***Overview:*** This project is a Windows Form Application written in C# with Emgu CV which automatically pieces fragmented 2D objects like torn photos, torn newspaper or torn book pages together. The user can upload their fragmented pieces by the user interface in the program, and the program will automatically generate the complete object without further editing by the user. The user can then preview the result and save it to a file. 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. Although this project is planned to be implemented in Windows Form Application, there are further plans that implement this project in a web application, Universal Windows 8.1 App and mobile phone App.

***Intellectual Merit:*** This project combines the advantages of previous algorithms of restoring photos and documents and overcomes the disadvantages of those algorithms. It can automatically detect the correct algorithm to use by checking the contour of the fragments so that the performance will be increased and the resulting image will be more accurate. In addition, this project can separate the fragments if the input image has multiple fragments, so that the algorithms that only deal with a single fragment can work correctly. In order to implement this project correctly, some functions in Emgu CV and OpenCV must be thoroughly studied. Since this project is designed to extend the functionality of current algorithms, those algorithms must be fully understood and correctly implemented in some test codes for the project. In order to let the program automatically fix the torn area of a photo, some algorithms of interpolating missing pixels must be researched.

***Broader Impact:*** By completing and publishing this project, people will have a tool that can fix torn or shredded photo or documents automatically in a very short time. Currently people need to manually piece broken parts together either by hand or using software that can only read one fragment at a time, and then using 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 torn in tens or hundreds of parts. The situation for repairing a torn book is similar to repairing a torn photo because people need to manually recover and scan each page. Since this project handles all the previous situation automatically without any human control, the repairing process will be significantly faster. This project will be very helpful in recovering old photos, both for old family photos or archaeology photos, in addition, this project will play a significant role in digitizing ancient documents so that more of human heritage will be preserved. Not only this is helpful in archeology, but this is essential in daily life too. People may sometime tear some photo or document accidentally, and this software can recover the original items automatically so that they don’t need to spend too much time recover the items manually.