C#

Lambdas and LINQ

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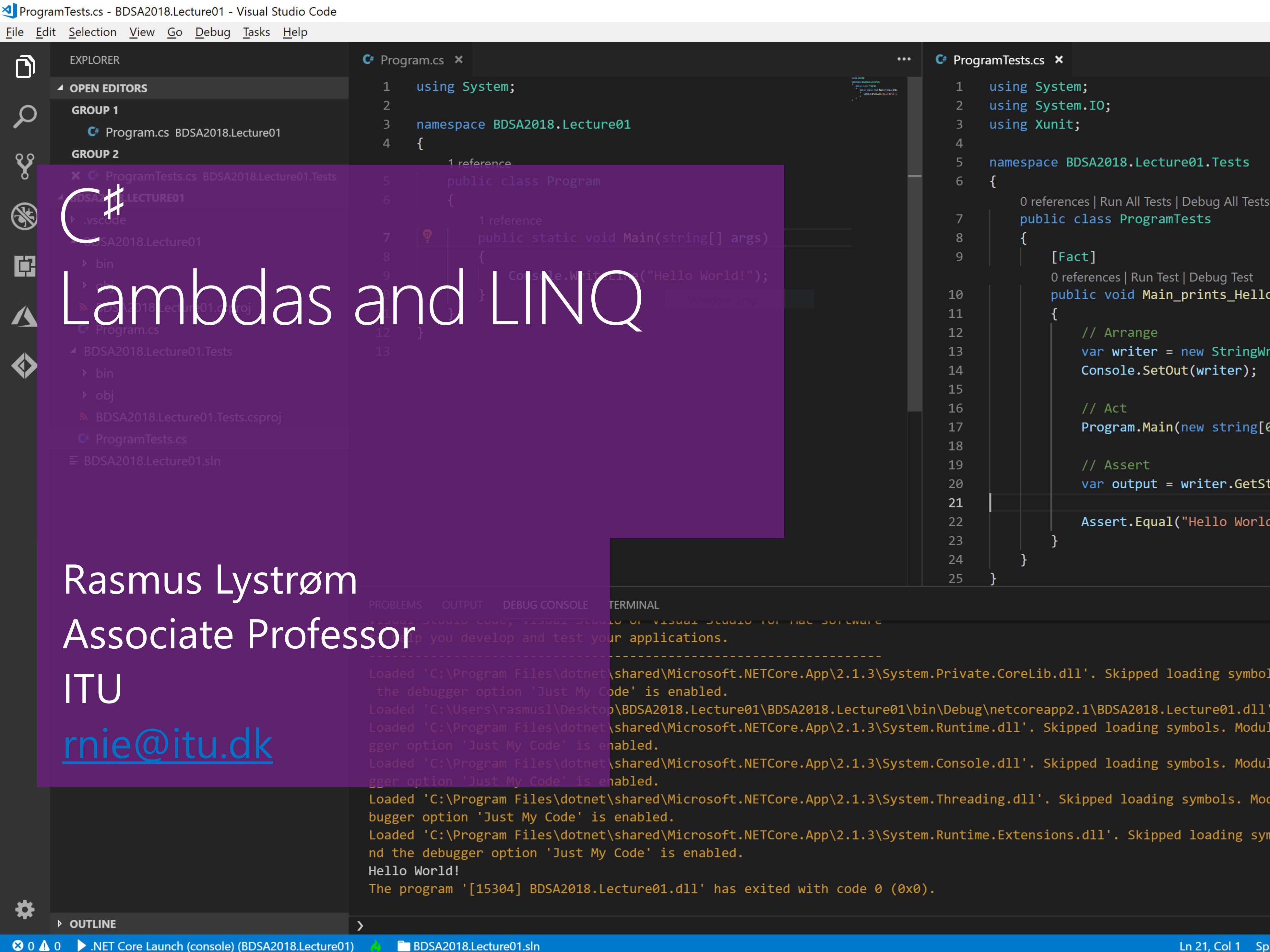

