

Scoring-Based Decision Model for Fair Scholarship Allocation



Sulaiman Yusuf Zakaria

47895810

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1. Process Description

Scholarship selection plays a crucial role in promoting fair and inclusive access to higher education (Gale & Parker, 2017). However, relying solely on a single indicator such as GPA may introduce bias and fail to capture the full potential of students (Kim & Choi, 2020). To address this limitation, the proposed model adopts a rule-based approach, applying a comprehensive scoring system that evaluates candidates across four main aspects: academic performance (GPA), financial need (family income), institutional reputation, and non-academic engagement.

Each aspect is assigned a specific weight, with the maximum score set at 100 points. The model is designed to ensure a structured, transparent, and fair selection process. For instance, applicants from prestigious institutions such as the Group of Eight universities in Australia, recognised for their academic excellence, are awarded additional points (Marginson & van der Wende, 2020). Similarly, candidates from lower-income families and those with strong non-academic involvement receive further consideration in the evaluation process (Kim & Choi, 2020).

The model classifies outcomes into four decision categories: Full Scholarship, Partial Scholarship, Manual Review, and Not Eligible. Applicants scoring between 60 and 69 are flagged for further evaluation by the scholarship committee. Ultimately, this system aims to ensure a transparent and inclusive scholarship selection process, particularly supporting students from underrepresented groups (Gale & Parker, 2017).

2. Data Structures

The decision model utilises structured student data as the primary input. Each entry consists of six attributes, which are used to calculate the applicant’s total eligibility score automatically. The data has been structured to align with the requirements of GoRules.

Each candidate must provide the following information:

Attribute	Data Type	Description
studentID	String	A unique identifier assigned to each student
fullName	String	The full name of the student
GPA	Float	The student’s Grade Point Average on a 0–4.0 scale
AnnualIncome	Integer	The total annual income of the student’s

		family, in AUD
SocioStatus	String	Level / prestige of student's previous university or qualification provider
ExtracurricularScore	Float (0-10)	A score evaluating the student's non-academic involvement (e.g. clubs, events)

All attributes are mandatory. If any field is missing or contains a null value, the system will automatically classify the applicant as not eligible, and no further scoring calculation will be performed.

3. Business Rule Statements

In this part, we'll talk about the business rules that are used in the scholarship eligibility plan. Every rule specifies how particular student characteristics are translated into points, which are then added together to generate a final score out of 100. These guidelines guarantee that the decision-making procedure stays impartial, consistent, and transparent.

1. GPA Scoring Rules (Maximum 40 points):

- Applicants receive GPA points only if their GPA is at least 3.0. The GPA score is calculated by multiplying the GPA value by 10.

2. Annual Income Scoring Rules (Maximum 25 points):

- Less than 20,000 AUD → 25 points
- Between 20,000 and 39,999 AUD → 20 points
- Between 40,000 and 59,999 AUD → 15 points
- Between 60,000 and 79,999 AUD → 10 points
- 80,000 AUD or higher → 5 points

3. Previous Institution Tier Scoring Rules (Maximum 15 points):

- Tier 1 institutions (e.g., Group of Eight universities) → 15 points
- Tier 2 institutions → 10 points
- Tier 3 or regional institutions → 5 points

4. Non-Academic Engagement Scoring Rules (Maximum 20 points):

- Scores between 9.0 and 10.0 → 20 points
- Scores between 7.0 and 8.9 → 18 points
- Scores between 5.0 and 6.9 → 15 points
- Scores between 3.0 and 4.9 → 10 points
- Scores below 3.0 → 5 points

5. Final Score Calculation:

All points from the four categories are summed to obtain the applicant's total eligibility score, with a maximum of 100 points.

6. Scholarship Outcome Categories:

- Total score ≥ 85 → Full Scholarship
- Total score between 70 and 84 → Partial Scholarship
- Total score between 60 and 69 → Manual Review
- Total score < 60 → Not Eligible

7. Manual Review Rule:

Applicants scoring between 60 and 69 are flagged for further manual evaluation by the scholarship committee to consider additional qualitative factors or hidden potential.

