

Artificial Intelligence and Education

Искусственный интеллект и образование



Prof. Ümit Deniz ULUŞAR
Akdeniz University
Computer Engineering
Head of Distance Education Center

1

Prof. Ümit Deniz ULUŞAR

- 2001, BS in Computer Engineering, Marmara University, Istanbul
- 2004, MS in System and Control Engineering, Boğaziçi University, Istanbul
- 2010, Ph.D. in Computer Science, Applied Science, University of Arkansas/USA
- Since 2011, Computer Engineering Department, Akdeniz University, Antalya
- 2011-2014, Founding Chair of the Computer Engineering Department
- 2017-2021, Head of IT Department of Akdeniz University
- Since 2021, Head of Distance Education Center
- Since 2023, Head of Computer Engineering Department

2001, Бакалавр компьютерной инженерии, Университет Мармара, Стамбул 2004, магистр в области системной инженерии и управления, Университет Богазиджи, Стамбул 2010, доктор философии в области компьютерных наук, прикладных наук, Университет Арканзаса / США С 2011 г. – Факультет компьютерной инженерии, Университет Акдениз, Анталия 2011-2014 гг. – заведующий кафедрой компьютерной инженерии 2017-2021 гг. – заведующий кафедрой информационных технологий Университета Акдениз С 2021 года руководитель Центра дистанционного образования С 2023 года начальник отдела компьютерной инженерии

2

Artificial Intelligence

Искусственный интеллект

3

DeepBlue (1997)



4

History of the Modern Artificial Intelligence

1942: Enigma broken with AI.

1957: General Problem Solver.

1980s: Artificial Neural Networks became popular.

1990s: Many new algorithms are devised on Machine learning, Event based reasoning, Computer vision, and other topics.

1995: The chatbot ALICE

1997: Garry Kasparov and Deep Blue chess game. Also first official robotic soccer game took place. (Robo-Cup)

2004: My thesis on 'Design and implementation of a real time planning system for autonomous robots'

2010: Deep Learning (Google, Microsoft , etc.)

2020: A revolutionary tool for automated conversations – GPT-3

Alan Turing

1997 yılında Garry Kasparov, Deep Blue ile satranç oynarken.

Deep Learning

5

How Fast is a Computer ?

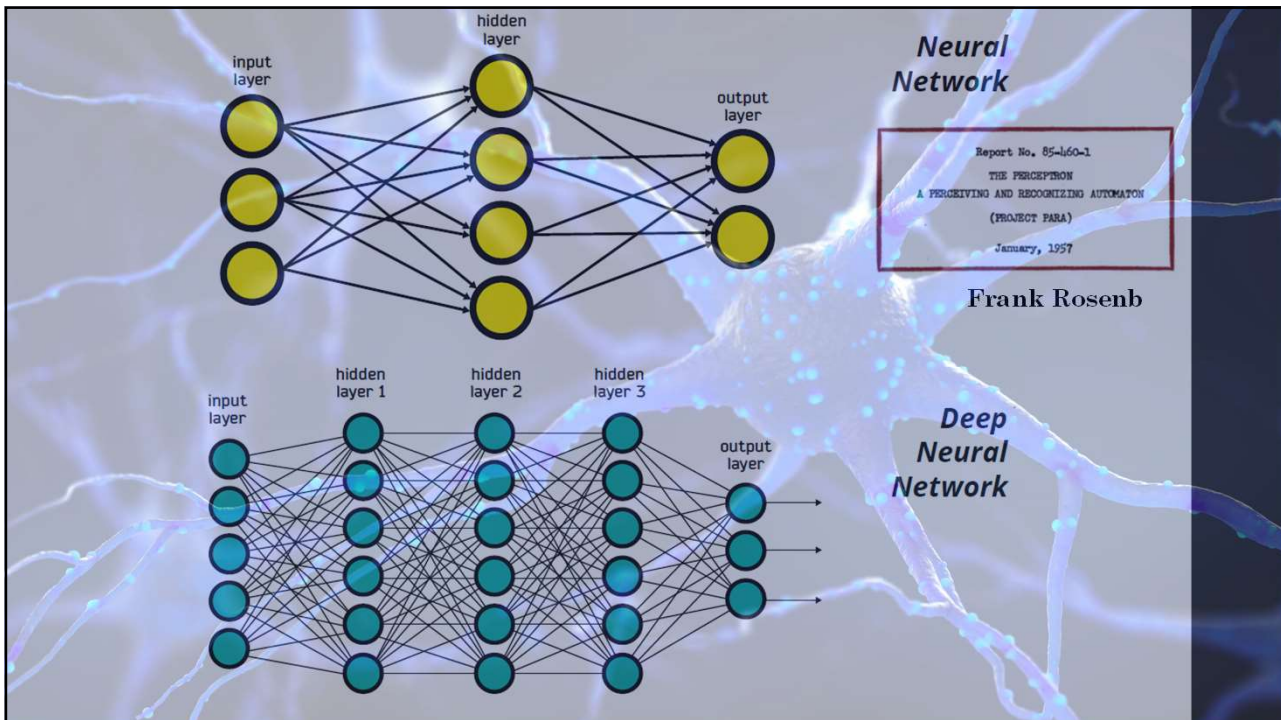
- Процессор Intel I9 с тактовой частотой 3,3 ГГц имеет 10 ядер. (Intel I9 CPU 3.3GHz processor has 10 cores.)
- Предположим, что вы можете выполнить простое сложение, например, 99+48, за 1 секунду. Lets say you can make a simple addition such as 99+48 in 1 second,
- Используя этот процессор, предположим, что мы выполняем вычисления в течение 1 секунды и подсчитываем количество операций. Using this CPU lets say we perform calculations for 1 second and count the number of operations.
- Сколько времени понадобится этому человеку, чтобы выполнить то же количество вычислений, которые процессор выполняет за одну секунду?
How long will it take that person to do the same number of calculations the CPU performs in one second?

