

Ölçme ve Değerlendirmenin Yeni Yüzü: Öğrenme Analitikleri ve Büyük Veri

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Sonuç odaklı ölçme ve değerlendirme

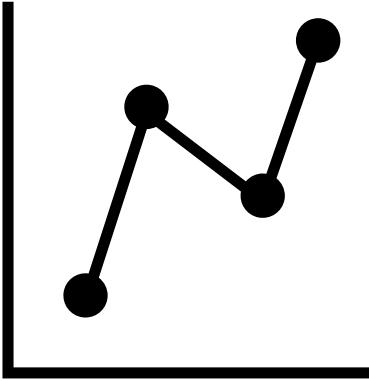
Yazılı/sözlü sınavlar, çoktan seçmeli testler, quizler

Süreç ve sonuç odaklı ölçme ve değerlendirme

Tanıma ve tarama sınavları
Biçimlendirici (formative) değerlendirme
Performans değerlendirme, gözlem formları, projeler,
öz-değerlendirme, akran değerlendirme

Ölçen/Değerlendiren → Süreci/Verileri Yorumlayan





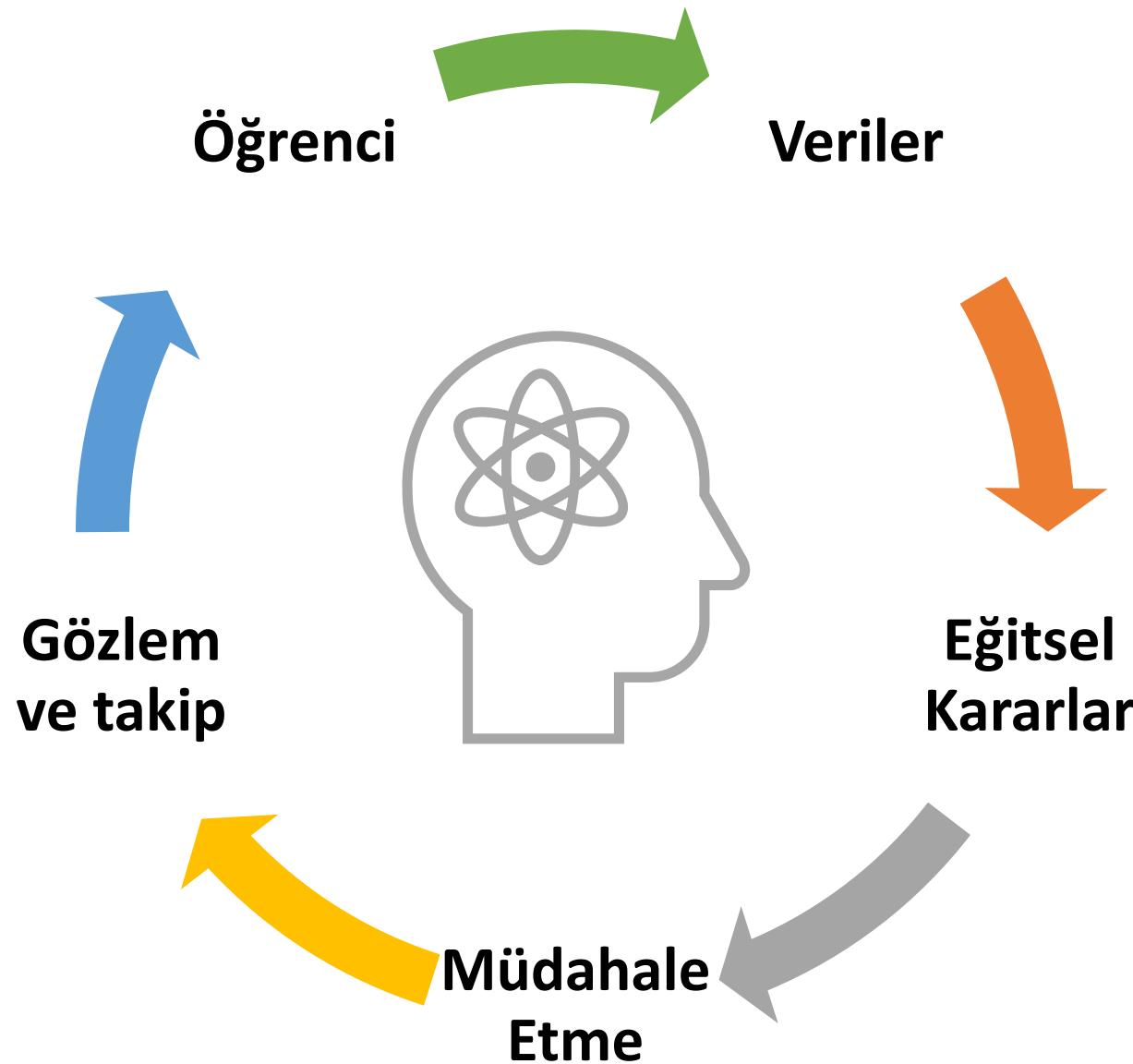
Öğrenme Analitikleri

“Öğrenmeye dair veri ve ipuçlarının öğrenme sürecini ya da sonuçlarını bilgilendirmek ve geliştirmek amacıyla toplanması ve analiz edilmesi.”

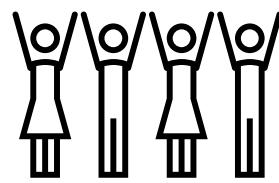
([Siemens et al., 2011](#))

Öğrenme sürecine dair eş zamanlı olarak bilgi edinme ve edinilen bilgi ile müdahalede bulunma

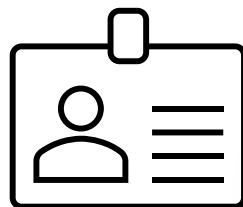




Öğrenme Verileri

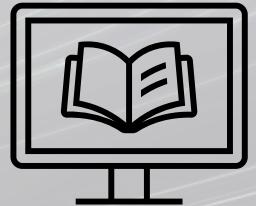


Öğrenci
başarısı



Öğrencilerin
kişisel
ozellikleri

Öğrencinin
eğitim geçmişi



Log verileri



Log Verileri (Dijital Ayak İzleri)

