

Peran AI Dalam Inovasi Digital Marketing Untuk Peramalan Penerimaan Mahasiswa Baru

Oleh:

Muhammad Farid Fathul Huda Pradhana

Rita Ambarwati Sukmono

Progam Studi Magister Manajemen

Universitas Muhammadiyah Sidoarjo

Juli 2024

Pendahuluan

Meskipun terjadi kenaikan atau penurunan dalam Peramalan jumlah mahasiswa baru, namun tren setelah dan sebelum periode covid akan memiliki tren yang berbeda.

Pertanyaan Penelitian (Rumusan Masalah)

Meskipun AI sudah berkembang sangat pesat, apakah AI mampu meramalkan jumlah mahasiswa baru dengan tingkat akurasi yang baik.

Metode

- ❑ Penelitian studi kasus ini dilaksanakan dengan metode kuantitatif dan kualitatif secara berurutan, dan menggunakan perhitungan ANN dalam melakukan peramalan.
- ❑ Penelitian ini melakukan peramalan penerimaan mahasiswa baru dan menganalisis apakah ada peran digital marketing dalam penerimaan mahasiswa baru.
- ❑ Pelaksanaan yang dilakukan pada penelitian, meliputi:
 - Observasi, observasi bertujuan untuk memperoleh data penerimaan mahasiswa baru.
 - pengolahan data, data yang sudah didapatkan akan diolah terlebih dahulu sebelum dilakukan pembangunan model ANN, pengolahan data meliputi:
 - a) Pembersihan data
 - b) Integrasi data
 - c) Transformasi data
 - Pembangunan model ANN, pada tahap ini dari data yang telah diolah, akan dilakukan peramalan untuk mendapatkan jumlah penerimaan mahasiswa baru pada periode berikutnya.
 - Evaluasi hasil prediksi, pada tahap ini hasil peramalan dievaluasi, untuk melihat seberapa besar tingkat akurasi.

Hasil

Aktual	Prediksi	Error	error	Error square	% Error	MAPE Sebelum	Mape Sesudah
154	155	-1	1	1	0.649	1.192	1.134
193	189	4	4	16	2.073		
162	160	2	2	4	1.235	Akurasi sebelum	Akurasi sesudah
192	189	3	3	9	1.563	98.808	98.866
226	225	1	1	1	0.442		
219	208	11	11	121	5.023		
192	192	0	0	0	0.000		
155	155	0	0	0	0.000		
184	184	0	0	0	0.000		
154	155	-1	1	1	0.649		

Nilai MAPE	Interpretasi
< 10%	Peramalan sangat akurat
10% - 20%	Peramalan baik
20% - 50%	Peramalan masih dapat diterima
> 50%	Peramalan tidak akurat

Hasil akurasi peramalan menggunakan ANN adalah sebesar 98,808% sebelum covid, dan 98,866% setelah covid. Angka akurasi tersebut menunjukkan bahwa hasil peramalannya sangat akurat.

Pembahasan

Penelitian sebelumnya menunjukkan pemasaran digital meningkatkan pengalaman pelanggan. Wawancara dengan staf marketing Institut 'XYZ' mengungkapkan bahwa strategi digital marketing menggunakan Google dan Facebook pada 2016-2023 signifikan mempengaruhi penerimaan mahasiswa baru. Grafik pada bagian hasil dan pembahasan mencatat fluktuasi penerimaan dari 2014/2015 hingga 2023/2024. Strategi digital marketing yang dimulai pada 2016/2017 menyebabkan penurunan -19.136% tetapi naik 15.625% pada 2017/2018. Faktor-faktor lain termasuk kualitas konten, kondisi ekonomi, kebijakan pemerintah, inovasi, dampak pandemi, biaya pemasaran, kompleksitas strategi, dan luas target juga mempengaruhi keberhasilan. Keberhasilan tidak hanya bergantung pada platform tetapi juga eksekusi dan penyesuaian strategi.