Unit	Meaning	33.000.000.000 calculations performed by the CPU in one sec
1 Hz	1 calculation/second	
1 kHz	1.000 calc/sec (10 ³)	
1 MHz	1.000.000 calc/sec (10 ⁶)	
1GHz	1.000.000.000 calc/sec (10 ⁹)	
3.3 GHz – 10 Core	33.000.000.000 calc/sec (33x10 ⁹)	

Unit	Duration
Second	33.000.000.000
Minute	550.000.000
Hour	9.166.666
Day	381.944
Year	1.046

Intel I9 - 10 Core
3.3 GHz <1000 \$

6



7

Recent Application of AI (Недавнее применение ИИ)

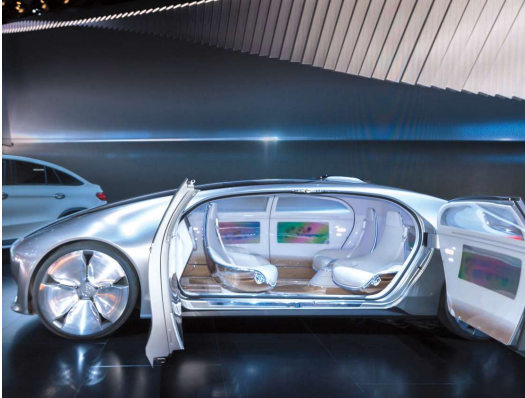
Machine Learning, Natural Language
Processing, Computer Vision

(Машинное обучение, обработка естественного
языка, компьютерное зрение)

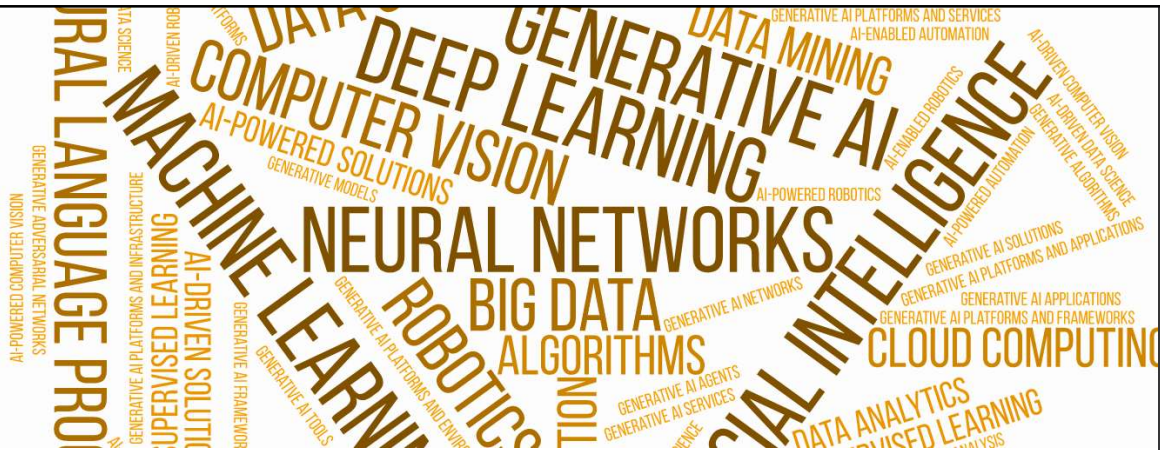
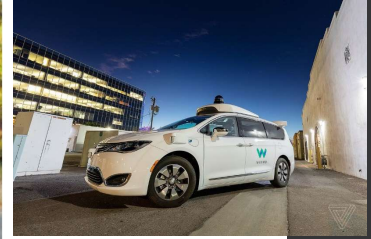
8

Driverless Cars

Беспилотные автомобили



Mercedes-Benz's Driverless Car



The Future of Productivity, Generative AI

Будущее производительности, генеративный ИИ

- Educational Challenges
- Content Generation
- The new way of searching things

Проблемы в сфере образования Генерация контента Новый способ поиска вещей

The screenshot shows a chat window on chat.openai.com. The left sidebar contains a list of chat titles, including "Процессор Intel I9", "Software Project Management", and "Change ListTile Icon Color". The main chat area shows a conversation:

- User (MA): Сколько времени понадобится этому человеку, чтобы выполнить то же количество вычислений, которые процессор выполняет за одну секунду?
- AI (GPT): Is it going to rain in Antalya today?
- User (GPT): I'm sorry, but as an AI language model, I don't have access to real-time weather data. To find out if it's going to rain in Antalya today, I recommend checking a reliable weather forecast website or using a weather app on your device.
- User (MA): Please make a predictive analysis for weather forecast for Antalya for today.
- AI (GPT): I apologize for the confusion, but as an AI language model, my responses are based on information available up until September 2021, and I don't have real-time data or the ability to make predictions about the weather. For accurate and up-to-date weather forecasts for Antalya, I recommend checking a reliable weather forecasting service or website.

