

Improving Academic Outcomes in Higher Education Through Data-Informed Decisions

The Role of Predictive Analytics in Artificial Intelligence: A Systematic Review

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OVERVIEW

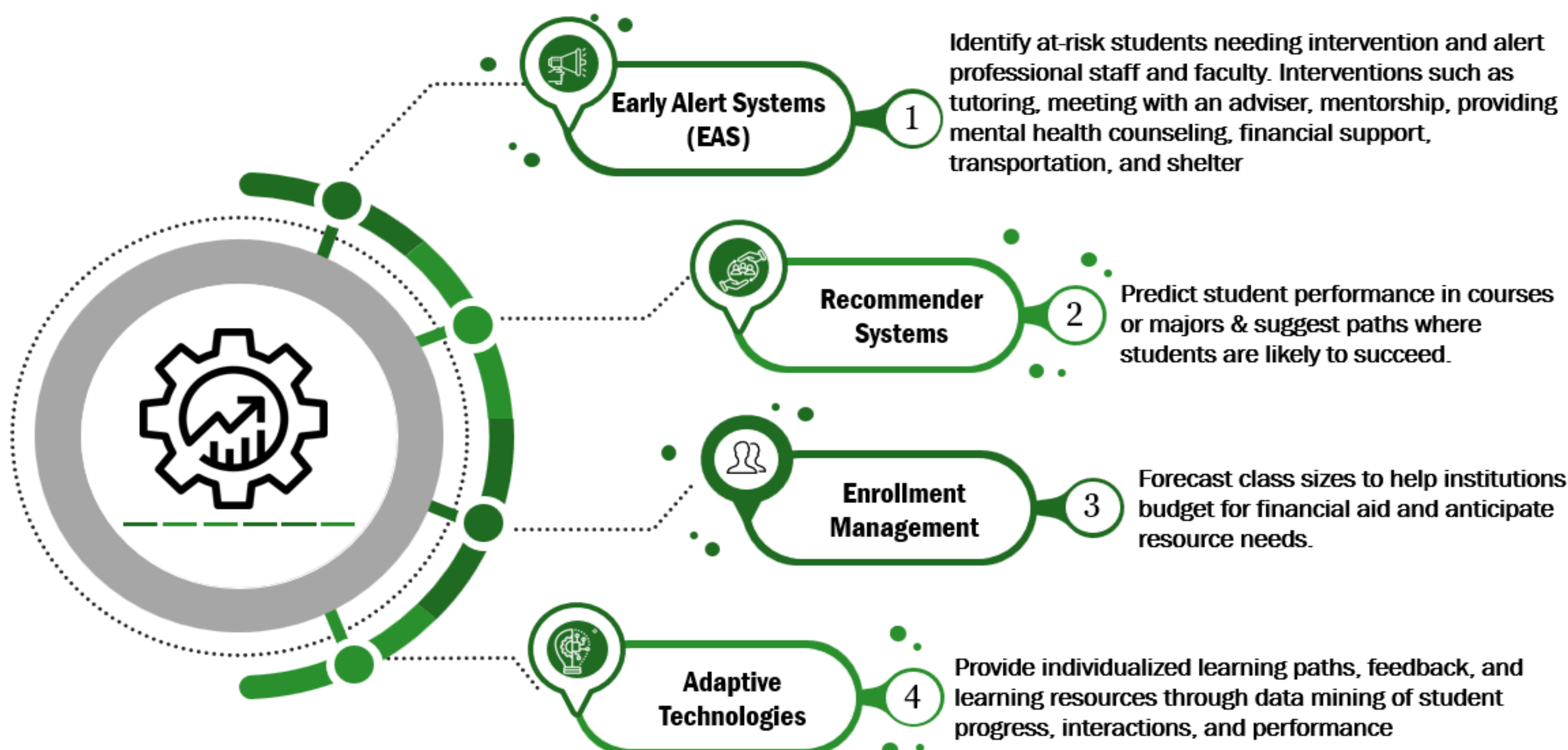
Higher education institutions are embracing data-informed strategies to improve student outcomes. Predictive Analytics, powered by artificial intelligence (AI), offers a transformative approach to identify trends, intervene early, and support at-risk students to improve academic outcomes.

INTRODUCTION

The continued adoption of technologies in higher education, such as the use of Learning Management Systems (LMS) (e.g. Canvas, Blackboard, Brightspace, etc.) and Student Information Systems (SIS) (e.g. Banner, Workday, PeopleSoft, etc.) to increase student engagement and expand education beyond traditional learners regardless of age, ability, or location, has increased the amount of learner data generated as students and instructors interact with such platforms. Predictive Analytics can derive insights from this data to improve student performance through adaptive learning, predictive modeling, and social network analysis¹.