Periode	Jumlah DU	Selisih (%)	Periode	Jumlah DU	Selisih (%)
2014/2015	154	0.000	2019/2020	219	-3.196
2015/2016	193	20.207	2020/2021	192	-14.063
2016/2017	162	-19.136	2021/2022	155	-23.871
2017/2018	192	15.625	2022/2023	184	15.761
2018/2019	226	15.044	2023/2024	154	-19.481

Temuan Penting Penelitian

Dari penelitian yang telah dilakukan, menunjukkan model ANN dapat meramalkan penerimaan mahasiswa baru dengan MAPE 1,192% sebelum Covid dan 1,134% setelah Covid, serta akurasi 98,808% sebelum Covid dan 98,866% setelah Covid. Strategi pemasaran melalui Google dan Facebook digunakan konsisten dari 2016/2017 hingga 2023/2024, tetapi fluktuasi penerimaan lebih dipengaruhi oleh pandemi Covid. AI dapat membantu menyusun strategi pemasaran dengan memahami target pasar, meski platform tetap sama.

Manfaat Penelitian

Manfaat dari penelitian ini adalah bisa merekomendasikan ke divisi marketing untuk menggunakan metode ANN dalam melakukan peramalan penerimaan mahasiswa baru. Sedangkan dari divisi marketing, untuk melakukan perhitungan peramalan mahasiswa baru masih menggunakan perhitungan manual.

Referensi

- [1] C. Zhang and Y. Lu, "Study on artificial intelligence: The state of the art and prospects," *J. Ind. Inf. Integr.*, vol. 23, p. 100224, 2021, doi: 10.1016/j.jii.2021.100224.
- [2] I. Ahmed, G. Jeon, and F. Piccialli, "From Artificial Intelligence to Explainable Artificial Intelligence in Industry 4.0: A Survey on What, How, and Where," *IEEE Trans. Ind. Informatics*, vol. 18, no. 8, pp. 5031–5042, 2022, doi: 10.1109/TII.2022.3146552.
- [3] S. Akgun and C. Greenhow, "Artificial Intelligence (AI) in Education: Addressing Societal and Ethical Challenges in K-12 Settings," *AI Ethics*, vol. 2, pp. 431–440, 2022, doi: 10.1007/s43681-021-00096-7.
- [4] A. Nguyen, H. N. Ngo, Y. Hong, B. Dang, and B. P. T. Nguyen, "Ethical principles for artificial intelligence in education," *Educ. Inf. Technol.*, vol. 28, no. 4, pp. 4221–4241, 2023, doi: 10.1007/s10639-022-11316-w.
- [5] H. Khosravi et al., "Explainable Artificial Intelligence in education," *Comput. Educ. Artif. Intell.*, vol. 3, no. March 2022, doi: 10.1016/j.caeai.2022.100074.
- [6] Aditya Nirwana, Sudarmiatin, and Melany, "Implementation of Artificial Intelligence in Digital Marketing Development: a Thematic Review and Practical Exploration," *J. Manaj. Bisnis, Akunt. dan Keuang.*, vol. 2, no. 1, pp. 85–112, 2023, doi: 10.55927/jambak.v2i1.4034.
- [7] C. Guan, J. Mou, and Z. Jiang, "Artificial intelligence innovation in education: A twenty-year data-driven historical analysis," *Int. J. Innov. Stud.*, vol. 4, pp. 134–147, 2020, doi: 10.1016/j.ijis.2020.09.001.
