Anomaly Detection Techniques to Find Influential Users

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# A. Proposal Overview

## A.1 Research Question or Organizational Need

Which users are influencing others the most with their reviews and recommendations of video games on the Steam platform?

## A.2 Context and Background

In this fictitious scenario based on real a real company, Valve Corporation and Steam gaming platform need help discovering user patterns in their recommendation and review data to better understand who their most influential users are. They have asked for a short list of the most influential users for study by their selves and other game development companies that use the Steam platform to sell their games. The hopes is that this will help game campanies develop better games and marketing strategies to increase sales. Since this data is not known at this time, they have asked to do some discovery and provide them a list of users with proper rational and methods. The value of this study could improve success for all parties.

## A.3 and A3A Summary of Published Works and Their Relation to the Project

**Rubric A3:** An accurate summary of 3 different published works that relate to the research question or organizational need in part A1 is provided, and the summary of *each* work includes essential details.

Any citable work produced by an industry or academic professional is acceptable, e.g., whitepaper, online articles, manuals, videos, etc.

**Rubric A3A:** The description logically addresses how *each* published work relates to the research question or organizational need from part A1.

The work only needs to relate to an aspect of your project, e.g., methodology, tools, statistical methods, models, etc.

For each work, start with an overview of the article, summarize the major points discussed, and include an APA style in-text citation, e.g., (Author, year). Next, describe how the work relates to the research question or organizational need provided in A.1.

### Review of Work 1

Include a summary, APA style in-text citation, e.g., (Smith, 2023), and relation to the research question or organizational need here.

### Review of Work 2

Include a summary, APA style in-text citation, e.g., (Purdue University, n.d.), and relation to the research question or organizational need here.

### Review of Work 3

Include a summary, APA style in-text citation, e.g., (Scribbr, 2022), and relation to the research question or organizational need here.

## A.4 Summary of Data Analytics Solution

The dataset has over thirteen million users. Steam is interested in the most impactfut. I will use basic Exploratory Data Analysis (EDA) to understand the dataset. I will use Principal Component Analysis (PCA) to reduce the number of dimensions to one, and take everything on the right tail at ninety five percent or more. I will use a second PCA model with two components to visualize the results. To be complete, I will also include a t-Distributed Stochastic Neighbor Embedding (t-SNE) model with two components to see if it agrees with the PCA visualization. After this selection and inspection, I will use the Isolation Forest algorithm to discover the outliers using the relevant features discovered during EDA. I will choose an appropriate contamination parameter to curate a dataset of under one thousand users. This will be saved to excel for further analysis by the client.

## A.5 Benefits and Support of Decision-Making Process

The benefits of this decision-making process will bring knowledge about which users to spend Steam’s research and marketing efforts first. Using statistics and machine learning techniques together will yield a high probability that the user list generated will be of have the greatest value to focus on first. The consequences of not doing it in a methodical manner could mean wasted time, effort, and money and opportunities could be missed if guessing starts to occur. The process laid out, can be reapted simply by removing the current list from the sample and repeating the steps to again get the next list to focus on.

# B. Data Analytics Project Plan

## B.1 Goals, Objectives, and Deliverables

* Goal 1: The goal is to select a set of users with the most influence among the others.
  + Objective 1.1: Use statistics and machine learning techniques to identify outlier users that are probably most influential on the platform.
    - Deliverable 1.3.1: The deliverable of this effort will be the final Excel file of the outliers of users from the sample delivered to the client along with any code used to produce said file.

## B.2 Scope of Project

### B.2.A Included in Project Scope

The scope of the project will be limited to de-idenfied user data with minimal features. The only hard deliverable here will be the final list of users in Excel format. No more than one thousand. If the client is not satisfied, we will review the issues and iterate again.

### B.2.B Not included in Project Scope

Bringing in identifiable data and doing further analysis will be the responsibility of the client. This data is not provided and thus would be impossible to provide.

