

SEAM CARVING

Content Aware Resizing

A B O U T O U R T E A M

16521102: NGUYỄN HỮU THẮNG

16520783: VŨ TRẦN THÀNH NAM

162521548: GIẢNG PHÚC VINH

A photograph of a large, ornate stone castle with two prominent towers featuring crenellated roofs. The castle has multiple levels with arched windows and a central entrance. In the foreground, a small figure of a person stands on a grassy hill, looking towards the castle. The sky is blue with some wispy clouds.

HOW CAN WE RESIZE AN IMAGE AND
KEEP ITS CONTENT NATURAL?

CROP?



ORIGIN

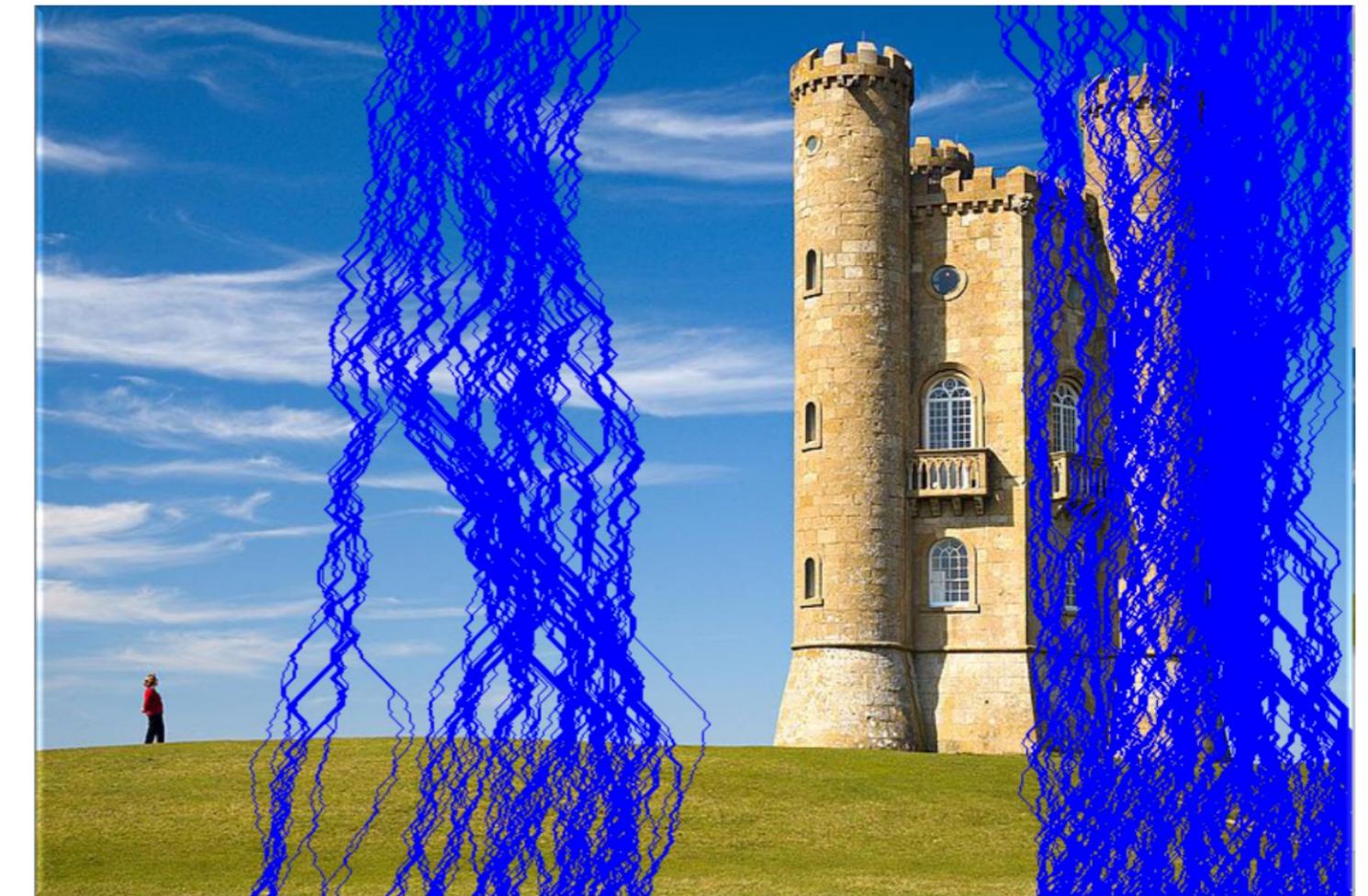
**Sure, it lost so much content.
We need another method!**



CROPPED

A photograph of a large, ornate stone castle with two prominent towers. The castle is made of light-colored stone and features multiple arched windows and a decorative crenelated roofline. In the foreground, a small figure of a person stands on a grassy hill, looking up at the castle against a backdrop of a blue sky with wispy clouds.

