Unsupervised Learning of Artistic Styles with Archetypal Style Analysis

Supplementary Material

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Here, we presents a set of additional results, which were not included in the paper for space limitation reasons, as well as experimental material such as the full set of archetypes learned by our approach.

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1	Influence of parameters $\sim \delta$ and comparison with [1]	

Influence of parameters γ , δ and comparison with [1].

In this section, we provide additional comparisons between our variant of [1] and the original one. All cases seem to confirm that (i) the heuristic $\gamma = \delta$ is reasonably good in terms of quality of the results, and (ii) our variant is much more accurate than [1] in terms of content preservation as soon as the amount of stylization is less than 100%. Figure 1 visualizes why the method of [1] loses so much detail regardless of the strength of stylization. Figures 2, 3, and 4 show more detailed comparisons of the two variants for different artworks and target styles.

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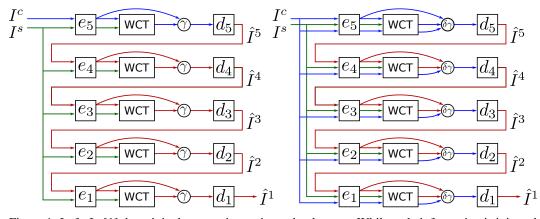
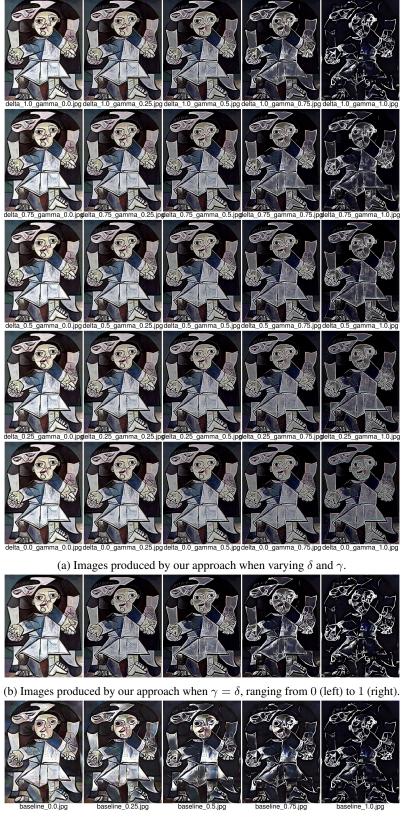


Figure 1: Left: In [1] the original content image is used only once. While style information is injected before every decoding step, information lost during the encoding, coloring and decoding steps can never be recovered. Right: Using I^c at every layer allows the decoders to produce more faithful reconstructions if desired.



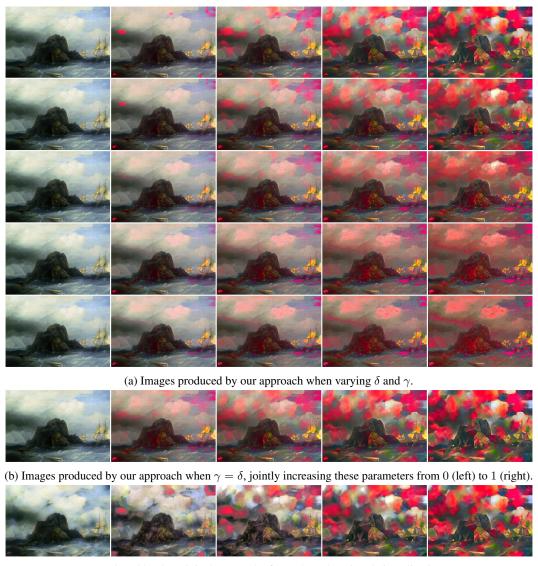
(c) Images produced by the original approach of [1] when changing their stylization parameter.

Figure 2: Comparison of stylization control between our approach and [1].



(c) Images produced by the original approach of [1].

Figure 3: Comparison of stylization control between our approach and [1].



(c) Images produced by the original approach of [1] when changing their stylization parameter.

Figure 4: Comparison of stylization control between our approach and [1].

2 Examples of Image Decompositions

We show in this section a few additional image decompositions, involving trivial ones, meaningful ones, and failure cases.

