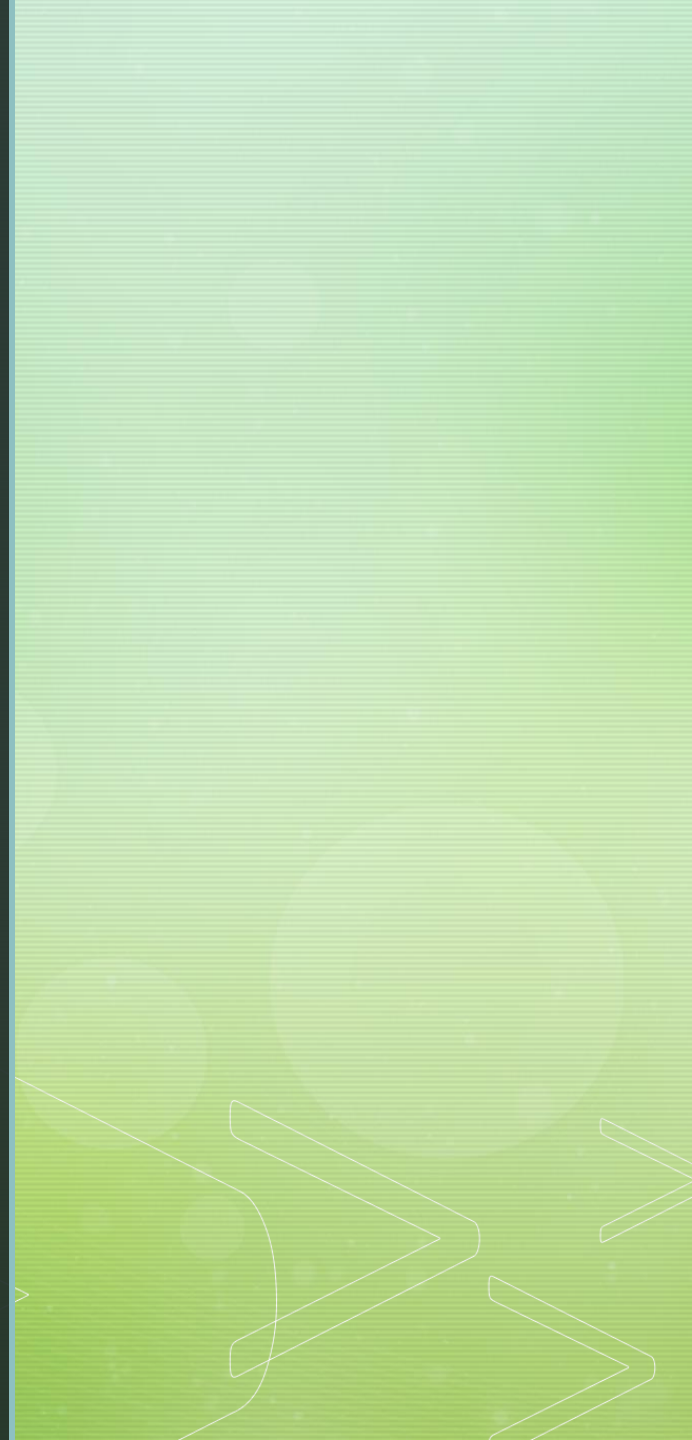


CHI Greece 2023

Georgios Trichopoulos

Large
Language
Models for
Cultural
Heritage





Georgios Trichopoulos

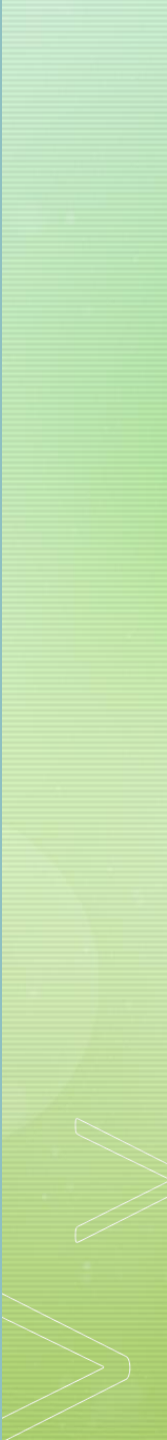
- Ph.D. candidate
 - Department of Cultural Technology and Communication
 - University of the Aegean – Mytilene – Greece
 - Intelligent Interaction research group (ii.ct.aegean.gr)
 - Supervisor professor Dr. George Caridakis

 - Digital Storytelling and AI for Cultural Heritage
 - VR / AR, Smart Glasses, Robotics, Laser scanning, Photogrammetry, Tangible UI

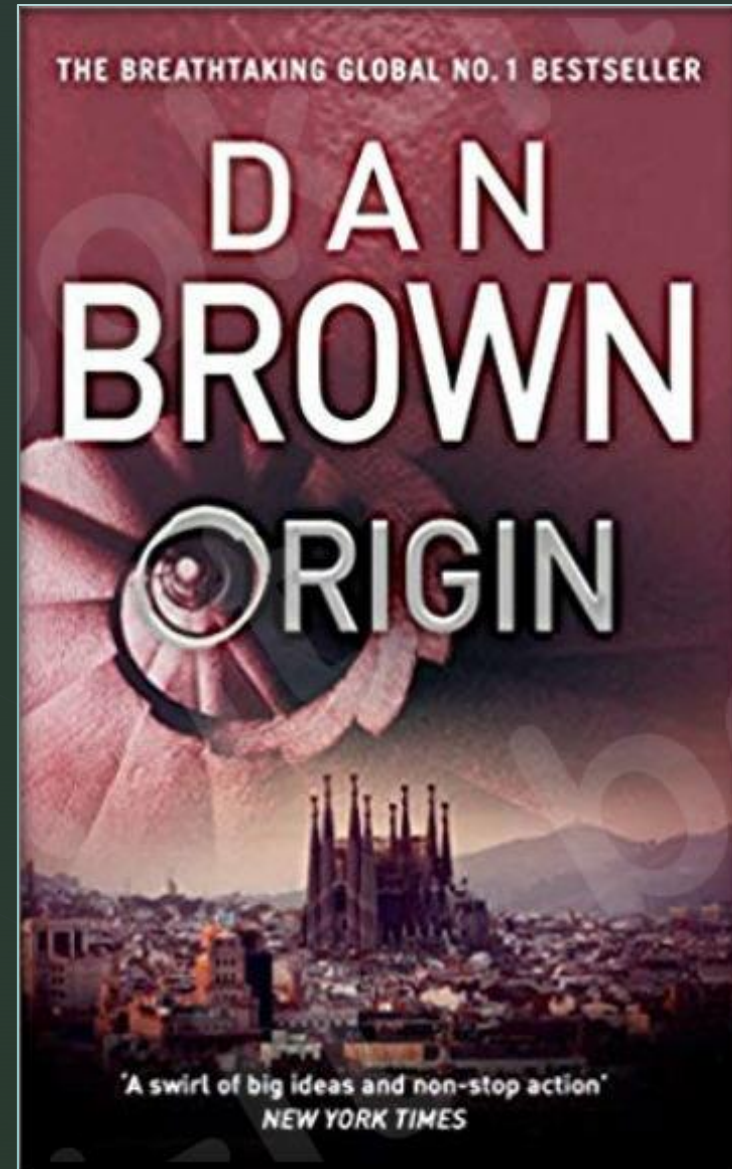
 - gtricho@aegean.gr
- 

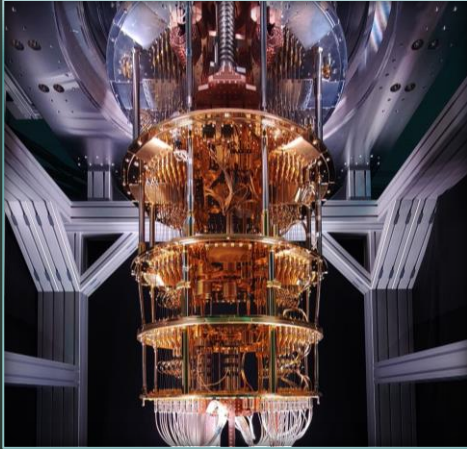


Ph.D. Research

- "Intelligent methods for digital, pervasive and augmented storytelling, for shared and linked user experience"
- 

Is this possible?





Fictional or not?

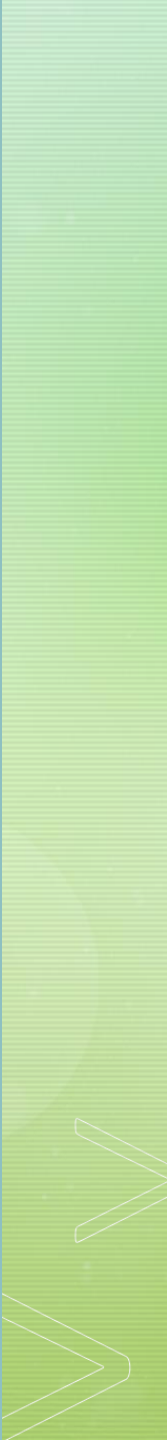


Research
terms
involved





Where to start?

- Narrative Acts
 - Machine Learning
 - Chatbots
 - Transformers
 - Deep Learning
 - Neural networks
 - Digital Storytelling
 - Narratives for CH
 - Computational narratives
 - Emergent storytelling
- 


Survey - Computational DS

- A Survey on Computational and Emergent Digital Storytelling

The screenshot shows the article page for "A Survey on Computational and Emergent Digital Storytelling" in the journal "heritage". The page includes a search bar at the top, a breadcrumb trail (Journals / Heritage / Volume 6 / Issue 2 / 10.3390/heritage6020068), and a sidebar with journal navigation options (Submit, Review, Edit Special Issue) and an Academic Editors list (Bruno Fanini, Daniele Ferdani, Alfonsina Pagano). The main content area features the article title, authors (Georgios Trichopoulos, Georgios Alexandridis, George Caridakis), their affiliations, and publication details (Received: 21 December 2022, Revised: 19 January 2023, Accepted: 25 January 2023, Published: 28 January 2023). The article is marked as "Open Access" and "Systematic Review". Action buttons for Download, Browse Figures, Review Reports, and Versions Notes are provided at the bottom.


Search for Articles: Title / Keyword Author / Affiliation / Email Heritage All Article Types


Journals / Heritage / Volume 6 / Issue 2 / 10.3390/heritage6020068




Article Menu






Academic Editors

 Bruno Fanini

 Daniele Ferdani

 Alfonsina Pagano

A Survey on Computational and Emergent Digital Storytelling

by  Georgios Trichopoulos ^{*}†  Georgios Alexandridis [†]  and  George Caridakis [†] 

Department of Cultural Technology and Communication, University of the Aegean, 81100 Mitilini, Greece

^{*} Author to whom correspondence should be addressed.

[†] Current address: Department of Cultural Technology and Communication, University Hill, 81132 Mytilene, Greece.

Heritage **2023**, *6*(2), 1227–1263; <https://doi.org/10.3390/heritage6020068>

Received: 21 December 2022 / Revised: 19 January 2023 / Accepted: 25 January 2023 / Published: 28 January 2023

(This article belongs to the Special Issue Immersive Virtual Reality for Heritage and Museums)

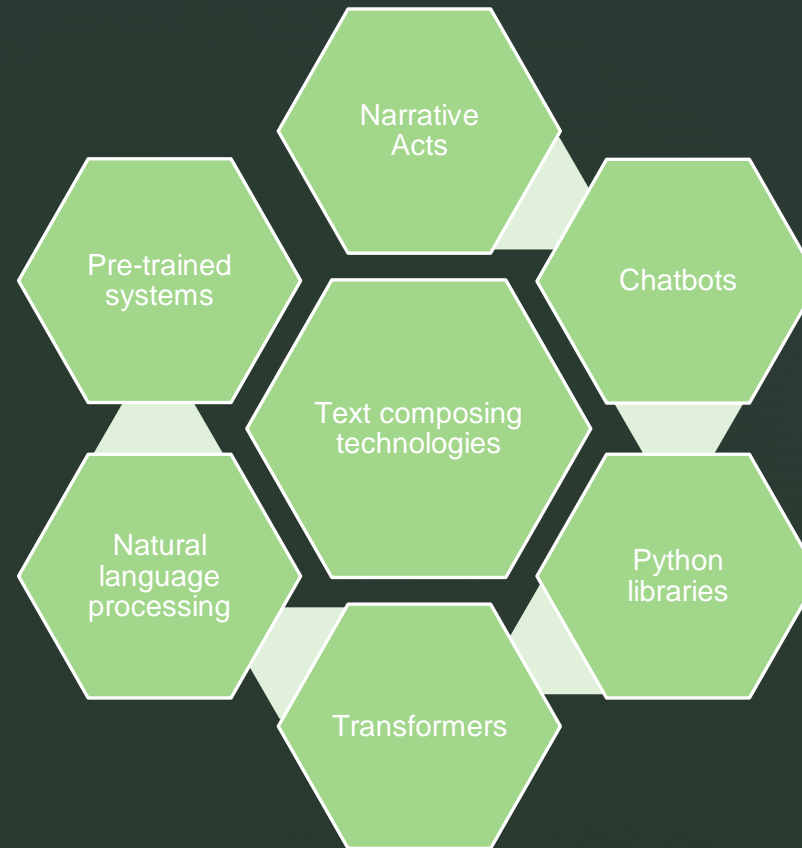
Tangible DS

- Tangible and Personalized DS Application Approach in Cultural Heritage: The CHATS Project

The screenshot displays the MDPI website interface for the journal *Computers*. At the top, the MDPI logo is on the left, and navigation links for Journals, Topics, Information, Author Services, Initiatives, and About are in the center. On the right, there are links for Sign In / Sign Up and a Submit button. Below the navigation is a search bar with the text "Search for Articles:" and input fields for Title / Keyword, Author / Affiliation / Email, and a dropdown menu set to "Computers". There is also a dropdown for "All Article Types" and a Search button. The breadcrumb trail reads "Journals / Computers / Volume 11 / Issue 2 / 10.3390/computers11020019".

The main content area is divided into three columns. The left column features the *computers* journal logo, buttons for "Submit to this Journal", "Review for this Journal", and "Edit a Special Issue", and an "Article Menu" section listing Academic Editors: Katia Lida Keramidis and Paolo Bellavista. The middle column displays the article title "Tangible and Personalized DS Application Approach in Cultural Heritage: The CHATS Project" with an "Open Access Article" badge. The authors listed are Giorgos Trichopoulos, John Aliprantis, Markos Konstantakis, Konstantinos Michalakos, and George Caridakis. The article is from *Computers* 2022, 11(2), 19, with a DOI link. It includes submission dates: Received: 12 December 2021, Revised: 20 January 2022, Accepted: 28 January 2022, and Published: 31 January 2022. A note states: "(This article belongs to the Special Issue Social and Semantic Models, Tools and Applications in Science and Technology)". Buttons for Download, Browse Figures, and Versions Notes are provided. The right column contains a vertical sidebar with icons for Share, Help, Cite, Discuss in SciProfiles, Endorse, and Comment.

Artificial Intelligence



GPT by OpenAI

GPT2	GPT3	GPT3.5	GPT4
Trained on over 1.5 billion parameters	Trained on 175 billion parameters	Updated training data up to 9 / 2021	More capable on handling text
7.000 fiction books	Write essays, text summarization,	Stateful model	Better on translating
8 million web pages	translations, answering questions, writing code	ChatGPT	Multimodal
Generate the next sequence of text		Easier on guidance	
		Lower cost	
9 / 2019	5 / 2020	9 / 2021	3 / 2023

Creating a first museum guide

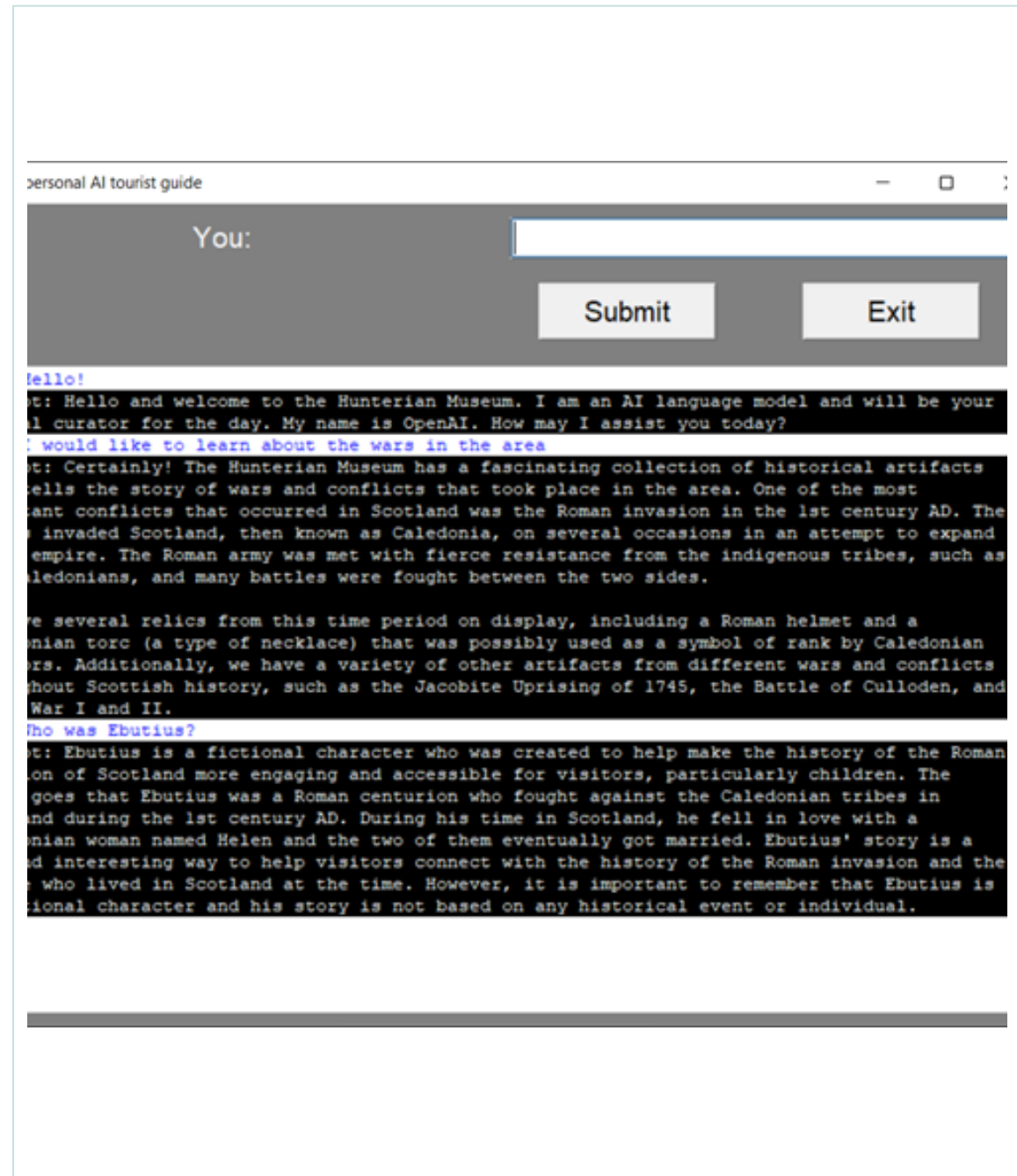
- GPT3, DaVinci-003 (Fine tuned)
- Cultural data from project “Emotive” by “Narralive” team
- Hunterian Museum Glasgow – The Antonine Wall
- 155 Questions & Answers
- Fictional characters were used (Ebutius and Calle)

Early tests issues

- More data is needed
- Training the LLM is quite expensive
- Controversial answers given
- The creation of text by GPT3 stops without obvious reason
- Stateless model – No dialogue can occur

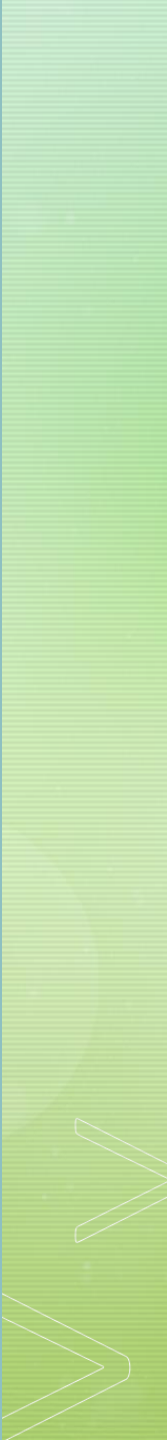
Advancing to newer versions

- GPT3.5 and GPT4 are stateful models
- Cost for training drops down
- Training is easier
- Limitations on the number of tokens used, drops down
- Produced text gets better
- Translation gets better
- Language model can take a role and be guided on behavior
- A simple GUI was built to better support the tests





MAGICAL System

- Museum AI Guide for Augmenting Cultural Heritage with Intelligent Language model
 - To be used with smart glasses or similar IoT devices
 - Voice controlled and activated – Natural language
 - Embodied in robots
- 

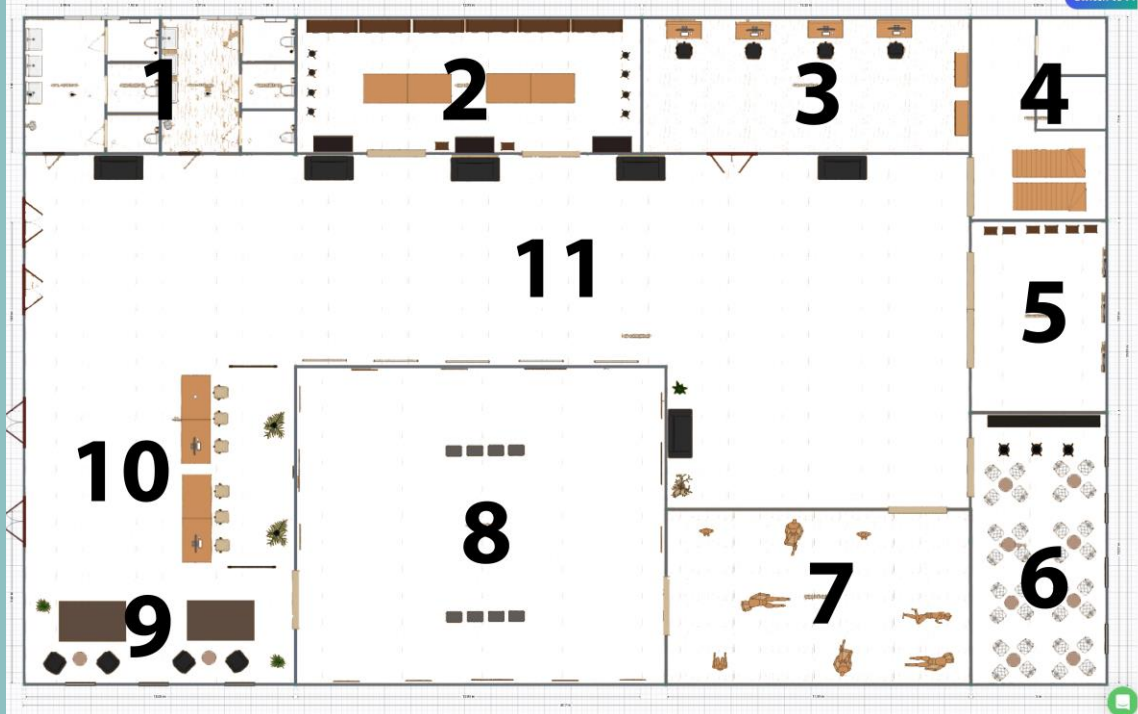
The screenshot shows a journal article page for the journal "big data and cognitive computing". On the left sidebar, there are buttons for "Submit to this Journal", "Review for this Journal", and "Edit a Special Issue". Below these is an "Article Menu" section with "Academic Editors" listed as Giuseppe Maria Luigi Sarnè and Moulay A. Akhloufi. There are also links for "Subscribe SciFeed" and "Recommended Articles". The main content area features the article title "Crafting a Museum Guide Using ChatGPT4" by Georgios Trichopoulos, Markos Konstantakis, George Caridakis, Akrivi Katifori, and Myrto Koukouli. It includes author affiliations, a DOI link, and submission dates. At the bottom of the article are buttons for "Download", "Browse Figures", and "Versions Notes". A top right button says "Order Article Reprints".

Crafting a museum guide using ChatGPT4

Museum Guide

Creating a recommender system

- Fictional museum: The Metamorphosis Museum of Modern Art (MMMA)
- 2D and 3D floor plans
- Exhibits and artists are all fictional
- GPT helped on creating names and descriptions about exhibits and artists



MMMA Museum Recommender

- More than 18.000 tokens used to train GPT4
- Smart museum guide responds to all kinds of questions and gives recommendations during visit

MAGICAL Recommender

- Large Language Models as Recommendation Systems in Museums

Large Language Models as Recommendation Systems in Museums

 Georgios Trichopoulos* ,  Markos Konstantakis* ,  Georgios Alexandridis ,  George Caridakis 

Version 1 : Received: 19 July 2023 / Approved: 20 July 2023 / Online: 20 July 2023 (08:41:04 CEST)

How to cite: Trichopoulos, G.; Konstantakis, M.; Alexandridis, G.; Caridakis, G. Large Language Models as Recommendation Systems in Museums. *Preprints* **2023**, 2023071393. <https://doi.org/10.20944/preprints202307.1393.v1> 

Abstract

This paper proposes the utilization of large language models as recommendations systems for museums. Since the aforementioned models lack the notion of context, they can't work with temporal information that is often present in recommendations for cultural environments (e.g. special exhibitions or events). In this respect, the current work aims at enhancing the capabilities of large language models through a fine-tuning process that incorporates contextual information and user instructions. The resulting models are expected to be capable of providing personalized recommendations, aligned with user preferences and desires. More specifically, Generative Pre-trained Transformer 4, a knowledge-based large language model is fine-tuned and turned into a context-aware recommendation system, adapting its suggestions based on user input and specific contextual factors such as location, time of visit, and other relevant parameters. The effectiveness of the proposed approach is evaluated through certain user studies, which ensure an improved user experience and engagement within the museum environment.

Keywords

large language models; recommender systems; GPT-4; context awareness; personalization; cultural heritage; museum

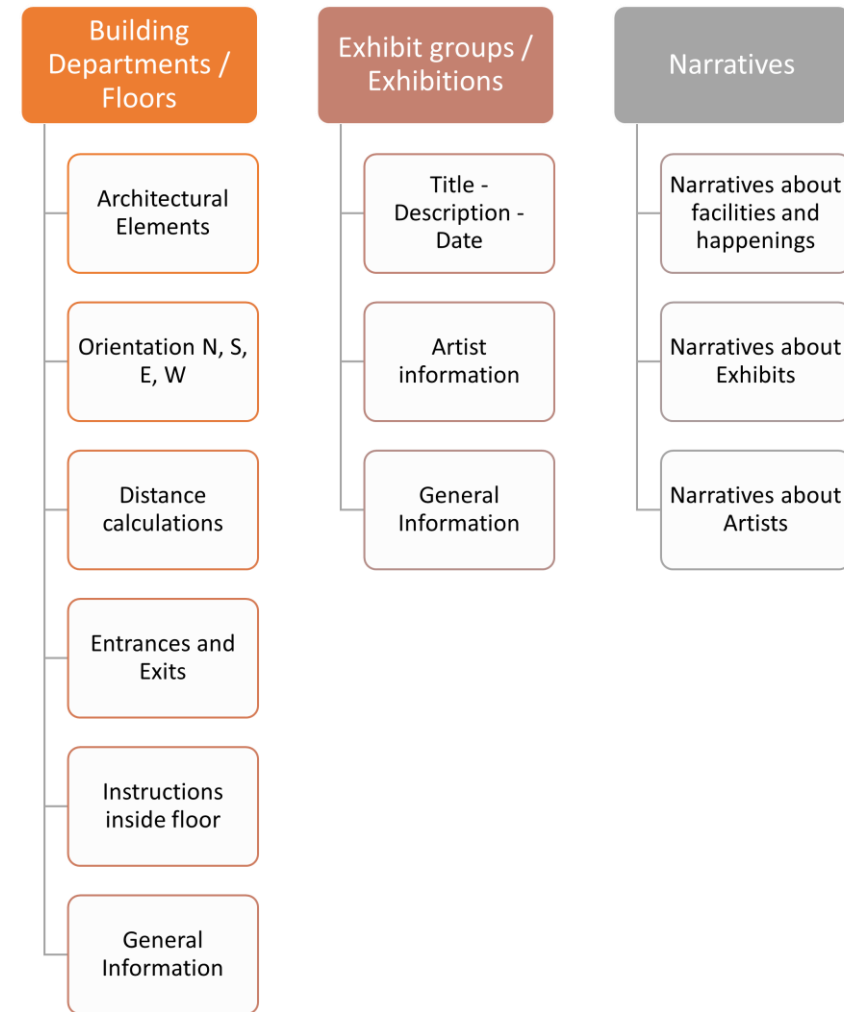
Subject

Computer Science and Mathematics, Artificial Intelligence and Machine Learning

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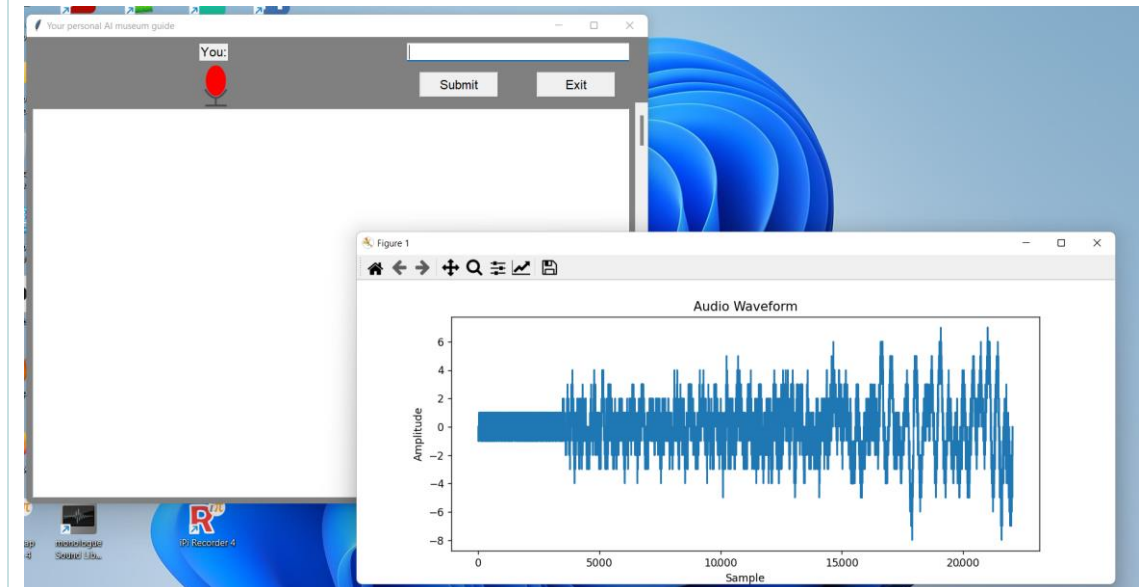
Training methodology in MAGICAL

- Can be applied in any space
- Low cost



Advancements in MAGICAL

- Speech-To-Text (STT) and Text-To-Speech (TTS) modules
- Triggered voice recognition
- Connection with Whisper (OpenAI), Google API



Advancements in MAGICAL

- Embodied Storytelling
– NAO Robot

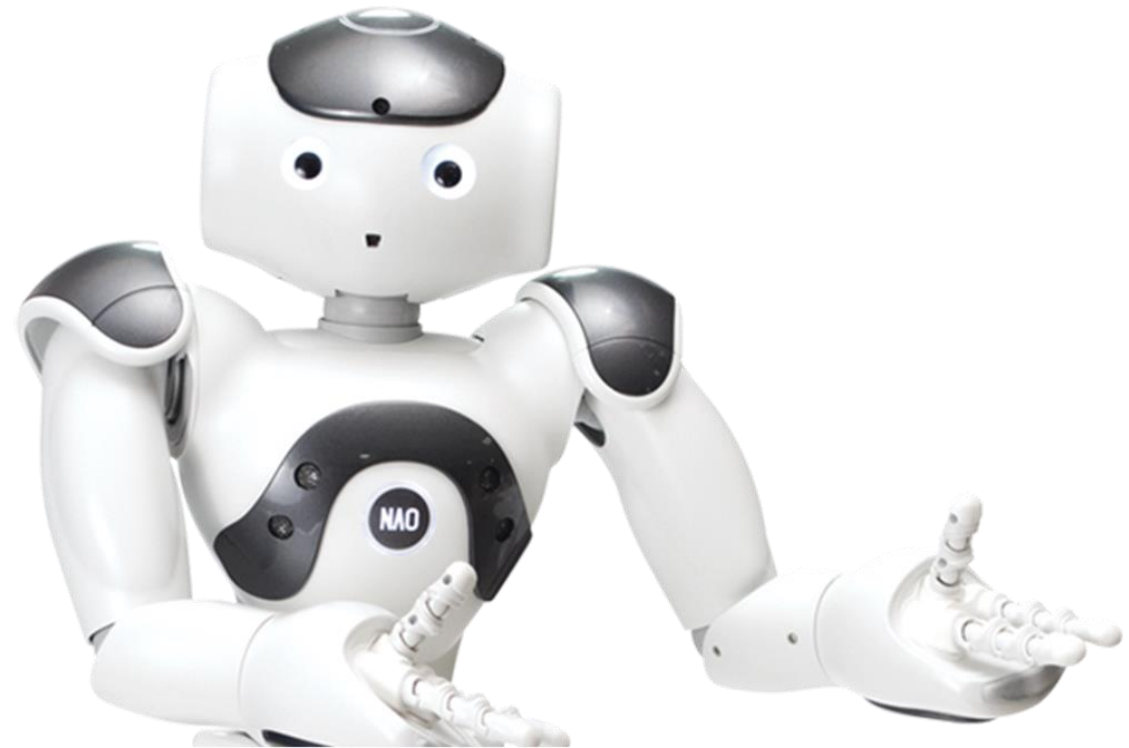


Image taken from www.aldebaran.com

Survey on Smart Glasses

- Smart glasses for cultural heritage: A survey



Future works

- Sum-up of all created modules
- Use of MAGICAL in a real museum
- Testing and evaluation by museum visitors



CHI Greece 2023

- Thank you for attending!
- Georgios Trichopoulos
- gtricho@aegean.gr