- [8] A. D. Suwandita, V. Pijajari, A. Eka Diani Prasetyowati, and M. Isa Anshori, "Analisis Data Human Resources Untuk Pengambilan Keputusan: Penggunaan Analisis Data Dan Artificial Intelligence (AI) Dalam Meramalkan Tren Sumber Daya Manusia, Pengelolaan Talenta, Dan Rentensi Karyawan," *Manaj. Kreat. J.*, vol. 1, no. 4, pp. 97–111, 2023, [Online]. Available: <https://doi.org/10.55606/makreju.v1i4.2161>
- [9] G. J. Hwang, H. Xie, B. W. Wah, and D. Gašević, "Vision, challenges, roles and research issues of Artificial Intelligence in Education," *Comput. Educ. Artif. Intell.*, vol. 1, 2020, doi: 10.1016/j.caeai.2020.100001.
- [10] G. Vallone and L. Longo, "Notions of explainability and evaluation approaches for explainable artificial intelligence," *Inf. Fusion*, vol. 76, pp. 89–106, 2021, doi: 10.1016/j.inffus.2021.05.009.
- [11] S.N.Nadeem, "EFFECTIVE DIGITAL MARKETING STRATEGY IN EDUCATION SECTOR," *Int. J. Multidiscip. Educ. Res.*, vol. 11, no. 11, pp. 146–152, 2022.
- [12] F. Khan, K. S.-J. of I. S. & Operations, and U. 2013, "Measuring the Perception and Effectiveness of Digital Marketing amongst the Marketing Professionals, an Exploratory Study in Odisha," *Indian J. Nat. Sci.*, vol. 13, no. 72, 2022, [Online]. Available: https://www.researchgate.net/profile/Mircea-Cirnu/publication/260424967_Circular_convolution_and_discrete_Fourier_transform/links/0deec533f63683a13600000/Circular-convolution-and-discrete-Fourier-transform.pdf#page=17
- [13] P. Pandiangan and I. A. O. Martini, "Digital Marketing Strategy of Property Agents in The New Normal Era," *JMBI UNSRAT (Jurnal Ilm. Manaj. Bisnis dan Inov. Univ. Sam Ratulangi)*, vol. 7, no. 3, pp. 502–511, 2021, doi: 10.35794/jmbi.v7i3.31251.
- [14] M. K. Peter and M. Dalla Vecchia, *The Digital Marketing Toolkit: A Literature Review for the Identification of Digital Marketing Channels and Platforms*, vol. 294, no. March. Springer International Publishing, 2021. doi: 10.1007/978-3-030-48332-6_17.
- [15] I. Putu, T. Noviana, and G. S. Darma, "Exploring Digital Marketing Strategies during the New Normal Era in Enhancing the Use of Digital Payment," *J. Mantik*, vol. 4, no. 3, pp. 2257–2262, 2020, [Online]. Available: <https://iocscience.org/ejournal/index.php/mantik%0Ahttps://ejournal.iocscience.org/index.php/mantik/article/view/1084>
- [16] J. R. Saura, "Using Data Sciences in Digital Marketing: Framework, methods, and performance metrics," *J. Innov. Knowl.*, vol. 6, pp. 92–102, 2021, doi: 10.1016/j.jik.2020.08.001.

