Hidden Object Detection

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CSCI 460

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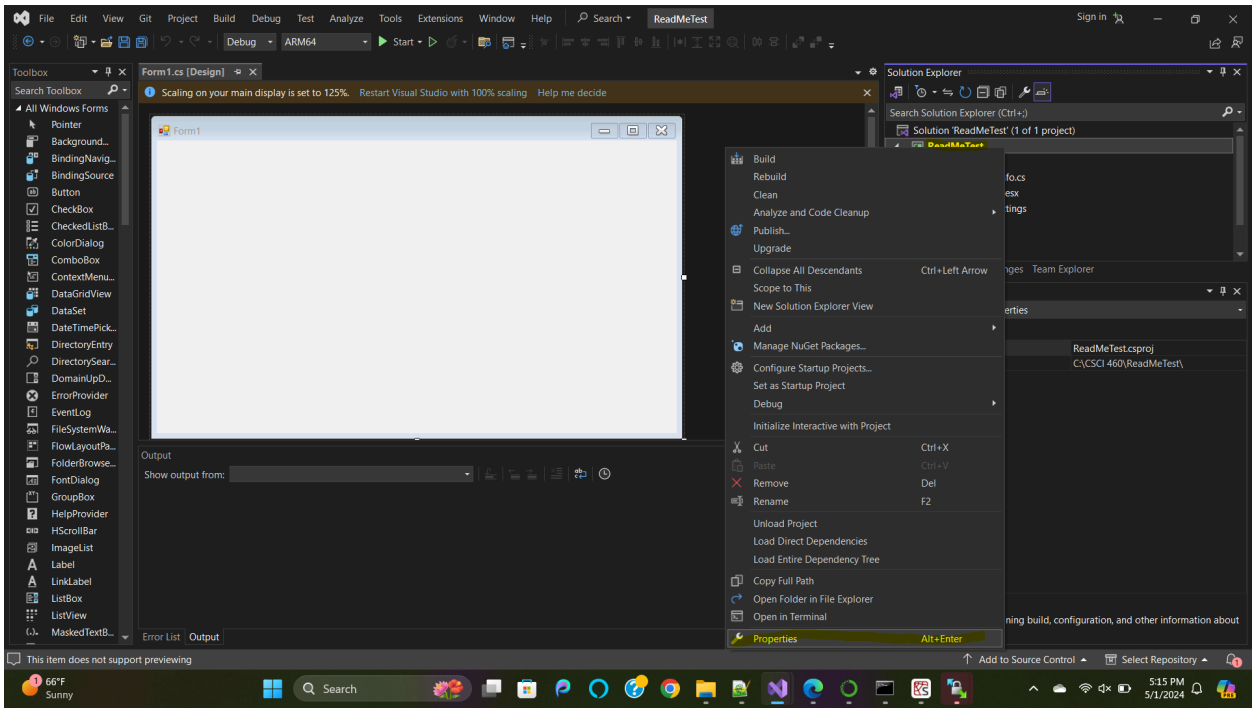
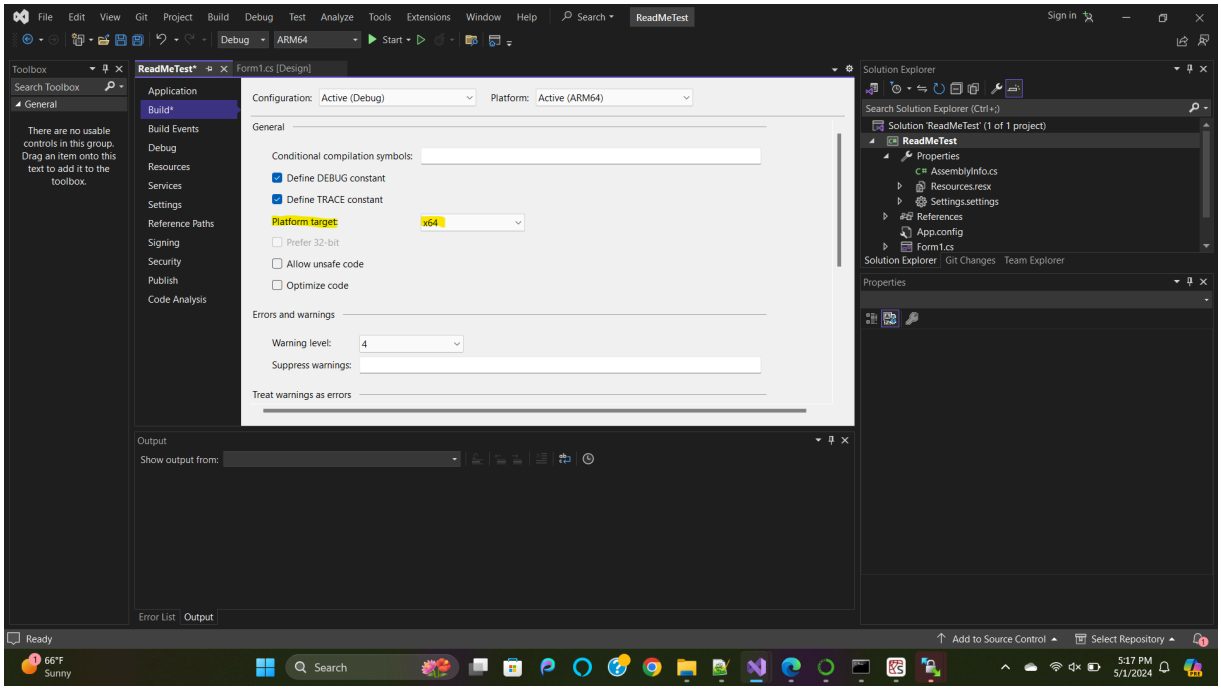
Project Setup:

Project Setup…for any project that uses the eye tracker…

1. Open Microsoft Visual Studio 2022
2. Create a *Windows Form App (.NET framework)*
3. Right Click on the Project
    a. Select *Properties*

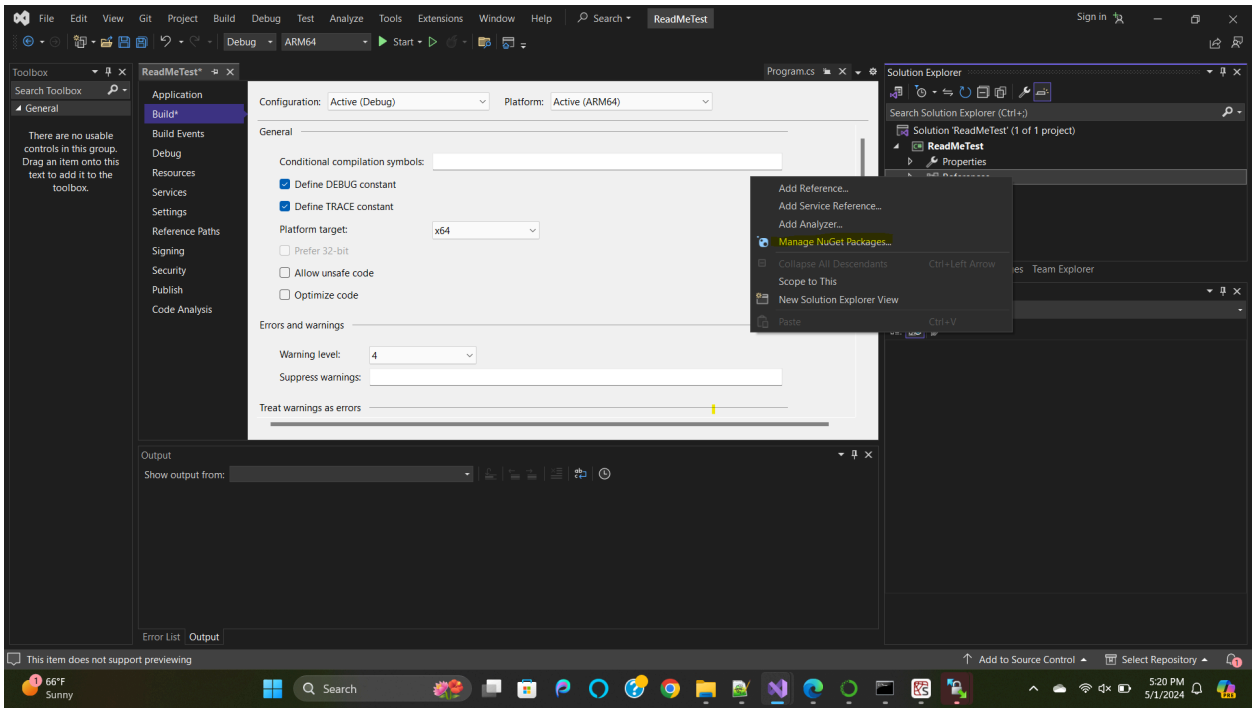


4. Under the *Build* Tab…
    a. Change the *Platform target* to x64
    b. Make sure that "*Prefer 32-bit*" is not checked