### B.3 Standard Methodology

This team will use the Rapid Application Development process. We have well-defined objectives and this is time sensitive. Also the user will likely have feedback and will let us know when they are satisfied. During the analysis and curation part of this project, we will define the requirements, go through a user design session, then begin constructing the solution to deliver the product. If the user is satisfied, we will end the engagement. If not, we will go back to a user design session and construction phase until the client is satisfied.

## B.4 Timeline and Milestones

**Rubric B4:** The provided timeline includes *all* project milestones, including the duration and start and end dates for *each* milestone. *Each* milestone is logically organized and logically sequenced by date, and *each* milestone is realistic and relevant to the project.

Your timeline should align with the deliverables described in section B.1. While a table is not specifically required, it provides a succinct presentation satisfying the requirements of B.4., and it is what evaluators have come to expect.

Example:

|  |  |  |  |
| --- | --- | --- | --- |
| Milestone or deliverable | Duration  (hours or days) | Projected start date | Anticipated end date |
| Deliverable 1 | 1 day | *Some future date* | *Some future date* |
| Milestone 3 | 36 hours | *Some future date* | *Some future date* |

## B.5 Resources and Costs

**Rubric B5:** The provided list includes *all* necessary resources and *all* associated costs to implement the project. *All* listed resources and costs are realistic and relevant to the proposed project.

Example:

1. Hardware item: $1000
2. Software item 1: No cost
3. Software item 2: No cost
4. 10 work hours: $500 (10 hours at $50 per hour)
5. Item 3: $100

Etc. Include the following: **hardware, software,** and **work hours.** Be realistic as possible when estimating costs. However, this is not a business project and values are not rigorously assessed. The minimum number of listed items is two.

## B.6 Criteria for Success

**Rubric B6:** The submission describes specific criteria for evaluating the success of project execution, and the criteria are measurable and relevant to the proposed project.

Provide a specific metric or criteria for determining success. The criteria or metric should provide specific objective means of assessing success. You should base these criteria on the completion of the analysis methods -not the results. For example, it is acceptable that a test fails to find results statistically significant provided the conclusion and methods are appropriate.

# C. Design of Data Analytics Solution

In this part, you will discuss the design details of your Capstone data analytics solution.

## C.1 Hypothesis

**Rubric C1:** The hypothesis is clearly stated and well aligned with the research question or organizational need identified in part A1.

Provide at least one testable hypothesis supporting the research question or organizational need given in section A1. The minimum required hypothesis is one.

## C.2 and C.2.A Analytical Method

**Rubric C2:** The identified analytical method aligns with the proposed solution.

Identify the statistical test or model which will support each hypothesis given in section C.1 and summarize how the method will be performed or developed. The minimum required method is one per hypothesis.

**Rubric C2A:** The submission justifies the chosen analytical method and includes specific, logical reasons why the chosen analytical method is appropriate for addressing the research question or organizational need identified in part A.

For each provided statistical test or model, describe why it is an appropriate choice for supporting the hypothesis (and thus the research question or organizational need from A1).

## C.3 Tools and Environments

**Rubric C3:** The description includes*all* tools and environments used to produce the data analytics solution, and *all* of them are relevant to the project. If third-party code was part of the tools and environment, it has been included.

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## C.4 and C.4.A Methods and Metrics to Evaluate Statistical Significance

**Rubric C4:** The submission thoroughly and accurately describes the methods and metrics. The description includes specific details on how the methods and metrics will evaluate statistical significance.

For *each* statistical test, provide the following information:

* A null hypothesis (the opposite of your hypothesis).
* The planned statistical test .
* The metric(s) generated from that test (e.g., a t-stat) from which probability is derived.
* The *alpha* value (denoted α; usually 1% or 5%) that will be used to determine statistical significance (e.g., if α = .05 and *p­*-value = .025 then the null hypothesis will be rejected and there is sufficient evidence to support the hypothesis).

