ASHESI

Masters in Intelligent Computing Systems
Machine Learning and Data Science (September 2025)

Problem Situation 3 (PROSIT 3): Predicting and Supporting Student Success at Ashesi

Now that you've unearthed some meaningful structure in the data, the leadership team at Ashesi University would like you to take it one step further and focus on possible predictions.

Leadership has noticed that each year, a group of students struggle academically, often silently, until it becomes too late for meaningful intervention.

"We don't want to wait until it's too late before we see who's at risk," the Provost says.
"If we could anticipate academic challenges early enough, our advisors could reach out and help, but we must do this responsibly."

Leadership also highlighted the following policies as stated in the Ashesi Student Handbook 2022/2023, which can be retrieved from the university website:

- **ACADEMIC STANDING:** At the end of each regular semester, the academic standing of all students is determined by the Academic Registry in conjunction with the Provost. Probation, and Dismissal are determined according to the following guidelines. A Dean's List of students who have obtained a semester GPA of 3.5 or above is published each academic year.

- **PROBATION:** Students will be placed on academic probation if, at the end of any regular semester, their cumulative grade-point average GPA is less than 2.0 (C average).

- **DISMISSAL:** Students will be subject to dismissal from Ashesi University if (1) they fail to make normal degree progress, or (2) after two consecutive regular semesters on academic probation, they have not achieved either a semester or cumulative GPA of 2.0.

  * Exiting probation(i.e., achieving a cumulative GPA of 2.0 or) is required for graduation.

Your team has now been tasked with exploring whether predictive modeling could help identify students who might need additional academic support before the end of the semester, among other tasks.

The leadership would like to remind your consultancy that in a “student success” context, academic probation is just one possible label or outcome variable. You can model other academic related outcomes that have practical relevance and ethical nuance. Some examples of other interesting labels include end-of-semester GPA, course failure, cumulative GPA drop, graduation within expected time, and improvement in GPA. Some interesting predictors include prior GPA, course load, and grades in pre-requisite courses. Neither of these lists of examples is meant to be exhaustive - the leadership team is really looking forward to seeing your creativity come through!

Your Deliverables

- Detailed notebook with model implementation, optimization, and evaluation
- Technical Report

Learning Outcomes

- Translate an open-ended business or research question from a stakeholder into a testable statistical/ML problem statement.
- Understand, apply, and interpret classical supervised-learning methods, including hyper-parameter tuning and cross-validation.
- Appreciate the need for regularisation techniques, apply common regularisation techniques, and quantify their effect on bias–variance tradeoffs.
- Identify ethical issues in applying supervised learning.
- Communicate results to technical and non-technical stakeholders, emphasizing assumptions, limitations, uncertainty, and next-step recommendations.

Resources

Textbooks

Anand, G., & Sharma, R. (2022). *Data science fundamentals and practical approaches.* BPB Publications.

Géron, A. (2022). *Hands-on machine learning with Scikit-Learn, Keras, and TensorFlow* (3rd ed.). O’Reilly Media.

Gupta, P. (2022). *Practical data science with Jupyter.* BPB Publications.

James, G., Witten, D., Hastie, T., Tibshirani, R., & Taylor, J. (2023). *An introduction to statistical learning with applications in Python*. Springer.

Ozdemir, S. (2024). *Principles of data science: A beginner's guide to essential math and coding skills for data fluency and machine learning* (3rd ed.). Packt Publishing Ltd.

Jupyter Notebook

Machine Learning with Python: https://github.com/mariahsonja/machine-learning

Articles

Supervised Learning: A Comprehensive Gude:
https://medium.com/%40MakeComputerScienceGreatAgain/supervised-learning-a-comprehensive-guide-355e12f8e73f

A Guide to Supervised Learning:
https://medium.com/%40ngneha090/a-guide-to-supervised-learning-f2ddf1018ee0

The Complete Supervised Learning Handbook: ML Algorithms:
https://medium.com/%40amitvsolutions/supervised-machine-learning-decoded-from-forecasts-to-decisions-4e57c6b1a0c4