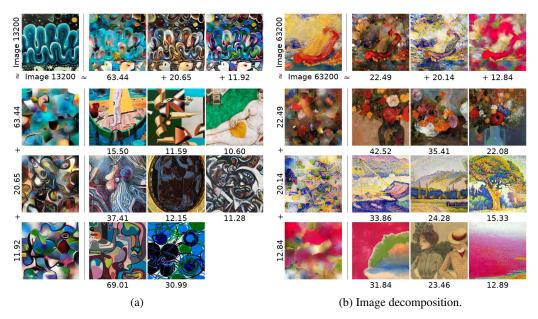


Figure 5: Image decompositions from the GanGogh collection.

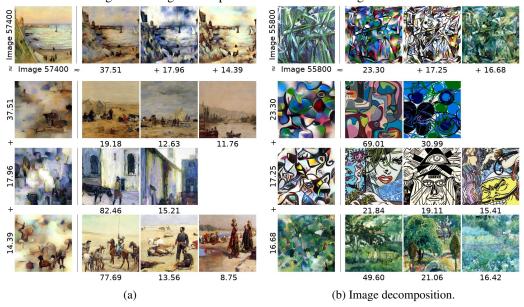


Figure 6: Image decompositions from the GanGogh collection.

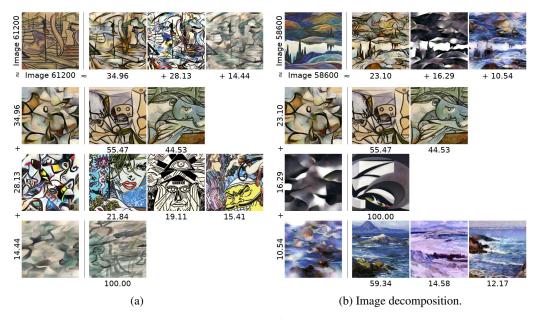


Figure 7: Image decompositions from the GanGogh collection.

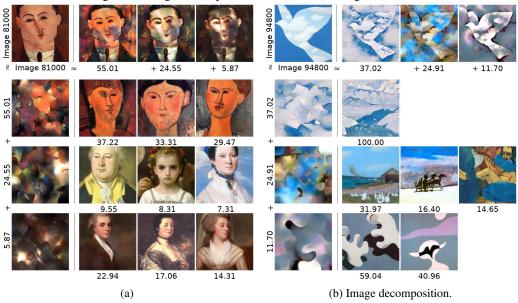


Figure 8: Image decompositions from the GanGogh collection.

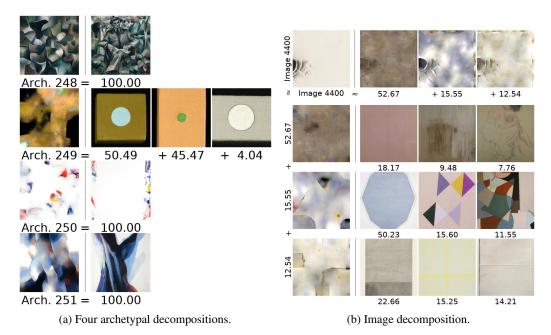


Figure 9: Failure cases of two archetypal decompositions (a) and image decomposition (b). (a): the second archetype seems to code only for "circle on rough canvas". While this is definitely the defining characteristic of the contributing images, it is not helpful for stylization. The other rows are examples of degenerate archetypes, *i.e.* archetypes with a single contribution. (b) A non-sparse image decomposition, hence difficult to interpret. The strongest three components seem to represent the absence of texture, but it is not clear what their contribution is to the image style.

3 Additional Examples of Style Manipulation

In this section, we present additional examples of style enhancement and interplation, as well as examples of stylization of natural photographs.



(a) "Woman with Book" by Pablo Picasso. From the GanGogh collection.

Figure 10: We demonstrate the enhancement of the two most prominent archetypal styles for different artworks. The middle panel shows a near-perfect reconstruction of the original content image in every case and uses parameters $\gamma, \delta = 0.5$. Then, we increase the relative weight of the strongest component towards the left, and of the second component towards the right. Simultaneously, we increase γ and δ from 0.5 in the middle panel to 0.95 on the outside.



Figure 11: "Maria and Baby" by Robert Henri. Free archetypal combination.