Referensi (2)

- [17] A. Masrianto, H. Hartoyo, Hubeis, A. V. S., and N. Hasanah, "Digital Marketing Utilization Index for Evaluating and Improving Company Digital Marketing Capability," *J. Open Innov. Technol. Mark. Complex.*, vol. 8, 2022, doi: 10.3390/joitmc8030153.
- [18] Y. Hartanto, M. A. Firmansyah, and L. Adhrianti, "Implementation Digital Marketing Pesona 88 Curup in to Build Image for the Decision of Visit Tourist Attraction," *Proc. 4th Soc. Humanit. Res. Symp. (SoRes 2021)*, vol. 658, no. SoRes 2021, pp. 589–594, 2022, doi: 10.2991/assehr.k.220407.121.
- [19] A. M. Harbi and M. Maqsood Ali, "Adoption of Digital Marketing in Educational Institutions: A Critical Literature Review," *IJCSNS Int. J. Comput. Sci. Netw. Secur.*, vol. 22, pp. 463–472, 2022, doi: 10.22937/IJCSNS.2022.22.4.55.
- [20] A. Kaya, G. Kaya, and F. Çebi, "Forecasting automobile sales in Turkey with artificial neural networks," *Int. J. Bus. Anal.*, vol. 6, no. 4, pp. 50–60, 2019, doi: 10.4018/IJBAN.2019100104.
- [21] N. Effendy et al., "Artificial neural network prediction on ultrasonic performance of bismuth-tellurite glass compositions," *J. Mater. Res. Technol.*, vol. 9, no. 6, pp. 14082–14092, 2020, doi: 10.1016/j.jmrt.2020.09.107.
- [22] M. İlbeği, M. Ghomeishi, and A. Dehghanbanadaki, "Prediction and optimization of energy consumption in an office building using artificial neural network and a genetic algorithm," *Sustain. Cities Soc.* (2020), vol. 1, 2020, doi: 10.1016/j.scs.2020.102325.
- [23] S. K. Tamang, P. D. Singh, and B. Datta, "Forecasting of Covid-19 cases based on prediction using artificial neural network curve fitting technique," *Glob. J. Environ. Sci. Manag.*, vol. 6, pp. 53–64, 2020, doi: 10.22034/GJESM.2019.06.SI.06.
- [24] G. M. Mulalem and Y. A. Liou, "Application of artificial neural networks in forecasting a standardized precipitation evapotranspiration index for the upper Blue Nile basin," *Water (Switzerland)*, vol. 12, no. 3, 2020, doi: 10.3390/w12030643.
- [25] İ. Güven and F. Şimşir, "Demand forecasting with color parameter in retail apparel industry using artificial neural networks (ANN) and support vector machines (SVM) methods," *Comput. Ind. Eng.*, vol. 147, no. July, 2020, doi: 10.1016/j.cie.2020.106678.
- [26] H. Doresdiana, S. Madelan, and A. B. Saluy, "Spare Parts Demand Forecasting During Covid 19 pandemic," *Dinasti Int. J. Econ. Financ. Account.*, vol. 2, no. 2, pp. 215–226, 2021, doi: 10.38035/dijefa.v2i2.852.
- [27] G. Alkhayat and R. Mehmood, "A review and taxonomy of wind and solar energy forecasting methods based on deep learning," *Energy AI*, vol. 4, 2021, doi: 10.1016/j.egyai.2021.100060.
- [28] M. Karl, F. Kock, B. W. Ritchie, and J. Gauss, "Affective forecasting and travel decision-making: An investigation in times of a pandemic," *Ann. Tour. Res.*, vol. 87, 2021, doi: 10.1016/j.annals.2021.103139.
- [29] L. Akyuz and H. Bilgil, "Application of Standard and Exponential Grey Forecasting Models on Turkey's Education Expenditures," *New Trends Math. Sci.*, vol. 10, no. 4, pp. 9–19, 2022, doi: 10.20852/ntmsci.2022.484.
- [30] S. Semerikov, H. Kucherova, V. Los, and D. Ocheretin, "Neural network analytics and forecasting the country's business climate in conditions of the coronavirus disease (COVID-19)," *CEUR Workshop Proc.*, pp. 22–32, 2020.
- [31] A. Fauzan, D. G. Rahayu, A. Handayani, I. Tahyudin, D. I. S. Saputra, and P. Purwadi, "Sales Forecasting Analysis Using Trend Moment Method: A Study Case of a Fast Moving Consumer Goods Company in Indonesia," *J. Inf. Technol. Cyber Secur.*, vol. 1, no. 1, pp. 1–8, 2023, doi: 10.30996/jitcs.7572.
- [32] A. K. Sahai, N. Rath, V. Sood, and M. P. Singh, "ARIMA modelling & forecasting of COVID-19 in top five affected countries," *Diabetes Metab. Syndr. Clin. Res. Rev.*, vol. 14, pp. 1419–1427, 2020, doi: 10.1016/j.dsx.2020.07.042
- [33] M. N. Atchadé and Y. M. Sokadjo, "Overview and cross-validation of COVID-19 forecasting univariate models," *Alexandria Eng. J.*, vol. 61, no. 4, pp. 3021–3036, 2022, doi: 10.1016/j.aej.2021.08.028.
- [34] M. Awaludin and A. G. Gani, "Pemanfaatan kecerdasan buatan pada algoritma k-means klastering dan sentiment analysis terhadap strategi promosi yang sukses untuk penerimaan mahasiswa baru," pp. 1–6, 2023.

Referensi (3)

