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**Dissertation Proposal Form**

**Date of Submission: 20-Nov-2023**

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| **Name** | Ghanshyam Kumar Mahato |
| **Student Id** | 220208169 |
| **Module Code** | COM7042M |
| **Project Title** | Earthquake forecasting using machine learning. |
| **Supervisor Name** | Haroon Sihan |
| **Supervisor Approval** | Yes |
| **Supervisor Signature** |  |

**Section 1: Academic**

*This section helps Academic staff assess the viability of your project. It also helps identify the most appropriate supervisor for your proposed research. This proposal will be referred to as a point of discussion by your supervisor in seminar sessions.*

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| NAME: Ghanshyam Kumar Mahato | STUDENT NUMBER: 220208169 | | | | |
| PROPOSED TITLE OF PROJECT: Earthquake forecasting using machine learning Algorithm. | | | | | |
| **BRIEFLY DESCRIBE YOUR FIELD OF STUDY:**  The study of earthquakes has become a prominent research area, driven by the challenge of identifying the crucial elements contributing to seismic events. The ability to predict earthquakes in advance is imperative for safeguarding lives and properties. However, this remains a significant challenge as no universally accepted method or technique for earthquake prediction has been established.  The prevailing technique involves analyzing historical earthquake data to identify patterns and make predictions about future events. Unfortunately, this method has limitations, providing only tentative information about the timing and location of potential earthquakes. To enhance the efficiency of earthquake prediction models, we propose expanding the dataset by introducing additional columns. These columns would capture relevant factors such as the gravitational forces of the Moon, the non-uniform gravitational field of the Earth.  By scrutinizing this enriched dataset, we aim to uncover the intricate relationships between various factors and earthquake occurrences. The influence of gravitational forces, both from the Moon and the Earth's varying gravity, along with the dynamic movements of tectonic plates, could significantly impact seismic events.  This research endeavor involves a comparative analysis of the results obtained from our enhanced dataset with those achieved using traditional methods and machine learning models for prediction. Through this comparative study, we seek to advance our understanding of the contributing factors to earthquakes and strive towards more accurate and efficient earthquake prediction models. | | | | | |
| **WHAT QUESTION DOES YOUR PROJECT SEEK TO ANSWER?**   * To what extent do the masses of the Earth and Moon contribute to the occurrence of earthquakes? * What methods can be employed to effectively identify and predict future earthquakes? * Which specific features play a crucial role in predicting earthquakes? * What types of machine learning techniques are commonly utilized for predicting earthquakes? * Among various algorithms, what is considered the most effective for identifying and predicting earthquakes? | | | | | |
| **WHAT HYPOTHESIS ARE YOU SEEKING TO TEST?**   * The mass of the Moon is approximately 81 times less than that of Earth. The centre of mass of the Earth-Moon system is located near the Earth due to its significantly larger mass. Does the gravitational pull of the Moon play a role in the occurrence of earthquakes? * The gravitational force of Earth exhibits variations from one location to another. Can these fluctuations in gravitational force across different places contribute to or influence seismic activities, such as earthquakes? * The distance between the Moon and Earth undergoes periodic changes. Is there a correlation between these variations in the Moon-Earth distance and the incidence of earthquakes? | | | | | |
| WHAT ARE THE PROJECT OUTCOMES?   * Advancements in our understanding of seismic activity could lead to improvements in earthquake forecasting, offering the potential to enhance our ability to predict and mitigate these natural events. * By delving into the influence of lunar gravitational effects, we aim to gain a comprehensive understanding of their impact on earthquake occurrences, paving the way for more accurate seismic assessments. * Investigating the correlation between fluctuations in Earth's gravitational force and seismic events provides an opportunity to unravel the intricate connections between these factors, contributing to a deeper comprehension of earthquake dynamics.   In the realm of earthquake prediction models within machine learning, I aim to enhance the predictive capabilities by incorporating additional data. Specifically, I propose augmenting the existing models with columns dedicated to storing the values of the Moon's displacement from Earth and the gravitational forces in areas where earthquakes have occurred. This augmentation is intended to facilitate the application of advanced machine learning techniques, with the goal of developing a more robust and accurate earthquake prediction model. | | | | | |
| **PLEASE PROVIDE A BRIEF BIBLIOGRPAHY OF 2-4 KEY TEXTS FOR YOUR STUDY (USE HARVARD REFERENCE STYLE)** Bibliography Adushkin, V. R. S. &. S., july 2017. Abstract. *Lunar–solar tide effects in the Earth’s crust and atmosphere.*  Aslanov, B., 28 March 2013. Abstract. *Effect of "Supermoon" on Earth seismotectonics,* p. all.  Salam, M. I. L. a. A. D., 2021. Earthquake prediction using hybrid machine learning techniques. *International Journal of Advanced Computer Science and Applications Preview publication details ,* Volume 12, p. all.  Tracy, V., 2023. *moon in motion.* [Online]  Available at: https://moon.nasa.gov/moon-in-motion/earth-and-tides/tides/  usgs, 2023. *usgs.* [Online]  Available at: https://earthquake.usgs.gov/earthquakes/map/?currentFeatureId=us6000lp5l&extent=-65.51296,217.96875&extent=77.46603,530.85938&range=search&timeZone=utc&search=%7B%22name%22:%22Search%20Results%22,%22params%22:%7B%22starttime%22:%221900-11-08%2000:00:00%22 [Accessed 2023]. | | | | | |
| **PLEASE NAME ANY MEMBER OF THE ACADEMIC TEAM YOU HAVE DISCUSSED THIS POTENTIAL PROJECT:** | | | | | |
| ***(staff use only) Project Approved by Academic Team?*** | | YES |  | NO |  |
| *Any other Academic Staff comments* | | | | | |