Figure 12: Tübingen image

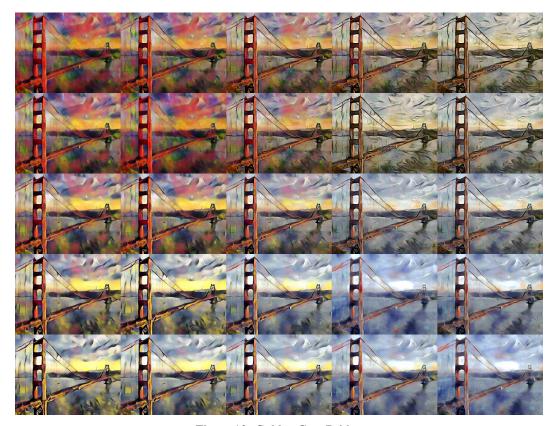


Figure 13: Golden Gate Bridge

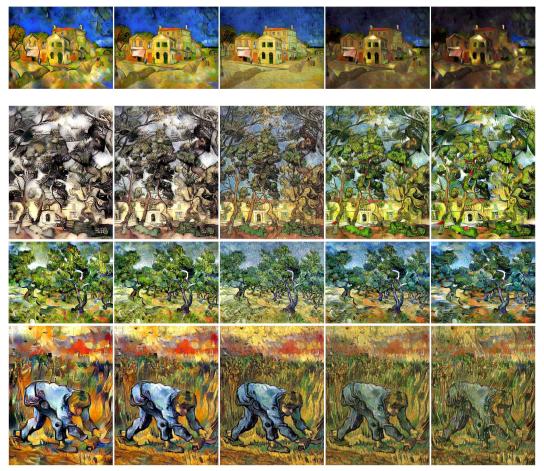


Figure 14: Additional examples of style enhancements of van Gogh's works.



Figure 15: Additional examples of style enhancements of van Gogh's works.

4 Full Set of van Gogh's Archetypes

In this section, we present the k=32 archetypes learned on the collection of Van Gogh's paintings; the archetypes seem to cover van Gogh's artistic development relatively accurately. The full set of archetypes is shown in Figures 16 and 17.

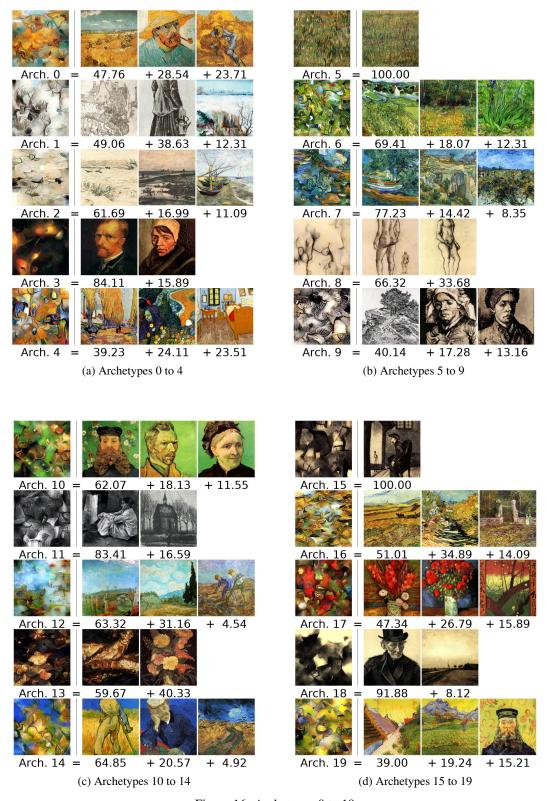
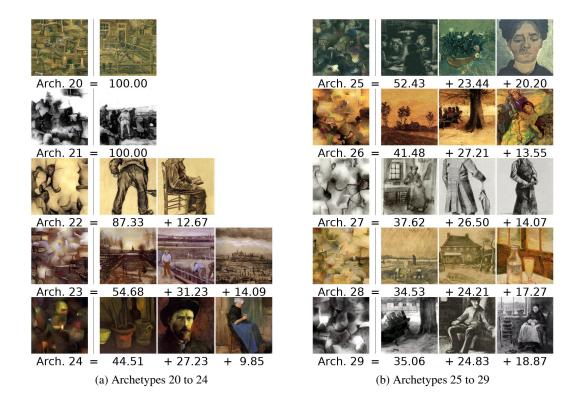
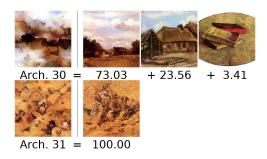