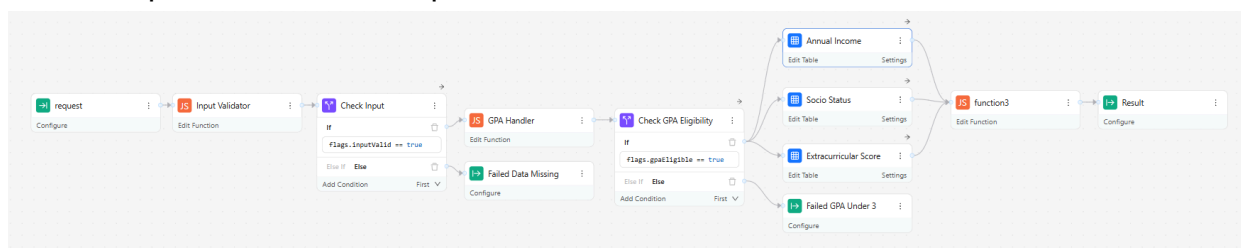
8. Data Completeness Rule:

If any critical attribute (GPA, Annual Income, SocioStatus, or ExtracurricularScore) is missing or null, the application is immediately classified as not eligible without further evaluation.

The use of a structured, rule-based scoring system such as this has been widely adopted in automated decision-making processes in higher education, ensuring transparency, fairness, and traceability (Langley et al., 2019).

3. Tests

To evaluate the decision model's reliability and ensure it operates according to the defined business rules, a series of structured tests was conducted. Before presenting the individual test cases, the following figure illustrates the overall flow of the scholarship decision model implemented in GoRules.



The model follows a structured sequence comprising input validation, GPA eligibility checking, scoring based on four weighted criteria, and final classification into scholarship outcomes. This structure ensures that both valid and invalid inputs are processed consistently and transparently.

The following test cases use JSON input formats to systematically assess whether the model behaves as expected under different applicant scenarios.

Test Case 1 – Not Eligible (Incomplete Data)

Input:

```
{"studentID": "S005", "fullName": "David Chandra", "GPA": 3.6,  
  "AnnualIncome": null, "SocioStatus": "Tier 2", "ExtracurricularScore": 7.0}
```

Expected Output: Automatically classified as Not Eligible due to missing critical attribute (AnnualIncome).

Test Case 2 – Not Eligible (GPA Below 3.0)

Input:

```
{"studentID": "S004", "fullName": "Kirana Dewi", "GPA": 2.7,  
  "AnnualIncome": 25000, "SocioStatus": "Tier 1", "ExtracurricularScore": 9.0}
```

Expected Output: Automatically classified as Not Eligible due to GPA below 3.0.

Test Case 3 – Partial Scholarship

Input:

```
{"studentID": "S002", "fullName": "Melati Nurfadhilah", "GPA": 3.6,  
  "AnnualIncome": 45000, "SocioStatus": "Tier 2", "ExtracurricularScore": 7.5}
```

Expected Output: Total Score: 79, Scholarship Category: Partial Scholarship

Test Case 4 – Full Scholarship

Input:

```
{"studentID": "S001", "fullName": "Aulia Ramadhan", "GPA": 4.0,  
  "AnnualIncome": 20000, "SocioStatus": "Tier 3", "ExtracurricularScore": 9.5}
```

Expected Output: Total Score: 85, Scholarship Category: Full Scholarship

Test Case 5 – Manual Review

Input:

```
{"studentID": "S003", "fullName": "Fadil Setiawan", "GPA": 3.2,  
  "AnnualIncome": 50000, "SocioStatus": "Tier 3", "ExtracurricularScore": 6.5}
```

Expected Output: Total Score: 67, Scholarship Category: Manual Review

4. Final Remarks

These test scenarios demonstrate the robustness and consistency of the rule-based model in handling diverse input conditions. By validating both valid and invalid cases, the model ensures a reliable decision-making process that aligns with the scholarship selection criteria. Additional test scenarios may be developed in the future to cover edge cases or accommodate future rule adjustments as policies evolve.

Reference:

- Gale, T., & Parker, S. (2017). *Retaining students in Australian higher education: Cultural capital, field distinction*. European Educational Research Journal, 16(1), 80–96.
- Kim, S., & Choi, S. (2020). *The role of scholarships in higher education: A systematic review*. Higher Education Research & Development, 39(2), 318–333.
- Langley, A., Mintzberg, H., Pitcher, P., Posada, E., & Saint-Macary, J. (2019). *Opening up Decision Making: Perspectives and Methods*. Oxford University Press.
- Marginson, S., & van der Wende, M. (2020). *Globalisation and higher education*. OECD Education Working Papers.