At the bottom, there is a "Send a message..." input field and a "Regenerate response" button. A footer note states: "ChatGPT may produce inaccurate information about people, places, or facts. ChatGPT May 24 Version".

11

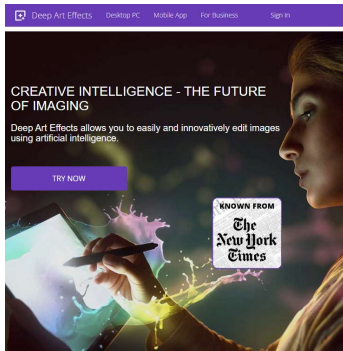
The screenshot shows a chat window on chat.openai.com. The left sidebar contains a list of chat titles, including "Процессор Intel I9", "Read CSV File", and "Software Project Management". The main chat area shows a conversation:

- User (MA): What is the next value for the following series 5 8 11 14
- AI (GPT): The given series follows an arithmetic progression with a common difference of 3. To find the next value, you add 3 to the previous term.
Therefore, the next value in the series would be 17.
- User (MA): For a triangle first two angles are 90 and 45. What is the third angle?
- AI (GPT): In a triangle, the sum of all three angles is always 180 degrees.
Given that the first two angles are 90 degrees and 45 degrees, you can find the third angle by subtracting the sum of the two known angles from 180 degrees.
$$180 - (90 + 45) = 180 - 135 = 45 \text{ degrees}$$

Therefore, the third angle of the triangle is 45 degrees.

At the bottom, there is a "Send a message..." input field and a "Regenerate response" button.

12



Генеративный ИИ — это категория искусственного интеллекта, которая позволяет машинам создавать контент. До сих пор мы видели много примеров в следующих областях: Генерация изображений и видео: Генеративно-сопоставительные сети (GAN), разновидность генеративной модели, часто используются для создания изображений и видео. Например, DeepArt и DeepDream — популярные инструменты, которые могут конвертировать изображения, чтобы имитировать стиль известных художников. Генерация текста: Генеративные модели искусственного интеллекта, такие как ChatGPT, используются во многих приложениях, связанных с генерацией текста, таких как составление электронных писем, написание статей, создание стихов и даже программирование.

Increased Productivity

Повышенная производительность

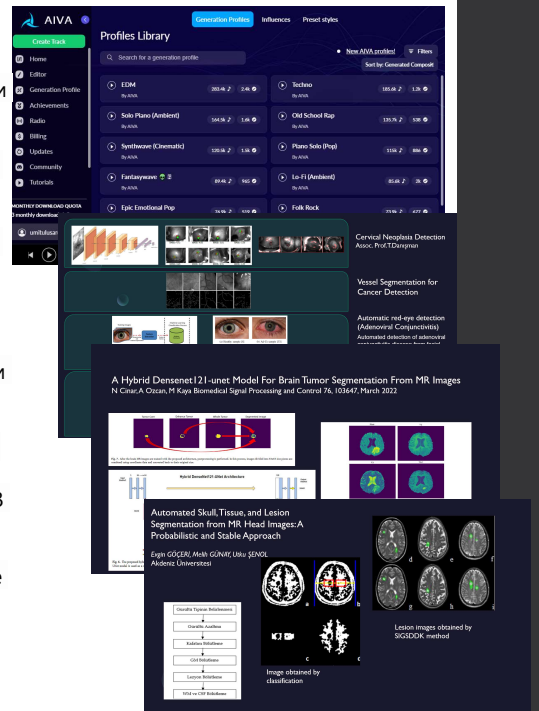
- Generative AI is a category of artificial intelligence that allows machines to **create content**.
- We have seen many examples so far for the following areas:
 - **Image and Video Generation:** Generative Adversarial Networks (GANs), a type of generative model, are often used to generate images and video. For instance, DeepArt and DeepDream are popular tools that can convert images to mimic the style of famous artists.
 - **Text Generation:** Generative AI models like ChatGPT are used in numerous applications involving text generation, such as drafting emails, writing articles, creating poetry, and even programming.

13

Increased Productivity

- **Music and Sound Generation :** Generative AI has also been applied to create music and sound. AIVA, OpenAI's MuseNet, and Google's Magenta are examples of tools that can generate original music pieces.
- **Drug Discovery:** Generative models are being used in the pharmaceutical industry to accelerate drug discovery. By learning the structure of existing drugs and how they interact with certain diseases, generative AI can create new potential drug compounds.
- **Gaming:** In the gaming industry, generative AI is used to create new levels, characters, and even entire games. This can lead to infinitely replayable games and new types of interactive experiences.

Музыка и генерация звука: Генеративный ИИ также применяется для создания музыки и звука. AIVA, MuseNet от OpenAI и Magenta от Google являются примерами инструментов, которые могут создавать оригинальные музыкальные произведения. Разработка лекарств: Генеративные модели используются в фармацевтической промышленности для ускорения разработки лекарств. Изучая структуру существующих лекарств и то, как они взаимодействуют с определенными заболеваниями, генеративный ИИ может создавать новые потенциальные лекарственные соединения. Игры: В игровой индустрии генеративный ИИ используется для создания новых уровней, персонажей и даже целых игр. Это может привести к бесконечному повторному прохождению игр и новым типам интерактивного опыта.



