**1. Paper & Code**

* **Title:** DiffCut: Catalyzing Zero‑Shot Semantic Segmentation with Diffusion Features and Recursive Normalized Cut
* **Authors:** Paul Couairon, Mustafa Shukor, Jean‑Emmanuel Haugeard, Matthieu Cord, Nicolas Thome
* **GitHub:** <https://github.com/PaulCouairon/DiffCut>

**2. Reproduction Summary**

We successfully ran the official Colab notebook on custom images, following these steps:

1. Cloned the repository (or opened the hosted Colab demo).
2. Installed dependencies (PyTorch, Detectron2, etc.) and set the runtime to GPU.
3. Uploaded several test images manually; extracted diffusion features via the UNet encoder.
4. Applied the recursive normalized-cut algorithm, refined masks with PAMR and median filtering, and overlaid results for comparison.

**3. Observations**

* **Clear Scenes:** Well‑lit photos with distinct, large objects yielded crisp, semantically meaningful segments.
* **Complex or Small Objects:** Images containing many small or overlapping elements—especially AI‑generated or highly stylized (DALL·E) graphics—produced noisier, less precise masks.
* **Blurred Backgrounds:** When the background was intentionally defocused or blurred, segmentation quality degraded slightly, with some boundaries bleeding into adjacent regions.
* **Resource Usage:** High-resolution (1024×1024) processing comfortably ran on Colab’s T4 GPU, but memory fragmentation occasionally led to out‑of‑memory errors during mask refinement.