- [35] B. Biswas, M. K. Sanyal, and T. Mukherjee, "AI-Based Sales Forecasting Model for Digital Marketing," *Int. J. E-bus. Res.*, vol. 19, no. 1, pp. 1–14, 2023, doi: 10.4018/IJEER.317888.
- [36] D. Vukovic, Y. Vykylyuk, N. Matsiuk, and M. Maiti, "Neural network forecasting in prediction Sharpe ratio: Evidence from EU debt market," *Phys. A Stat. Mech. its Appl.*, vol. 542, 2020, doi: 10.1016/j.physa.2019.123331.
- [37] S. D. Latif, M. S. B. N. Azmi, A. N. Ahmed, C. M. Fai, and A. El-Shafie, "Application of Artificial Neural Network for Forecasting Nitrate Concentration as a Water Quality Parameter: A Case Study of Feitsui Reservoir, Taiwan," *Int. J. Des. Nat. Ecodynamics*, vol. 15, no. 5, pp. 647–652, 2020, doi: 10.18280/ijdne.150505.
- [38] M. de B. Braga et al., "Artificial neural networks for short-term forecasting of cases, deaths, and hospital beds occupancy in the COVID-19 pandemic at the Brazilian Amazon," *PLoS One*, vol. 16, no. 3, p. e0248161, 2021, doi: 10.1371/journal.pone.0248161.
- [39] P. R. Jena, R. Majhi, R. Kalli, S. Managi, and B. Majhi, "Impact of COVID-19 on GDP of major economies: Application of the artificial neural network forecaster," *Econ. Anal. Policy*, vol. 69, no. December, pp. 324–339, 2021, doi: 10.1016/j.eap.2020.12.013.
- [40] V. Wineka Nirmala, D. Harjadi, and R. Awaluddin, "Sales Forecasting by Using Exponential Smoothing Method and Trend Method to Optimize Product Sales in PT. Zamrud Bumi Indonesia During the Covid-19 Pandemic," *Int. J. Eng. Sci. Inf. Technol.*, vol. 1, no. 4, pp. 59–64, 2021, doi: 10.52088/ijesty.v1i4.169.
- [41] L. Gossling, J. J. P. Alix, T. Stavroulakis, and A. R. Hart, "Investigating and managing neonatal seizures in the UK: An explanatory sequential mixed methods approach," *BMC Pediatr.*, vol. 20, no. 1, pp. 1–15, 2020, doi: 10.1186/s12887-020-1918-4.
- [42] W. W. Thammasat, R. A. Stewart, K. Panuwatwanich, and J. Sunkpho, "Applying Mixed Methods Sequential Explanatory Design to Innovation Management," *10th Int. Conf. Eng. Proj. Prod. Manag.*, vol. 1, 2020, doi: 10.1007/978-981-15-1910-9.
- [43] D. M. Jenkins, "WHAT THE BEST LEADERSHIP EDUCATORS DO: A Sequential Explanatory Mixed Methods Study of Instructional and Assessment Strategy Use in Leadership Education," *J. Leadersh. Educ.*, vol. 19, no. 4, pp. 37–55, 2020, doi: 10.12806/v19/i4/r4.
- [44] M. S. Romadhon, R. T. Nugroho, Y. Saputra, and Paduloh, "Analisis Peramalan Penjualan Susu Formula Di Toko Susu Ty- Syar Dengan Menggunakan Metode Moving Average," *J. Salome Multidisipliner Keilmuan*, vol. 2, no. 1, pp. 117–125, 2024.
- [45] T. Yuniarti, I. Rusmar, T. Rachmi Hidayani, M. Mirandaulia, and P. Teknologi Kimia Industri, "Penggunaan Artificial Neural Network (ANN) Untuk Memodelkan Volume Ekspor Crude Palm Oil (CPO) Di Indonesia," *Ready Star 2*, vol. 2, no. 1, pp. 247–255, 2019.
- [46] M. Rianto and R. Yunis, "Analisis Runtun Waktu Untuk Memprediksi Jumlah Mahasiswa Baru Dengan Model Random Forest," *Paradig. - J. Komput. dan Inform.*, vol. 23, no. 1, Mar. 2021, doi: 10.31294/p.v23i1.9781.
- [47] Z. Bánhidi and I. Dobos, "Sensitivity of TOPSIS ranks to data normalization and objective weights on the example of digital development," *Cent. Eur. J. Oper. Res.*, vol. 32, pp. 29–44, 2024, doi: 10.1007/s10100-023-00876-y.
- [48] R. U. Bollapragada and A. Mankude, "Forecasting the price of crude oil," *DECISION*, vol. 48, no. 2, pp. 207–231, 2021, doi: 10.1007/s40622-021-00279-5.
- [49] M. Ssenyonga, "Imperatives for post COVID-19 recovery of Indonesia's education, labor, and SME sectors," *Cogent Econ. Financ.*, vol. 9, 2021, doi: 10.1080/23322039.2021.1911439.
- [50] C. Ziakis and M. Vlachopoulou, "Artificial Intelligence in Digital Marketing: Insights from a Comprehensive Review," *Inf.*, vol. 14, no. 664, pp. 1–30, 2023, doi: 10.3390/info14120664.