Figure 16: Archetypes 0 to 19





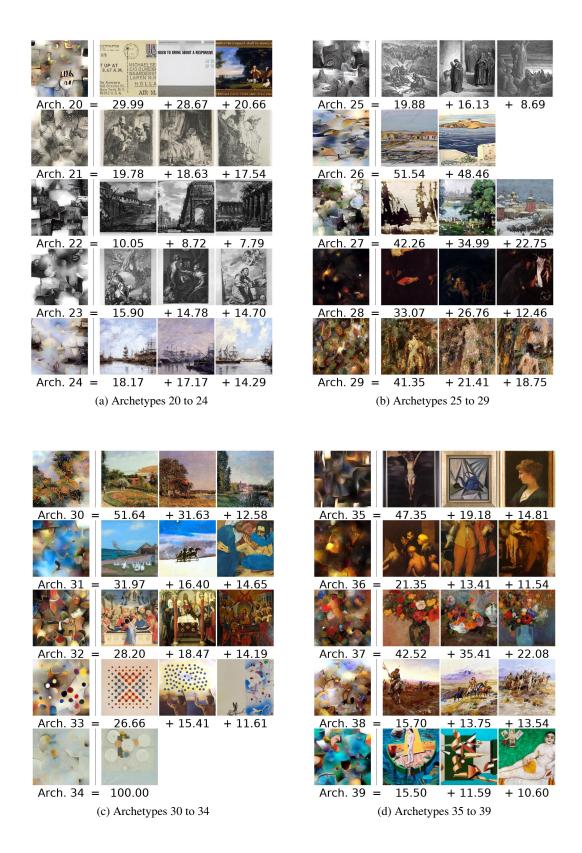
(c) Archetypes 30 to 31

Figure 17: Archetypes 20 to 31

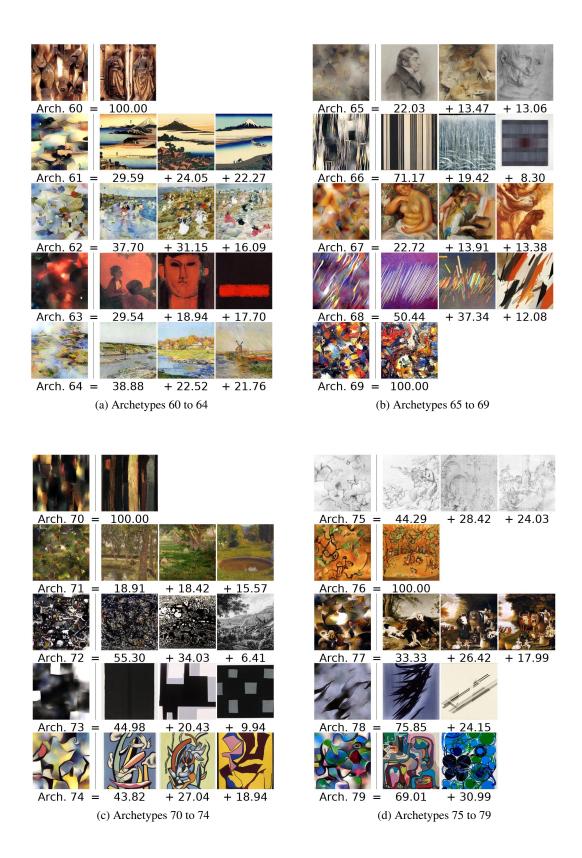
5 Full Set of GanGogh Archetypes

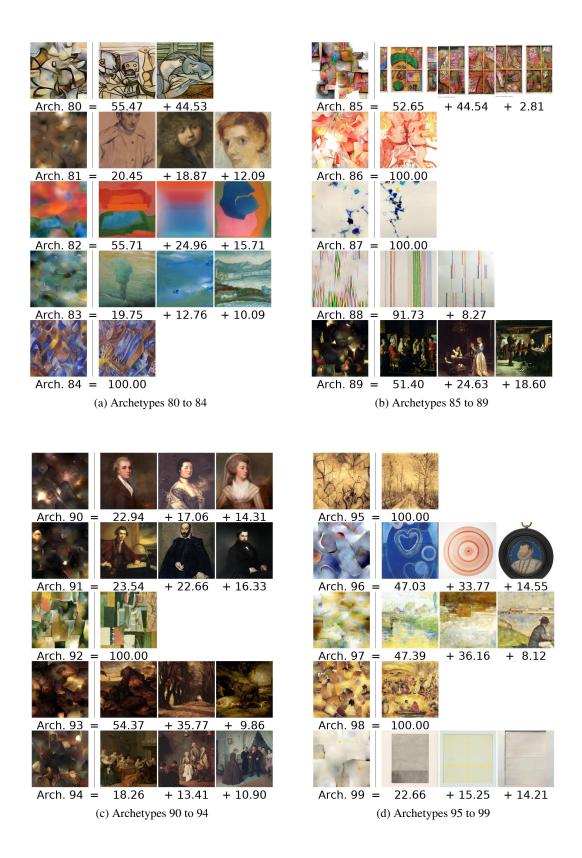
In this section, we provide the full set of 256 archetypes learned on the Gangogh collection. Visualization is performed in the same way as in the main paper.