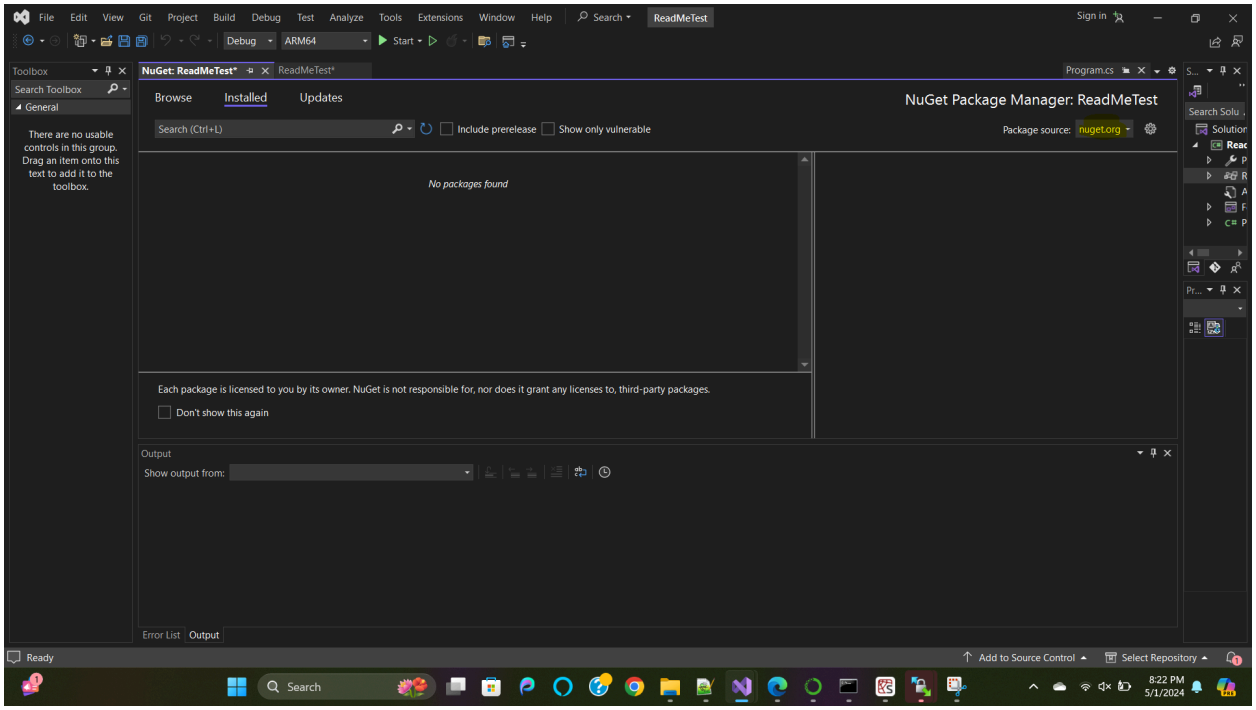


If you do not have the NuGet installed…(If you already do, skip to step 13)

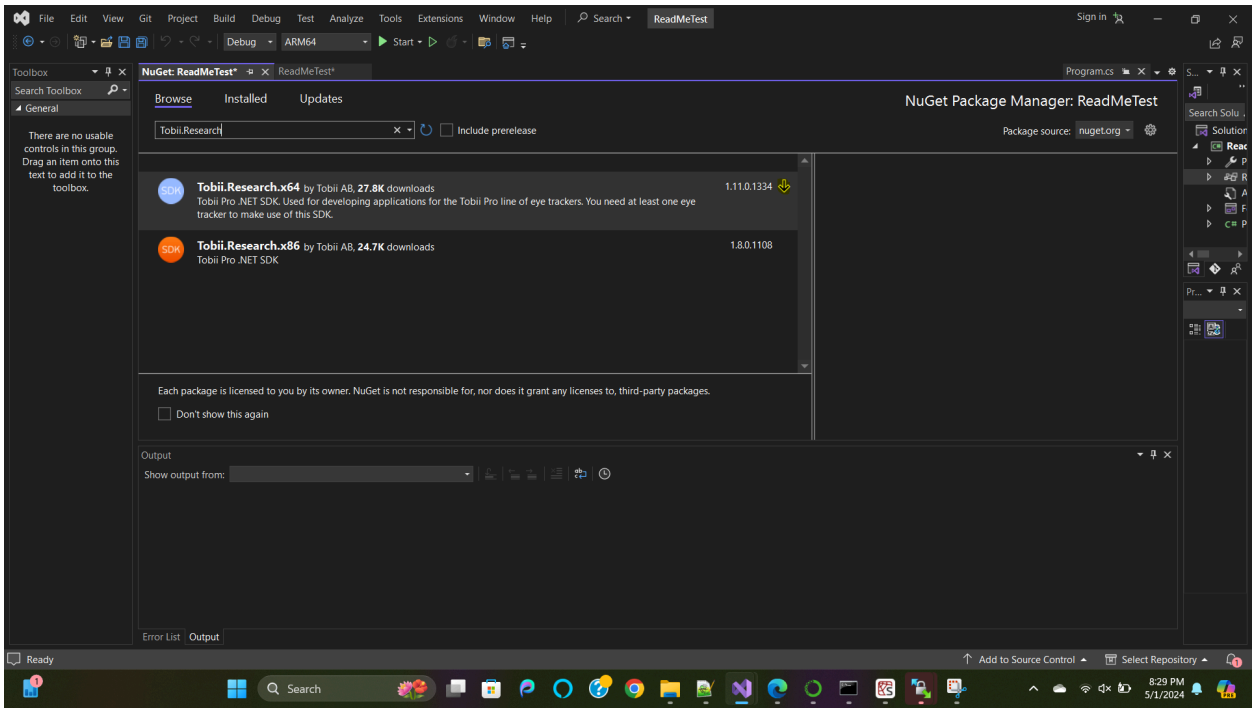
5. Open the *Solution Explorer*
6. Right click on *References*
7. Select *Manage NuGet Packages*



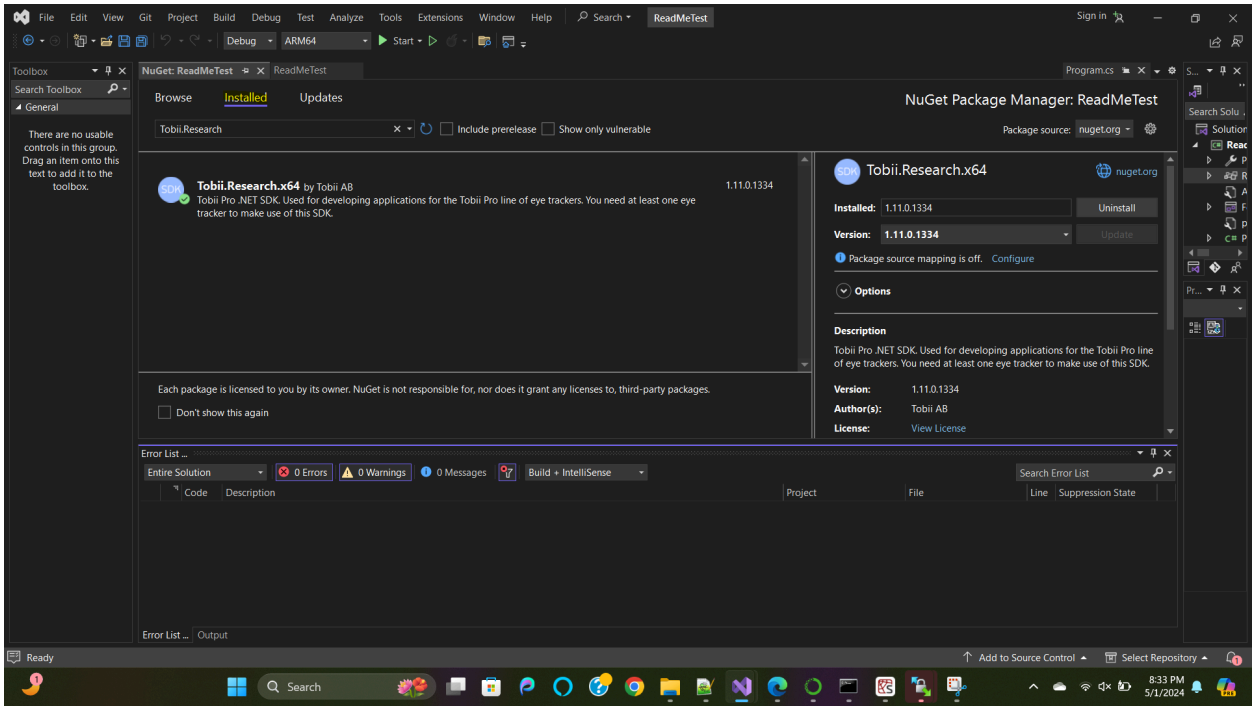
8. Make sure that the *Package Source* is *nuget.org*



