FYP Project Ideas

School of Computer Science Teaching Staff

The following project ideas have been submitted by the teaching staff of the school of computer science. These ideas are intended to spark your imagination and are not necessarily developed to the point of a solid project proposal.

If you are interested in any of the projects outlined in this document, please contact the staff member who submitted the project idea to discuss further. If you would like to be supervised by a particular staff member and that staff member agrees to your request please let me know and I will do my best to accommodate you with the allocations.

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# Jane Courtney

Please contact Jane at [Jane.Courtney@TUDublin.ie](mailto:Jane.Courtney@TUDublin.ie) for additional information

## SkinDeep: Human Flesh Detection in Images

While deep learning has changed the world of Computer Vision, with breakthroughs in vision systems applications from face detectors to self-driving cars, it has left a lot to be desired in one area – human skin. This has led to racial bias in face detectors and failure to recognise people in autonomous driving applications. Deep learning is only as good as the data you feed it. However, classical computer vision techniques have better approaches to the flesh detection problem using alternative colour spaces. Not only does this work across different skin tones, but it is also faster, requiring less processing power and energy to implement. This opens it up to more reliable real-time implementation and on-board low-power processing for mobile applications.

In this project, the shortcomings of existing approaches will be investigated, and a classical computer vision solution will be implemented and tested alongside existing deep-learning techniques, towards both comparison and analysis and investigation of the potential for a hybrid implementation. The design will be applied to both reducing or eliminating racial bias in computer vision applications and in online content safety, an area of great interest to both Google and Microsoft, who are both offering financial support for research in this area.

## Rock Paper Scissors: The Showdown

Since the ground-breaking AlexNet of 2015, deep learning has dominated the world of Computer Vision. This led to incredible breakthroughs in vision systems applications from face detectors to self-driving cars. However, it also led to an influx of designers with no knowledge of classical image processing techniques and over-reliance on CNNs (convolutional neural networks). This resulted in some disturbing failures, including racist face detectors and catastrophic misdiagnoses of diseases. In this project, the simple task of distinguishing rock, paper and scissors from a video of a game of roshambo will be used to pit a classical image processing algorithm against a deep learning design. The focus will be on identifying the strengths and weaknesses of each approach and potentially designing a hybrid system that takes advantages of the strengths of both.

## Design of a Diagnosis Aid for Diabetic Retinopathy

Diabetic retinopathy is an eye disease associated with diabetes where blood leakage in the retina forms red lesions. Detecting these lesions from retinal images allows easier diagnosis of this disease. In this project, a red-lesion extraction method will be designed for use in a diagnostic aid. The project will be implemented in Python and tested on retinal image datasets and its performance compared with the State of the Art.

## Restoring the Past

While valiant efforts have been made to painstakingly, manually restore old films to their former glory by enthusiasts, this process is slow and makes for little headway into the preservation of the vast archives of decaying films. Even a single minute of film contains over 1000 individual frames and each frame must be manually processed. Technology has since advanced to a point that much of this time-consuming but important work can be automated. The expertise for automating this process can be found in the area of Computer Vision and Image Processing. The extent to which this processing can be automated, depends on the intelligence of the algorithm used. However, even just semi-automation could speed up the process considerably and allow for the rescue of whole archives of otherwise lost gems. In this project, a post-processing algorithm will be designed to tackle the main effects of film damage, towards automating / semi-automating the restoration process.

# Paul Doyle

Please contact Paul at [Paul.Doyle@TUDublin.ie](mailto:Paul.Doyle@TUDublin.ie) for additional information

## Star Visualiser in VR

A project to visualise all naked eye stars from Earth using VR. Paul is not a VR specialist but knows astronomy and has access to a database which could be used.

# Bryan Duggan

Please contact Bryan at [Bryan.Duggant@TUDublin.ie](mailto:Bryan.Duggant@TUDublin.ie) for additional information

[https://bryanduggan.org/projects/final-year-project-ideas/](https://eur05.safelinks.protection.outlook.com/?url=https%3A%2F%2Fbryanduggan.org%2Fprojects%2Ffinal-year-project-ideas%2F&data=05%7C01%7CJack.ONeill%40TUDublin.ie%7Cc8ab514b15e548a57e7e08dbb9cfd26f%7C766317cbe9484e5f8cecdabc8e2fd5da%7C0%7C0%7C638308074454682985%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C3000%7C%7C%7C&sdata=yt8T2ukZAaXlIJKYt3QJcflFVBR41MvwBDs62SN7r3k%3D&reserved=0)

# Damian Gordon

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Universal Design

## Accessibility Checker Comparison

The Bobby Accessibility check was the de facto standard for increasing the accessibility degree of a website (using the guidelines established by the World Wide Web Consortium's (W3C) Web Access Initiative (WAI), as well as Section 508 guidelines from the Architectural and Transportation Barriers Compliance Board (Access Board) of the U.S. Federal Government). Since it was officially closed, a new standard accessibility checker has yet to emerge, this project will compare accessibility tools on a variety of types of webpages.

## Universal Design Code Parser

This project seeks to develop a parser that will scan Python code to determine how closely the code adheres to the 7 Universal Design principles. NOTE: This is not looking at the user interface produced by code to assess it's universal designedness, it is looking at the code itself, and seeing how universal designed the code is.

## Universal Design App Development

Redesign an existing App to see how accessible or universally designed it is using a software accessibility checker, and then using a number of Assistive Technology devices to test it's effectiveness.

## Text Simplification Project

Develop a parser to scan through an existing text; and to identify words, phrases, and sentence structures that can be simplified to help the user understand the text by making it more clear.