SO WE NEED SEAMCARVING ALGORITHM!



MOVING PIXELS WITH THE LOWEST ENERGY?

IMAGE RESIZED BY VERTICAL SEAMS

Energy Function

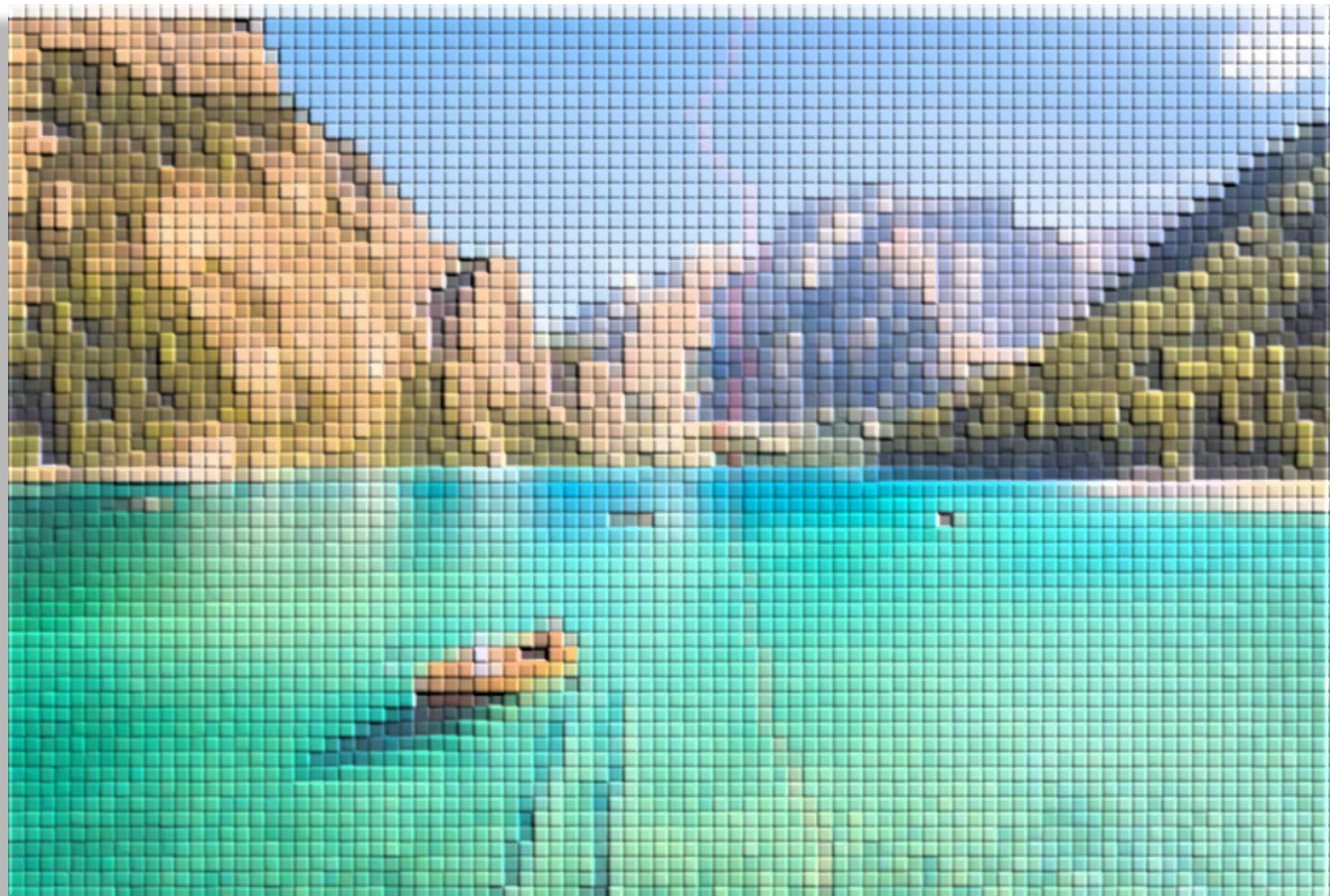
$$e_1(\mathbf{I}) = \left| \frac{\partial}{\partial x} \mathbf{I} \right| + \left| \frac{\partial}{\partial y} \mathbf{I} \right|$$