**Section 2: Technical**

*This section is designed to help the technical team ensure the appropriate equipment to support each project has been ordered. It also exists to help you fully ascertain the technical requirements of your proposed project. In filling out this section please note that we do not ‘buy’ major items of equipment for student projects. However, if a piece of equipment has a use to the department beyond the scope of a single project, we will consider purchasing it. Though purchasing equipment through the university is often a slow process.*

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| **PLEASE DESCRIBE YOUR PROJECT IN TECHNICAL TERMS:**  Conducting data collection, analysis and developing machine learning models. | | | | |
| **WHAT EXISTING LAB EQUIPMENT DO YOU NEED ACCESS TO UNDERTAKE YOUR PROPOSED PROJECT:**  Consider investing in a MacBook or exploring paid subscriptions for comprehensive data collection. | | | | |
| **PLEASE LIST ANY MINOR EQUIPMENT YOU MUST PURCHASE TO COMPLETE YOUR RESEARCH PROJECT: (eg, switches, resistors, raspberry pi, Arduino etc)**  **No.** | | | | |
| **PLEASE LIST ANY MAJOR EQUIPMENT YOU REQUIRE TO COMPLETE YOUR RESEARCH PROJECT ALONG WITH LINKS TO WHERE IT MAY BE PURCHASED (eg, a Drone, mobile phone etc).**  No. | | | | |
| **HAVE YOU DISCUSSED THE FEESIBILITY OF YOUR PROJECT WITH A MEMBER OF THE TECHNICAL TEAM? IF SO, WHO?** | | | | |
| ***(staff use only) Project Approved by Technical Team?*** | YES |  | NO |  |
| Please comment on the Feasibility of the project: | | | | |

**Section 3: Ethics Approval**

*This section of the form will help ascertain if you need to complete and undergo the universities research ethics approval process. Please answer all questions honestly.*

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| **Question** | **Yes** | **No** |
| **Does your Research involve any of the following?**  **Human participants / subjects, Human tissue, Documents** |  | **No** |
| **Will the research require the collection of primary source material that might be considered offensive or illegal to access or hold on a computer? (e.g. studies related to state security, pornography, abuse, illegal behaviour or terrorism).** |  | **No** |
| **Does your research concern group which may be construed as terrorist or extremist?** |  | **No** |
| **Will the research involve visual/vocal methods where participants may be identified?** |  | **No** |
| **Will the research involve the use of genetic data (inherited/acquired genetic characteristics resulting from the analysis of a biological sample)?** |  | **No** |
| **Will the study require the co-operation of a gatekeeper to give access to, or to help recruit, participants? (eg, headteacher or group leaders publicising your work)** |  | **No** |
| **Will it be necessary for participants to take part in the study without their knowledge or consent at the time?** |  | **No** |
| **Will the study involve recruitment of patients through the NHS?** |  | **No** |
| **Will inducements be offered to participants? (eg the offer of being entered into a prize draw)** |  | **No** |
| **Does the study involve participants who are particularly vulnerable or unable to give informed consent? (e.g. participants under 18. Adults with learning disabilities, the frail elderly, or anyone who may be easily coerced due to lack of capacity)** |  | **No** |
| **Is there a possibility that the safety of the researcher may be in question?** |  | **No** |
| **Will the study require participants to commit extensive time to the study?** |  | **No** |
| **Are drugs, placebos or any other substances to be administered to participants, or will the study involve invasive, intrusive or potentially harmful procedures of any kind?** |  | **No** |
| **If there are experimental and control groups, will being in one group disadvantage participants?** |  | **No** |
| **Is an extensive degree of exercise or physical exertion involved?** |  | **No** |
| **Will blood or tissue samples be obtained from participants?** |  | **No** |
| **Could the study induce psychological stress or anxiety or cause harm or negative consequences beyond the risks encountered in normal life?** |  | **No** |

*This part of Section 3 requires you to thoroughly* ***identify*** *and* ***mitigate*** *the ethical challenges of your research project. This is required to enable the computer Science ethics panel to properly consider if your proposed project requires you to submit a formal proposal to the university ethics panel.*

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| **With your answers to the previous questions in mind, please describe the main ethical challenges of your research project and how you propose to mitigate them. Your discussion may include material not covered in the above questions. Please be as through as possible:** |