For *each* model, provide the following information:

* The type of model, e.g., supervised regression, supervised classification, etc.
* The algorithm(s) to be used to develop the model.
* The metric(s) to be used to assess performance.
* The benchmark to which the above metric(s) will be compared to determine success of the model(s), e.g., “If the correlation coefficient is ≥ .6, the model will be considered successful…”

**Rubric C4A:** The submission justifies the chosen methods and metrics, including specific, logical, and well-supported reasons for why the chosen methods and metrics are appropriate for the data analytics solution.

For *each* statistical test or model, describe why it is an appropriate choice. This may repeat parts of section C.2.A.

## C.5 Practical Significance

**Rubric C5:** The submission describes how the practical significance of the data analytics solution will be assessed, including specific criteria regarding whether the solution has provided the expected benefits and supported a decision-making process in the context of the chosen research question or organizational need.

Practical significance refers to how meaningful your findings are in practical application. Results are practically significant when the difference is large enough to be meaningful in real life. This is subjective. But at minimum discuss some criteria to judge the practical significance and how this will be used to support the research question or organizational need from A1. Consider including an example of how the client might apply your work discussed in sections C1 through C.4.A.

## C.6 Visual Communication

**Rubric C6:** The submission describes key details about *each* tool and graphical representation that will visually communicate the findings of the data analytics solution, and the described tools and graphical representations will effectively communicate the expected findings.

Task 3, the Project Report, must include graphic visualizations (at least two) for visually communicating elements of your project (see Task 3: G2). Describe a plan to include at least two visualizations of the data, statistical test(s), or model(s). Specifically, name the types of graphs, what they will visualize, and the tools you’ll use to generate the images.

# D. Description of Dataset

## D.1 Source of Data

**Rubric D1:** *Each* source of the data is correctly identified.

Identify each data source. The minimum number of data sources is one.

## D.2 Appropriateness of Dataset

**Rubric D2:** The discussion provides reasons why the dataset is appropriate for the stated goals of the project.

Describe why each data source provided in section D.1 is appropriate for supporting the research question or organizational need from section A.1.

## D.3 Data Collection Methods

**Rubric D3:** The described data collection methods are thorough.

Describe how each data source listed in section D.1 was collected, e.g., “the data was collected by downloading the .csv file from www.kaggle.com/data\_source\_link.html.”

## D.4 Observations on Quality and Completeness of Data

**Rubric D4:** The summary includes logical and accurate observations on *both* the quality and completeness of the data.

Describe both the quality and completeness of the data and any accommodation needed. Often, data is already clean and complete, but it is still necessary to comment on both.

## D.5 and D.5.A Data Governance, Privacy, Security, Ethical, Legal, and Regulatory Compliances

**Rubric D5:** The discussion accurately addresses the data governance, privacy and security, ethical, legal, and regulatory compliance considerations, and *all* of these relate to the dataset and the proposed project.

Specifically, address how *each* of the following relates to your data and project:

* Data governance
* Privacy
* Security
* Ethical, legal, and regulatory compliance considerations

**Rubric D5A:** *Each* described precaution includes specific details about working with and communicating about the data, and there is a precaution described for *each* of the considerations discussed in part D5. *Each* precaution reasonably manages the risk associated with the considerations discussed in part D5.

Describe any necessary precautions. In cases where an item is not relevant, you must explain why. You only need to discuss measures for handling human data if you collected that data.

References

Anton Kozyriev. (2023). Game Recommendations on Steam [Data set]. Kaggle. <https://doi.org/10.34740/KAGGLE/DS/2871694>Scribbr. (2022, December 21).

Glackin, C. E. W., & Adivar, M. (2023). Using the power of machine learning in sales research: process and potential. Journal of Personal Selling & Sales Management, 43(3), 178–194.

Elbaghazaoui, B. E., Amnai, M., & Fakhri, Y. (2022). Data Profiling and Machine Learning to Identify Influencers from Social Media Platforms. Journal of ICT Standardization, 10(2), 201–218.

# Appendix A

# Title of Appendix

Put any supporting material in these appendices. Add additional or delete superfluous appendices as needed.

# Appendix B

# Title of Appendix

Put any supporting material in these appendices. Add additional or delete superfluous appendices as needed.

# Appendix C

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# Appendix D

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