Ödev/sınav bitirme süreleri

Çevrimiçi derslere katılım istatistikleri

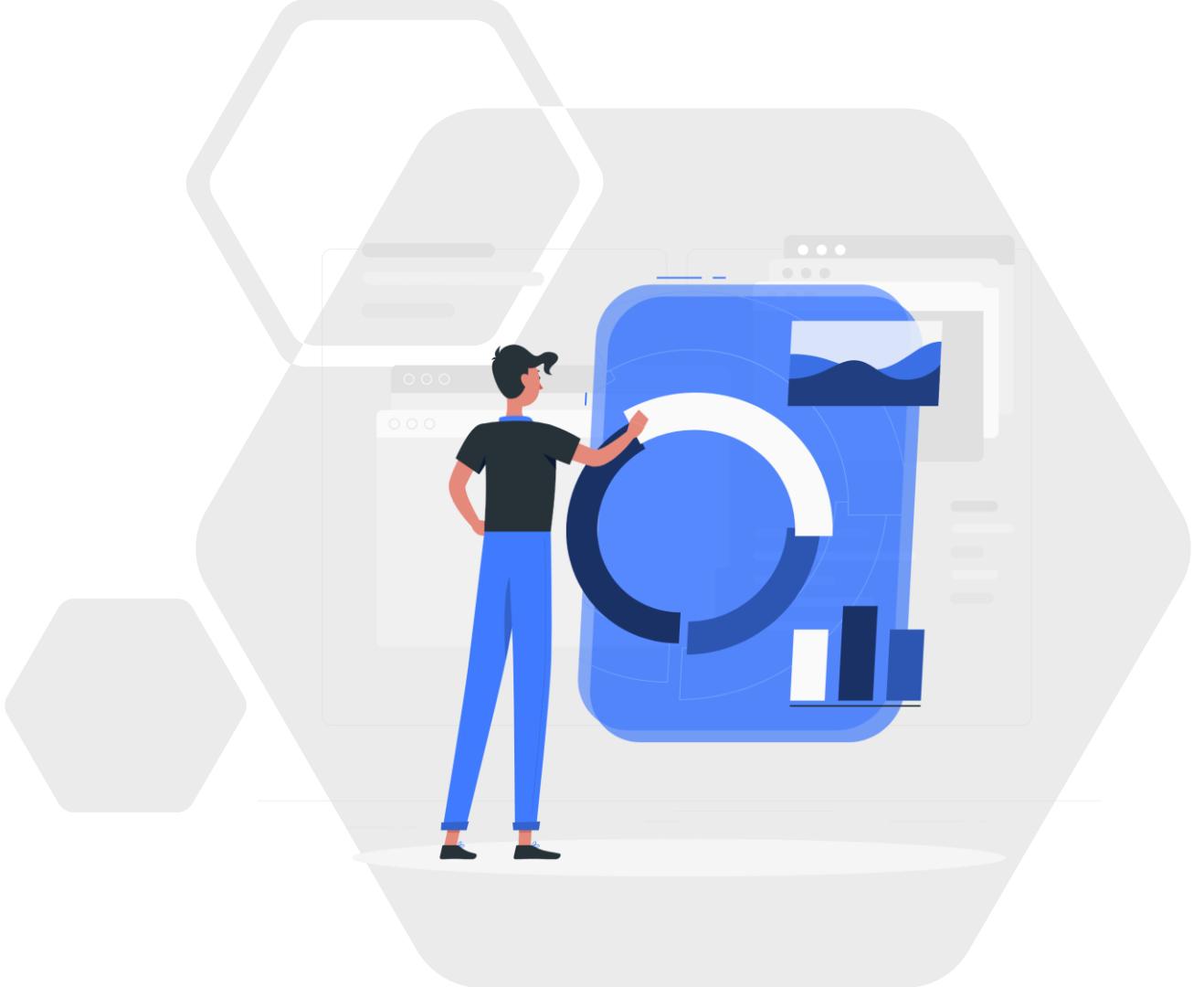
Öğrenciler arası etkileşim verileri

Materyallere erişim sıklığı

Boylamsal veriler



Öğrenme Analitiklerine İlgi Neden Arttı?

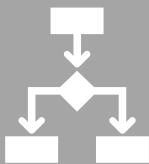


1

Dijital formatta
biçimlendirici
(formative)
sınavlar



İlköğretimden liseye kadar
uzanan tarama ve gelişim takip
sınavları



Veriye dayalı karar verme
(Data-Driven Decision-Making)



Kişiye özgü başarı hedefleri
belirleme ve bunun takibi

2

Massive Open
Online Courses
(MOOC)

