# BC2407 Project Proposal

Instructions: Fill up the boxes. Submit this word document into NTULearn > Class site > Team by the stated deadline. If there are major changes after submission, inform your instructor and re-submit.

| BC2407 Class: | 1 | Team: | 6 |
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| Name of Entity/Event[[1]](#footnote-0) | Facebook | | |
| Preferred Wk of Presentation[[2]](#footnote-1) | No Preference | | |

| Project Title |
| --- |
| Predicting misinformation with Analytics – Facebook |

| Background of the Case  [What’s the circumstances and background of the case?] |
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| **Facebook’s business environment**  Despite Facebook being one of the pioneers in the social media scene, many new rivals have entered the market over the years. With the rise of Facebook’s competitors such as Twitter, Snapchat, Linkedin, Tiktok, etc. Facebook must keep up with changing user behavior and tastes to remain as a dominant player in the market.  Further challenged by new social and culture trends like social activism, proliferation of misinformation and hate speech, additional measures must be taken by Facebook to maintain its reputation and credibility and stay abreast of the dynamic environment.  Made up of user-generated content, evolution of technology could impact Facebook’s revenue streams. Emerging technologies like Virtual Reality, Artificial Intelligence may change the mode of interaction on the Facebook platform.  With social media exerting significant influence on society, regulators have expressed concerns about Facebook’s operations and its possible negative influences. . In response to increasing concerns over data privacy and security, more regulatory constraints have been introduced (Raymond, 2014). Misinformation, hate speech and content moderation have also become increasingly important threats that Facebook has to tackle in recent years.  **Facebook’s stakeholders**   1. Users   As the most widely used social media platform globally with more than 2.9 billion monthly  active users, its users undeniably play an important role in their business. They have been found to seek a user-friendly, secure network that allows them to interact with their friends, family, and communities.   1. Investors   Facebook is a publicly traded company with a market capitalization of over $500 billion in Feb 2023 (*Meta (Facebook) (FB) - Market Capitalization*, n.d.). Strong financial performance, growth potential, and efficient risk management, particularly that linked to data protection, false information, and competition, are all things that investors are interested in.   1. Advertisers   As advertising accounts for the bulk of Facebook's income *(Franek, 2021)*, advertisers are crucial to achieving sustainable profits. When choosing a platform, advertisers seek effective advertisement targeting and placement for better audience outreach, and one that offers accurate and transparent advertising data.   1. Regulators   A number of legislative frameworks, such as data privacy, antitrust, and content moderation regulations, are applicable to Facebook. Authorities want to make sure Facebook abides by these rules and laws and takes action to address concerns with false information and hate speech on its site.  **Facebook’s business model**    *Fig 1: Facebook Business Model (Pereira, 2020)*  Facebook’s main source of revenue is advertising. With increasing time spent engaged on the platform, users are exposed to more advertisements. To cater to user’s clear preferences for relevant advertisements (Zuckerberg, 2020), Facebook also has to decide what kind of information and advertisements to show users to keep them engaged on the platform. However, their existing algorithms may lack the means to correctly identify misinformation, inadvertently pushing such content to its users.  **Facebook’s business processes**  In supporting Facebook’s main revenue generation in advertising, data management and content moderation is essential (O’Connell, 2018).  To determine which advertisements are relevant to the user, a detailed profile of each user must first be generated. To best match the interest of the user (Singer, 2018), data from the user’s personal information, likes, browsing history can all be analysed. To comply with data privacy regulations and maximize information security, good data management and hygiene must be simultaneously practiced.  Content moderation is also an important function to regulate the content displayed on the platform. Before application of analytics to content moderation is feasible, Facebook had a team of 7,500 moderators to comb through its content to apply content moderation guidelines (Wong & Solon, 2018). With the evolution of artificial intelligence, Facebook is developing ways to perform this function without human intervention.  **Our project focus**  In this project, our team would like to suggest improvements in the content moderation process through analytics. The prevalence of misinformation and fake news, coupled with varying degrees of media literacy, has the ability to pollute the information environment and sway decision-making. This culminates in an increase in effort needed for people to discern which information to believe (de Ridder, 2021).  Today, information and data shared through social media is generated at speeds and volumes too high to be checked for misinformation manually. Unlike traditional media companies which utilise manual labour, a tech-giant like Facebook can leverage its prowess in technology and data to continuously refine and improve its artificial intelligence (AI) models to detect such misinformation and reduce its negative impacts.  Usually created with political or commercial interests in mind (de Ridder, 2021), misinformation can sway the masses and cause devastating impacts on society. According to Facebook, more than 180 million posts were flagged to contain misinformation during the 2020 US Presidential Elections (*Here’s How We’re Using AI to Help Detect Misinformation*, 2020). From Photoshop to AI-generated images, the form in which misinformation is constantly evolving. Using predictive analytic techniques, our team aims to provide Facebook with a relevant yet scalable solution to the misinformation problem. |

