Concept A: "Armour" ■ Concept B: "Spider" ■ Blended Concept



■ **Method: Construct a concept detector**



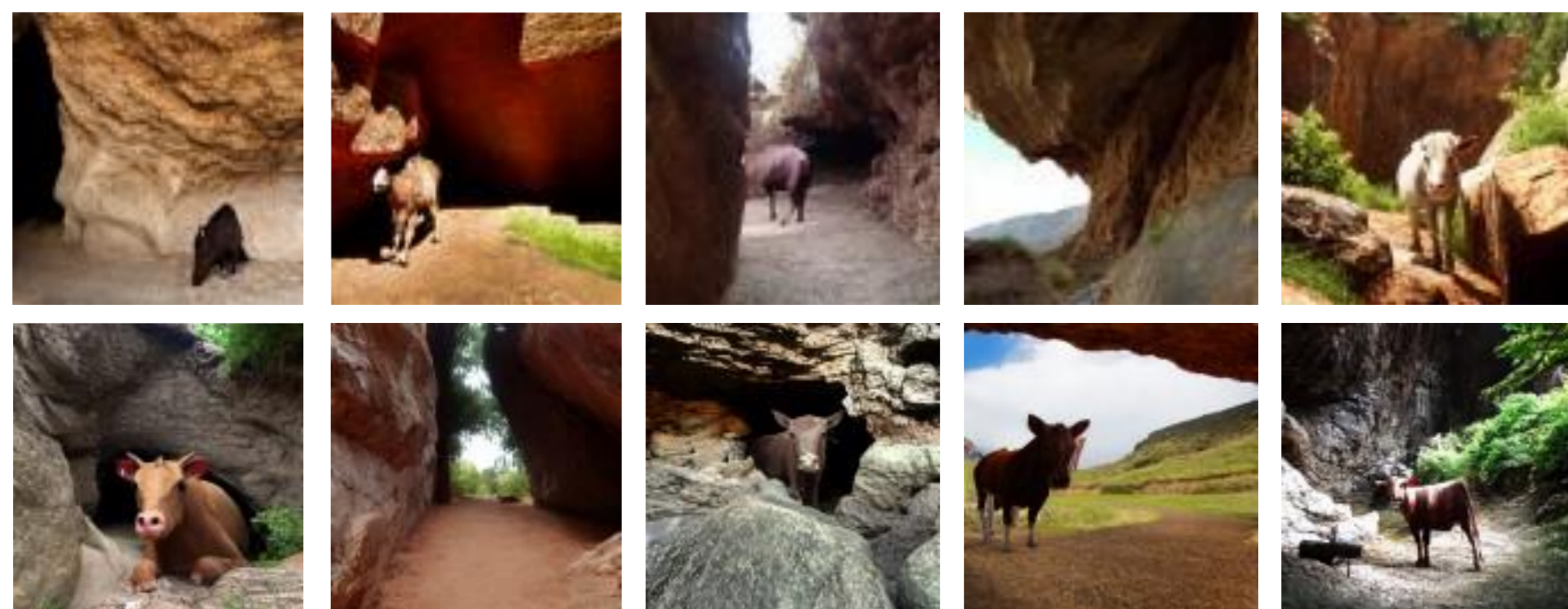
■ **Result: With different interpolation ratios**



✓ Max. 62.1% image sets yield blending

Exp. 2: Conceptual Blending for Randomly Created English Nonwords^[2]

Nonword: /'kæv/ ("calve")



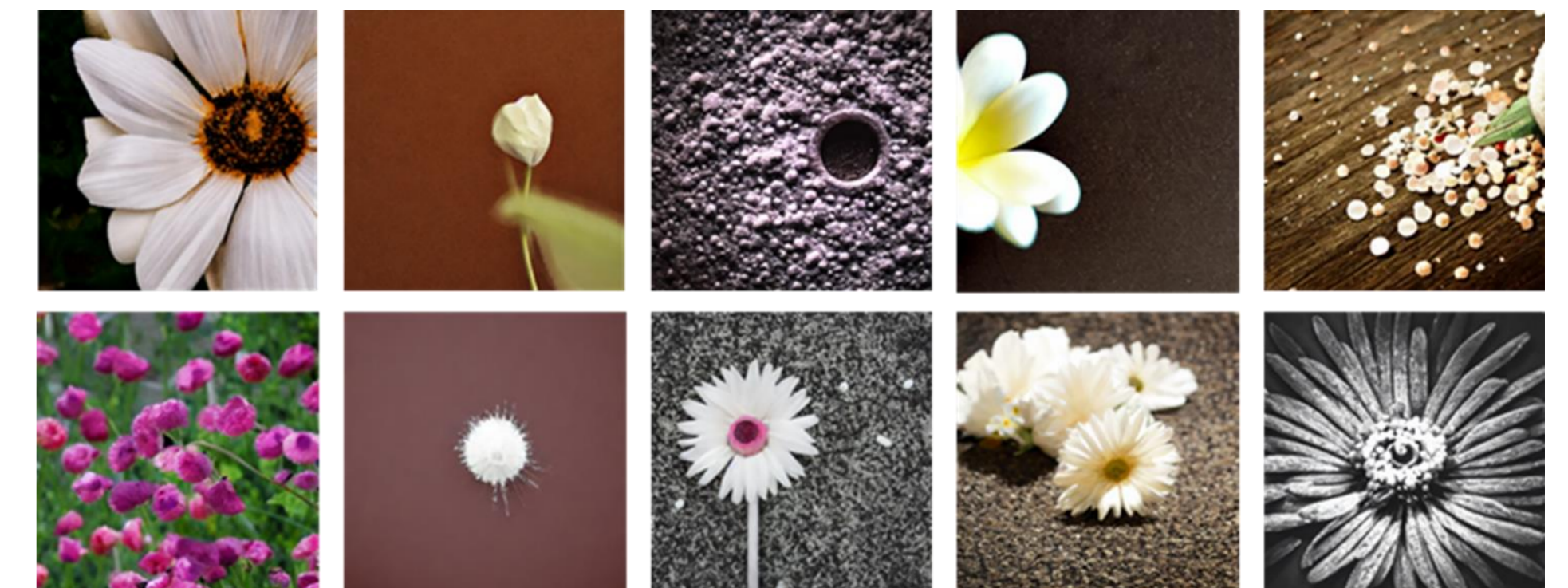
Blend: "calf" and "cave"

Nonword: /'brɔɪn/ ("broin")



Blend: "brain" and "bone"

Nonword: /'bləʊə/ ("blour/blower")



Blend: "flour" and "flower"

✓ Succeeded in generating blended concepts of similar-sounding words

[1] Matsuhira et al.: Interpolating the text-to-image correspondence based on phonetic and phonological similarities for nonword-to-image generation, IEEE Access, 2024.

[2] Sabbatino et al., "'splink' is happy and 'phrouth' is scary: Emotion intensity analysis for nonsense words", WASSA 2022.

[3] Melzi et al., "Does Stable Diffusion dream of electric sheep?", Image Schema Day 2023.