## Universal Design Parser for Online Forms

Exploring the Accessibility and Universal Design issues around online forms, taking particularly into account the W3C ARIA guidelines.

## User Testing and Usability Testing

To test the usability of an application, or a range of applications (from simple to more complex applications). The goals of the project will be to select suitable methodologies (interviews, think-aloud protocol, cognitive walkthrough, etc.), and use software tools like Keyboard logging and Eyetracking to monitor the user experience of the app(s). The output could be a methodology or a set of guidelines.

## Accessible Computer Science Notes Taker

Existing applications like Word and Excel can be produce formulas and equations relevant to Computer Science, however their output can prove to be challenging to assistive technology devices, this project proposes the development of an accessible Computer Science Note Taking tool that will easily create formula and equations, and will be more accessible for students with visual impairments, and work well with AT devices.

## BrailleNote Teaching tool

This project looks at the development of an interactive teaching tool to help users understand how to effectively use the BrailleNote Touch Plus Tablet, this will include the development of interactive lessons as well as the creation of quizzes, and other assessments.

## User Input Devices Comparison

The typewriter keyboard that most laptops and PCs use was designed to slow down typists when it was first created in the 1870s. A number of new interface devices have been developed since then, including speech input, drag-and-drop, point-and-click, swipe-and-tap, and braille devices like the BrailleNote. This project proposes the development of a taxonomy of input devices by comparing these input on various specified tasks using GOMS.

Sustainability

## Sustainability Scanner

This project will explore the development of a code parsing tool to see if there are any ways of restructuring the code to make it less computationally complex and thus reducing the energy usage in its execution. It is envisioned that the tool will work like an accessibility check (e.g. WebAim's Wave) where there are three categories of feedback the each part of the code can get:

- Definite energy waster

- Potential energy waster

- Commendation for good sustainably code

## Data Centre Game

YOU are the CEO of a large IT corporation! The Irish government has told you that you can build as many data centres, where you like! This is a world-building game, like Civilization, where you get to put the data centres where you want, but ideally near a university to hire the staff. Should you build one big data centre, or several smaller ones distributed? You will be given a range of data demand (sometimes lots of data has to be stored and processed, other times it is quieter), but each data centre has a huge (or potentially disastrous) impact on water usage and energy usage (and other impacts) for that area.

## Sustainability Educational Tools

This project will involve the development of an educational tool to teach people about different aspects of sustainability, including recycling, renewable energy, biodiversity and clean water. This will include the development of interactive lessons as well as the creation of quizzes, and other assessments.

## Recycling App

This project is a GIS project where you are required to create an app that would locate nearest recycling centre for different kinds of waste and e-waste, and would do a route-finding algorithm for visiting different centres.

## Sustainable Device Settings

This project will involve the development of an OS image with all of the default settings focused on sustainability, including the display settings, printing set to double sided, default sleep mode, etc.

## Image File Format Tool

This project will involve the development of an educational tool to teach people about different image file formats (tiff, gif, jpg, etc.), and explain when it is best to use each one from a sustainability perspective. This will include the development of interactive lessons as well as the creation of quizzes, and other assessments.

Other ideas

Project Ideas on other themes here:

[https://damiansprojectideas.blogspot.com/](https://eur05.safelinks.protection.outlook.com/?url=https%3A%2F%2Fdamiansprojectideas.blogspot.com%2F&data=05%7C01%7CJack.ONeill%40TUDublin.ie%7C55d4488656e4486dab7f08dbb9d4d269%7C766317cbe9484e5f8cecdabc8e2fd5da%7C0%7C0%7C638308095942280308%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C3000%7C%7C%7C&sdata=FlIAfF2B7%2Fg4BtzH7Ci0Nhx2m2SDdlbfs4HUpQ2NimI%3D&reserved=0)

# Denis Manley

Please contact [Denis.Manley@TUDublin.ie](mailto:Denis.Manley@TUDublin.ie) for additional information

Anything in the area of bio-informatics and using machine learning to analyse genetic data (data science).

Ideally the use of neural networks to predict biological relevant sequences within the data.

If anyone is interested in the topic of data science applied to scientific data I can discuss with them possible directions....

# Bujar Raufi

Please contact Bujar at [Bujar.Raufi@TUDublin.ie](mailto:Bujar.Raufi@TUDublin.ie) for additional information

## Title:  Multitasking Interface for divided attention

Design a web interface for multitasking based on divided attention. This involves designing a web interface that can manipulate two inputs (one visual and another audio) to create a divided attention in users while they perform a certain task (math, memory or some other tasks). This can be used to create mental workload conditions.

**Knowledge required:** HTML, javascript and web application frameworks.

Other interesting ones that haven't seen among students would be:

## Title:  Face detection and identification

Design a machine learning model and application capable of detecting face and identify the face after detection. To push their limits if someone is more enthusiastic, to try to detect and identify one or multiple person of interest from crowd for example.

**Knowledge required:** Programming, machine learning.

Title: Academic Performance Evaluator  
This project would be developing a system that can evaluate students' academic performance based on inputs like, grades, test score, attendance etc. This can be used to generate the student profile. I believe if this is developed well from a student, can be used from the school as pilot internally.

**Knowledge required:** Programming, knowledge of statistical analysis and machine learning algorithms.

# Brendan Tierney

The following project ideas are for MSc final year projects but could be adapted for FYPs. Please contact Brendan at [Brendan.Tierney@TUDublin.ie](mailto:Brendan.Tierney@TUDublin.ie) for additional information

<https://docs.google.com/spreadsheets/d/1IqkgZNaWDT-Q0Aa1NxB2WzB5nJdozc5jKv1JpBgybkU/edit?usp=sharing>