9. Search for *Tobii.Research*
10. Select and Install the *Tobii.Research.x64*

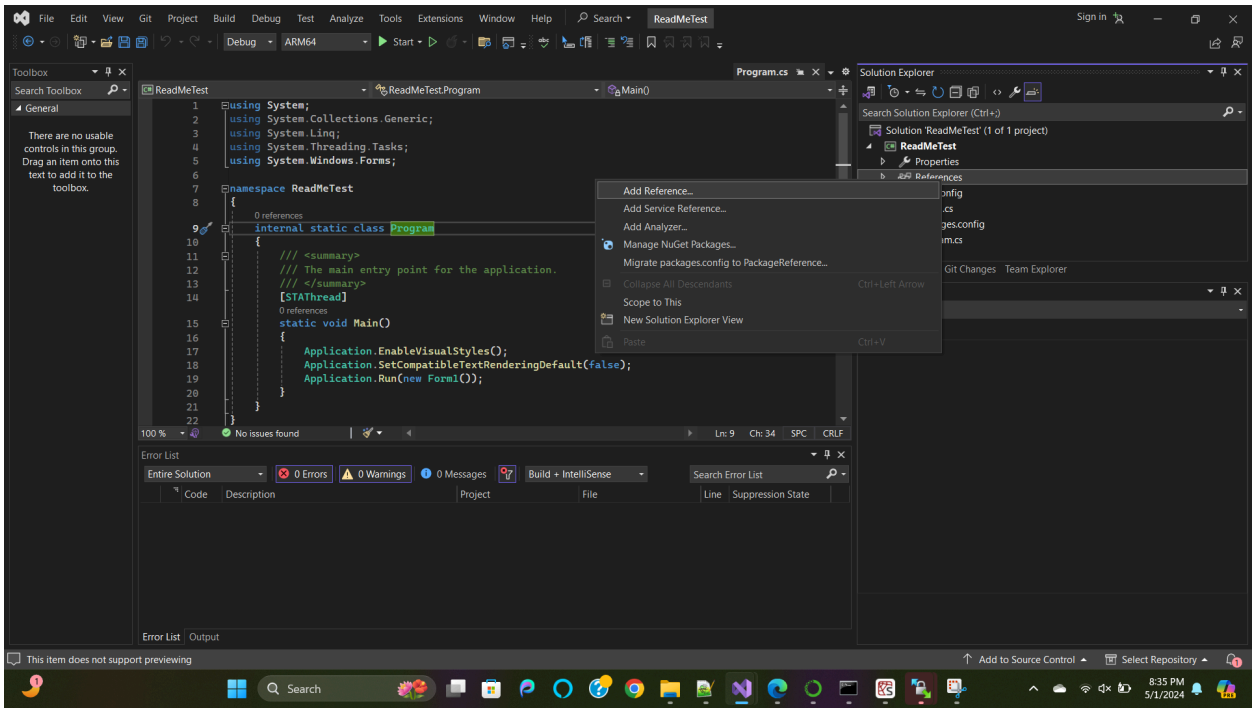


11. If necessary, click *Accept* for dependent packages to be installed
12. Once the installation is completed, open up the *Installed* section to verify that the installation completed successfully.

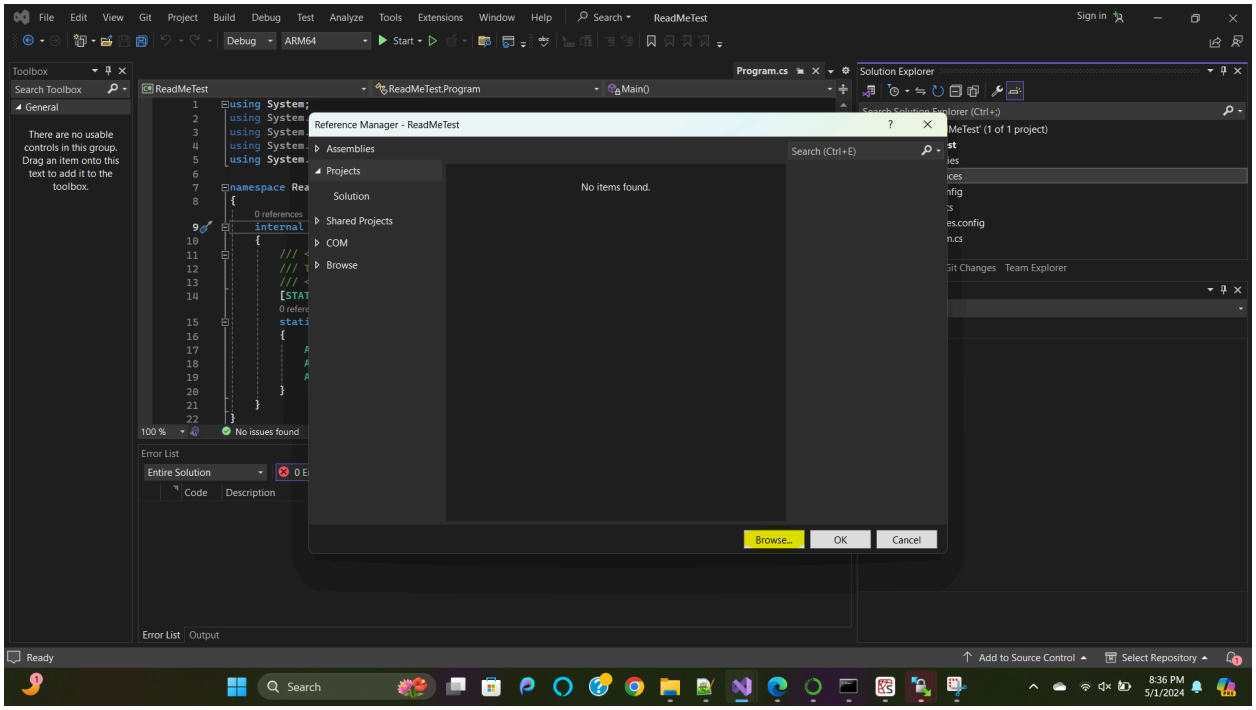


Now that the package is installed, we can add the correct .dlls to the project…

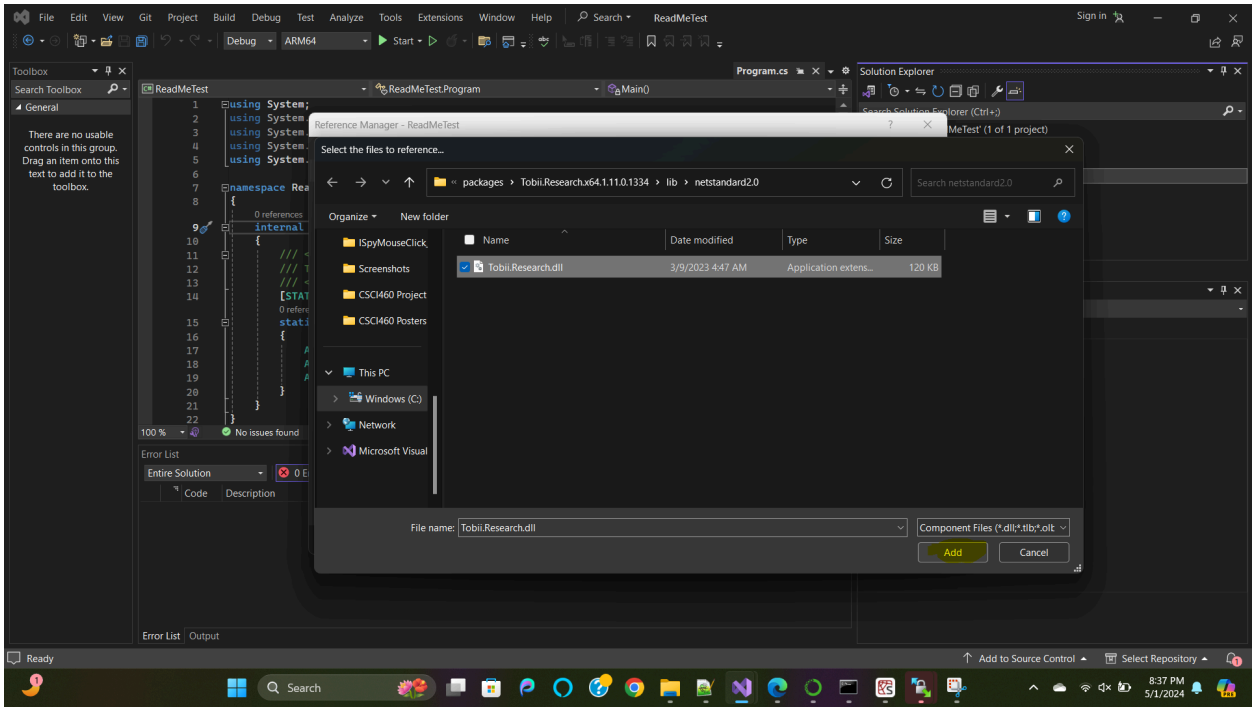
13. Right click on *References* and select *Add Reference*…