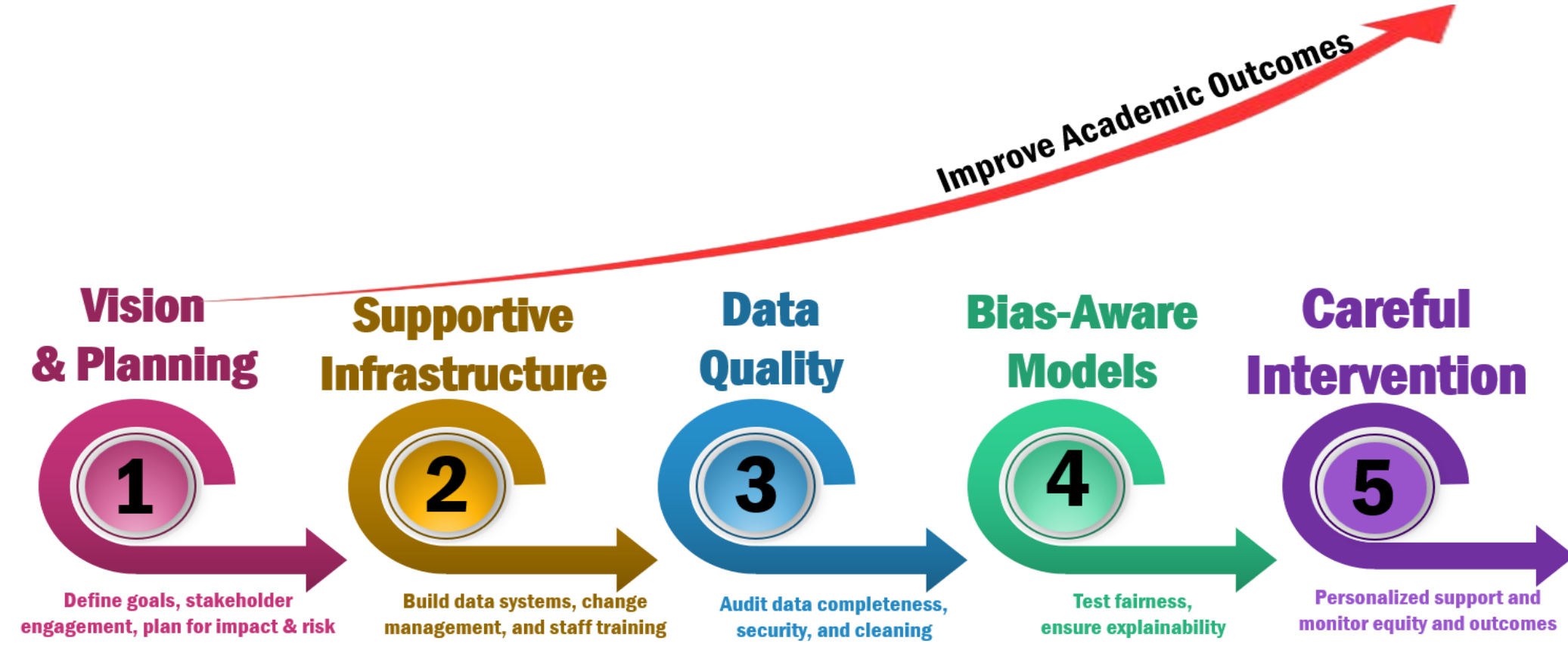
Predictive Analytics employs a combination of techniques to draw inferences about uncertainties through the assessment of historical data aimed at discovering patterns that can be used to predict future trends. In the higher education context, the interest of measurement may vary and can include but is not limited to student academic success, instructional styles, course delivery methods, and faculty retention

