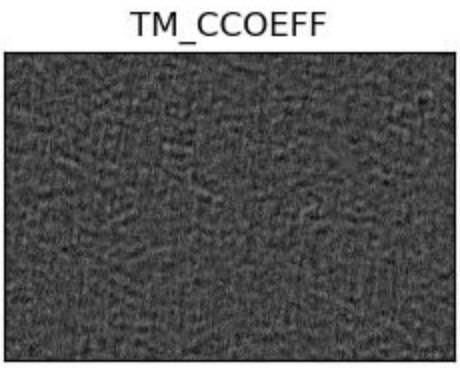
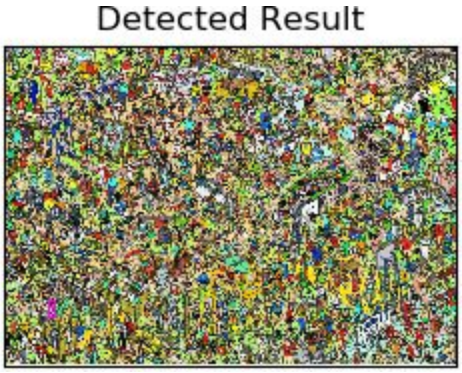
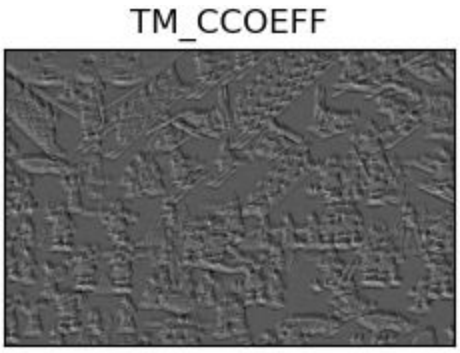
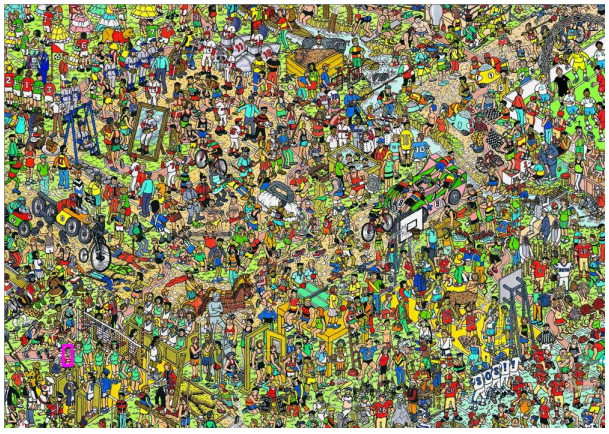
John Hacker
EEL 4660
Template Matching

CCOEFF





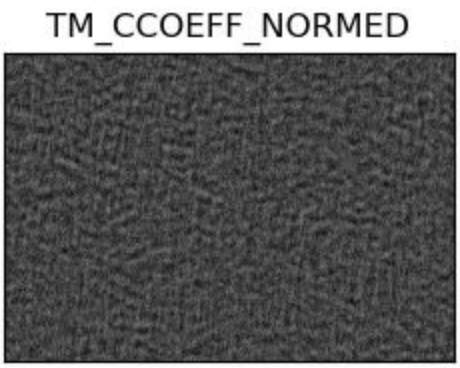


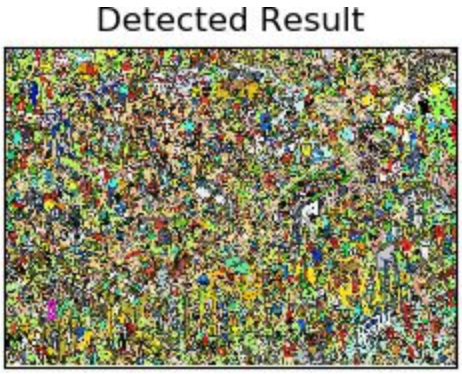


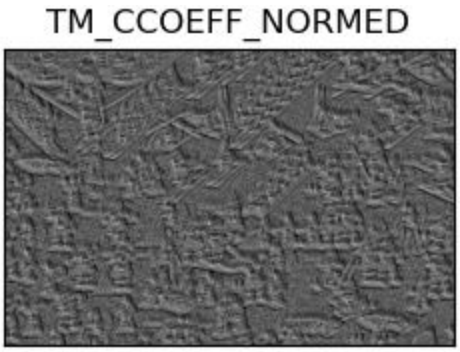
$$R(x,y) = \sum_{x',y'} (T'(x',y') \cdot I(x+x',y+y'))$$