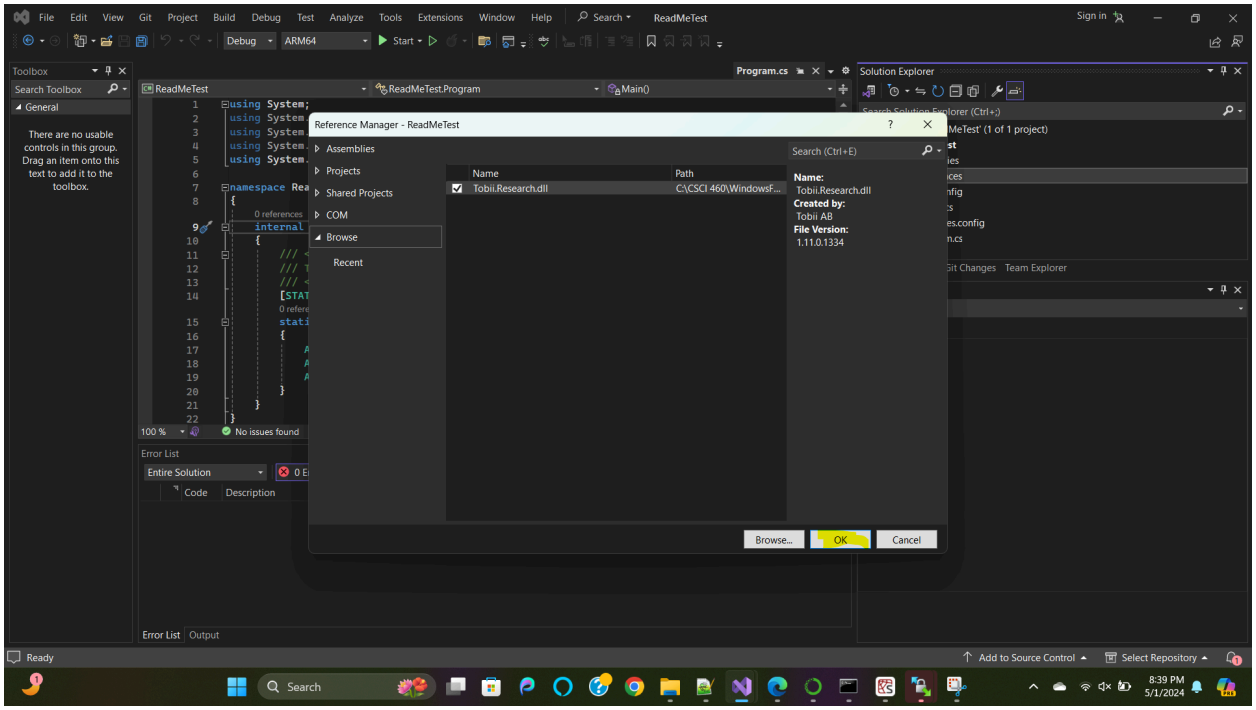
14. Select *Browse*…



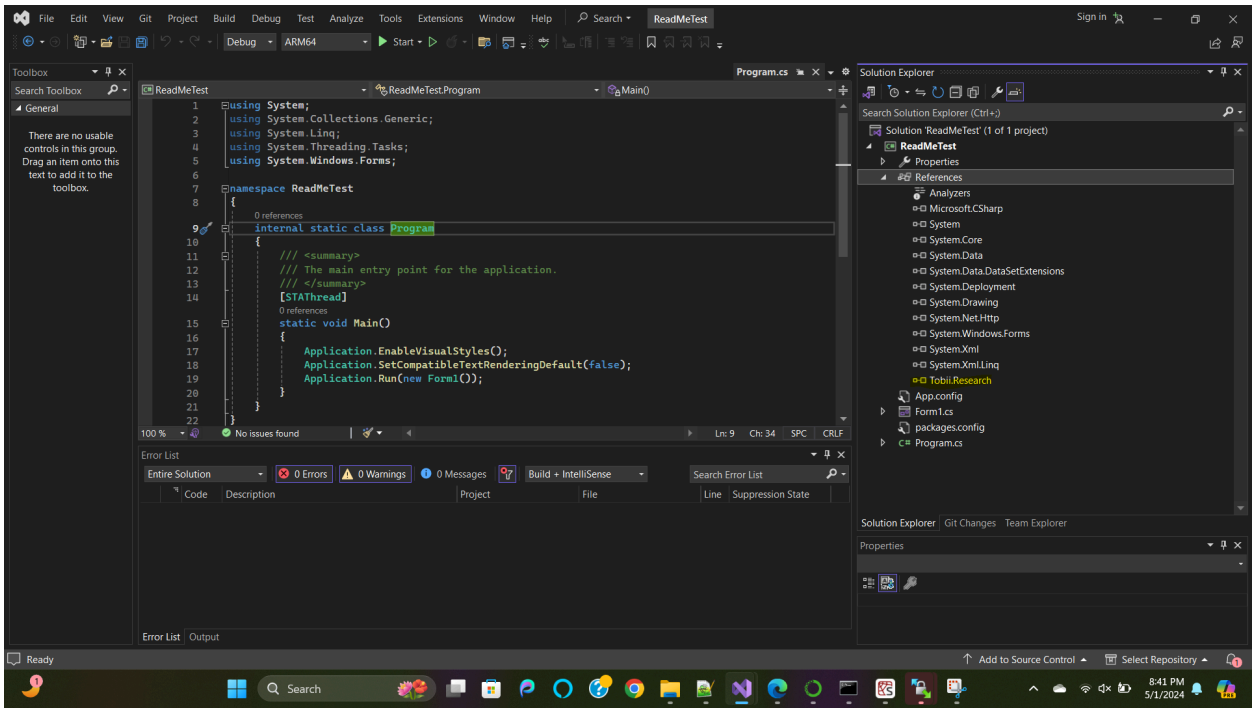
15. Locate the *Tobii.Research.dll* and add it to the project.



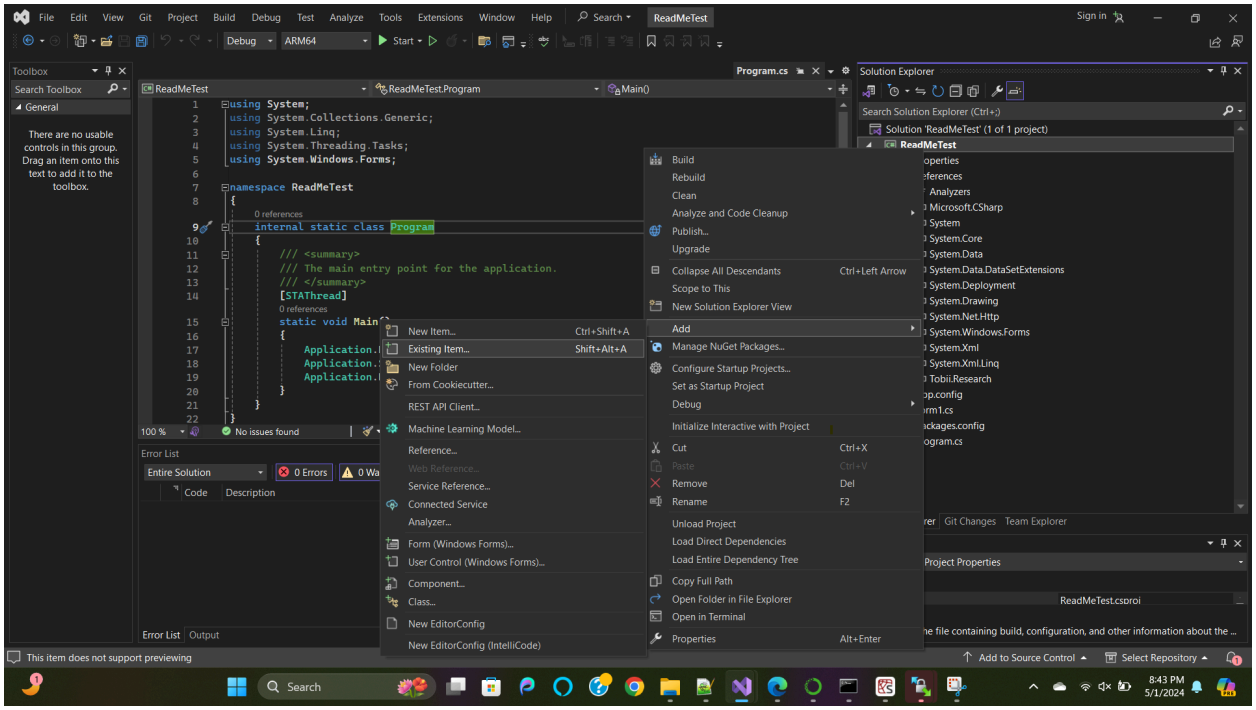
16. Select the .dll from the list and click *Ok*