FOUR MAJOR CATEGORIES OF PREDICTIVE ANALYTICS USAGE



ETHICAL PREDICTIVE ANALYTICS: PILLARS OF PROGRESS

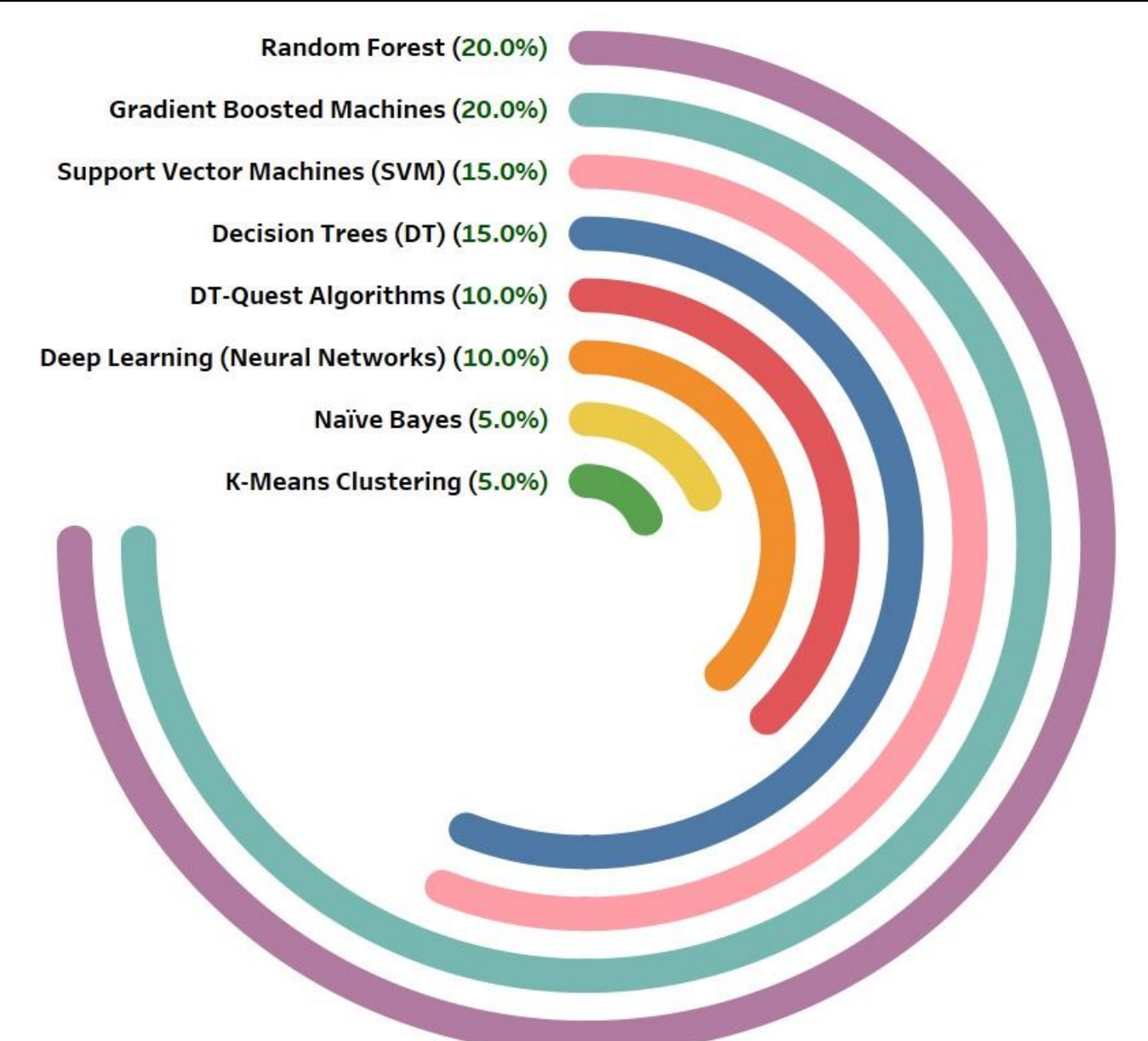
When predictive analytics is implemented responsibly and ethically, it shifts decision-making from reactive to proactive, ensuring timely and targeted support for students.



Ethical Foundations

- ☒ Fairness & Bias Mitigation
- ☐ Transparency & Explainability
- ☒ Privacy & Consent
- ☒ Data Governance & Security
- ☒ Stakeholder Engagement

Top Algorithms in Educational Predictive Modeling



PRACTICAL APPLICATIONS

Course Signals (EAS) – Purdue University: Used a predictive student success algorithm to provide real-time feedback, resulting in a **10.37%** increase in As and Bs and a **6.41%** decrease in Ds and Fs among users².

Temple University (EAS): Implemented analytics to identify likely dropouts, finding correlations with maximum grant recipients persisting at higher rates².

Degree Compass (Recommender System) - Austin Peay State University (APSU): Guides students in selecting courses relevant to degree pathway: **4%** increase for Pell grant recipients in passing grades².

Intellipath (Adaptive Technology) – Colorado Technical University: Used to identify learning gaps and present information to individual students, improving grades, retention, and engagement².

REFERENCES

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- Ekowo, M., & Palmer, I. (2017). *Predictive analytics in higher education. Five guiding principles for ethical use*. New America. <https://reportcenter.highered.texas.gov/sites/docid/cache/file/AC2E2644-9DF0-2DF2-467C1FD0F2571918.pdf>