14



Increased Productivity

Прогнозное моделирование: Генеративные модели можно использовать для моделирования возможных будущих событий на основе прошлых данных. Это полезно в различных областях, включая финансы (моделирование рыночных событий), здравоохранение (прогнозирование вспышек заболеваний) и климатологию (моделирование изменений климата).
 Moda и дизайн: Генеративный ИИ также может помочь в разработке новых модных тенденций или архитектурных проектов, изучая существующие проекты и стили. Это может помочь предсказать, какие дизайны могут понравиться потребителям.

- **Predictive Modelling:** Generative models can be used to **simulate possible future events based on past data**. This is useful in a variety of fields including finance (simulating market events), healthcare (predicting disease outbreaks), and climate science (modelling climate changes).
- **Fashion and Design:** Generative AI can also help in designing new fashion trends or architectural designs by learning from existing designs and styles. It can help to predict what designs might appeal to consumers.

Smart Education



E-Pedagogy



World-class AI for education
Say hello to Khanmigo, Khan Academy's AI-powered guide, Tutor for learners. Assistant for

AI-powered K-12 adaptive instructional system and services

Providing personalized & high-quality K-12 after-school tutoring at an affordable price.

Personalized Learning

- AI systems can adapt to the learning pace and style of each student, identifying areas of weakness and customizing content to target these areas, thereby offering a more personalized learning experience.
- Adapt to Learning Pace and Style**
- Identify Areas of Weakness**
- Customizing Content**
- Example: AI-Based Learning Platforms:**
 - Khan Academy
 - Squirrel AI
 - Carnegie Learning
 - Thinkster Math

17

Visit all these places and MANY more with the Google Expeditions App!

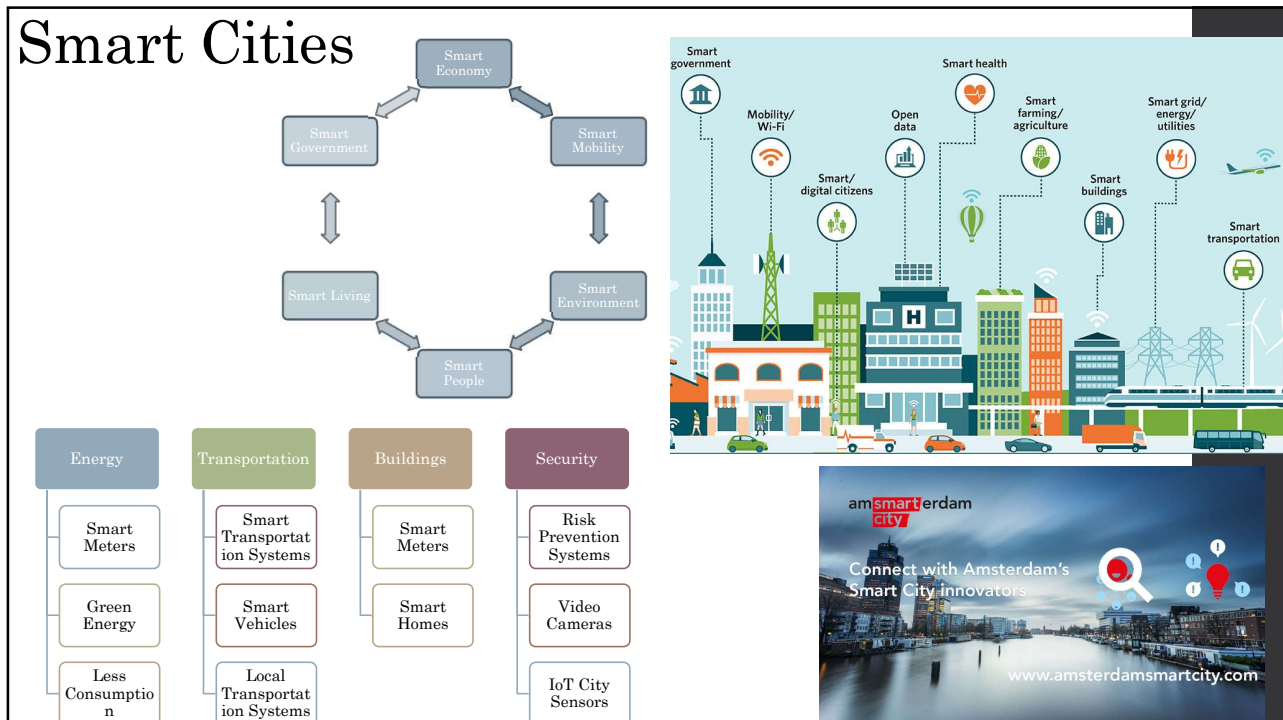
Google Expeditions: over a million students, on trips to virtually anywhere

OVER A MILLION STUDENTS, ON TRIPS TO VIRTUALLY ANYWHERE

Interactive Learning Experiences and AI Tutors


- AI can enable interactive and immersive learning experiences, like simulations, virtual field trips, and intelligent tutoring, thereby making education more engaging.
- Intelligent Tutoring**
 - Providing Explanations
 - Offering Practice Problems
 - Answering Questions
- Simulations**
- Virtual Field Trips**

18



19

Sundar Pichai



Born Pichai Sundararajan
July 12, 1972 (age 46)
Madurai, Tamil Nadu, India

Citizenship American

Alma mater Indian Institute of Technology Kharagpur
Stanford University
The Wharton School

Salary US\$199.7 million^[1] (2016)

Title CEO of Google

Board member of Alphabet Inc.^[2]
CapitalG^[3]
Magic Leap^[4]

Google / CEO

- 'Mobile First' to 'AI First' (2017 I/O Summit)
- How can we use AI in all our products.
- How can we use AI in whatever you do ?