| Business Problem or Opportunity in the Case  [State the business problem or opportunity that had been or could be solved with Analytics. What did the business aim to achieve?] |
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| **Corporate Responsibility**  The wrongful dissemination of misinformation can undermine otherwise factually accurate and reliable information on the platform, leading to flawed perspectives concerning important matters like healthcare or legislations. An example that comes to mind is the misinformation regarding the COVID-19 vaccinations. False information provided had led several people to opt against receiving the COVID-19 vaccination, needlessly raising their risk of infection and hospitalization. In turn, this has put a heavy pressure on healthcare systems and led to a rise in diseases and fatalities. Besides health hazards, the wrongful spreading and creation of information can cause unnecessary tension and acts of violence that would cause harm to people (Spring, 2020a). As such, Facebook bears a corporate responsibility to prevent false information from spreading on their platform. By reducing the amount of false information on their platform, Facebook stands to benefit from an enhanced reputation and a better public image. With a quarter of the world's population regularly using Facebook (Statistica, 2023), the social media network needs to establish its reliability in order to keep its members' steadfast commitment. If not, users would be reluctant to utilize the platform out of concern of being unwitting distributors of false information.  **Legislation in Place**  Besides maintaining trust with their users, Facebook also has to deal with the increased regulatory requirements governments around the world have against spreading misinformation, like that of Singapore (Yahoo News, 2019). To remain a player in the global market, Facebook will have to create technology to combat fake news to comply with the demands of governments around the world who are seeking to prevent the spread of misinformation in their states.  **Advertising Revenue**  In addition to corporate responsibility and public image, Facebook’s revenue from ads is threatened by the platform’s increasing amount of misinformation. In 2020, more than 150 companies have halted buying advertising rights on Facebook due to a #StopHateForProfit boycotting campaign (Spring, 2020b). With Facebook’s ad revenue coming in at $113.6 billion in 2022 (Meta, 2022b), a boycott by its advertisers can cause a significant loss in revenue. To avoid history from repeating itself, Facebook has to find a way to satisfy their customers by reducing misinformation on their platform.  **Facebook’s Large and Increasing User Base**  Facebook has the largest number of active daily users on its platform in the world at 2 billion *(Meta, 2022a)*, with this number of active users set to increase. The increasing number of users on Facebook means two things. First, an increase in daily data traffic on its platform with more users posting content is to be expected. Next, there will be more users who can act as agents of spreading and receiving misinformation. Either way, the increase in user base will also likely increase the connectivity between them, facilitating the faster and further spread of misinformation.    *Fig 2. Graph showing Facebook’s increasing number of Active Daily Users (Meta, 2022a)*    *Fig 3. Social Media Market Share based on Active Monthly Users (Dixon, 2023)*  Using analytics, misinformation can be identified earlier and quicker. The automation of analytics software makes it possible to sift through the vast amount of data on Facebook to detect, removing any sources of misinformation it is allowed to propagate. |