**4. Challenges Encountered**

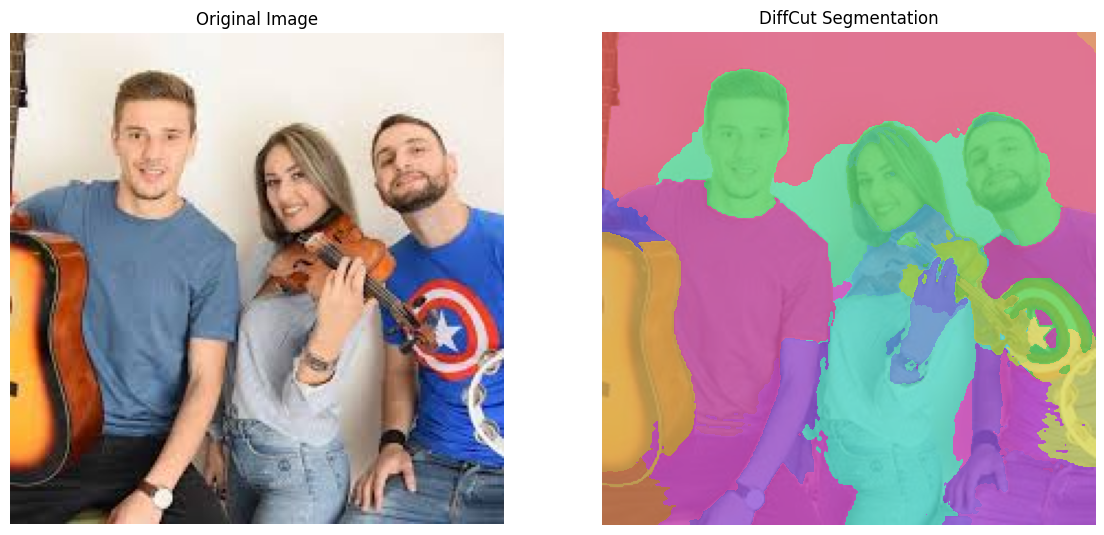
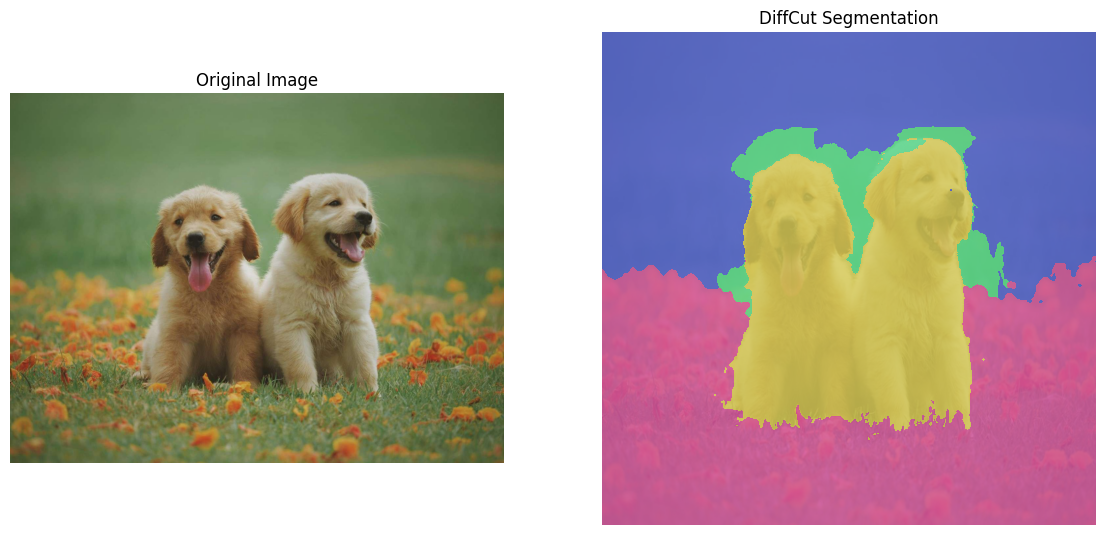
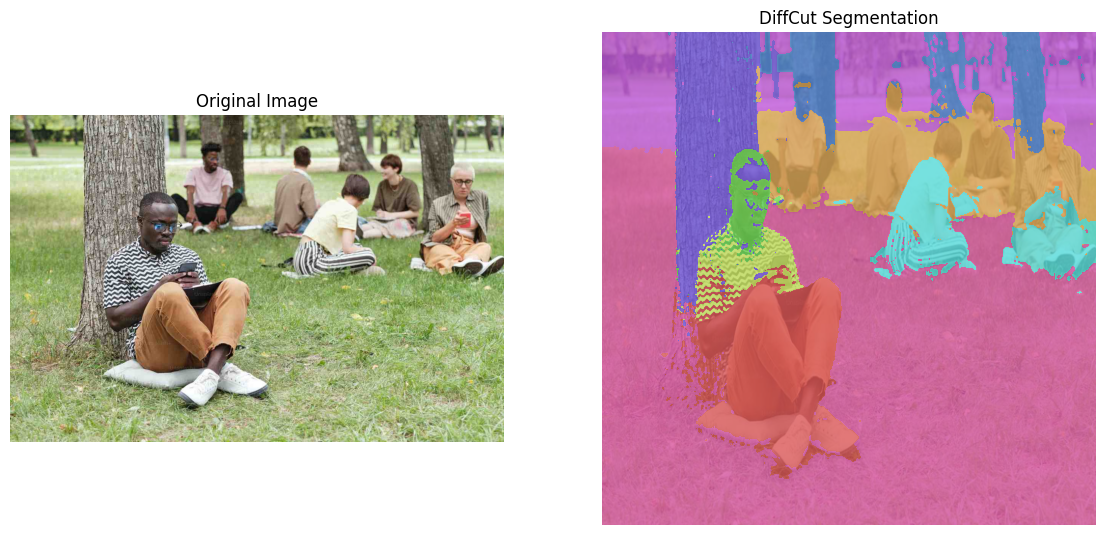
* **Environment & Imports:** Ensuring the tools/ldm.py module was discoverable required correct working‑directory settings and Python path adjustments.
* **Image Diversity:** Stylized and low‑contrast images sometimes confused the diffusion features, impacting mask accuracy.
* **Memory Constraints:** The PAMR refinement step consumed substantial GPU memory, triggering CUDA OOM errors. We mitigated this by downscaling to 512×512, emptying the CUDA cache, or running refinement on CPU.

1. **Contribution**

**Viswanth Tammana**

* Environment Setup & Troubleshooting: Cloned and configured the DiffCut repo in Colab, resolved import‑path and GPU memory issues to ensure the pipeline ran reliably.
* Experimentation & Reporting: Ran segmentation on diverse images, analyzed performance variations (clear, complex, blurred), and documented insights and relevance to WanderTales.

**Sample Outputs**

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