Automation of Daily Tasks
Content Generation

Автоматизация повседневных задач
Генерация контента

20

Metaverse

- Вовлечение студентов
- Вовлечение учителей
- Персонализированное образование
- Экзамены, оценки и домашние задания
- Student Engagement
- Teacher Engagement
- Personalized Education
- Exams, Evaluations and Homeworks



21

Metaverse - The Immersive Digital World

Иммерсивная, 3D, виртуальная, а также многопользовательская онлайн-среда, которая позволяет (реальным) людям взаимодействовать друг с другом, социально и экономически, независимо от их местонахождения, используя вычислительные инструменты, такие как персонализированные агенты и моделирование (Diaz, Saldana & Avila, 2020) 3D-пространства в метавселенной позволят нам общаться, учиться, сотрудничать и играть способами, выходящими за рамки того, что мы можем себе представить.

- Immersive, 3D, virtual and also **multi-user online environment**, which allows (**real**) people to interact with each other, socially and **economically**, regardless of their location, using computational tools such as **personified agents** and simulation (Diaz, Saldana & Avila, 2020)
- 3D spaces in the metaverse will let us socialize, learn, collaborate and play in ways that go beyond what we can imagine.

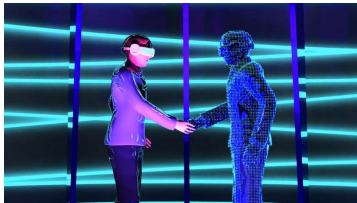


22

Education Metaverse (Образовательная метавселенная)

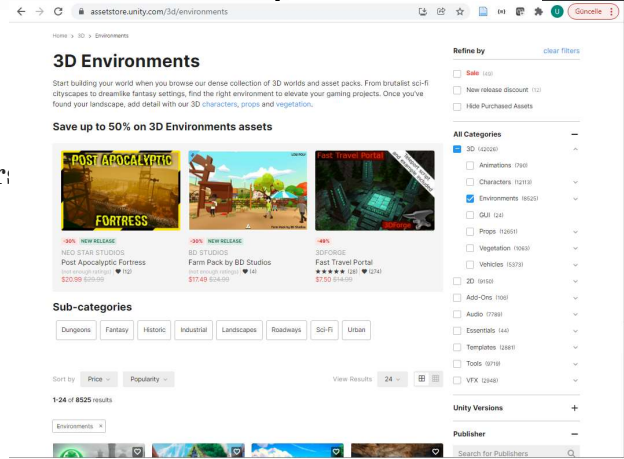
Преимущества

Данные об учащихся в режиме реального времени
Экономия времени учителей
Виртуальная учебная среда
Виртуальные лаборатории
Безграничное творчество



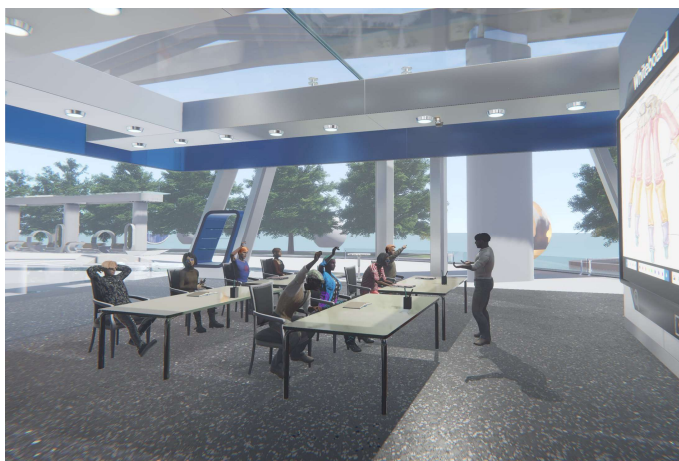
• Benefits

- Real-Time Student Data
- Saving Teachers' Time
- Virtual Learning Environments
- Virtual Laboratories
- Limitless Creativity



<https://assetstore.unity.com/3d/environments>

Example 3D Classrooms



Kwangwoon University, "See you at Metaverse Campus!"

<https://www.breakroom.net/virtual-classroom>

Virtual Laboratory Now Available via e-Government Gateway

14 Dec 2020

Share: [f](#) [in](#)

