Individual Project (CS3IP16)

Department of Computer Science

University of Reading

Project Initiation Document

## PID Sign-Off

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| **Student No.** | **30000205** |
| **Student Name** | **Lyndon Fernandes** |
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| **Degree programme** (BSc CS/BSc CSwIY) | **BSc CSwIY** |
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| **Supervisor Name**  *(Consultation with supervisor is mandatory)* | **Pat Parslow** |
|  | Supervisor to sign PID form on Bb (grade centre) |
| **Date** | **08/10/2024** |

# SECTION 1 – General Information

## Project Identification

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| **1.1** | **Project Title** |
|  | Predictive Policing in a Local town |
| **1.2** | **Please describe the project with key-phrases (max 5)** |
|  | **- (Data driven insights) Analysing historical crime data to uncover patterns and trends.**  **- (Predictive modelling) Developing machine learning algorithms to forecast crime hotspots**  **- (Resource Optimisation) Enhancing law enforcement efficiency through informed decision making.** |
| **1.3** | **E-logbook maintenance agreed with supervisor**  *Use Google doc, OneDrive, or any mobile App whereby you will be able to generate a PDF copy* |
|  |  |
| **1.4** | **GitLab link for maintain source code and research data**  *Any change in GitLab link and Source code repository MUST be explicitly mention in final report* |
|  | [**https://github.com/Lyndon-Fernandes/Lyndon-Fernandes-Final-Year-Project**](https://github.com/Lyndon-Fernandes/Lyndon-Fernandes-Final-Year-Project)  [**https://csgitlab.reading.ac.uk/wk000205/lyndon-fernandes-final-year-project#**](https://csgitlab.reading.ac.uk/wk000205/lyndon-fernandes-final-year-project) |

# SECTION 2 – Project Description

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| **2.1** | **Summarise the project’s background in terms of research field /application domain (max 100 words).** |
|  | The project’s background lies in the field of predictive policing an emerging application of data science and machine learning in law enforcement. This domain combines criminology, statistics and computer science to forecast criminal activity and optimise police resource allocation. Predictive policing has gained traction globally as agencies seek to leverage data for proactive crime prevention. The research risk terrain modelling, to identify high-risk areas and times for specific crime types. While promising, the application domain also faces challenges related to data quality, algorithmic bias, and ethical considerations, making it a complex and evolving area of study. |
| **2.2** | **Summarise the project aims, objectives and outputs (max 250 words).** These aims, objectives, and outputs should appear as the tasks, milestones and deliverables in your project plan (fill out Section 3). |
|  | Objectives:  Collect and analyse historical crime data for Swindon.  Develop machine learning models to predict crime hotspots and categorise crime types.  Create an interactive web application with intuitive user interface.  Implement data visualisation tool for effective crime data representation.  Ensure data privacy and ethical use of crime information.  Validate the accuracy of predictive models and conduct user testing.  Outputs:  Comprehensive crime database for Swindon (data containing time, location crime type ,etc)  Machine learning models (Crime hotspot prediction model, Crime Categorisation model)  Interactive web application (user friendly, interactive map, crime type breakdown)  Data visualisation (heat maps of crime intensity)  Documentation (Technical documentation of models and algorithm, user guide for web apps)  Validation report (Model accuracy assessment, User testing feedback and improvements)  Data privacy and ethics compliance report |
| **2.3** | **Initial project specification – roughly indicate key features and functions of your finished program/application. Indicate possible method, data source, technology etc. (max 400 words)** (Sensible and relevant Charts, Table, and Figures can be used) |
|  | The project aims to develop a user-friendly web application that provides crime analytics for potential homebuyers in Swindon, enabling informed decision-making based on local crime data. Key features will include historical crime data visualization, crime type categorization, and temporal analysis. The application will employ predictive modelling techniques to forecast crime hotspots and future trends. An interactive map interface will allow users to explore Swindon, with a heat map overlay displaying crime intensity and clickable markers for detailed information. Users will have the ability to search by postcode, generate customizable reports, and create accounts to save favourite locations and receive alerts. The project will utilize data from the UK Police Open Data and the Office for National Statistics, employing methods like web scraping and machine learning algorithms such as Kernel Density Estimation for hotspot prediction. The technology stack will consist of Python (Flask or Django) for the backend, PostgreSQL with PostGIS for geospatial data management, and React.js for the frontend, along with Leaflet.js for mapping and D3.js for visualizations. Overall, this comprehensive application will leverage advanced data analytics to provide valuable insights for homebuyers while adhering to ethical standards in data use. |
| **2.4** | **Describe the social, legal and ethical issues that apply to your project. Does your project require ethical approval? (If your project requires a questionnaire/interview for conducting research and/or collecting data, you will need to apply for an ethical approval)** |
|  | Project unlikely to be made public (so probably no (Discuss with Pat)) |
| **2.5** | **Identify the items you may need to purchase for your project. A cost upto £200 can be applied (include VAT and shipping if known). You need to have consent of your supervisor. Your request will be assessed by the department.** |
|  | Potential costs (Not a necessary yet):  Mapping Api from google maps,  GCP,  Domain? |
| **2.6** | **State whether you need access to specific resources within the department or the University e.g. special devices and workshop** |
|  | The lab PC for machine learning computes |

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| **SECTION 3 - Project Plan** | | | | | | | | | | | | | |
| Please provide your project plan.  Below is an example project plan, you can use any tool or software to generate yours. | | | | | | | | | | | | | |
| **Project stage** [this is only indicative – write your own stages] | **START DATE: 01/10/2024 <enter the project start date here>****Project Weeks** | | | | | | | | | | | | |
| Oct 1-16 | Oct 17- Nov 1 | Nov 2 – Nov 17 | Nov 18 – Dec 3 | Dec 4 – Dec 19 | Dec 20 – Jan 4 | Jan 5 – Jan 20 | Jan 21 – Feb 5 | Feb 6 – Feb 21 | Feb 22 – Mar 9 | Mar 10 -Mar 25 | Mar 26 – Apr 10 | Apr 11 – Apr 30 |
| 1 Data Collection and Analysis |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * 1. Look at literature |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 1.2 Research data sources |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 1.3 Analyse the data |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 2 Machine Learning Model Dev |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 2.1 scope deep learning methods |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 2.2 Build model |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 3 Testing/evaluation/validation |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 3.1 Validate and test model |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 3.2 Check for relevancy |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 4 Develop a Web app |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 4.1 Using react make a web app |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 4.2 Gain feedback on web app |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 5 User Trial |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 5.1 Have first user trial |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 5.2 Implement feedback |  |  |  |  |  |  |  |  |  |  |  |  |  |