coursera

Future
Learn



udemy

USQ
AUSTRALIA
UNIVERSITY OF
SOUTHERN QUEENSLAND

edX

MITx

Free online courses from MIT



iversity



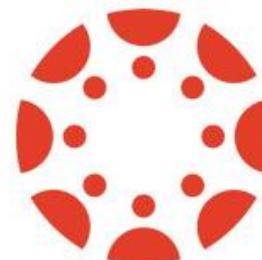
UDACITY

3

Öğrenme
yönetim
sistemleri



Blackboard



canvas

4

Büyük verinin
erişilir hale
gelmesi

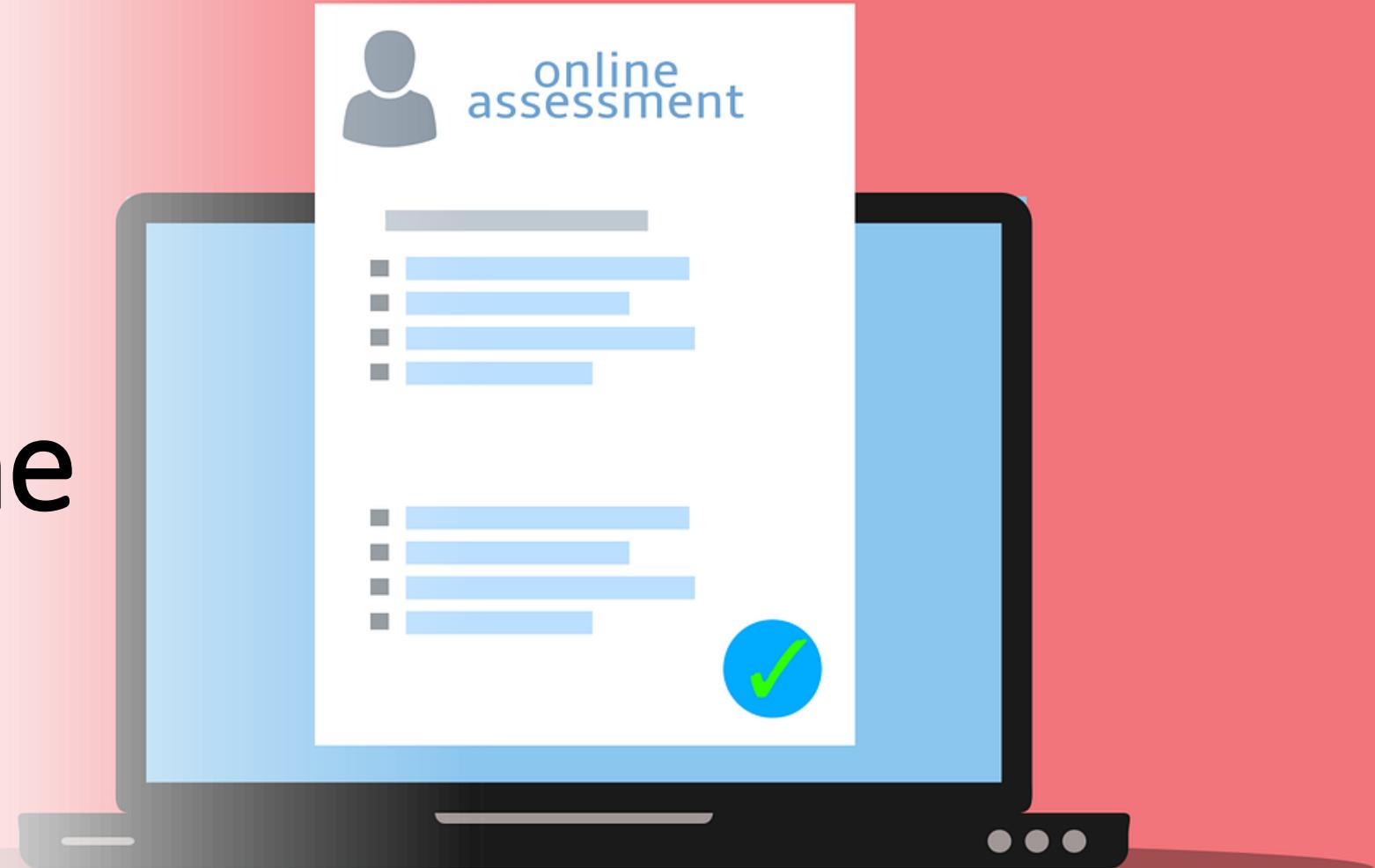


BÜYÜK VERİ: HACİM + HIZ + ÇEŞİTLİLİK

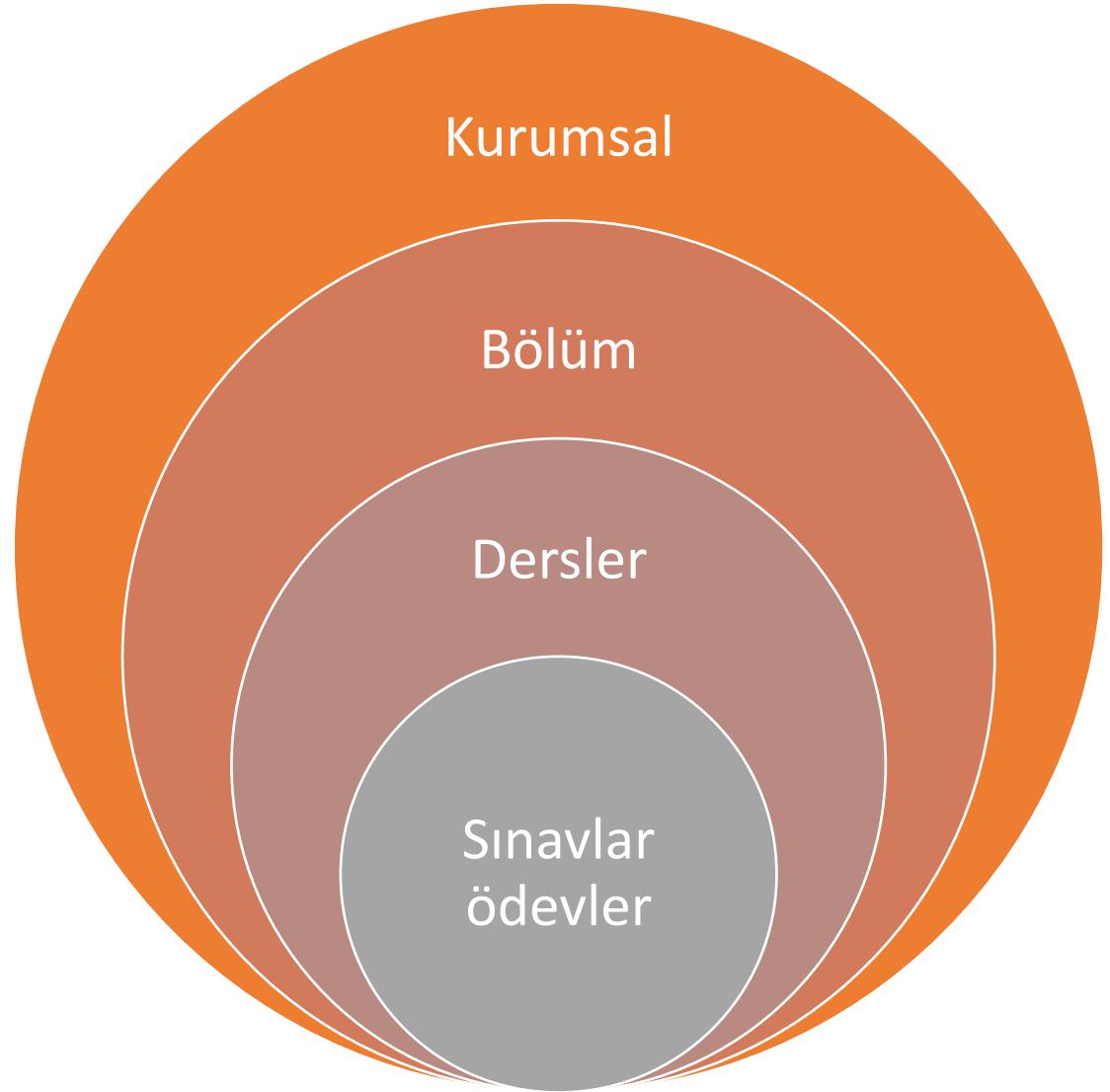


Dijital Ölçme

Bilgisayar destekli,
çevrimiçi sınavlar ve
ödevler



Öğrenme
analistikleri hangi
aşamalarda
kullanılabilir?



Öğrenme Verilerini Analiz Etme

Özellik mühendisliği
(feature engineering)

- Ham verilerden önemli olanları seçme ve yeni özellikler çıkarabilme

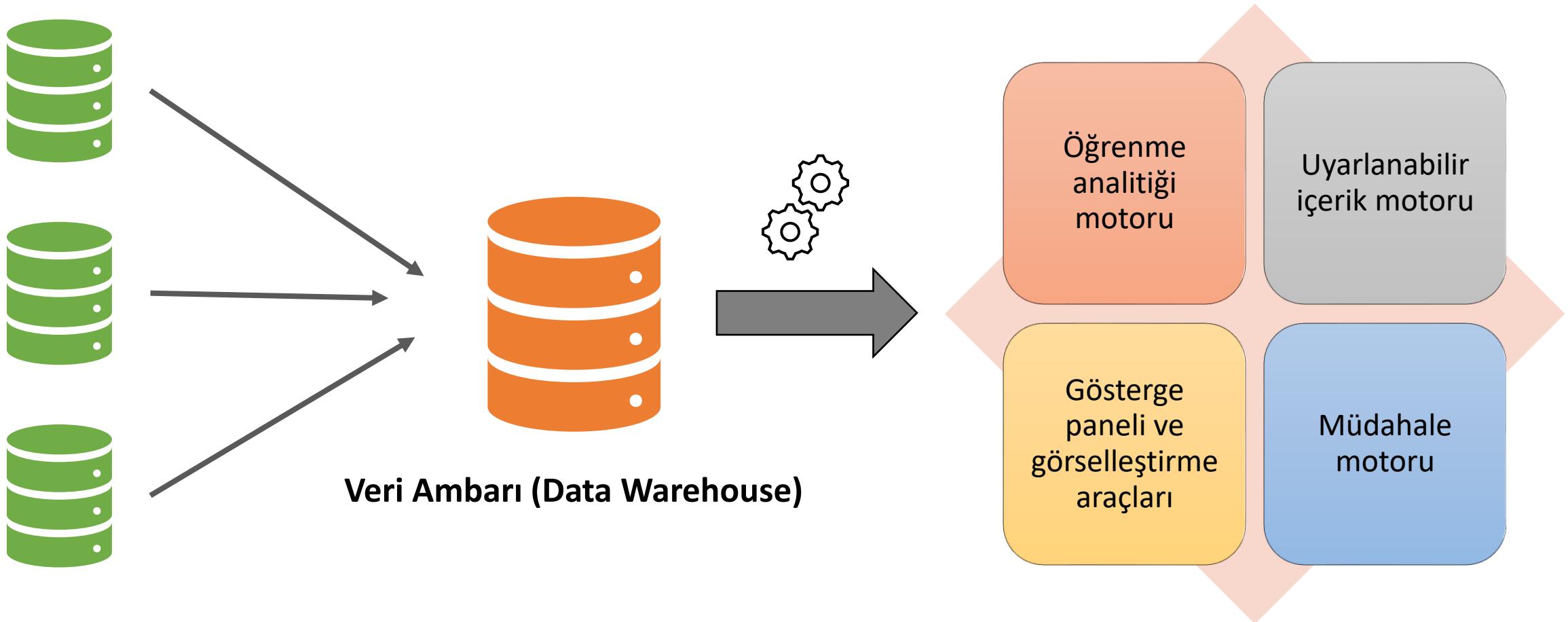
Veri madenciliği

- Büyük veri içinde gizlenen anlamlı desenleri ve örüntüleri çıkarma

Modelleme

- Makine öğrenme algoritmaları
- Yapay sinir ağları (neural networks) ve derin öğrenme (deep learning)
- Pekiştirmeli öğrenme (reinforcement learning)