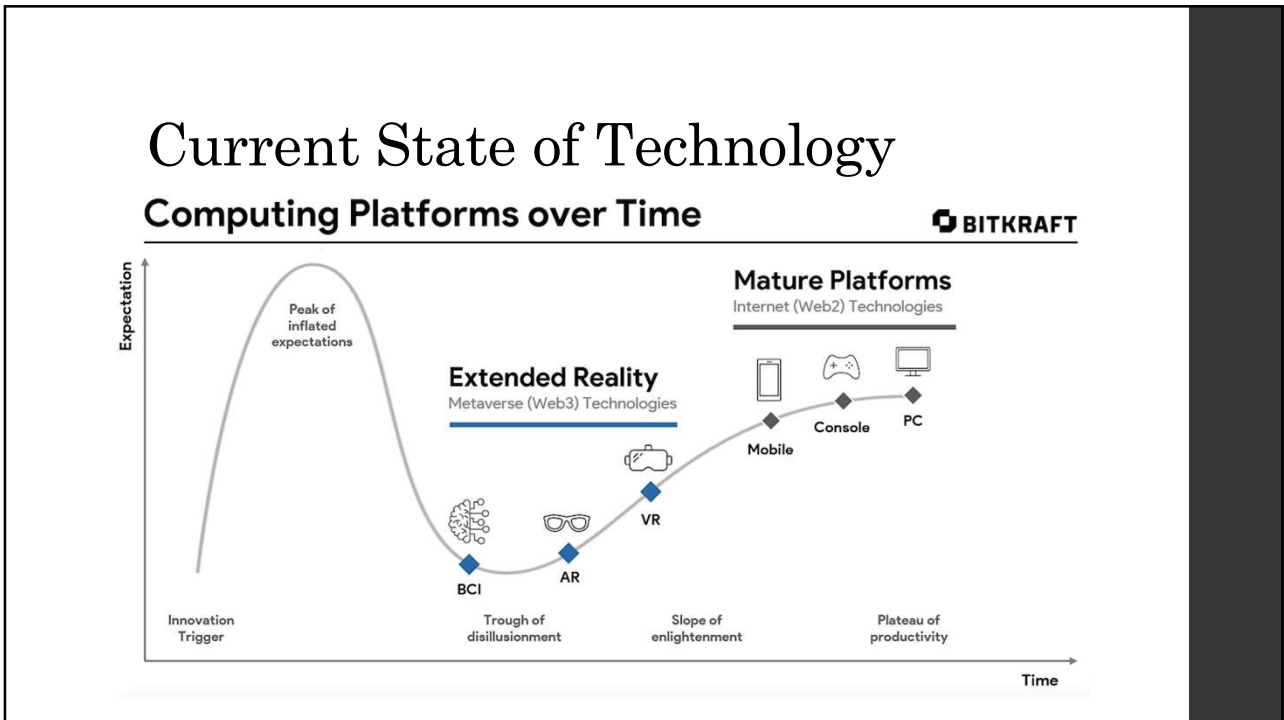
Virtual Laboratory Application service is now available via e-Government Gateway. Students attending the universities offering distance learning can receive the laboratory courses of physics and chemistry by joining the Virtual Laboratory of Council of Higher Education (YÖK) in digital space. Please click to access Virtual Laboratory Application.

<https://www.vrlabacademy.com/>

Example Laboratories

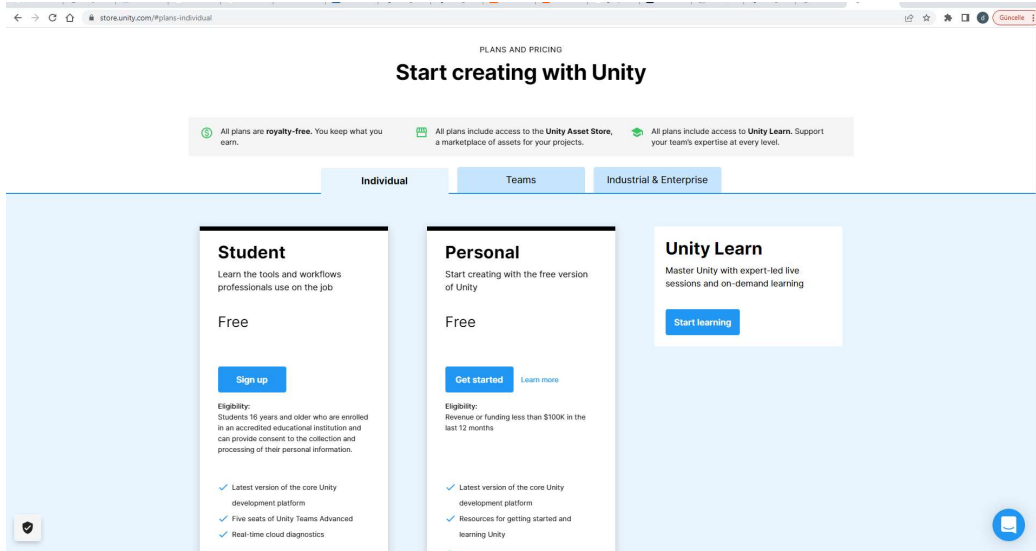
Примеры лабораторий

25



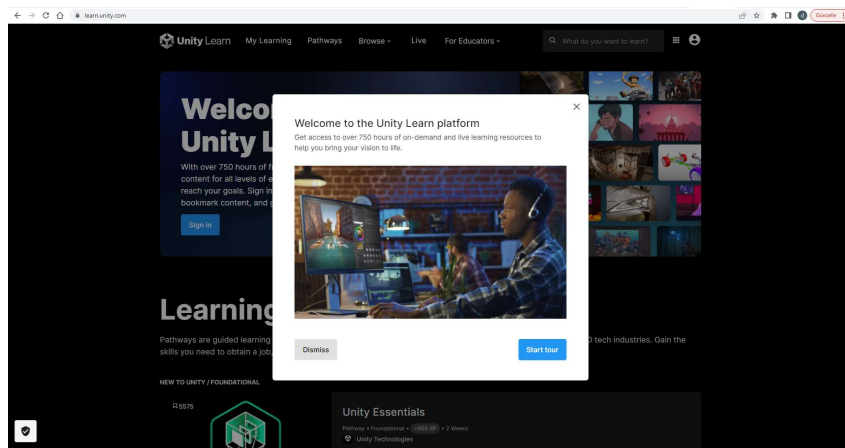
26

Start Creating with Unity (Free)



27

Unity Learning Platform



28

Evaluation of Metaverse as a Learning Environment and Level of Technology Acceptance: Engineering Example

This study aimed to assess the influence of the Metaverse on learning outcomes and the level of acceptance and usage of this new technology among mechanical engineering students. Participants were randomly assigned to two groups: a control group receiving traditional education and an experimental group that received both traditional education and supplementary training **in the Metaverse environment**. **Pre-test and post-test assessments were conducted to compare the change in knowledge levels between the two groups**. Furthermore, the technology acceptance and usage of students using the Metaverse were evaluated using a Turkish valid and reliable scale based on the Unified Theory of Acceptance and Use of Technology (UTAUT) model (1,2). The findings of this study contribute to our understanding of the potential benefits of the Metaverse in enhancing learning outcomes and its adoption in engineering education.