| Interestingness of the Case [Why did your team choose this case? What is interesting or Important?] |
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| **Our Rationale for Decision Making**  In making our decision, our team wanted to target a currently unresolved problem, which was prevalent and pressing. With the establishment of the Protection from Online Falsehoods and Manipulation Act and having observed the dangers of inaccurate medical advice from the COVID-19 pandemic, the topic of misinformation had come to mind.  **The Seriousness of Misinformation**    *Fig 4. Line graph demonstrating the rising popularity of social media platforms (Statista, 2022)*  Furthermore, the recent surge in social media users from 4.26 to 4.89 billion (Statista, 2023) from 2022 to 2023 and the increased time spent on such platforms (AFPRelaxnews, 2022) provides clear evidence that misinformation is a growing problem with the potential to impact on a large scale.    *Fig 5. Chart demonstrating the surveyed trustworthiness of common social media platforms (Aliza Vigderman, Senior Editor, Industry Analyst, 2023)*  To tackle the problem most effectively, we wanted to target the source of the problem – Social Media Companies, of which Facebook was found to be a key contributor to (Hamilton, 2021).  **The interestingness of misinformation**  Tasked to solve problems with the use of analytics, the issue of misinformation seemed especially interesting, as it felt like a perfect fit for the problem. With the vast amounts of information generated daily in so many different forms (e.g Text, Audio, Video), the ability to carefully process every piece of information on such a scale falls beyond the realm of human capability. Within the company, employing human moderators to regulate misinformation can incur huge additional costs in time, effort and money (Tarasov, 2021) , and put a strain on the company’s resources.  While user-centric options such as user reports are cost-free for Facebook’s disposal, the effectiveness of this approach is reliant on each user’s ability to correctly identify misinformation. Shifting the responsibility of misinformation handling is unsustainable in the long run, and could lead to loss of customers due to dislike and distrust of the platform, which could substantially affect Facebook’s main source of revenue - Advertising.    *Fig 6. Chart showing the breakdown of Facebook’s sources of revenue from 2016 to 2020 (Franek, 2021)*  In contrast, analytics is not subjected to human limitations, presenting a more efficient solution. Analytical solutions are well suited to receive and process large amounts of data round the clock, while deriving key insights and producing consistent, highly accurate outputs in short timeframes. With more data fed to analytical solutions over time, therein lies a potential for continually improving performance, and scalability in the long-run. With Facebook already possessing huge collections of user data as part of its advertisement personalisation efforts (Zuckerberg, 2020), it can easily leverage this data to build more accurate Machine Learning Models. Boasting a large and competent team of data scientists and engineers, their expertise in the analytic domain further simplifies solution implementation, avoiding the need to incur additional costs in acquiring the otherwise required manpower.  **Our Proposed Approach**  In providing an all-encompassing, well-rounded approach, we will target misinformation taking the form of either an image or text. In handling text data, analytical methods such as Random Forest and Gradient Boosting (XGBoost) can be used. The aforementioned methods are well-suited to the problem due to two reasons: First, Their low overfitting risks given that they are ensemble techniques; and second, their ability to handle both numerical and categorical data in text-data. Image classification can be achieved with the help of Convolutional Neural Networks and Random Forest. Convolutional Neural Networks’ (CNN) built in convolutional layer reduces the high dimensionality of images without information loss (Lang, 2022), increasing the computational efficiency and the likelihood of extraction of key features of the image. The amount of specified parameters is also independent of the image size (Le, 2018), making it a versatile choice suitable for a wider range of use cases. On the other hand, Random Forest compensates for CNN’s inadequacies through its relatively faster training and testing times (Bosch et al., 2007), lower resource requirements (Montantes, 2021), and better results with smaller input datasets.  **The Need to Fight Back**  The proper management of the issue of misinformation is essential, as it impacts both Facebook and the society at large. Efforts to reduce misinformation can sustain user trust in the platform, achieving their business objective of making it an accessible platform for all. User retention can further serve to support Facebook’s payment-free service model for everyday users, by retaining their revenues from advertising and subscription-based services like Facebook Workplace. Appropriate handling tactics would also allow Facebook to evade unnecessary legal complications, alongside heavy financial costs and bad publicity. With an information integrity preserved, users can browse through content with a peace of mind, without the fear of falling prey to misinformation. |

| Data Sources  [Where will you get the data?] |
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| 1. **Meta Deepfake Detection Challenge - Meta**   <https://ai.facebook.com/datasets/dfdc/>  In order to accelerate the detection of Deepfakes, Meta partnered with various industry leaders and experts to host the Deepfake Detection Challenge (DFDC) where anybody from students to postgraduates and professionals come together and compete against one another to create the best detection model. The preview version of this dataset contains 5000 videos, 2 facial modification algorithms and related research papers. The full version of the dataset contains 124000 videos, 8 facial modification algorithms and related research papers. The dataset was created by Meta using paid actors. Given that this is the actual data that Meta used to accelerate the development of their deepfake detection system, this dataset would be highly reliable and beneficial for us when we are doing our analysis.   1. **Misinformation & Fake News text dataset - Kaggle**   <https://www.kaggle.com/datasets/stevenpeutz/misinformation-fake-news-text-dataset-79k>  This dataset contains 79000 compiled articles on misinformation, fake news and propaganda. 34975 of the articles are real and the rest are fake news. The real articles came from various trusted news sources such as *The New York Times* and *The Washington Post*. The fake articles came from various sources such as *EUvsDisinfo projec*t and right wing extremist websites such as *Redflag Newsdesk*.   1. **Some like it hoax - Research Article Dataset**   <https://github.com/gabll/some-like-it-hoax>  This is the dataset used by researchers in the research article “Some Like it Hoax: Identifying Fake News in Social Networks (2017)”. It consists of 15,500 Facebook posts and 909,236 users. The dataset is used to classify facebook posts with high accuracy into hoaxes and non-hoaxes on the basis of users who liked the posts.   1. **Photoshopped Faces - Kaggle**   <https://www.kaggle.com/datasets/tbourton/photoshopped-faces>  This dataset contains 500 original and 500 modified images from Flickr and OpenImage which is used by researchers to detect photoshopped faces. |