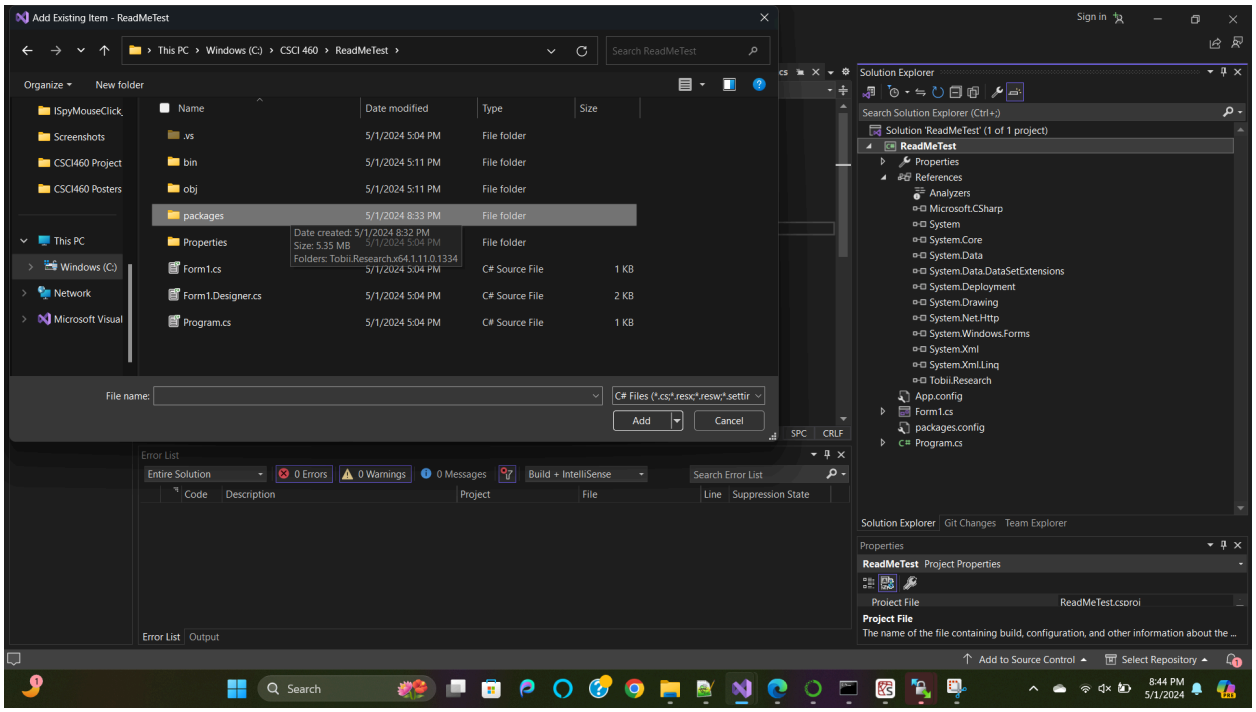
17. To verify that the installation was done correctly, check that *Tobii.Research* appears in the *References* list

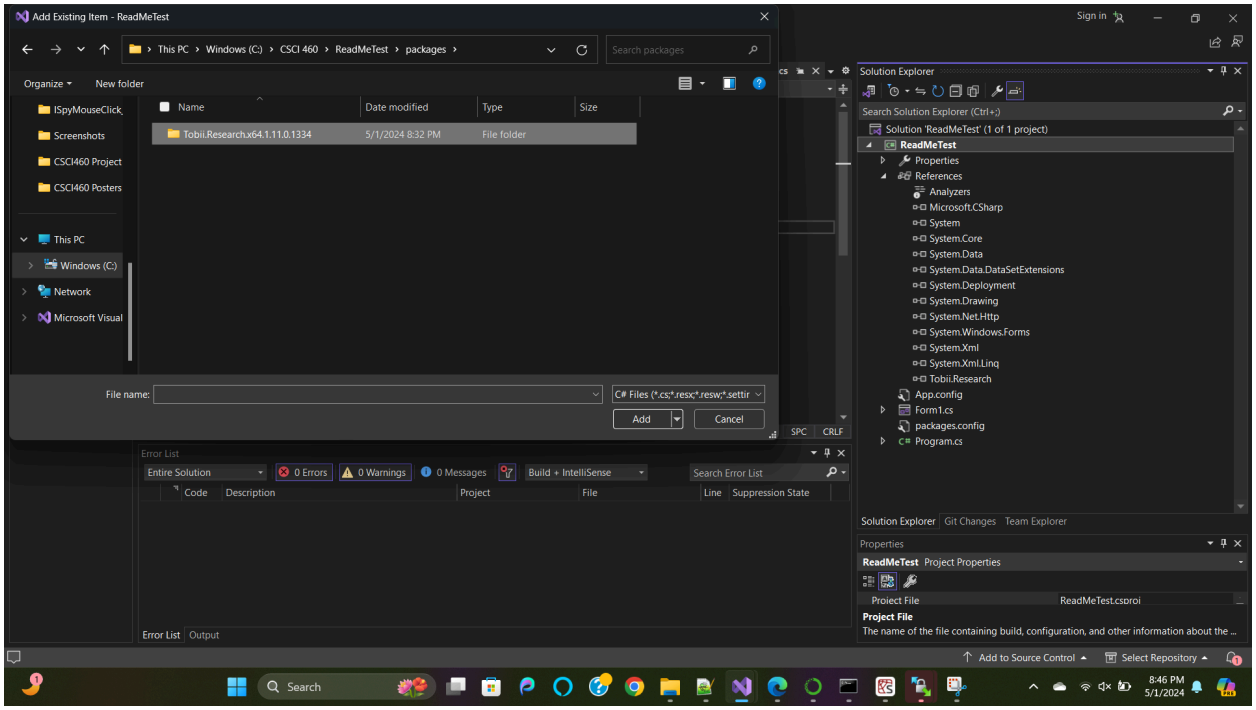


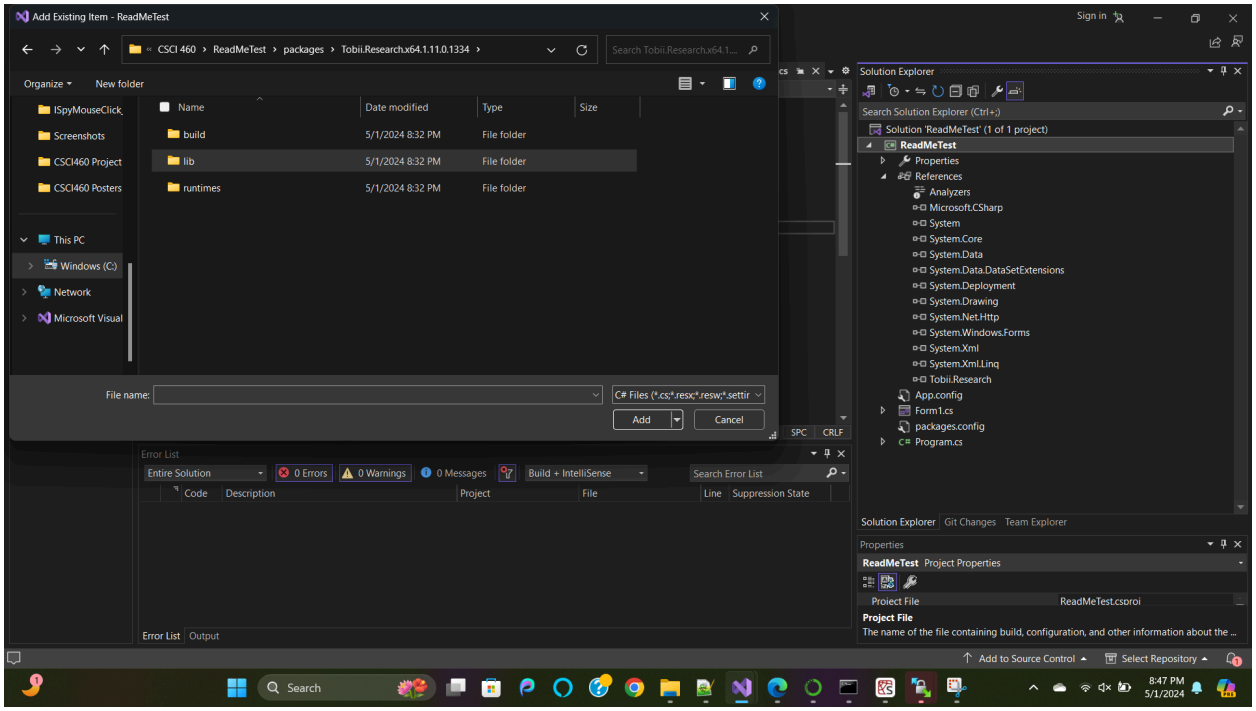
18. Right click on the project and select *Add* → *Existing Item*...