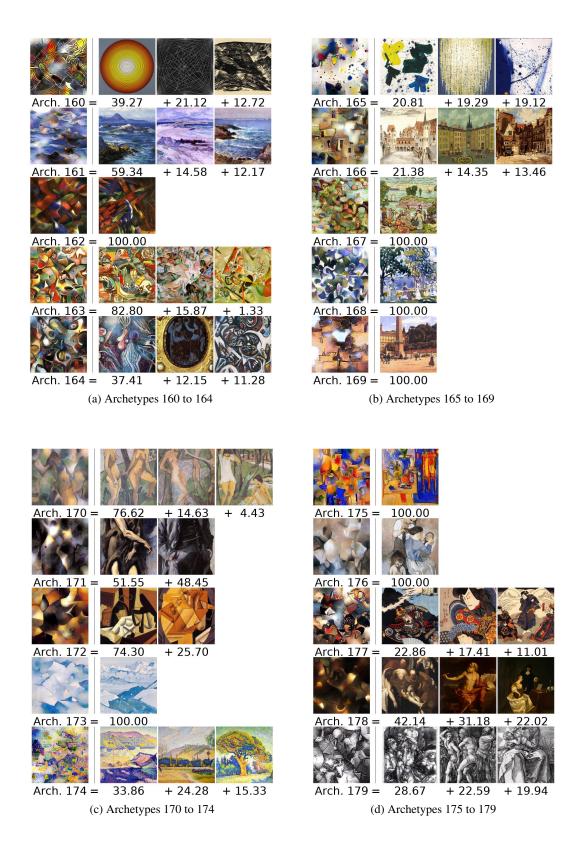


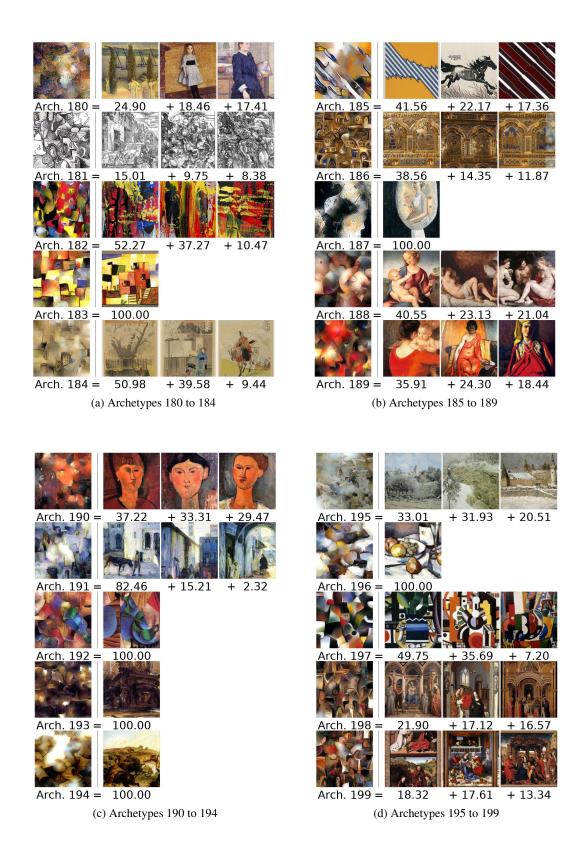


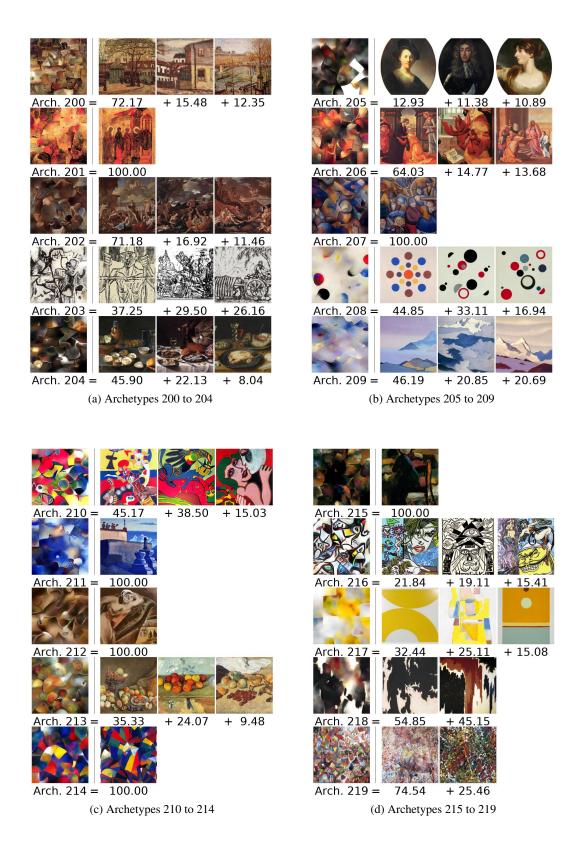


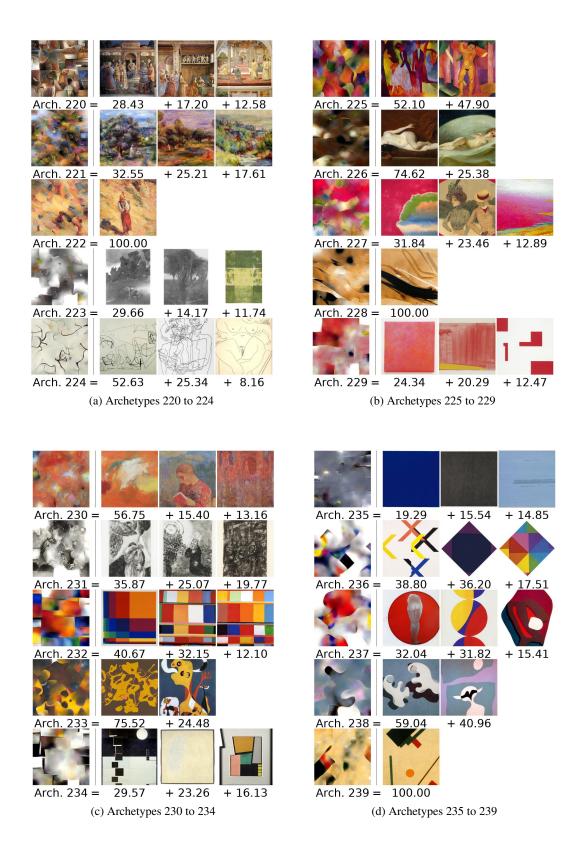






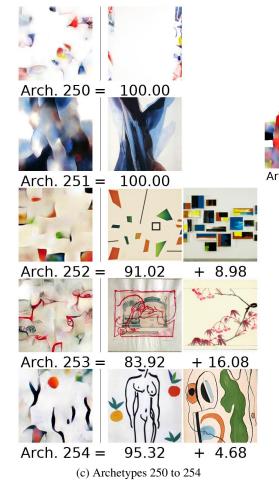














References

[1] Y. Li, C. Fang, J. Yang, Z. Wang, X. Lu, and M.-H. Yang. Universal style transfer via feature transforms. In *Adv. Neural Information Processing Systems (NIPS)*, 2017.