| Important References  [What are the important publications or prior analysis done? Sources?] |
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The Guardian. <https://www.theguardian.com/technology/2018/apr/24/facebook-releases-content-moderation-guidelines-secret-rules> 14. Yahoo News. (2019, November 29). POFMA Office issues correction notice to Facebook over States Times Review post. Yahoo News Singapore. <https://sg.news.yahoo.com/pofma-office-issues-correction-notice-to-facebook-over-states-times-review-post-040827385.html?guccounter=1&guce_referrer=aHR0cHM6Ly93d3cuZ29vZ2xlLmNvbS8&guce_referrer_sig=AQAAALvhrBeMsDehNu57jqkNyp18-zwaS01tCYONG8FLwIDRhqmU1vHLR1DQJ3pwTbbT8DSq_sRMgA4N7xLbsf_Gpqo57zgaKEa4kV170Gb_RJ7swMGWZzaBNI8SLazlBauMru6ax5k9cHs3GRDFwpZkU_Lobu9Y60_-vmNk2MCWh7wl> 15. Yahoo! (2019, November 29). POFMA office issues correction notice to Facebook over States Times Review Post. Yahoo! News. Retrieved February 17, 2023, from <https://sg.news.yahoo.com/pofma-office-issues-correction-notice-to-facebook-over-states-times-review-post-040827385.html> 16. Zuckerberg, M. (2020, June 22). 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| Project Schedule  [Planned Timeline and milestones to be achieved.] |
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| * **Week 6 - Proposal discussion** * Brainstorming of proposal * **Week 7 - Proposal submission** * Start of project meeting * Defining business problem * Delegating responsibilities * Documenting variables used in our dataset * Submission of proposal * **Week 8 - Data Cleaning and Analysing data set** * Performing Exploratory Data Analysis (EDA) * Finding key variables * Dealing with outliers/NAs * Dealing with missing data * Identify relationships between variables * **Week 9 - Building and debugging R/Python script** **if needed** * Test various clustering models and random forest classification * Clean up script file and set up PowerBI to build visual models * Continue research to find data we can use to aid our analysis * Test various models for accuracy      * **Week 10 - Begin report writing and preparation of slide deck** * Indepth researching to back up our claims * Work on making data more presentable and simplified in slide deck as our audience is assumed to not be experienced in data analytics * Consultation with professor * **Week 11 - Continue report writing and preparation of slide deck** * Preparation for presentation * Presentation flow rehearsal * Preparation for visual aids   **Submission deadline:** End of Week 11 (2 Apr)   * **Week 12/13 - Presentation** * Presentation day! |

| Key Responsibilities  [State the Key Responsibilities of each team member.] |
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| Sua Qi Rong   * Ensure project is smooth sailing and deal with any team conflicts * Ensure project is on track and milestones are achieved on time * Delegate task fairly and responsibly * Assist in building and testing R/Python script * Assist in research for extra data * Assist in making slides for presentation * Assist in report writing * Assist in creating PowerBI/Tableau dashboard for presentation   Sim Ian Leng   * Ensure that insights are well presented and explained in report * Simplify data-findings to be as less technical as possible * Crafting a good introduction in executive report * Keep an eye out for other factors that could affect accuracy of model * Assist in writing report * Assist in making slides for presentation * Assist in creating PowerBI/Tableau dashboard for presentation   Neo Xue Ying   * Assist in building and testing R/Python script * Crafting second paragraph in executive report * Ensure project is well documented i.e. proper references and data variables are properly documented * Take charge to inform professor if the team requires any details or help * Assist in making slides for presentation * Final editor of R/Python script * Help in creating PowerBI/Tableau dashboard for presentation   Low Chi Hang   * Assist with researching on other data models to be used if appropriate * Ensure quality of code is readable and commented * Assist in checking script and ensure outputs are desirable * Assist in writing of final project report, checking grammar and formatting * Assist in making slides for presentation * Assist in creating PowerBI/Tableau dashboard for presentation   **We are not limited to the above key responsibilities and will help out each other if the need arises.** |

1. Do not choose any organization in the exclusion list (unless instructor approves). See Appendix A & B in BC2407 Project Grading, Requirements and Guidelines.PDF. [↑](#footnote-ref-0)
2. All teams must submit project by the stated deadline. State your preferred wk to present project in class (if any). If there are too many requests for a specific wk (max 6), instructor may ballot and announce in NTULearn by wk 9. [↑](#footnote-ref-1)