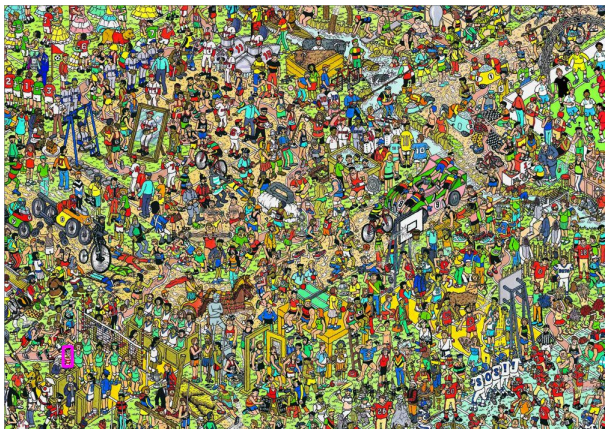
This method was able to match the template correctly.
This is the Pearson Correlation Coefficient method. It takes the sum of the dot product between the template and the image where it overlaps as it moves the template image over the entire image, using the reciprocal of the of the pixel value sum and the number of pixels. The area that produces the highest value is used as the match estimate.

CCOEFF_NORMED





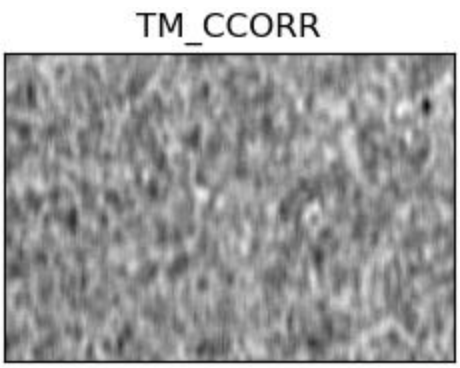


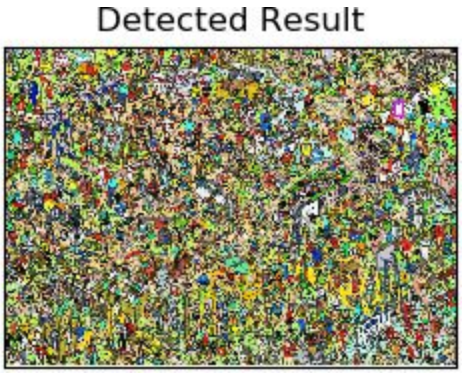


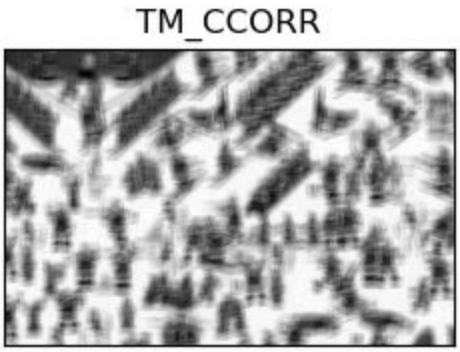
$$R(x,y) = \frac{\sum_{x',y'}(T'(x',y') \cdot I'(x+x',y+y'))}{\sqrt{\sum_{x',y'} T'(x',y')^2 \cdot \sum_{x',y'} I'(x+x',y+y')^2}}$$

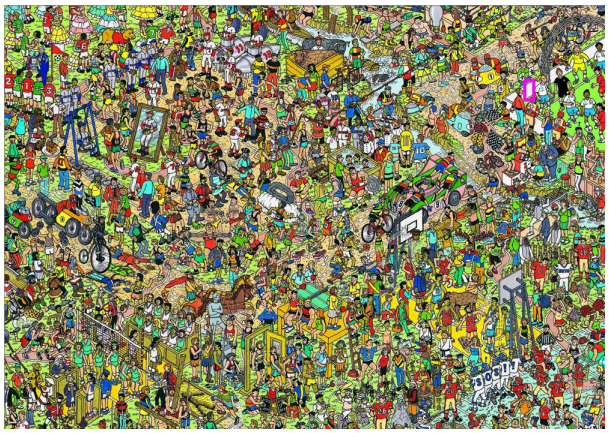
This method was able to match the template correctly.
This is the Pearson Correlation Coefficient Normalized method. It takes the sum of the dot product between the template and the image where it overlaps as it moves the template image over the entire image, using the reciprocal of the of the pixel value sum and the number of pixels. The area that produces the highest value is used as the match estimate.

