Assignment 4

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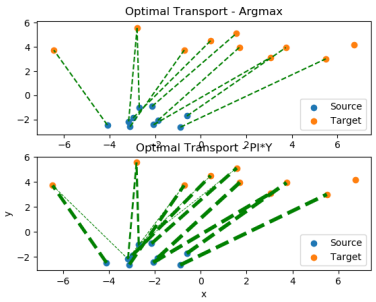
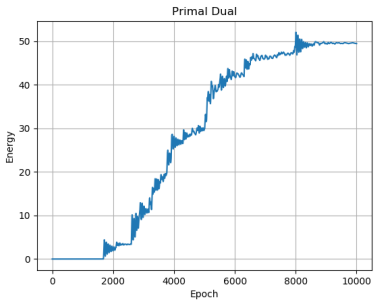
1. Dual Primal

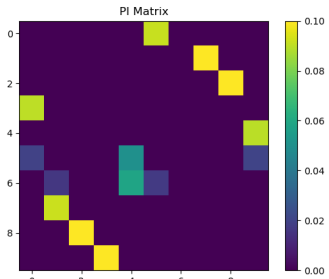
   The 1a shows in the second subplot the probability from one point to another by the thickness. The more sure the algorithm is that source and target is connected by a more thicker line. As seen by 20 or 50 plots, the algorithm is pretty sure and only one point is connected with another point.



(a) Optimal Transport

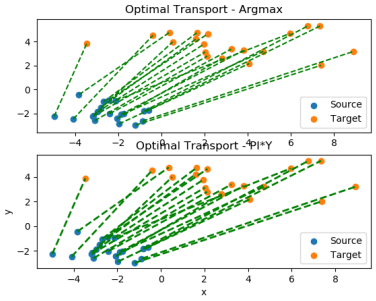


(b) Energy

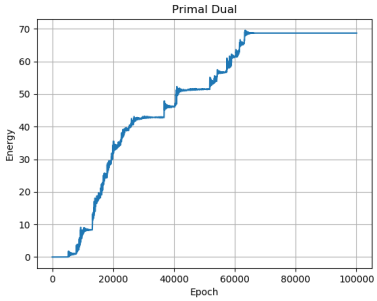


(c) Matrix PI

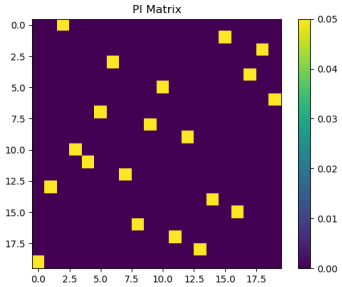
Figure 1: Primal Dual with 10 Points



(a) Optimal Transport

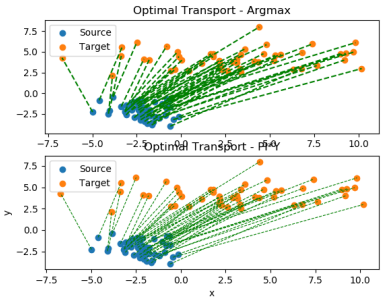


(b) Energy

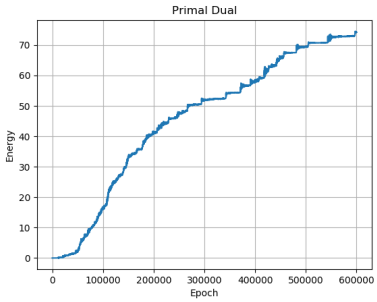


(c) Matrix PI

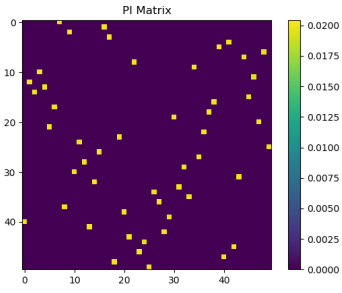
Figure 2: Primal Dual with 20 Points



(a) Optimal Transport



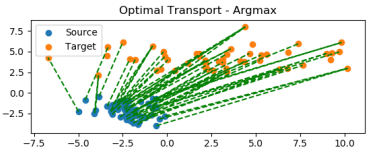
(b) Energy



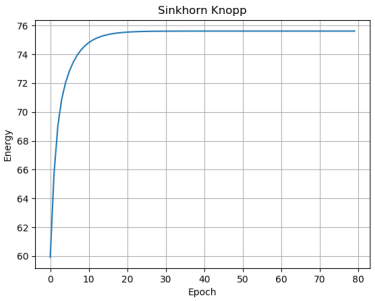
(c) Matrix PI

Figure 3: Primal Dual with 50 Points

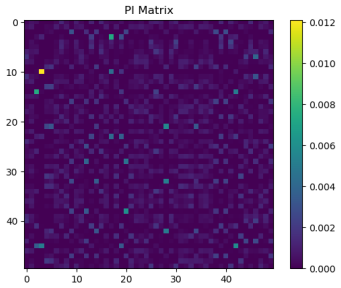
2. Sinkhorn Knopp



(a) Optimal Transport



(b) Energy



(c) Matrix PI

Figure 4: Sinkhorn Knopp with 50 Points

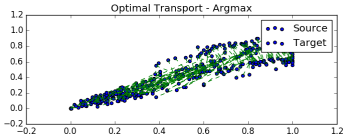
3. Color Transform

   The 2 input images are used to transfer colors from the left (sunset) to the right image). Therefore, I used different ϵ to do so. The matrix C is normalized $M = exp(\frac{-\overline{\sum C}}{\epsilon})$. A very small $\epsilon = 10^{-7}$ maximizes the regularization. At the sky of the output image can be many homogeneous areas be seen. As tradeoff, it slows down the convergence. The matrix PI also shows almost one color, no peaks. This is because of influence of the regualization term. The bigger epsilon, the less iterations for convergence (about 20). It can be seen more peaks in the PI matrix, so there is not that much regularization anymore.

