***Overview:*** Currently people struggle on repairing torn photos and documents because they need to manually piece broken parts together either by hand or using software that can only read one fragment at a time, and then use image processing software like Photoshop to fill the missing pixels by hand. This is very time-consuming, tedious and requires a lot of skill, especially when dealing with photos or documents torn in tens or hundreds of parts. This project, written with C# and Emgu CV using Windows Form Application, is an innovative and very efficient approach for repairing torn objects. It automatically pieces fragmented 2D objects like torn photos, torn newspaper or torn book pages together.By using this software, people can save at least 80% of the time on repairing torn photos and documents compare to the time spend by using the most efficient technology widely available, so people can have more time doing things that are more important.

This program has two features, which are restoring torn or shredded photos and restoring torn or shredded documents. The photo restoration allows user to input source image files with single or multiple fragments of a complete image, and generates that complete image. The program can fix the torn area of the image automatically, so the resulting image is just like it were not torn before. The document restoration is an OCR for fragmented document. It accepts images of fragmented documents, and there can be multiple fragments in one image file too. It then generates the complete document to an editable document file like MS Word using OCR. This tool can also accept fragments from multiple pages, so it can be used to restore a complete book as well.

***Intellectual Merit:*** This project invents a brand new approach by introducing an innovative algorithm to let computer decide which algorithm to use for image repairing. Most of the algorithms for image repairing only deal with one situation. If they are used in other situations, the accuracy and performance will drop dramatically. The algorithm used in this program is omnipotent because it can automatically detect the correct algorithm to use by checking the contours of the fragments so that it can achieve a significant improvement in accuracy and performance. Since there are bottlenecks and edge cases that a one situation algorithm is hardly to overcome, this research can overcome the deficits of one situation algorithm in a much easier way. In addition, this algorithm sheds light on future research on procedural image repairing because this introduces an innovative way of improving efficiency by improving the algorithm to let computer to decide the best one situation algorithm to use without human intervention.

***Broader Impact:*** This project provides a tool that can fix torn or shredded photo or documents automatically in a very short time, and it can be used in both daily life and professional work. People may sometimes tear some photos or documents accidentally, or they might want to repair a old torn family photo. This software can recover the original items automatically so that they don’t need to spend too much time and money recover the items manually. As for benefits in professional fields, this project will be very helpful in disciplines depended on historical artifacts because this project will achieve a much higher efficiency in digitizing ancient documents. The archeologists will spend less time on repairing and digitizing a single manuscript, and there will be more ancient artifacts aviliable to general public. This is also beneficial for forensics because it makes the judges much easier to recover torn material evidences, so that more lawsuits will be judged in a fair way.