



**Student Failure Prediction in Higher Education – A Case
Study at Mercu Buana University (Indonesia)**



THESIS

Gabor Nemeth

NIM: 55117110187

**UNIVERSITAS
MERCU BUANA**

PROGRAM MAGISTER MANAJEMEN

PROGRAM PASCASARJANA

UNIVERSITAS MERCU BUANA

TAHUN 2020



**Student Failure Prediction in Higher Education – A Case
Study at Mercu Buana University (Indonesia)**

THESIS

Submitted in Partial Fulfilment of the Requirements for the
Master Degree in Management

Gabor Nemeth

NIM: 55117110187

MERCU BUANA

PROGRAM MAGISTER MANAJEMEN

PROGRAM PASCASARJANA

UNIVERSITAS MERCU BUANA

TAHUN 2020

ABSTRACT

Our study examined the issue of operational inefficiency in higher education caused by unanticipated student failure. We inspected the data of students between the intakes of 2010-2014 at the Faculty of Engineering of Mercu Buana University (Indonesia) and tried to answer the question whether the data already available at the institution should be considered as a potential means of improvement of the said inefficiency. Four predictive models were constructed to emulate the end-of-term assessments in the first half of their 8 semester study periods. The models were set up to categorize the students into 3 levels of predicted performance as a recommendation for the students' academic advisors. The logistic regression models used prediction variables of: gender, study program, study mode, intake, GPA, attendance, cumulative credits and tuition fee payment timeliness. The models achieved prediction accuracies of 83%, 90%, 93% and 96% in the 1st, 2nd, 3rd and 4th semesters respectively. The most important predictor was found to be the GPA of the previous semester however all of the used variables contributed to improving prediction accuracy. The data available at the institution was found to be sufficient for providing useful prediction of student failure. Linking the predictive models to student assessment can lead to improvements in operation efficiency.

Keywords: Predictive analytics, Higher education, Student failure, Graduation delay, Logistic Regression



ABSTRAK

Penelitian ini meneliti masalah inefisiensi operasional dalam pendidikan tinggi yang disebabkan oleh kegagalan mahasiswa yang tidak diantisipasi. Kami memeriksa data angkatan mahasiswa 2010-2014 di Fakultas Teknik Universitas Mercu Buana (Indonesia) dan mencoba menjawab pertanyaan apakah data yang sudah tersedia di lembaga tersebut harus dipertimbangkan sebagai sarana potensial untuk memperbaiki ketidakefisienan tersebut. Empat model yang dihasilkan memprediksi penilaian akhir semester mahasiswa antara semester 1-4. Model penelitian kami mengkategorikan mahasiswa dalam 3 tingkat kinerja yang diprediksi sebagai rekomendasi tindakan untuk dosen pembimbing akademik para mahasiswa. Model regresi logistik ini menggunakan variabel prediksi sebagai berikut: jenis kelamin, program studi, mode studi, angkatan, IPK, kehadiran, kredit kumulatif dan ketepatan waktu pembayaran biaya kuliah. Model berhasil mencapai akurasi prediksi 83%, 90%, 93% dan 96% pada semester 1, 2, 3 dan 4. Prediktor yang paling penting adalah IPK semester sebelumnya, namun semua variabel yang digunakan berkontribusi untuk meningkatkan akurasi prediksi. Data yang tersedia di institusi dinilai cukup untuk memberikan prediksi kegagalan mahasiswa yang berguna. Dengan menghubungkan model prediktif dengan sikap dosen pembimbing akademik institusi dapat memperoleh sebuah peningkatan efisiensi operasi.

Kata kunci: Predictive analytics, Pendidikan tinggi, Kegagalan mahasiswa, Keterlambatan kelulusan, regresi logistik



UNIVERSITAS
MERCU BUANA

LEMBAR PERNYATAAN

Saya yang bertanda tangan di bawah ini menyatakan dengan sebenar-benarnya bahwa semua pernyataan dalam tesis ini:

Judul : Student Failure Prediction in Higher Education – A Case Study at Mercu Buana University (Indonesia)
Bentuk Tesis : Penelitian / Kajian Masalah
Nama : Gabor Nemeth
NIM : 55117110187
Program : Magister Manajemen
Tanggal : 14 Juni 2020

Merupakan hasil studi pustaka, penelitian lapangan, dan karya saya sendiri dengan bimbingan Komisi Dosen Pembimbing yang ditetapkan dengan Surat Keputusan Program Studi Magister Manajemen Program Pascasarjana Universitas Mercu Buana.

Karya ilmiah ini belum pernah diajukan untuk memperoleh gelar kesarjanaan pada program sejenis di perguruan tinggi lain. Semua informasi, data, dan hasil pengolahannya yang digunakan, telah dinyatakan secara jelas sumbernya dan dapat diperiksa kebenarannya.

Marseille, 14 Juni 2020



(Gabor Nemeth)

PERNYATAAN *SIMILARITY CHECK*

Saya yang bertanda tangan di bawah ini menyatakan, bahwa karya ilmiah yang ditulis oleh

Nama : Gabor Nemeth
NIM : 55117110187
Program Studi : Magister Manajemen

dengan judul

“Student Failure Prediction in Higher Education –A Case Study at Mercu Buana University (Indonesia)”, telah dilakukan pengecekan *similarity* dengan sistem Turnitin pada tanggal 02/03/2020, didapatkan nilai persentase sebesar 14 %.

