

## Marking Rubric

Mark	10	5	0
Idea potential	The idea has great potential and is very well suited for a research project. The idea reflects the current state of the art and represents potentially a hot topic from an emerging research or technological field. The idea reflects the student's programme of study and builds on existing competencies and modules taught and delivered within the programme.	The idea has good potential and is suited to develop as a research project. The idea stems from a well-known area that is well understood and there is a large amount of existing work in the area. The idea reflects the programme of study and builds on existing competencies and modules taught and delivered within the programme.	The idea is not suited for a research project. The idea does not demonstrate any level of ambition and/or is unrelated to the programme of study.
Research Context	The motivation and narrative for the research is very defined and articulated. The high level topic is very well described and challenges related to the topic are specified and detailed. The research context is easy to read and flows logically. The proposal clearly identifies where the contribution fits into existing work in the area. Existing work is appropriately cited and references are included. References are appropriate and are properly specified and the reader is convinced that a comprehensive review of the area was conducted. The student has demonstrated a high level of critical thinking when developing the research context.	The motivation is embedded in the text but sometimes it can be difficult to extract when reading the proposal. The topic does describe some of the challenges in the area but these are not placed in context to the idea. The context reads like a background to the area rather than a critical analysis of where the proposed project fits into the field. Citations are included but the reader is not convinced that a comprehensive review of the area is conducted. Some/most of the references are web references from sources that are not peer reviewed or are proprietary in nature.	The research context does not demonstrate any level of critical analysis and reads more like a proposal that would be presented at undergraduate level.
Aim	A simple statement that refers to the main goal of the project is defined. This goal relates and is developed bearing in mind the research context presented. The aims demonstrate some ambition and are appropriate to the level sought.	A research aim has been defined that relates somewhat to the research context presented.	Research aim is not appropriate to the level sought i.e. MSc. The aim is not related in any way to the context and motivation included as part of the proposal.
Objectives	The research objectives are well defined and constructed correctly. An appropriate number of research objectives/questions have been defined. The research objectives relates to the research context and identified challenges in the field. The research objectives are realistic and are within the scope of the project.	The project proposal may have defined too many objectives and may be presented incorrectly. They objectives are ill defined and only somewhat related to the context presented. Some of the research objectives lack ambition and outline questions that may be clearly answered without undertaking a research project.	The questions/objectives are ill defined, lack ambition and are do not align with a level 9 masters project. The research questions read like what you would expect at an undergraduate level.

## Example 2

### Project Title

Watts Available - Electric Vehicle Charge Point  
Prediction Application

### Research Context

We live in a world that is constantly changing. Now more than ever, due to global warming overheating the Earth, we need to look at alternative forms of energy consumption. Global warming is a man-made problem and thus requires and man-made solutions. Greenhouse gases are a major contributing factor and 26% of the total emissions in the USA is caused by transportation alone [1]. An alternative to petrol driven cars is the Electric Vehicle (EV). EV sales in UK are predicted to overtake fossils fuels cars by 2027 [2]. All the major car companies such as; Nissan, BMW, Toyota and Tesla, are creating 100% electric models. EVs are more efficient at converting raw power to wheel power. However, EVs do not come without their own disadvantage. EVs rely on electricity as their only energy source which is taken from on-board batteries. When the battery runs low it must be recharged. Their need for recharge is a substantial consideration, a trip of 300km could require two charges, with each charge taking up to an hour. If a driver must wait for a charge point to become free the journey becomes considerably longer. Petrol cars derive their energy source through combustion, the burning of petrol. It's a very quick process to top-up the petrol tank in car when it runs low. The throughput of a petrol station at peak times can be quite large, but they can still process petrol queues efficiently, with relatively little delay. EVs are not offered the same convenience, although there are charge points in petrol stations, car parks, street parking, public and private properties, finding a charge point that is available on a said route can be taxing. I propose to create an application that can evaluate real-time EV charge point information and predict the next best charge location suit journey requirements.

**Research to Date:** There has been research into "Real-Time Forecasting of EV Charging Station Scheduling for Smart Energy Systems" [3]. The paper proposes the creation of an on-board Internet of Things (IOT) device that interacts with the car battery by monitoring its depletion rate. As the battery enters a low state the IOT devices can schedule and reserve a charge point by communicating with a server. This requires both an IOT device on-board and installation of IOT device at each EV charging location to enable communication between car and charging stations by broadcasting when already booked by other EV users and the distance between the users location to the destination location [3]. The approach I propose to take is different as no IOT devices would be required for communication. As an alternative I aim to leverage data analytics to predict availability of a charge point. The prediction will be based on the current status of the charge location or an estimation based on historical trends. The ESB provides a data feed detailing the current real-time status of charge locations. The benefits of such as system might help reduce the journey time, especially over long distances, where more than one charge may be required.

**Time series and short-term forecasting:** A time-series is a model that seeks to gain insight into seasonal patterns and trends in relation to external factors based on time. Time-series forecasting can be described as making a prediction derived from information in a time series to forecast future values of that series. Short-term EV charge point availability forecasting will be an essential element of the project with aims to enable drivers to select their route and departure time. The time series model researched and developed to see if availability can be modelled as a function of past observed values. [4]. An appropriate model would have to be developed based on data collected from the ESB EV charge point location live data source and will collected and sorted at regular intervals.

**Data streaming:** There are many data streaming problems, from large streams to small ones, satellites images, tra\_cs cameras streams. For example a sensor deployed at sea that

Marking Rubric	
Example Number:	
Idea potential	
Research Context	
Aim	
Objectives	

records the sea temperature every hour, this would be small stream sending a small amount of data. Increasing the boy count into the millions then all the streams would be required to be processed and stored [5]. "Watt Available" application being considered may be required to handle streams of data and update the end user application accordingly based on new information. At achieve real-time forecasting the system must be capable of performing several steps with the data streams including; data ingestion, storage, model building, model deployment and new data evaluation. Data ingestion is real-time import of a data stream for processing and storage. Cloud Application: All the data gathered will be added to an existing data model to enhance the predictions returned. A cloud application that is reactively intelligent providing automatically updates, responses and adapts to their location [6] without the user having to request an update. All aspects of this proposal, from creating a time-series model for prediction and to implementing of a real-time processing and response system that gives timely feedback to the user will be equally challenging. This is the beginning of the research and I hope to find more detailed relevant research, specifically with regard to time-series analysis and the processing of live streams of data to give timely feedback to users of the application.

### Research Aim

The aim of this research is to create a cloud based application (Watts Available) that can evaluate real-time and historical information gathered from ESB Networks EV charge locations. The digested information can then be sent to a user of the application to help them reliably predict the availability of a charging point based on the current location of a vehicle/destination. A desired aim is that the application would be highly available and fault tolerant, that it will reconnect in the event of a lost connection on the journey. Technical aims are not the only consideration but to provide a quality user experience for user of application, to convey a trustworthy system and an ease of use.

### Research Objectives

The objectives of the research are as follows:

- To demonstrate the viability and feasibility of Watts Available as a service.
- To critically assess data from ESB networks charging locations and determine whether it can be leveraged to create availability predictions.
- Design and develop a time-series model that will deliver predictions to users of the application.
- Design and develop a cloud based application to surface real-time information or predictions with the aim to provide users of the application timely updates.
- Evaluate the accuracy of the predictions being calculated.