<https://metaverse-makine.itch.io/lesson>



29



Study Group

- The population of this study was engineering students studying the topic of machine parts. The sample of students selected is primarily from the **Mechanical Engineering** program, to facilitate easy access to the students in a group setting. The students were assigned to the experiment or control group by randomly selecting student numbers from a list of students in the class where the course was taught and dividing the total number of students in half.

30

Variables	Category	n	%
Class	1 st	52	57,1%
	2 nd	39	42,9%
Sex	Male	71	87%
	Female	11	13%
Age (mean ± sd)		82	19,4 ± 1,1
Device Ownership			
Mobile Phone		82	100%
Tablet		15	18%
Laptop		61	74%
Mobile Phone Usage	Very good	32	39%
	Good	37	45%
	Moderate	13	16%
Internet Usage			
Availability		82	100%
Easy to use		80	98%
App download		81	99%
Using for education		65	79%
	YouTube	38	46%
	Google	14	17%
	Udemy	9	11%
	Other	18	21%
Knowledge about Metaverse		48	57%

Table 1.
Demographic data
of the
respondents.

31

Variables	Control group (n=47)		Metaverse group (n=44)		Test Value	p
	Mean ± SD	Median (Q1-Q3)	Mean ± SD	Median (Q1-Q3)		
Pre Test	33.1 ± 14.4	30 (25-40)	34.2 ± 12.1	30 (25-45)	t: -0.40	.69 ^a
Post Test	68.5 ± 2.1	75 (55-85)	77.8 ± 13.8	77.5 (72.5-90)	U: 774	.038^b
Test Value p	z: -5.85 <.001 ^c		z: -5.79 <.001 ^c			
Post Test – Pre Test (Δ)	35.4 ± 19,8	35 (20-50)	43.6 ± 15.6	45 (35-55)	t: -2.19	.031^a

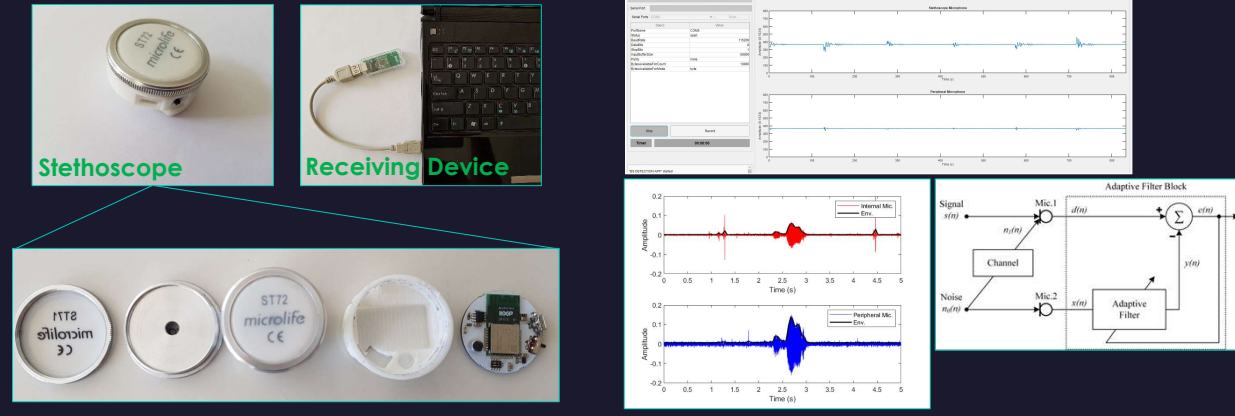
Pre-Post Fail-Pass Rates

32

IoT-Driven Electronic Stethoscope for Automatic Detection of Bowel Sounds

- Turk, E., Ulsar, U.D., Ogunc, G., Canpolat, M., Yaprak, M. (2021). Active Noise Cancellation for IoT-Driven Electronic Stethoscope: A Comparative Study of Adaptive Filters. In: Ever, E., Al-Turjman, F. (eds) Forthcoming Networks and Sustainability in the IoT Era. FoNeS-IoT 2020. Lecture Notes of the Institute for Computer Sciences, Social Informatics and Telecommunications Engineering, vol 353. Springer, Cham. https://doi.org/10.1007/978-3-030-69431-9_2
- Ulsar, U.D., Turk, E., Oztas, A.S., Savli, A.E., Ogunc, G., Canpolat, M. (2019). IoT and Edge Computing as a Tool for Bowel Activity Monitoring. In: Al-Turjman, F. (eds) Edge Computing. EAI/Springer Innovations in Communication and Computing. Springer, Cham. https://doi.org/10.1007/978-3-319-99061-3_8
- Ulsar, U.D.: Recovery of gastrointestinal tract motility detection using Naive Bayesian and minimum statistics. Comput. Biol. Med. 51, 223–228 (2014). <https://doi.org/10.1016/j.combiomed.2014.05.013>