ProgramTests.cs - BDSA2018.Lecture01 - Visual Studio Code
File Edit Selection View Go Debug Tasks Help
EXPLORER
OPEN EDITORS
GROUP 1
Program.cs BDSA2018.Lecture01
GROUP 2
ProgramTests.cs BDSA2018.Lecture01.Tests
BDSA2018.LECTURE01
.vscode
BDSA2018.Lecture01
bin
obj
BDSA2018.Lecture01.csproj
Program.cs
BDSA2018.Lecture01.Tests
bin
obj
BDSA2018.Lecture01.Tests.csproj
ProgramTests.cs
BDSA2018.Lecture01.sln
OUTLINE
Program.cs
ProgramTests.cs
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL
0 0 .NET Core Launch (console) (BDSA2018.Lecture01) BDSA2018.Lecture01.sln Ln 21, Col 1 Sp

```
using System;

namespace BDSA2018.Lecture01
{
    1 reference
    public class Program
    {
        1 reference
        public static void Main(string[] args)
        {
            Console.WriteLine("Hello World!");
        }
    }
}
```

```
using System;
using System.IO;
using Xunit;

namespace BDSA2018.Lecture01.Tests
{
    0 references | Run All Tests | Debug All Tests
    public class ProgramTests
    {
        [Fact]
        0 references | Run Test | Debug Test
        public void Main_prints_Hello
        {
            // Arrange
            var writer = new StringWr
            Console.SetOut(writer);

            // Act
            Program.Main(new string[0

            // Assert
            var output = writer.GetSt

            Assert.Equal("Hello Worl
        }
    }
}
```

```
Visual Studio Code, Visual Studio for Mac software
help you develop and test your applications.
-------------------------------------------------------------------------
Loaded 'C:\Program Files\dotnet\shared\Microsoft.NETCore.App\2.1.3\System.Private.CoreLib.dll'. Skipped loading symbol
 the debugger option 'Just My Code' is enabled.
Loaded 'C:\Users\rasmusl\Desktop\BDSA2018.Lecture01\BDSA2018.Lecture01\bin\Debug\netcoreapp2.1\BDSA2018.Lecture01.dll'
Loaded 'C:\Program Files\dotnet\shared\Microsoft.NETCore.App\2.1.3\System.Runtime.dll'. Skipped loading symbols. Modul
gger option 'Just My Code' is enabled.
Loaded 'C:\Program Files\dotnet\shared\Microsoft.NETCore.App\2.1.3\System.Console.dll'. Skipped loading symbols. Modul
gger option 'Just My Code' is enabled.
Loaded 'C:\Program Files\dotnet\shared\Microsoft.NETCore.App\2.1.3\System.Threading.dll'. Skipped loading symbols. Mod
bugger option 'Just My Code' is enabled.
Loaded 'C:\Program Files\dotnet\shared\Microsoft.NETCore.App\2.1.3\System.Runtime.Extensions.dll'. Skipped loading sym
nd the debugger option 'Just My Code' is enabled.
Hello World!
The program '[15304] BDSA2018.Lecture01.dll' has exited with code 0 (0x0).
```

Agenda

Properties

Anonymous methods

Delegates

Lambda expressions

Local functions

Anonymous types

Tuples

Extension methods

LINQ

Properties 1/4

```
public class City
{
    public int Id { get; set; }
    public string Name { get; private set; }
}
```

Properties 2/3

```
public class City
{
    private int _id;
    public int Id { get => _id; set => _id = value; }

    private string _name;
    public string Name { get => _name; set => _name = value; }
}
```

Properties 3/3

```
public class City
{
    private int _id;
    public int Id
    {
        get
        {
            return _id;
        }
        set
        {
            // Place setter validation logic here if required
            _id = value;
        }
    }
}
```

Delegates

```
public delegate int BinaryOperation(int x, int y);

static void Main(string[] args)
{
    var add = new BinaryOperation(
        delegate (int x, int y)
        {
            return x + y;
        }
    );
}
```

Delegates demo

Lambda Expressions

```
Action<string> write = s => Console.WriteLine(s);

Predicate<City> b = c => c.Name.StartsWith("B");

Func<int, int> square = a => a * a;
```

(Local functions)

```
static void Main(string[] args)
{
    int square(int a) { return a * a; };

    Console.WriteLine(square(16));
}
```

Anonymous types

```
var question = new
{
    Title = "The answer...?",
    Answer = 42
};
```

(Tuples)

```
var s = Tuple.Create("Clark Kent", "Superman");

var b = ("Bruce Wayne", "Batman");

var f = (name: "Barry Allen", alterEgo: "The Flash");

IEnumerable<(float x, float y)> GenerateCoordinates()
{
    yield return (1.3f, 23.45f);
}
```

Extension methods 1/2

```
IEnumerable<City> cities = new[]
{
    new City { Id = 1, Name = "Berlin" },
    new City { Id = 2, Name = "Hamburg" },
    new City { Id = 3, Name = "Frankfurt" },
    new City { Id = 4, Name = "Munich" }
};

var count = cities.Count();

var sorted = cities.OrderBy(c => c.Name);

var filtered = cities.Where(c => c.Name.Contains("i"));

var pick = cities.FirstOrDefault(c => c.Id == 2);
```

Extension methods 2/2

```
public static class Extensions
{
    public static int WordCount(this string str)
    {
        return str.Split(
            new char[] { ' ', '.', '?' },
            StringSplitOptions.RemoveEmptyEntries).Length;
    }
}
```

LINQ

```
IEnumerable<City> cities = new[]
{
    new City { Id = 1, Name = "Berlin" },
    new City { Id = 2, Name = "Hamburg" },
    new City { Id = 3, Name = "Frankfurt" },
    new City { Id = 4, Name = "Munich" }
};

var sorted = from c in cities
             where c.Name.Contains("i")
             select new { N = c.Name };
```

LINQ demo