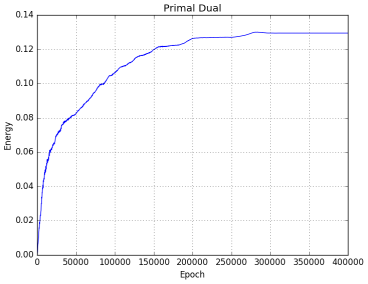
(a) Source Image

(b) Target Image

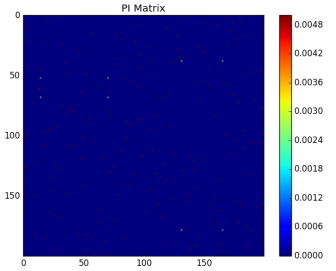
Figure 5: Input Images



(a) Optimal Transport (2nd subplot is deactivated)



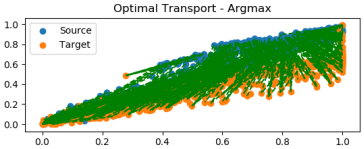
(b) Energy



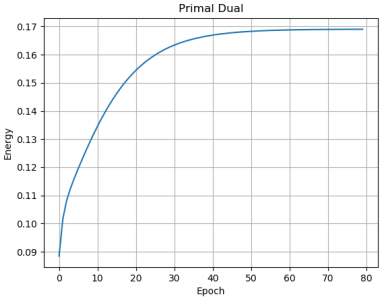
(c) Matrix PI

(d) Output Image

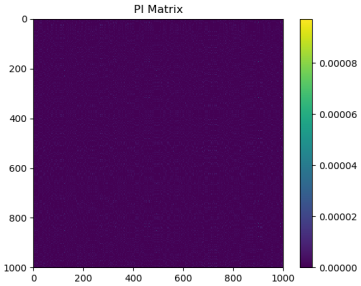
Figure 6: Primal Dual with 200 Points. More points are very time consuming on my laptop.



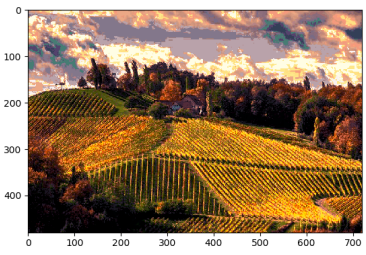
(a) Optimal Transport (2nd subplot is deactivated)



(b) Energy

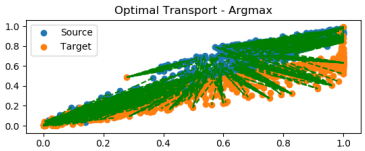


(c) Matrix PI

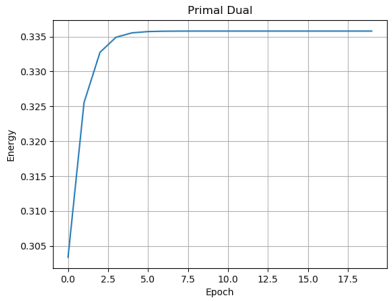


(d) Output Image

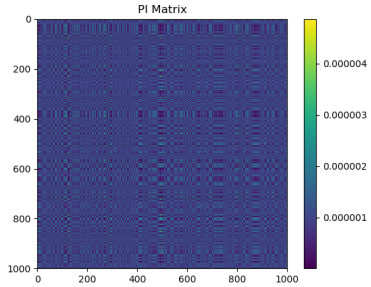
Figure 7: Sinkhorn Knopp with $\epsilon = 10^{-7}$



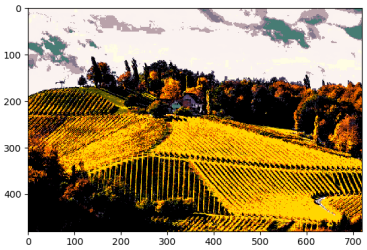
(a) Optimal Transport (2nd subplot is deactivated)



(b) Energy

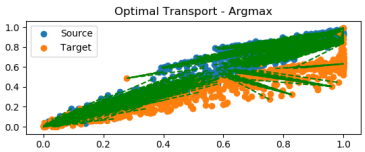


(c) Matrix PI

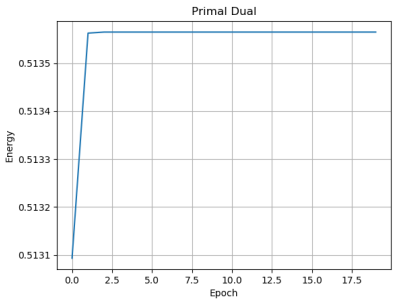


(d) Output Image

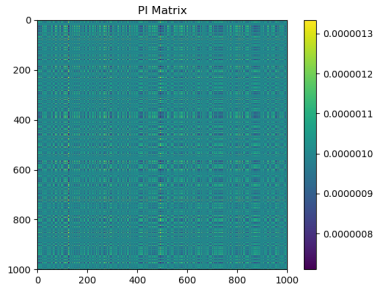
Figure 8: Sinkhorn Knopp with $\epsilon = 10^{-6}$



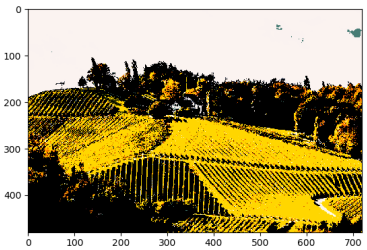
(a) Optimal Transport (2nd subplot is deactivated)



(b) Energy



(c) Matrix PI



(d) Output Image

Figure 9: Sinkhorn Knopp with $\epsilon = 10^{-5}$