Cumulative Minimum Energy M

$$M(i, j) = e(i, j) + \min(M(i - 1, j - 1), M(i - 1, j), M(i - 1, j + 1))$$



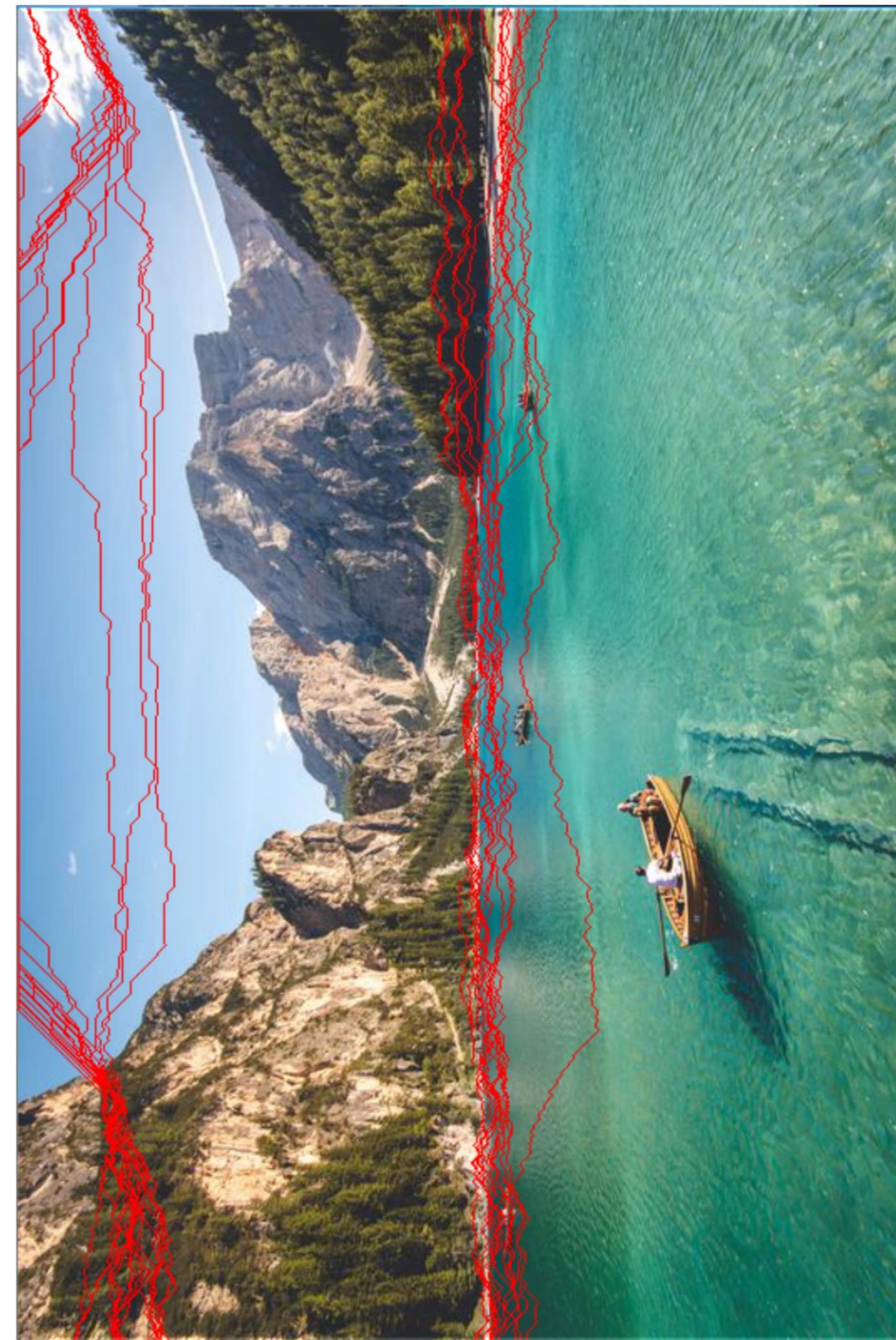


Cumulative Minimum Energy M

	0	1	2	3	4
0	3	1	2	2	5
1	1+1	2+1	6+1	1+2	1+2
2	3+1+1	2+1+1

IMAGE RESIZED BY HORIZONTAL SEAMS

We just need to rotate the image 90 degree and resize it by vertical seams



COMINE VERTICAL AND HORIZON WE GOT:



REFERENCE: Seam Carving for Content-Aware Image Resizing

Shai Avidan Mitsubishi Electric Research Labs Ariel Shamir The Interdisciplinary Center & MERL

" S U C C E S S I S W A L K I N G
F R O M F A I L U R E T O
F A I L U R E W I T H N O
L O S S O F
E N T H U S I A S M . "

WINSTON CHURCHILL