Öğrenme Verilerini Kullanma





Homepage

Entrepreneurship for CS course

 Manage dashboard

8

 122
Enrolled students

9

 6.8 (+ 12%)
Average mark

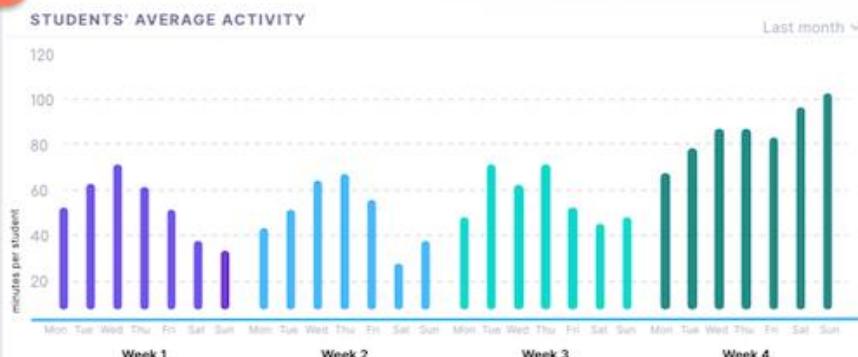
10

 12 (10%)
Underperforming students

11

 83%
Of latest assignment submitted

1



2

STUDENTS' AVERAGE SCORE



A descending list of students and their average scores. The scores range from 7.9 to 9.3.

Student	Average Score
Lucie Williams	9.3
Josh Smith	8.9
Paul Manson	8.7
Dave Johnson	8.2
Cathy Taylor	8.2
Sophie Springsteen	8.1
Joe Davids	7.9

3



12

 4
Days until next test

13

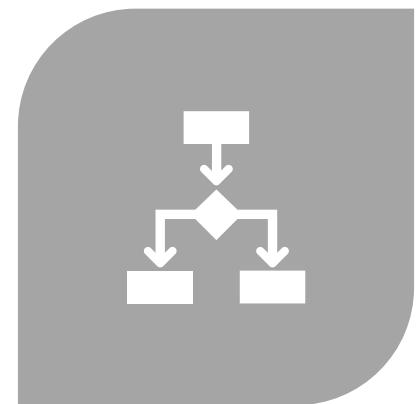
 32
Average total hours spent

Template credits to Chin Labs

Nelere Dikkat Edilmeli?



VERİ KALİTESİ



KARAR/EYLEM



VERİ GÜVENLİĞİ

Öğrenme Verilerinin Kullanımına Dair Örnekler

- MOOC tarzı derslerde öğrenci motivasyonunu ve dersleri tamamlama isteklerini tespit etme ([Chaplot et al., 2015](#); [Sunar et al., 2017](#))
- Kişiselleştirilmiş eğitim imkanları yaratma ([Klašnja-Milićević et al., 2020](#); [Pardo et al., 2018](#))
- Tavsiye-öneri sistemleri (recommender systems) ile öğrencilere bireye özgü ders önerilerinde bulunma ([Bhumichitr et al., 2017](#); [Bydžovská, 2016](#))

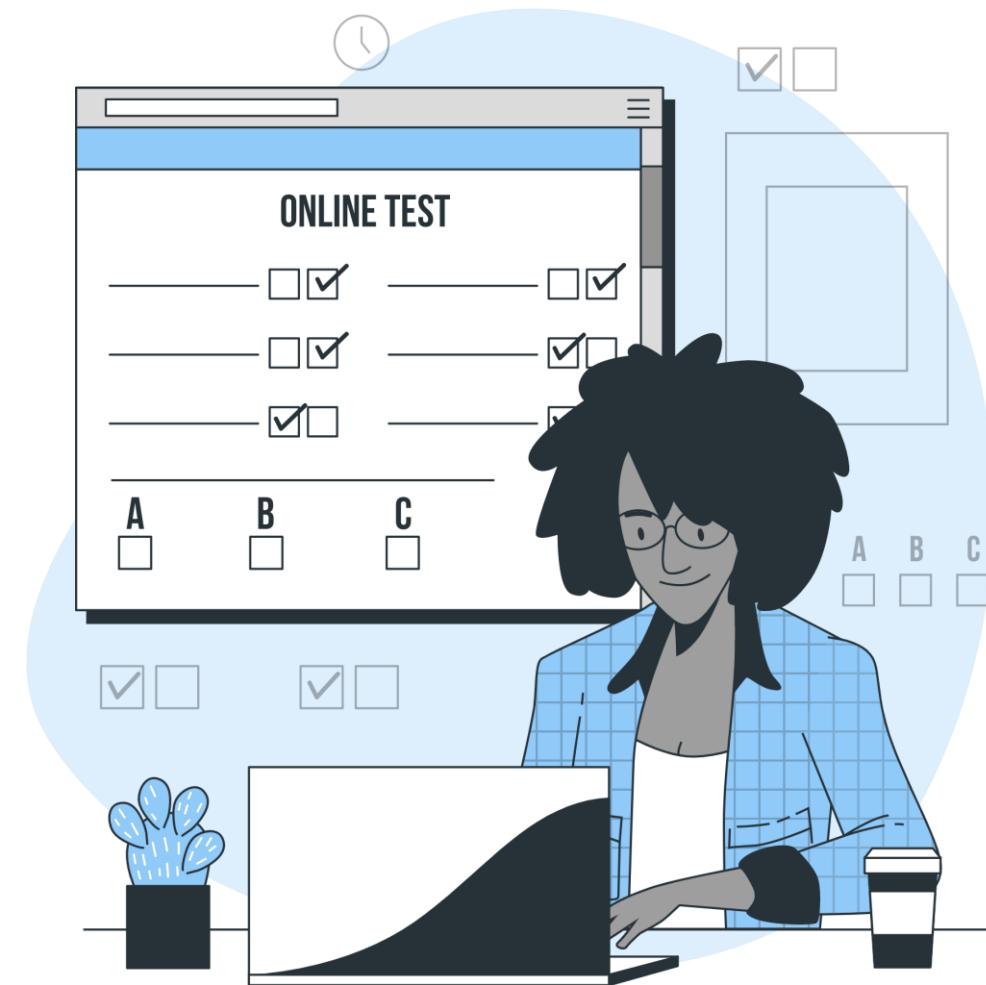
Bireye Özgü Sınav Takvimi Belirleme

Bilgisayar destekli

biçimlendirici sınavlar

Erken tarama sınavları

Gelişim takip sınavları



Bireye Özgü Sınav Takvimi Belirleme

Hangi
öğrenciler?



Ne zaman?



Hangi
sıklıkla?