Jakarta, 02 Maret 2020

Administrator Turnitin

UNIVERSITAS
MERCU BUANA

Arie Pangudi, A.Md

PENGESAHAN THESIS

Judul : Student Failure Prediction in Higher Education –A Case Study at
Mercu Buana University (Indonesia)

Nama : Gabor Nemeth

NIM : 55117110187

Program Studi : Magister Manajemen

Tanggal : 23 Maret 2022

Mengesahkan
Pembimbing

Dr. Ahmad Hidayat Sutawijaya, M.Com

Direktur Pascasarjana

Ketua Program Studi

Magister Manajemen

Prof. Dr. -Ing. Mudrik Alaydrus

Dudi Permana, Ph.D

TABLE OF CONTENTS

<i>ABSTRACT</i>	i
ABSTRAK.....	ii
STATEMENT OF ORIGINALITY.....	iii
STATEMENT OF SIMILARITY CHECK.....	iv
VALIDATION THESIS.....	v
TABLE OF CONTENTS.....	vi
LIST OF TABLES.....	viii
LIST OF FIGURES.....	ix

CH.1.

INTRODUCTION.....1

1.1	Background of the research.....	1
1.2.	Research problem and limitations.....	10
1.2.1.	Research problem identification.....	10
1.2.2.	Limitations of the research.....	10
1.2.3.	Research problem description.....	11
1.3.	Objectives and benefits of research.....	12
1.3.1.	Research objectives.....	12
1.3.2.	Benefits of the research.....	13

2. LITERATURE REVIEW, THEORETICAL FRAMEWORK, HYPOTHESES.....15

2.1.	Theoretical Background.....	15
2.2.	Literature Review of Relevant Research.....	16
2.3.	Theoretical Framework.....	20
2.4.	Hypothesis.....	27

3. RESEARCH METHOD.....28

3.1.	Research Type.....	28
3.2.	Operational Definition of Variables.....	28
3.3.	Study Population and Sampling.....	31
3.4.	Data Collection Methods.....	32
3.5.	Data Processing Methods.....	33
3.6.	Analysis Methods.....	34
3.6.1.	Testing the Assumptions of Linear Regression.....	35
3.6.2.	Logistic Regression Analysis.....	36
3.6.3.	Log-likelihood and deviance statistics.....	37
3.6.4.	Evaluating the Overall Model Utility.....	38
3.6.5.	Assessing the contribution of predictors.....	38
3.6.6.	Odds ratio.....	39

4. RESEARCH FINDINGS AND DISCUSSION.....40

4.1.1.	Description of the Company.....	40
4.1.2.	Scope and Field of Business.....	41
4.1.3.	Business Challenges.....	41

4.2.	Research Findings	42
4.3.	Discussion	47
5.	CONCLUSION AND RECOMMENDATION	53
5.1.	Conclusion.....	53
5.2.	Recommendation.....	53
	BIBLIOGRAPHY	57
	APPENDICES	61
	Appendix No. 1. Multinomial logistic regression analysis (Semester 1).....	61
	Appendix No 2. Multinomial logistic regression analysis (Semester 2).....	66
	Appendix No 3. Multinomial logistic regression analysis (Semester 3).....	70
	Appendix No 4. Multinomial logistic regression analysis (Semester 4).....	81
	Appendix No. 5. Linearity testing of the logit	87
	Appendix No. 6. Multicollinearity tests	89
	Appendix No. 7. Research Data.....	111
AUTHOR'S CV		123



List of Tables

Table 1: Study program performance report template for national accreditation	5
Table 2: Recommended academic advisor action classification	25
Table 3: Description of variables to be used in the research	29
Table 4: Study population.....	31
Table 5: Margin of error per model	32
Table 6: Goodness of fit of the final model for 1st semester.....	43
Table 7: Goodness of fit of the final model for 2nd semester	43
Table 8: Goodness of fit of the final model for 3rd semester	43
Table 9: Goodness of fit of the final model for 4th semester	43
Table 10: Model fitting information (semester 1)	44
Table 11: Model fitting information (semester 2)	44
Table 12: Model fitting information (semester 3)	44
Table 13: Model fitting information (semester 4)	44
Table 14: Classification plot for the 1st semester model.....	45
Table 15: Classification plot for the 2nd semester model	46
Table 16: Classification plot for the 3rd semester model	46
Table 17: Classification plot for the 4th semester model	46
Table 18: Matrix of research variables used for the final predictive models	50
Table 19: Evaluation of the research variables in the final models	51



List of Figures

Figure 1: Percentage of Companies that have integrated their Datasets (Capgemini 2016)	2
Figure 2: Student fail ratio (intakes 2010-2014).....	4
Figure 3: Semester grade averages distribution (2010 - 2014 intakes)	6
Figure 4: Average Student graduation semester per intake	7
Figure 5: Ratio of delayed students	8
Figure 6: Average cumulative academic credits by the end of the 8th active semester	9
Figure 7: Explanation how the quality and frequency of teacher-student interaction improves learning outcomes. (Hagenauer & Volet, 2014).....	15
Figure 8: Differences between STEM Academy sophomore GPAs before and after the student explorer implementation (Krumm, Waddington, Teasley, & Lonn, 2014)	19
Figure 9: Dropout rates in tertiary education OECD (2008)	20
Figure 10: Theoretical diagram depicting the central importance of data analysis in operational excellence	22
Figure 11: Determining the student categories for the 1st semester assessment	23
Figure 12: Determining the student categories for the 2nd semester assessment.....	24
Figure 13: Determining student categories for the 3rd semester assessment	24
Figure 14: Determining student categories for the 4th semester assessment	25
Figure 15: Framework of Research Variables	26
Figure 16. Research variable selection flowchart.....	35
Figure 17. Final Research Framework.....	47