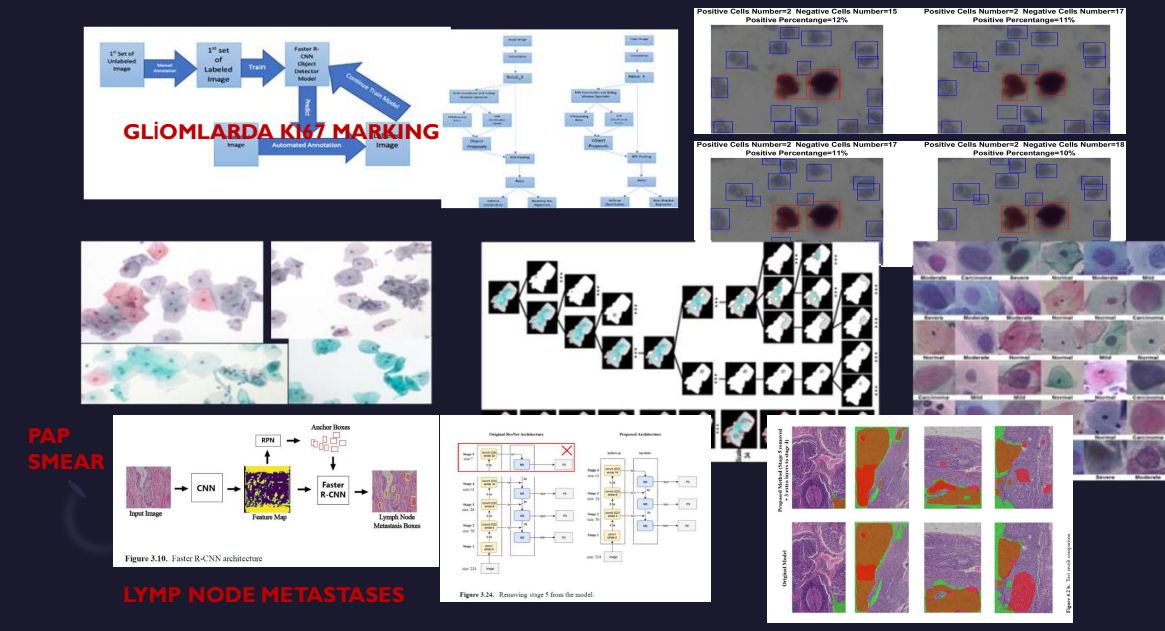
We have developed an IoT-guided Electronic Stethoscope specifically designed to monitor continuous bowel activity of hospitalized patients after abdominal surgery. Active Noise Cancellation methods used for noise reduction have been developed. Naive Bayesian and Minimum Statistics used for recognition of intestinal activity.



33

Fusion Planet: Past, Today and Future of Computer Scientific Solutions in Digital Pathology.

Arş. Gör. Taha Yiğit ALKAN, Doç. Dr. Havva Serap TORUN, Dr. Öğr. Üyesi Hüseyin Gökhan AKÇAY

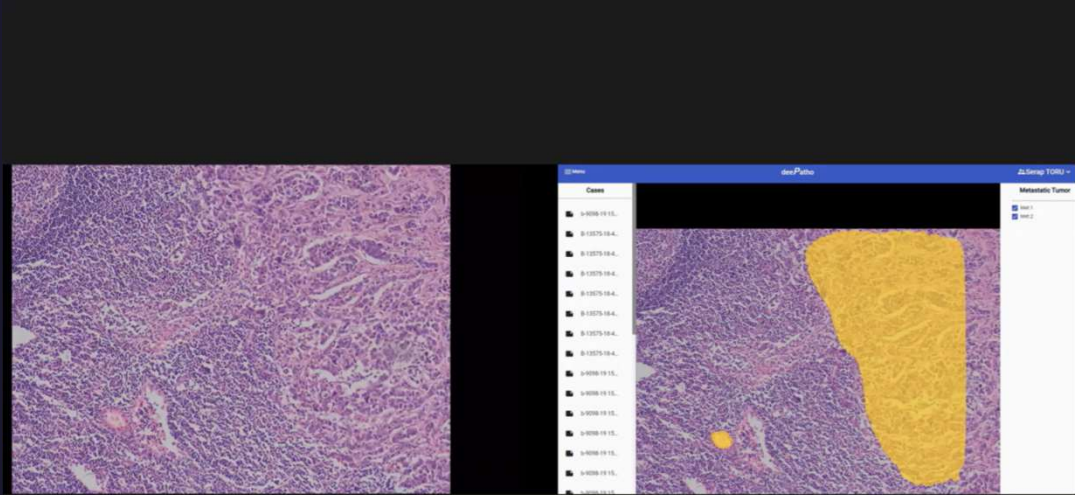


34

Fusion Planet: Past, Today and Future of Computer Scientific Solutions in Digital Pathology.

ICOFMEP'21

Arş. Gör. Taha Yiğit ALKAN, Doç. Dr. Havva Serap TORUN, Dr. Öğr. Üyesi Hüseyin Gökhan AKÇAY



35

35

Thanks

Prof. Ümit D. ULUŞAR
Akdeniz University Computer Eng.
E-Mail: umitulusar@akdeniz.edu.tr



36