19. Locate the *tobii_pro.dll* and *tobii_firmware_upgrade.dll* files.
    a. Packages > Tobii.Research.x64.1.11.0.1334 > lib > netstandard2.0




Add Existing Item - ReadMeTest
This PC › Windows (C:) › CSCI 460 › ReadMeTest › packages ›
Search packages
Organize
New folder
Name
Date modified
Type
Size
Tobii.Research.x64.1.11.0.1334
5/1/2024 8:32 PM
File folder
File name:
C# Files (*.cs;*.resx;*.resw;*.settir
Add
Cancel
Solution Explorer
Search Solution Explorer (Ctrl+;)
Solution 'ReadMeTest' (1 of 1 project)
ReadMeTest
Properties
References
Analyzers
Microsoft.CSharp
System
System.Core
System.Data
System.Data.DataSetExtensions
System.Deployment
System.Drawing
System.Net.Http
System.Windows.Forms
System.Xml
System.Xml.Linq
Tobii.Research
App.config
Form1.cs
packages.config
Program.cs
Error List
Entire Solution
0 Errors
0 Warnings
0 Messages
Build + IntelliSense
Search Error List
Code
Description
Project
File
Line
Suppression State
Error List
Output
Solution Explorer
Git Changes
Team Explorer
Properties
ReadMeTest Project Properties
Project File
ReadMeTest.csproj
Project File
The name of the file containing build, configuration, and other information about the ...
Add to Source Control
Select Repository
Search
8:46 PM
5/1/2024


Add Existing Item - ReadMeTest
CSCI 460 › ReadMeTest › packages › Tobii.Research.x64.1.11.0.1334 ›
Search Tobii.Research.x64.1....
Organize
New folder
Name
Date modified
Type
Size
build
5/1/2024 8:32 PM
File folder
lib
5/1/2024 8:32 PM
File folder
runtimes
5/1/2024 8:32 PM
File folder
File name:
C# Files (*.cs;*.resx;*.resw;*.settir
Add
Cancel
Solution Explorer
Search Solution Explorer (Ctrl+;)
Solution 'ReadMeTest' (1 of 1 project)
ReadMeTest
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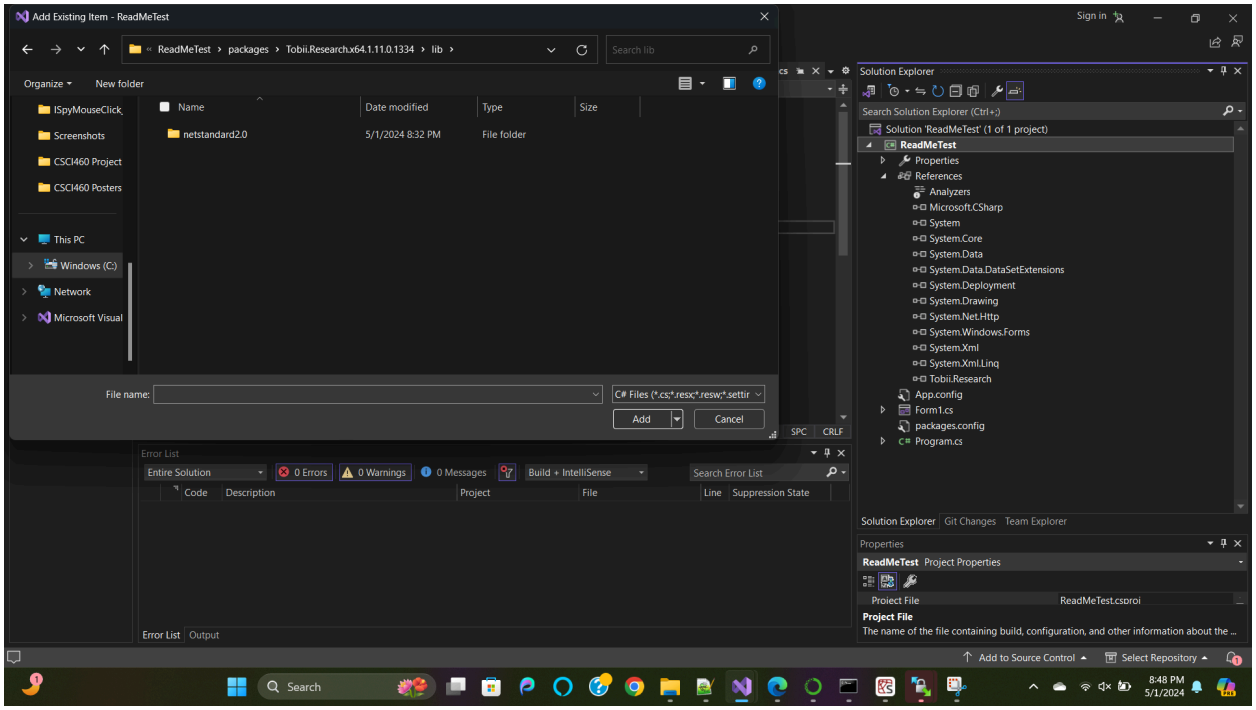
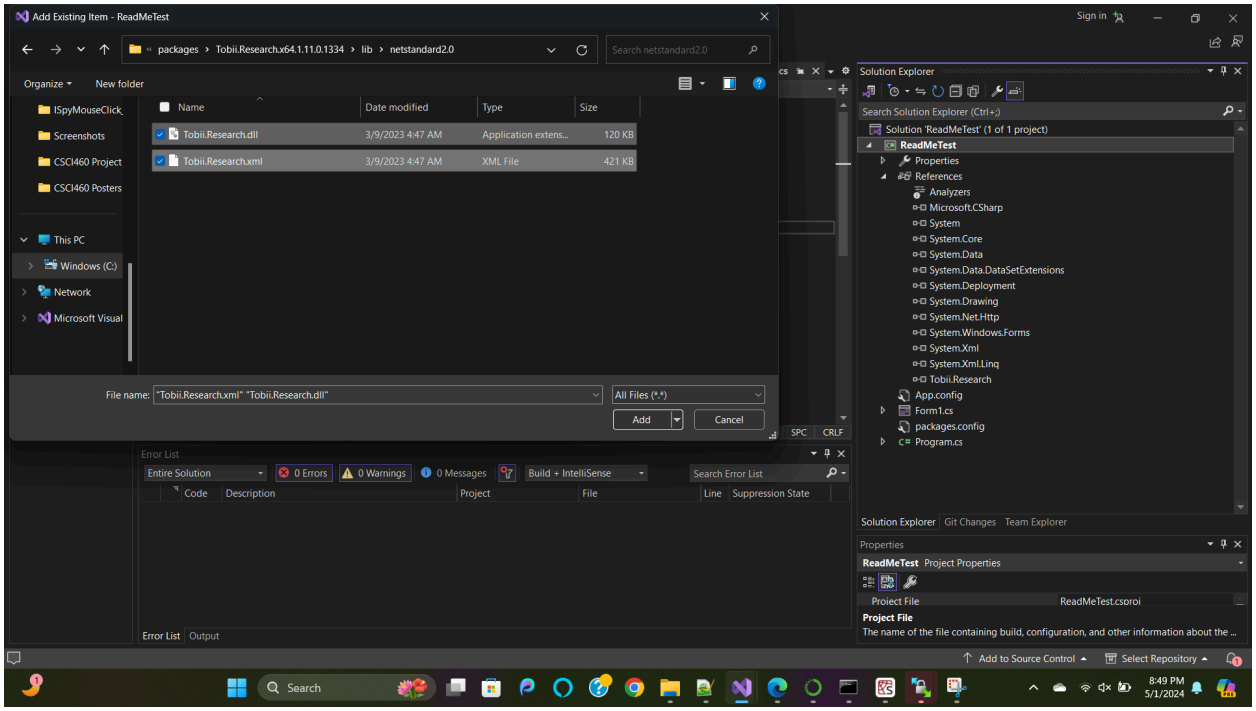
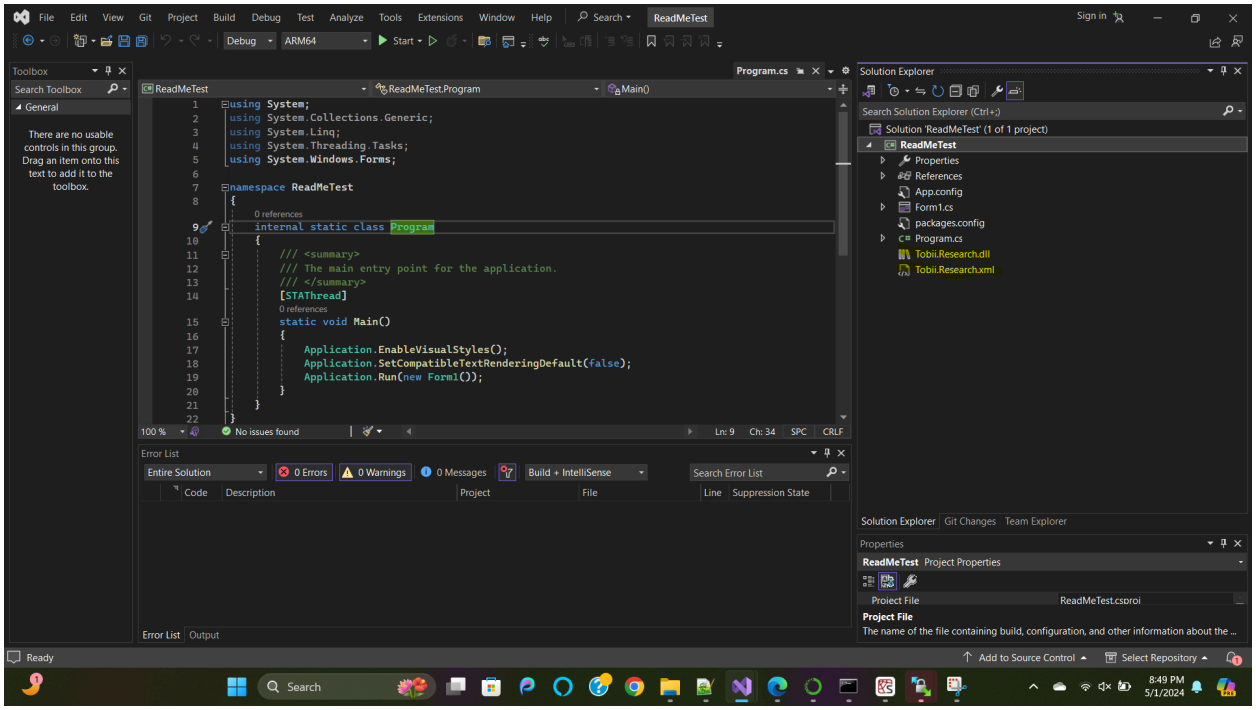
Tobii.Research
App.config
Form1.cs
packages.config
Program.cs
Error List
Entire Solution
0 Errors
0 Warnings
0 Messages
Build + IntelliSense
Search Error List
Code
Description
Project
File
Line
Suppression State
Error List
Output
Solution Explorer
Git Changes
Team Explorer
Properties
ReadMeTest Project Properties
Project File
ReadMeTest.csproj
Project File
The name of the file containing build, configuration, and other information about the ...
Add to Source Control
Select Repository
Search
8:47 PM
5/1/2024