Veri Tabanı



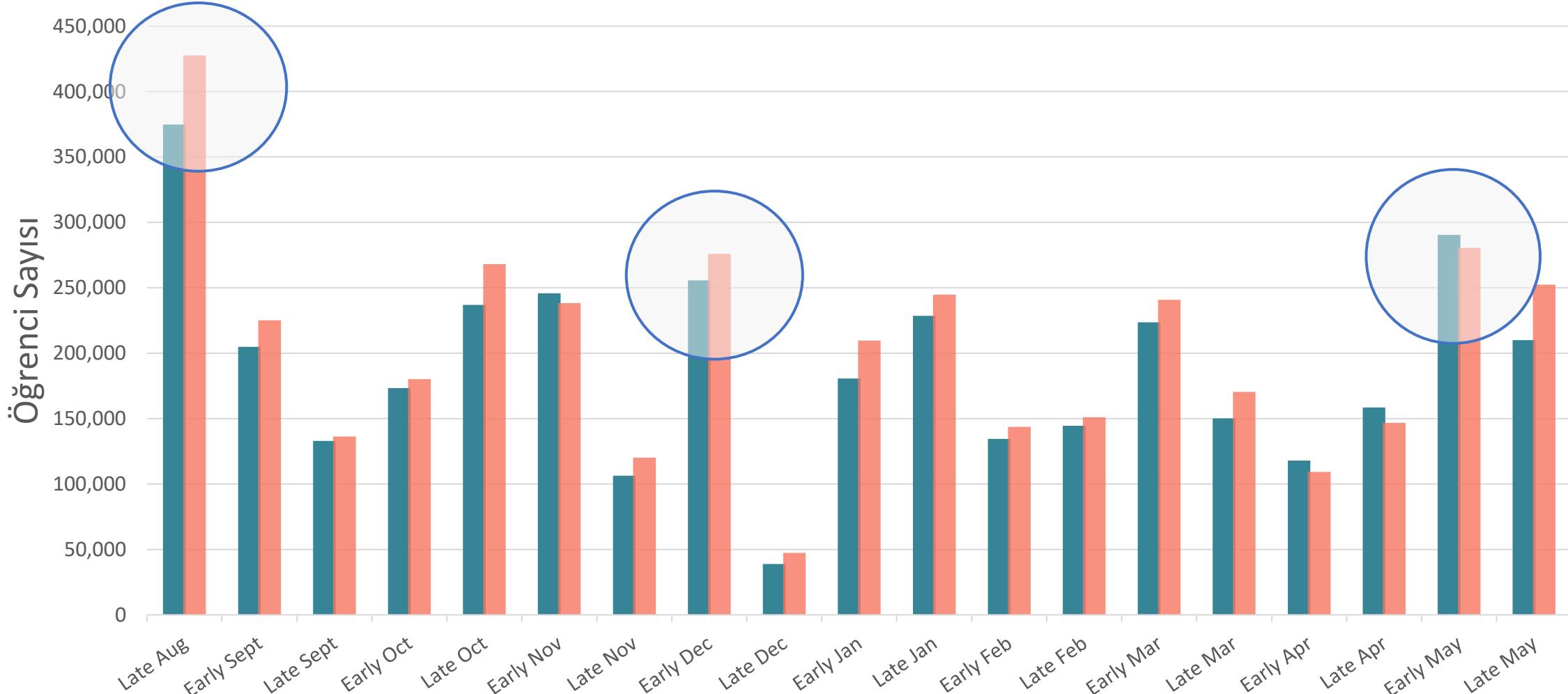
STAR™
Reading

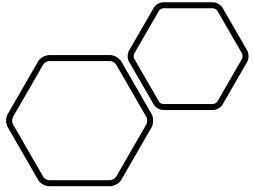
2. Sınıf ($n = 668,324$)

4. Sınıf ($n = 727,147$)

Sınav Dönemi Takvimi (Ağustos'tan Mayıs Sonuna Kadar)