CCORR





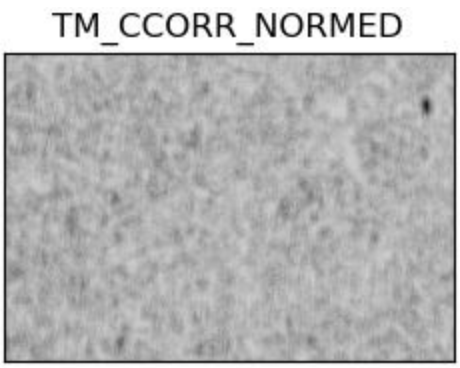


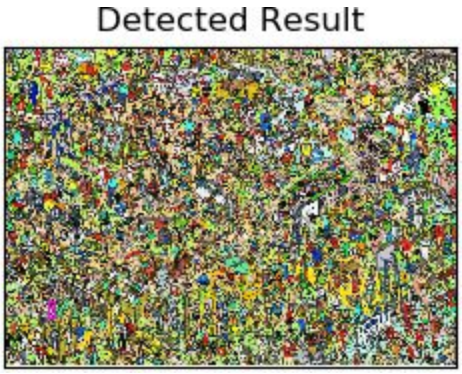


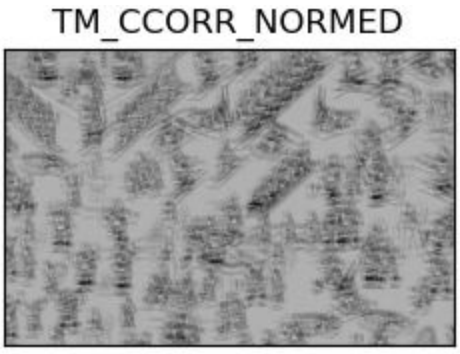
$$R(x,y) = \sum_{x',y'} (T(x',y') \cdot I(x+x',y+y'))$$

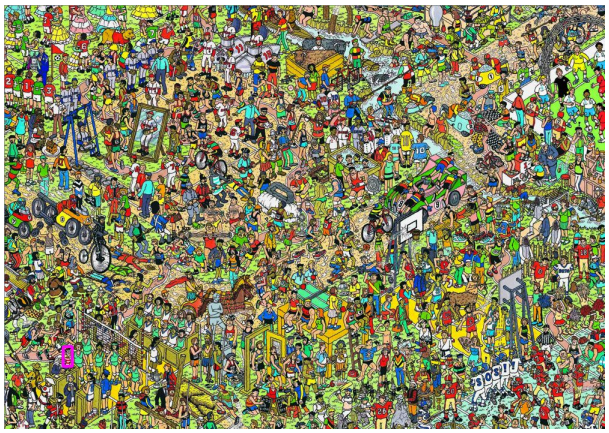
This method was NOT able to match the template correctly.
This is the Cross Correlation method. It takes the sum of the dot product between the template and the image where it overlaps as it moves the template image over the entire image, using the mean value of each pixel in the areas. The area that produces the highest value is used as the match estimate.

CCORR_NORMED





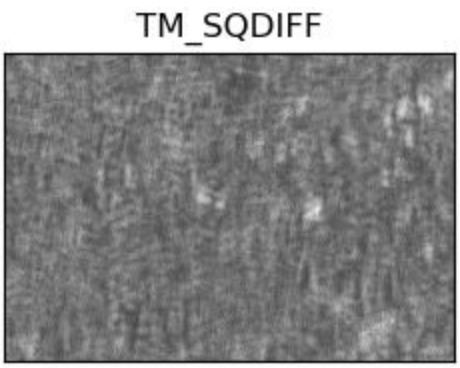


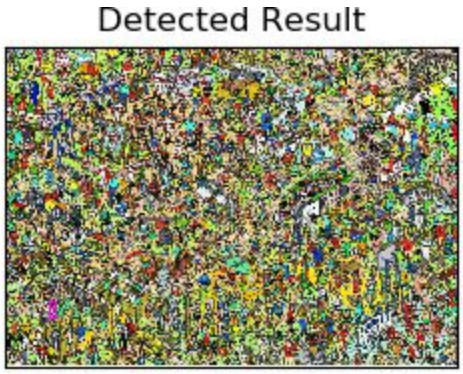


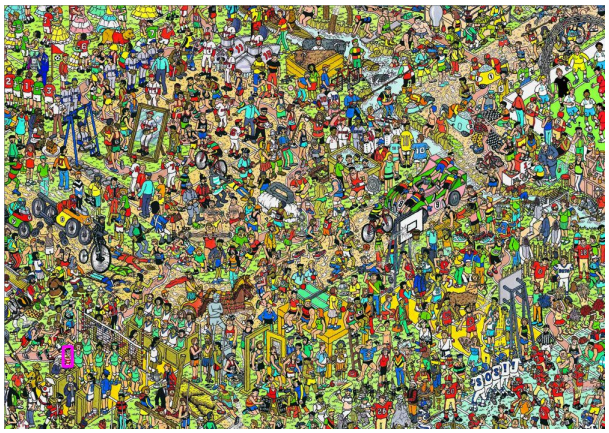
$$R(x,y) = \frac{\sum_{x',y'}(T(x',y') \cdot I(x+x',y+y'))}{\sqrt{\sum_{x',y'} T(x',y')^2 \cdot \sum_{x',y'} I(x+x',y+y')^2}}$$

This method was able to match the template correctly.
This is the Cross Correlation Normalized method. It takes the sum of the dot product between the template and the image where it overlaps as it moves the template image over the entire image, using the mean value of each pixel in the areas. The area that produces the highest value is used as the match estimate, after normalizing the results.

SQDIFF



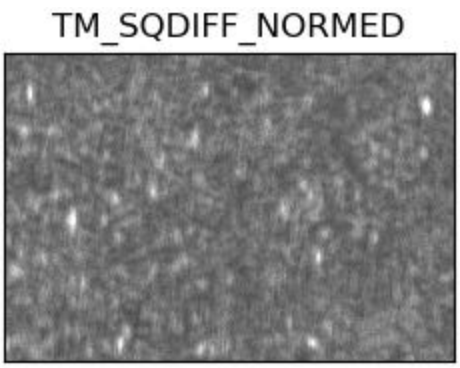


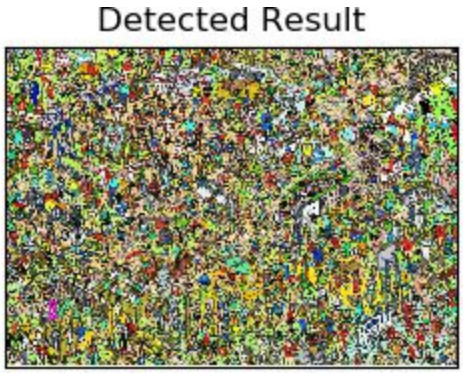


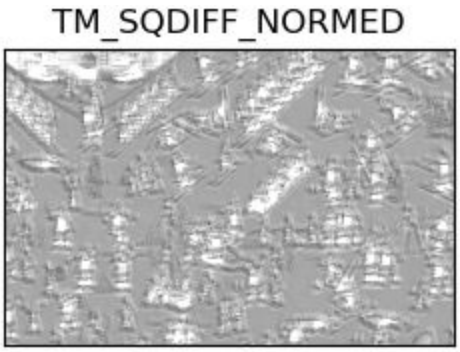
$$R(x,y) = \sum_{x',y'} (T(x',y') - I(x+x',y+y'))^2$$

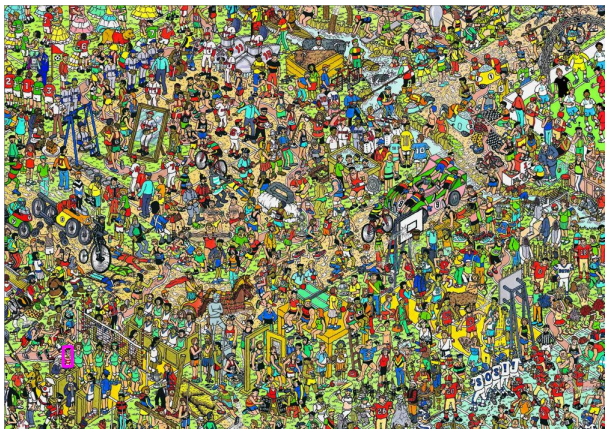
This method was able to match the template correctly.
This is the Squared Difference method. It takes the sum of the squared difference between the template and the image where it overlaps as it moves the template image over the entire image, using the mean value of each pixel in the areas. The area that produces the highest value is used as the match estimate.

SQDIFF_NORMED









$$R(x,y) = \frac{\sum_{x',y'}(T(x',y') - I(x+x',y+y'))^2}{\sqrt{\sum_{x',y'} T(x',y')^2 \cdot \sum_{x',y'} I(x+x',y+y')^2}}$$

This method was able to match the template correctly.
This is the Squared Difference Normalized method. It takes the sum of the squared difference between the template and the image where it overlaps as it moves the template image over the entire image, using the mean value of each pixel in the areas. The area that produces the highest value is used as the match estimate, after normalizing the results.