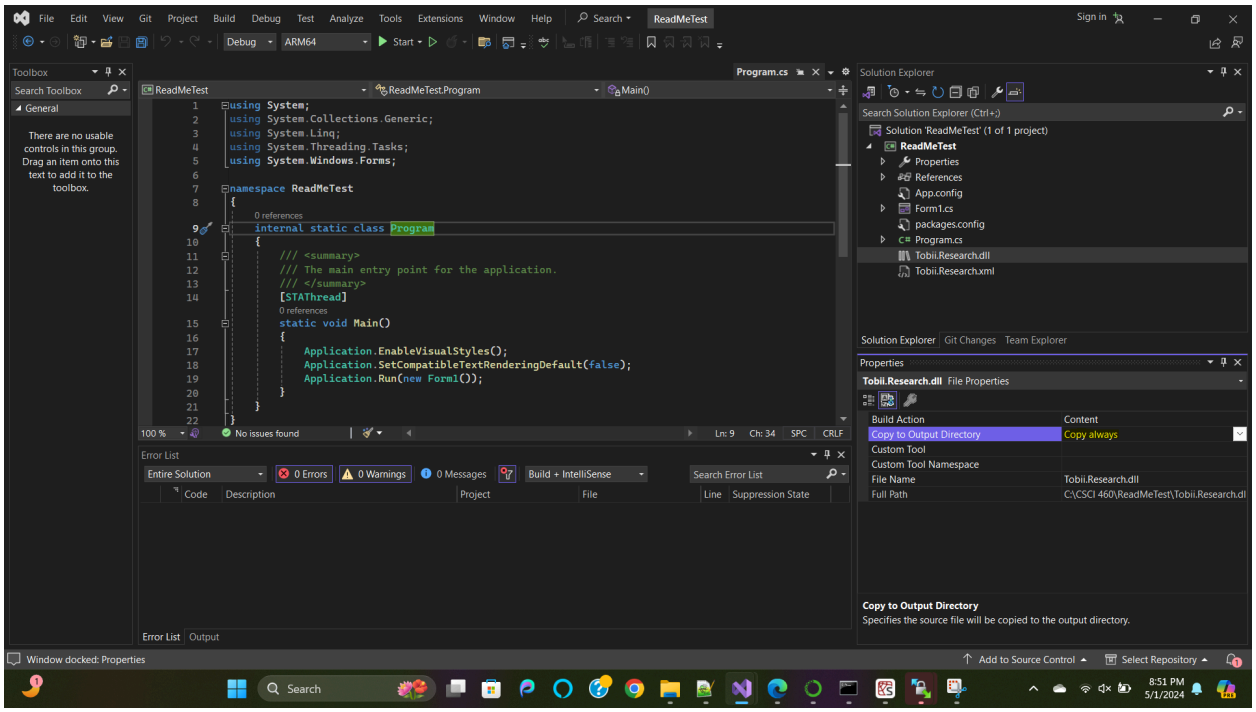


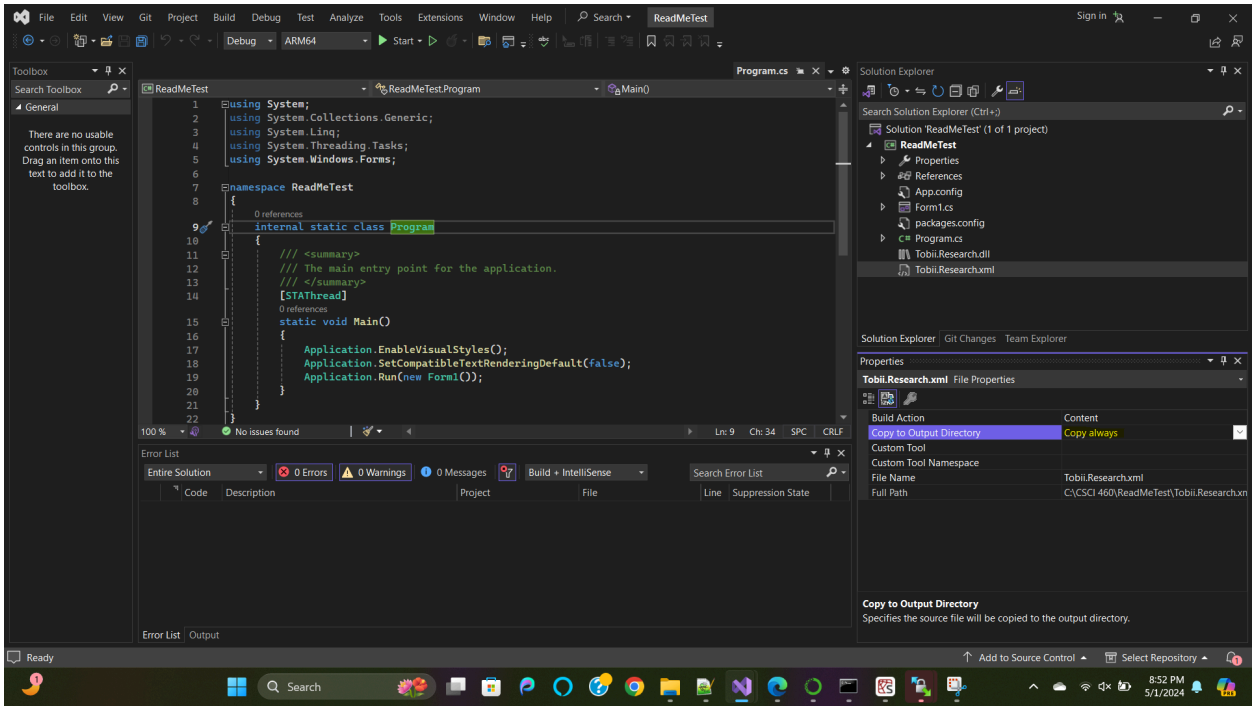


20. Add the two files to the project
21. You will see the two files in the *Solution Explorer*



22. Select each file individually and change the property *Copy to Output Directory* from *Do not copy* to *Copy always*.