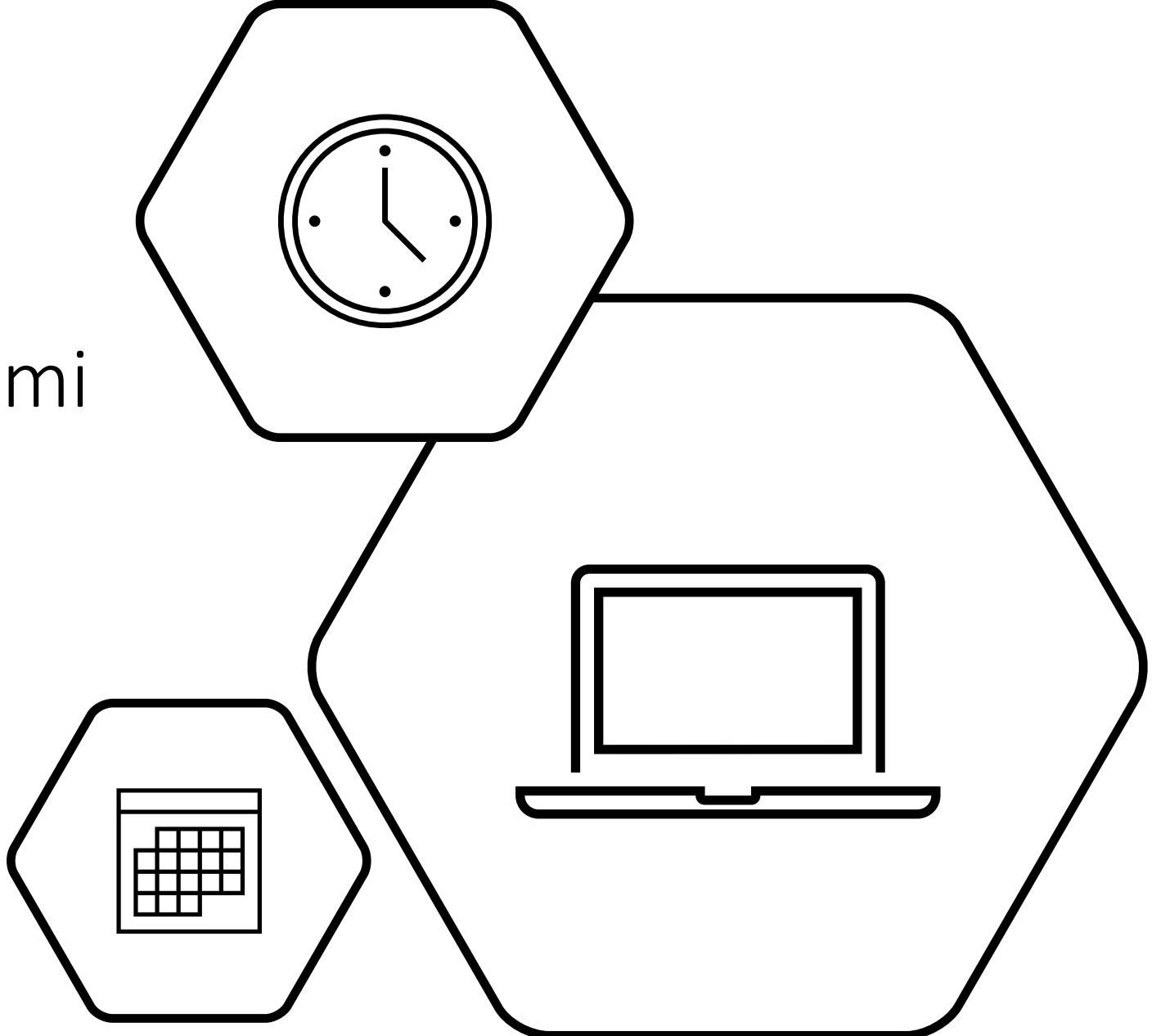
■ 2. Sınıf ■ 4. Sınıf





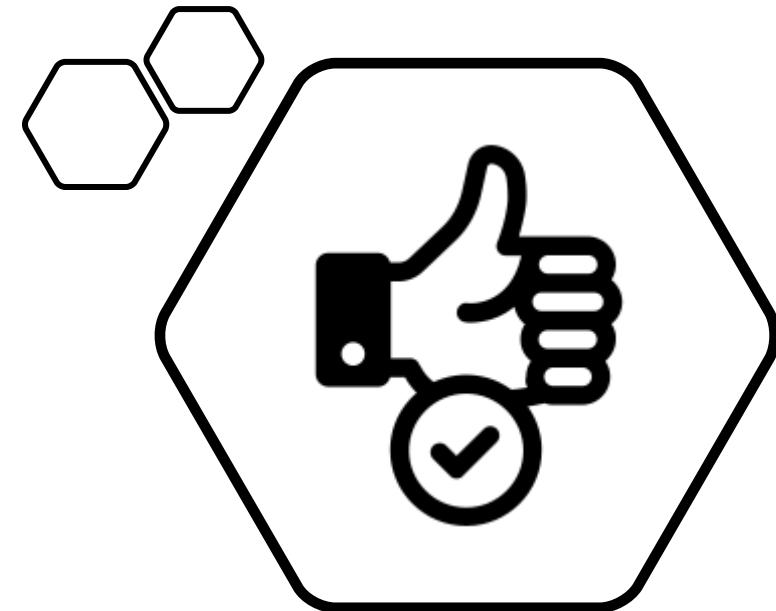
Tavsiye (Öneri) Sistemi

- **Amaç:** Her bir öğrenci için en ideal test takvimini belirleme
 - Sınav sayısı
 - Sınav sıklığı
 - Sınavın zamanı

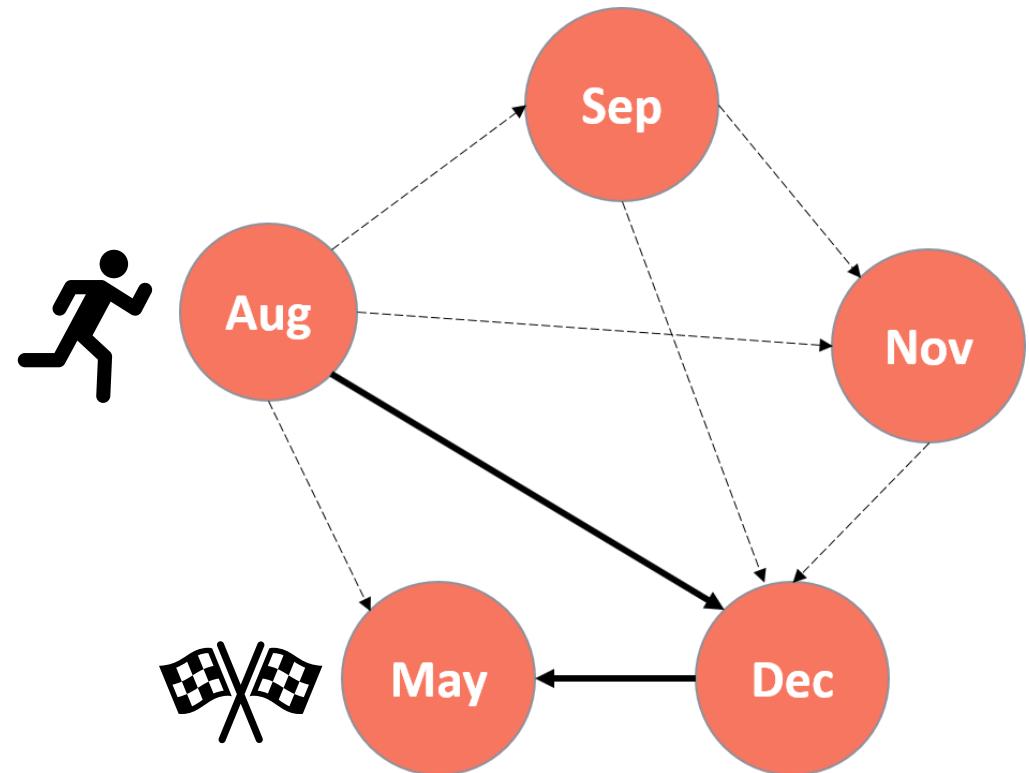
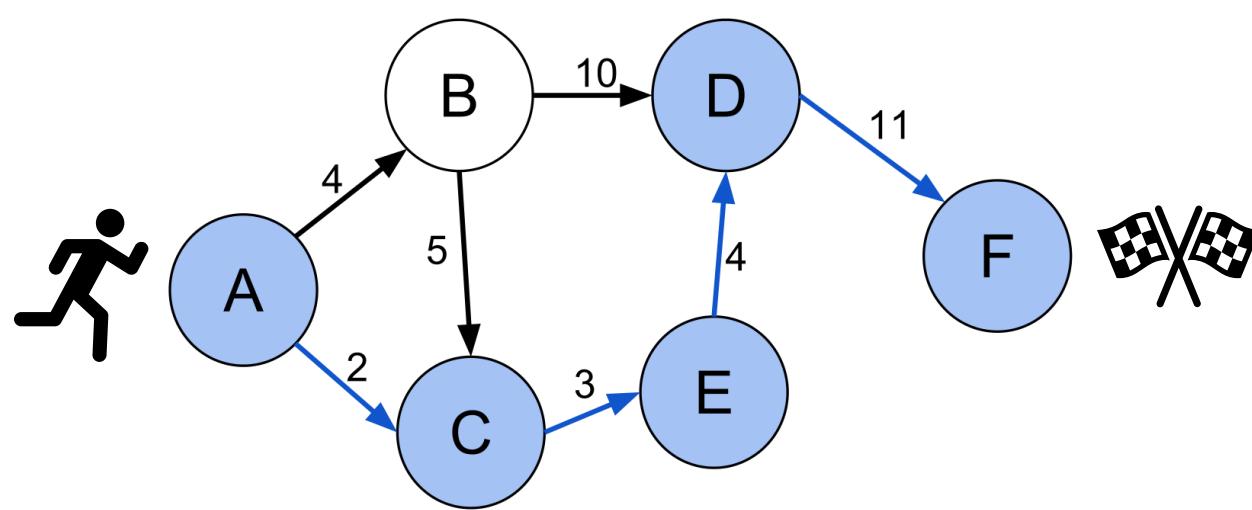


Tavsiye (Öneri) Sistemi

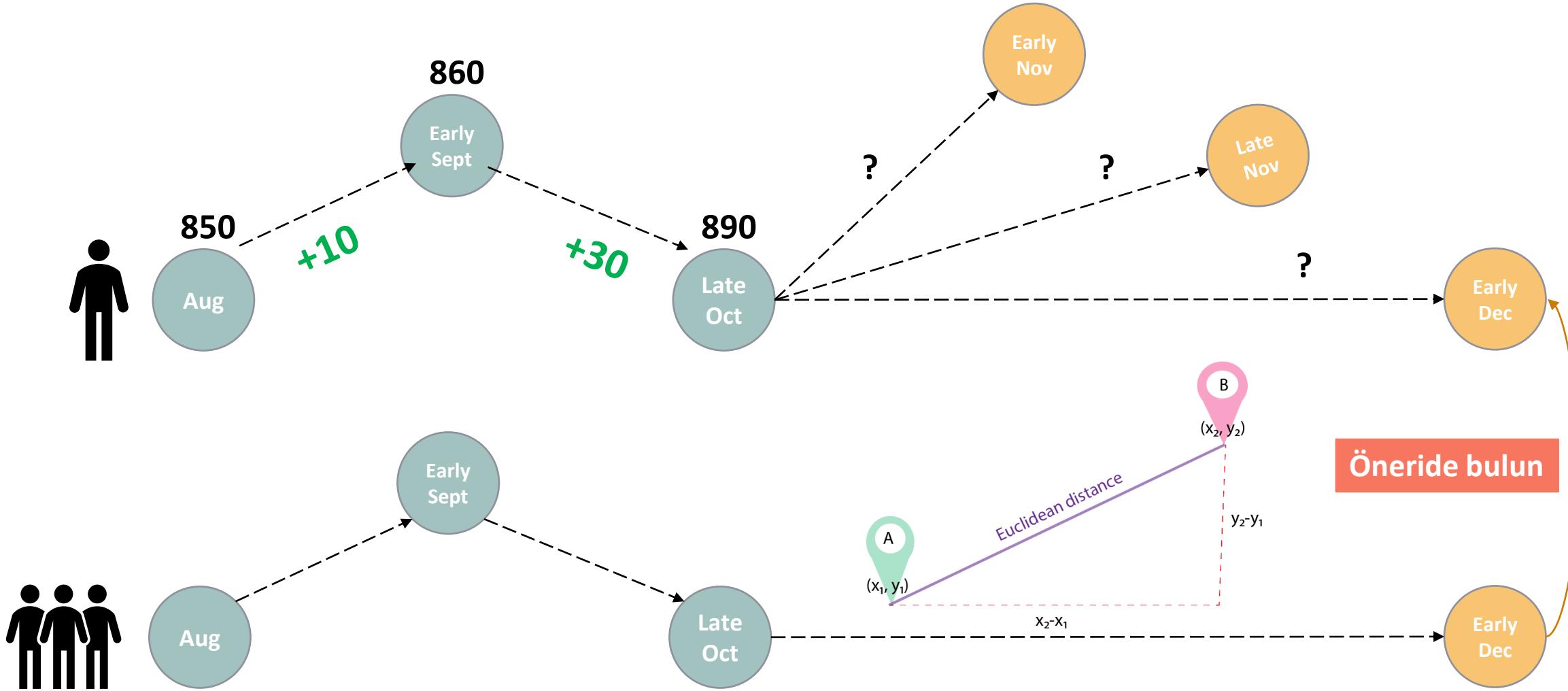
- İdeal (optimal) test takvimine sahip öğrenciler
 - ☒ Pozitif gelişim gösterme (pozitif eğim/slope)
 - ☒ Ortalamanın üstünde gelişim gösterme
- Optimizasyon problemi
 - ⌚ Sınavlar arasındaki puan farkını en yüksek seviyede tutmak
 - ⌚ Sınav sayısını en düşükte tutmak



Dijkstra'nın En Kısa Yol Algoritması (Shortest Path First)



Öneri Oluşturma



Sonuçlar

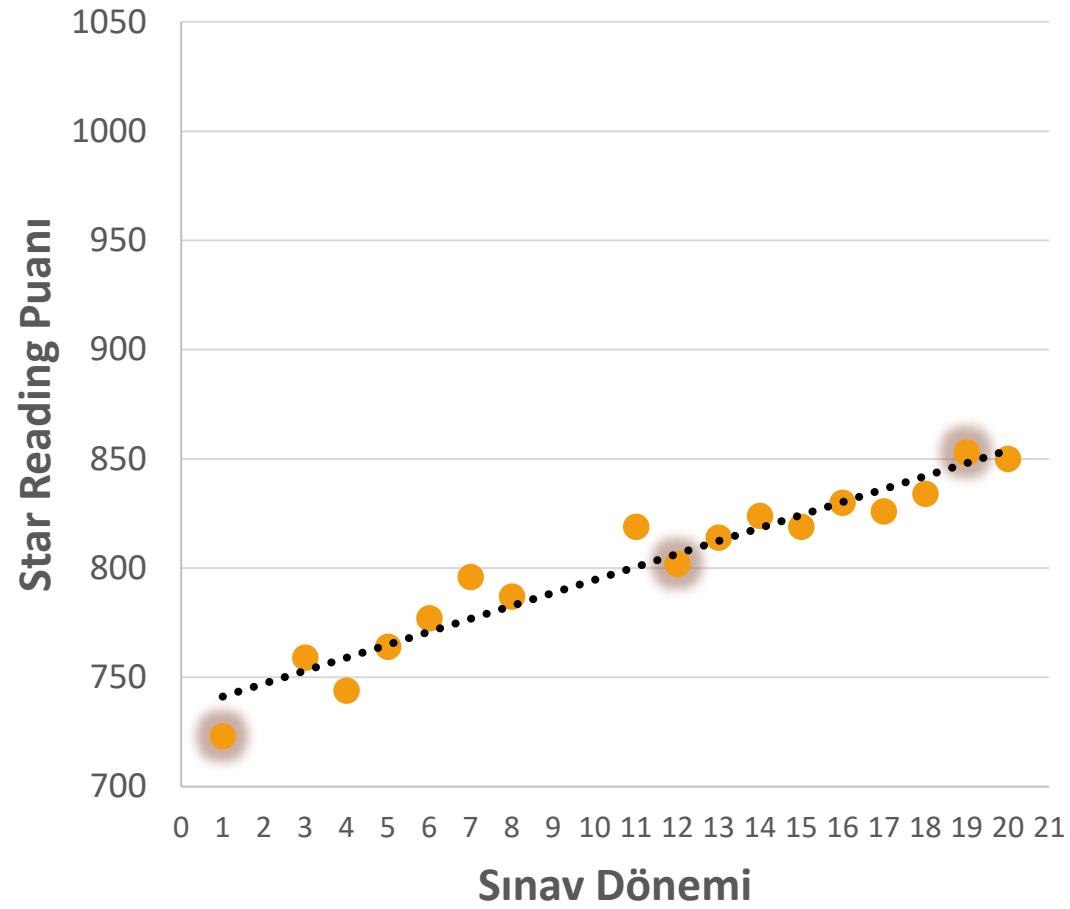
18 sınav → **5** sınav
2. SINIF

17 sınav → **6** sınav
4. SINIF

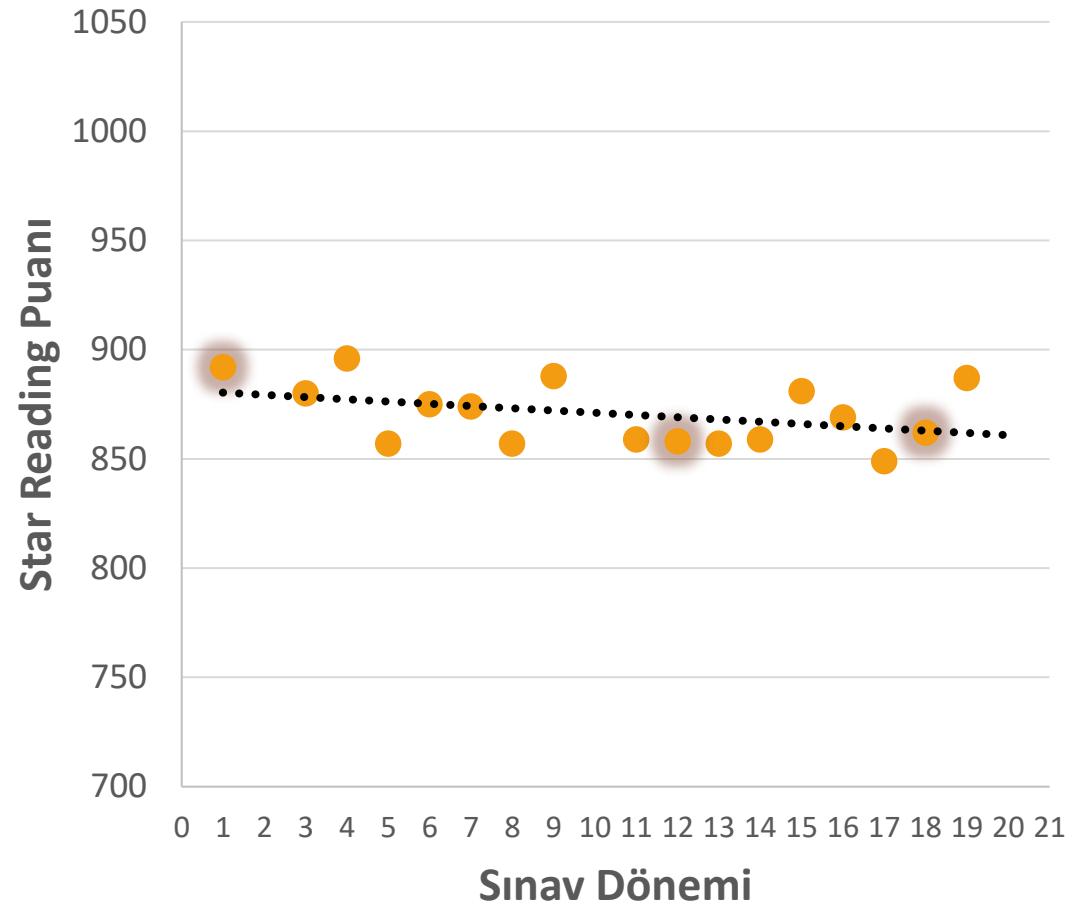


%0.10'a kadar öneride bulunulamayan durumlar

Öğrenci 1



Öğrenci 2



● Gözlenen sınav oturumları

● Önerilen sınav oturumları



An Intelligent Recommender System for Personalized Test Administration Scheduling With Computerized Formative Assessments

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Specialty section:
This article was submitted to
Assessment, Testing and Applied
Measurement,
a section of the journal
Frontiers in Education

Received: 15 June 2020
Accepted: 04 September 2020
Published: 23 September 2020

Citation:
Bulut O, Cormier DC and Shin J (2020) An Intelligent Recommender System for Personalized Test Administration Scheduling With Computerized Formative Assessments. *Front. Educ.* 5:572612.
doi: 10.3389/feduc.2020.572612

The introduction of computerized formative assessments in schools has enabled the monitoring of students' progress with more flexible test schedules. Currently, the timing and frequency of computerized formative assessments are determined based on districts and school authorities' agreements with testing organizations, the teachers' judgment of students' progress, and grade-level testing guidelines recommended by researchers. However, these practices often result in a rigid test scheduling that disregards the pace at which students acquire knowledge. Furthermore, students are likely to experience the loss of instructional time due to frequent testing. To administer computerized formative assessments efficiently, teachers should be provided systematic guidance on finding an optimal testing schedule based on each student's progress. In this study, we aim to demonstrate the utility of intelligent recommender systems (IRSs) for generating individualized test schedules for students. Using real data from a large sample of students in grade 2 ($n = 355,078$) and grade 4 ($n = 390,336$) who completed the Star Math assessment during the 2017–2018 school year, we developed an IRS and evaluated its performance in finding a balance between data quality and testing frequency. Results indicated that the IRS was able to recommend a fewer number of test administrations for both grade levels, compared with standard practice. Further, the IRS was able to maximize the score difference from one test administration to another by eliminating the test administrations in which students' scores did not change significantly. Implications for generating personalized schedules to monitor student progress and recommendations for future research are discussed.

Keywords: recommender system, formative assessment, personalized learning, progress monitoring, mathematics

INTRODUCTION

Classroom assessments allow K–12 teachers to evaluate student learning (i.e., monitor students' progress) and make a variety of important decisions about learning outcomes (e.g., producing feedback, assigning grades). Teachers use two types of assessments to evaluate student learning in the classroom: summative and formative (Black and Wiliam, 2009). Summative assessments are typically used at the end of an instructional period, such as a unit or a semester, to evaluate student learning relative to content standards or benchmarks. Quizzes, midterm exams, or a final project are



Building an intelligent recommendation system for personalized test scheduling in computerized assessments: A reinforcement learning approach

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Accepted: 20 April 2021
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Abstract

The introduction of computerized formative assessments in the classroom has opened a new area of effective progress monitoring with more accessible test administrations. With computerized formative assessments, all students could be tested at the same time and with the same number of test administrations within a school year. Alternatively, the decision for the number and frequency of such tests could be made by teachers based on their observations and personal judgments about students. However, this often results in rigid test scheduling that fails to take into account the pace at which students acquire knowledge. To administer computerized formative assessments efficiently, teachers should be provided with systematic guidance regarding effective test scheduling based on each student's level of progress. In this study, we introduce an intelligent recommendation system that can gauge the optimal number and timing of testing for each student. We discuss how to build an intelligent recommendation system using a reinforcement learning approach. Then, we present a case study with a large sample of students' test results in a computerized formative assessment. We show that the intelligent recommendation system can significantly reduce the number of testing for the students by eliminating unnecessary test administrations where students do not show significant progress (i.e., growth). Also, the proposed recommendation system is capable of identifying the optimal test time for students to demonstrate adequate progress from one test administration to another. Implications for future research on personalized assessment scheduling are discussed.

Keywords Test administration optimization · Reinforcement learning · Computerized formative assessment · Personalized learning

Introduction

Computerized formative assessments establish a connection between computer technologies and formative assessments to effectively manage and deliver classroom assessments (Webb et al., 2013). Formative assessments refer to the general process that engages students and teachers to evaluate student learning, provide feedback, and improve learning

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outcomes using formative evaluation (McManus, 2008). In a critical review of research on formative assessments, Dunn and Mulvenon (2009) collectively defined formative evaluation as the evidence-based evaluation aiming to "inform teachers, students, and educational stakeholders about the teaching and learning process" (p.4, Dunn & Mulvenon, 2009). A diverse format of tools can be applied to formative assessment to effectively collect evidence of student learning (Bennett, 2011). Such tools include, but are not limited to, peer feedback and assessment (e.g., Volante & Beckett 2011), questioning (e.g., Black & Harrison, 2001), self-assessment (e.g., Andrade, 2019), and pedagogical documentation, such as portfolios (e.g., Buldu, 2010).

Appropriate use of formative assessment tools in the classroom has previously been identified to result in a profound student learning (McManus, 2008; Kingston & Nash, 2011). Meta-analyses on the effect of classroom formative assessment have revealed that formative assessments show predominant effects to improve learning outcomes

Published online: 15 June 2021

 Springer



Öğrenme
analitiklerine
dair birkaç
kaynak...

- [Society for Learning Analytics Research](#)
 - [Journal of Learning Analytics](#)
 - [Learning Analytics and Knowledge \(LAK\) Conference](#)
- [Learning Analytics Research Network](#) at NYU
 - [Learning Analytics 101](#)
- [LASER Institute](#)
- [SHEILA](#) (Supporting Higher Education to Integrate Learning Analytics)



Dinlediğiniz
için teşekkür
ederim.

<https://bit.ly/cmeep2020>