Tobii Pro Spark Reference Page: [.NET - Getting started - Tobii Pro SDK documentation]

How to Connect to the Eye Tracker (.NET):

```
using System;
using System.Collections.Generic;
using System.Linq;
using System.Text;
using System.Threading.Tasks;
using Tobii.Research;

namespace Tobii.Research.CodeExamples
{
   class GFG
   {
      // Main Method
      static public void Main(String[] args)
      {
         // specific eye tracker address so the program can connect to it
         //https://developer.tobiipro.com/NET/dotnet-getting-started.html
         // create the address with our specific eye tracker
         Uri address = new Uri("tobii-prp://tpe01-100203100135/");
         // assign the eye tracker to IEyeTracker x so it can be used
         IEyeTracker x = EyeTrackingOperations_GetEyeTracker_Uri.GetEyeTracker(address);
         // get eye tracker data from the eye tracker
         IEyeTracker_GazeDataReceived.Execute(x);
         Console.ReadLine();
      }
   }

   internal static class EyeTrackingOperations_GetEyeTracker_Uri
   {
      internal static void Execute(Uri address)
      {
         EyeTrackingOperations_GetEyeTracker_Uri.GetEyeTracker(address);
      }
      internal static IEyeTracker GetEyeTracker(Uri address)
      {
         Console.WriteLine("\nGet eye tracker from Uri: {0}.", address);
         var eyeTracker = EyeTrackingOperations.GetEyeTracker(address);
         Console.WriteLine("Got eye tracker");
         Console.WriteLine("Address: {0}", eyeTracker.Address);
         Console.WriteLine("Device name: {0}", eyeTracker.DeviceName);
         Console.WriteLine("Model: {0}", eyeTracker.Model);
         Console.WriteLine("Serial number: {0}", eyeTracker.SerialNumber);
         Console.WriteLine("Firmware version: {0}", eyeTracker.FirmwareVersion);
         Console.WriteLine("Runtime version: {0}", eyeTracker.RuntimeVersion);
         return eyeTracker;
```

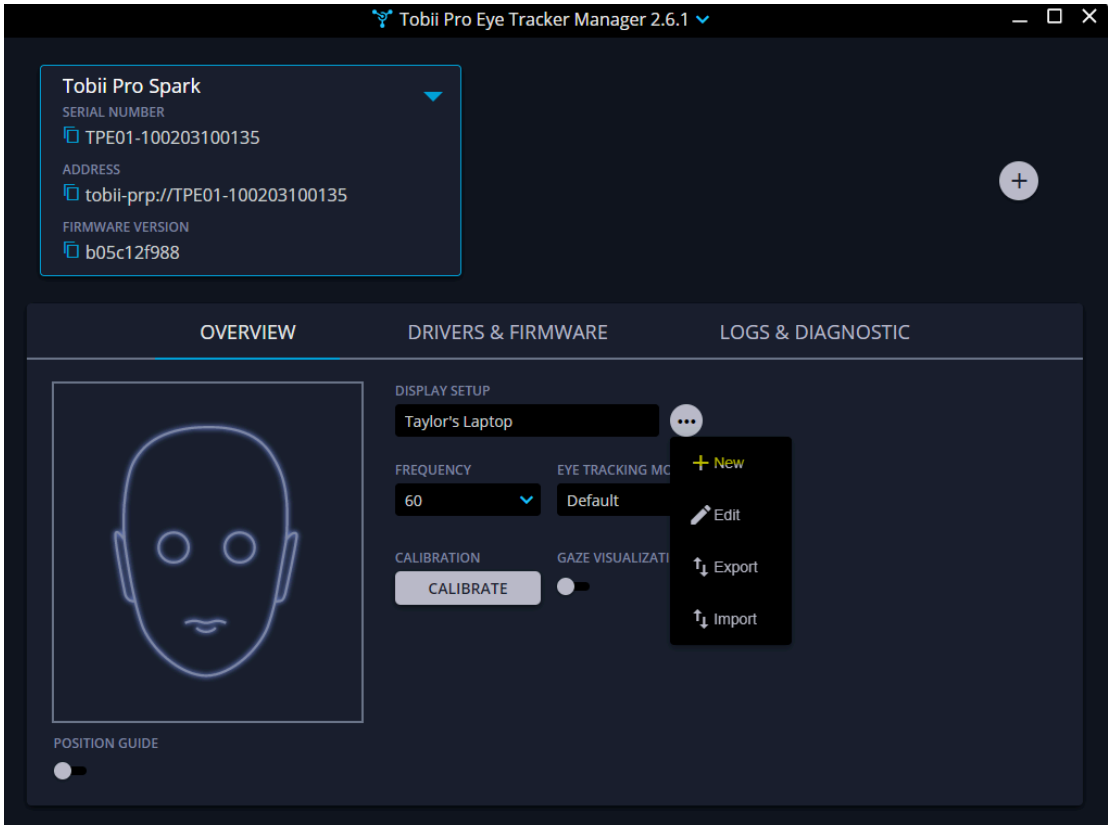
```
        }
    }
    class IEyeTracker_GazeDataReceived
    {
        public static void Execute(IEyeTracker eyeTracker)
        {
            if (eyeTracker != null)
            {
                GazeData(eyeTracker);
            }
        }
        private static void GazeData(IEyeTracker eyeTracker)
        {
            // Start listening to gaze data.
            eyeTracker.GazeDataReceived += EyeTracker_GazeDataReceived;
        }
        private static void EyeTracker_GazeDataReceived(object sender, GazeDataEventArgs e)
        {
            Console.WriteLine(
            "Got gaze data with {0} left eye at point ({1}, {2}) in the user coordinate system.",
            e.LeftEye.GazePoint.Validity,
            e.LeftEye.GazePoint.PositionOnDisplayArea.X,
            e.LeftEye.GazePoint.PositionOnDisplayArea.Y);

            Console.WriteLine(
            "Got gaze data with {0} right eye at point ({1}, {2}) in the user coordinate system.",
            e.RightEye.GazePoint.Validity,
            e.RightEye.GazePoint.PositionOnDisplayArea.X,
            e.RightEye.GazePoint.PositionOnDisplayArea.Y);
        }
    }
}
```

My Application:

To run my application…

1. Complete the following steps above to ensure all packages and .dlls are installed correctly
2. Add the following files to the project: GameForm.cs, GameForm.Designer.cs, gameOver.cs, gameOver.Designer.cs, mainScreen.cs, mainScreen.Designer.cs, Program.cs, ReplaySearchPath.cs
3. Make sure all images and txt files that you are using are in the project folder
4. Correct the file paths in the following lines of the code…

   GameForm.cs - 93, 97, 99, 164, 166, 168, 253, 272, 291, 373, 378, 383, 388
   gameOver.cs - 42, 46, 49
   mainScreen.cs - 30, 92, 153
   ReplaySearchPath.cs - 42, 178, 182, 189, 204,
5. See below for background text file set up, file paths will need to be correct there as well.
6. Plug in the eye tracker!
7. Don't forget to calibrate it using the Tobii Pro Eye Tracker Manager
   a. Select New Setup when you are using the eye tracker on a new device, and carefully follow the instructions in the app to correctly line up the eye tracker



Tobii Pro Eye Tracker Manager Installation: [Tobii Pro Eye Tracker Manager introduction - Tobii Pro SDK documentation]

How to Run your Own Experiment:

When starting a new experiment…

1. Clear out the following files and make sure they are in the project folder (names must be exact)…
   - easyReferenceImageCount.txt
   - easyRefObjCoords.txt
   - easyTargetImageCoords.txt
   - easyTargetImageCount.txt
   - easyTimerCoords.txt
   - easyTimerCount.txt
   - easyTimes.txt
   - mediumReferenceImageCount.txt
   - mediumRefObjCoords.txt
   - mediumTargetImageCoords.txt
   - mediumTargetImageCount.txt
   - mediumTimerCoords.txt
   - mediumTimerCount.txt
   - mediumTimes.txt
   - hardReferenceImageCount.txt
   - hardRefObjCoords.txt
   - hardTargetImageCoords.txt
   - hardTargetImageCount.txt
   - hardTimerCoords.txt
   - hardTimerCount.txt
   - hardTimes.txt

2. Set trialCount.txt to 0
3. Application will create two new files each run…
   a. TrialNumReplaySearchPathXCoords.txt
   b. TrialNumReplaySearchPathYCoords.txt
4. Application will rewrite…
   a. currentGameInfo.txt
5. Application will add to…
   a. gazePointData.txt
6. Include the following three files in the project, make sure that they follow the formatting below…
   a. easyBackground.txt
   b. mediumBackground.txt
   c. hardBackground.txt

Background Text File Set Up:

1. First line is the total number of lines in the text file
2. Second line is the background image file path
3. Third line is the number of target images the program can pick from for this background image
4. The following lines will be set up as follows…
    a. Reference image file path
    b. Left edge of the reference image (x value)
    c. Right edge of the reference image (x value)
    d. Top edge of the reference image (y value)
    e. Bottom edge of the reference image (y value)
5. Include as many of those as you would like
6. Make sure that the full file paths are included and correct

Data Flow Diagram: