MEET SPARK

The Power of Large Language Models, Generative Pre-Trained Transformers and Custom Neural Networks in Higher Education Training.

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INTRODUCTION







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GPT'S, LLM'S, AI'S

Recent technology developments have made it possible to index, reference and infer connections between concepts contained in large bodies of human knowledge. Chat-GPT3 for instance is trained on a corpus of text approaching half-a-trillion words





WHAT IS A GPT AND WHAT CAN IT DO?

A Generative Pre-trained Transformer (GPT) is a language model that uses deep learning to produce human-like text. It does this by statistically predicting the next word(s) in a body of text relevant to an input question or 'prompt' by a user.

It can also 'create' cognitive connections between ideas and concepts based on how it's neural learning network is trained to identify and apply rules of theory and correlation.



ChatGPT

O Examples

antum computing in simple terms" ->

"Got any creative ideas for a 10 year old's birthday?" →

"How do I make an HTTP request in Javascript?"

4 Capabilities

ers what user said earlier in the

tGPT Feb 13 Version. Free Research Preview. Our goal is to s more natural and safe to interact with. Your







WHY IS THIS TECHNOLOGY SO POWERFUL NOW?

Lexical and semantic text analysis was developed in the 1950's - the idea that strings of text can be grouped, classified and meta-tagged into concepts is not new. The innovation driving it today is super fast, cheap, highly scalable processing power (GPU's) and lightweight programming languages. These enabled the creation of advanced machine learning platforms that mimic the way that humans think and communicate.



BUT AI IS BAD AND WE DON'T LIKE IT.

We somewhat agree. This technology has far reaching effects for humanity and we're only just scratching the surface. Instead of taking a naive approach where we pretend the machines aren't going to enslave us or an adversarial one where we try to ignore them, we prefer to test and learn about them with care.





CAN WE USE THIS **TECHNOLOGY IN** HIGHER EDUCATION?

By thinking about how these new tools can augment and extend the capabilities of our people rather than replace them, interesting use-cases can be found - particularly as they relate to developing human capacity in Higher Education Institutions in South Africa.





One example is that trainers and trainees alike should be highly familiar with the material created by SAIDE on behalf of USAf. The body of theoretical and practical material is relatively dense and spans multiple training delivery days over the course of 2 years.

Assuming that there are gaps between training sessions, we can infer that there will be a 'spacing' effect' during which certain concepts and pieces of knowledge will be forgotten over time.

Since lecturers and Master Trainers are likely to be time constrained by their day-to-day responsibilities, could we assist by making the learning material more accessible with AI?





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ULDP USE CASE





SO...WHAT IF WE CREATED AN AI CO-PILOT?

An 'always-on' reference tool that learns and refines its' responses to questions about the ULDP learning material. That 'remembers' your learning needs and can make pedagogical connections between subject matter. That never gets tired of answering you.

Are you ready to meet Spark?



WHAT WE DID

GPT LANGUAGE MODEL

OpenAI

SAIDE LEARNING MATERIAL

- Chong_20
- DBR Sessi
- DBR Sessio
- **DBR Sessi**
- Denhere_
- Doc3_Med
- Doc4_Bio
- Haffejee_ Herringtor
- Herringto
- Incorpora
- Learning [
- Learning
- LearningD
- More Abou
- OER & OA

Leveraging OpenAl's DaVinci003 syntax, grammar and text analysis model as the basis for a custom AI Chat Bot aka Spark

Trained Spark on the PDF documents provided by SAIDE for the ULDP Programme

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CANVAS LMS INTEGRATION

20_physiotherapy ed_authentic as				
on 3 Resources links.pdf			canvas	
Authentic pedagogy_Implications f			BY INSTRUCTURE	
diation_Three_Presences_in_Learni 💿		Ask me anything about ULDP	output	
logy_Session_1_DNA_annotated.pdf 💿	Ν	what is the uldp strategy?	The ULDP strategy is to develop and professionalize university academic staff by providing a	
2021_Photovoice in health sciences 💿			Master Trainer Programme (MTP) and a Lecturer Development Programme (LDP). The curriculum for both components is being designed to reach over 1,000 participants from all 26 public universities in the next two years. The ULDP design and delivery team will comprise	
n Oliver_2000_Instr design fwork.pdf 💿			local and international teaching and learning, digital transformation, ICT and OD expertise.	
n_2006_Keynote Authentic Learnin 💿				
ting authentic learning_university c 💿		Clear	Submit	
Design.pdf 💿				
with Technology.pdf 💿				
Design393951.pdf 💿				
ut Competencies.pdf 💿				
Publishing.pdf 🥑				

Placed Spark inside Canvas - this is live in the <u>ULDP-DEV Course</u> right now for testing purposes







REFERENCE

It can act as a content library driven by natural language questions



WHAT CAN SPARK DO?

Surprisingly more than you'd think, but it's not quite there yet.

RECONSTITUTE / EVALUATE

Ideas & concepts against one another. Can output results in new formats.



SUMMARISE

Concepts, paragraphs, documents, lesson plans and lecture notes



CREATE & INFER

Complex relationships between theoretical concepts...erm ok a bit...it's still learning :)





Enter your text		
How can you help train university lecturers giv	<i>v</i> en the information you l	have at hand?
Clear		Submit

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Saide is not a pers	on: it is an acronym for the South African Institute for Distance Education
	Flag

< Bit of an attitude but we'll let it slide for now...:)

output

Based on the information provided, I would suggest a plan to help train university lecturers on the techniques of using a multimedia program as a situated learning environment. The plan should include the following components:

1. Provide an overview of the multimedia program and its capabilities, including the nine elements of situated learning that are incorporated into the program.

2. Demonstrate how the program can be used to create an authentic learning environment, including the use of authentic tasks, collaboration, and articulation.

3. Provide examples of how the program can be used to support collaborative construction of knowledge, including the use of classroom organization, incentive structures, and scaffolding.

4. Demonstrate how the program can be used to promote reflection and articulation, including the use of non-linear navigation, comparison with experts and other learners, and the opportunity to publicly present arguments.

5. Provide guidance on how to use the program to promote authentic assessment of learning within the tasks, including the use of fidelity of context, multiple indicators of learning, and validity and reliability with appropriate criteria for scoring varied products.

6. Provide guidance on how to use the program to support coaching and scaffolding, including the use of collaborative groups and the lecturer's role

System



Enter your text	
Why do you think that students enter the world of work wi	thout the ability to transfer learning to real life situations
Clear	Submit

Enter your text		
Design a 5 point lesson plan to teach students know	ledge transfer. Le	ts think step by step
Clear		Submit

S P A R K

output

Students enter the world of work without the ability to transfer learning to real life situations because they are often taught in a largely fragmentized and decontextualised manner in the classroom. This means that they are not given examples of expert performances to model real-world practice, which is necessary for developing professional performance. Furthermore, they are not given the opportunity to examine a problem or a topic from various theoretical and practical perspectives and points of view, which is necessary for developing transferable skills such as analytical and creative thinking, communication and interpersonal skills, teamwork, problem solving, resultsoriented performance, decision making, conflict management and digital skills. Additionally, they are not provided with adequate coaching and scaffolding to help them develop the necessary skills and strategies to complete tasks in the real world. Finally, they are not given the opportunity to engage in authentic assessment, which is necessary for developing the ability to put the multi-disciplinary knowledge acquired during their studies into practice to solve real-world problems. This lack of authentic assessment is further compounded by the fact that the current education system is largely based on a neo-liberal agenda, which focuses on the acquisition of knowledge rather than the development of skills and competencies. This means that students are not given the opportunity to engage in activities that

Flag

output

1. Introduction (10 minutes): Introduce the concept of knowledge transfer and explain why it is important. Ask students to brainstorm examples of knowledge transfer in their everyday lives. Discuss the different stages of knowledge transfer, such as McCracken's stages, and the computer software used.

2. Activity (15 minutes): Divide students into small groups and provide each group with a scenario. Ask them to discuss the scenario and identify the knowledge transfer that is taking place. Ask them to consider the question from a number of different perspectives, such as the parents', teachers' and children's perspectives.

3. Discussion (15 minutes): Ask each group to present their scenario and explain the knowledge transfer that is taking place. Ask the class to discuss the different types of knowledge transfer that can take place.

4. Examples (15 minutes): Provide students with examples of knowledge transfer from different contexts. Ask them to identify the knowledge transfer that is taking place in each example. Ask them to analyze the data to gain insight into the effectiveness of the program and the pattern of use.

5. Conclusion (5 minutes): Summarize the main points of the lesson and ask students to reflect on what they have learned. Ask them to think of ways they can

< Response is cut-off as the maximum response word count was reached. This can be improved as the AI learns to be less verbose in its' responses.





Enter your text	
Summarise the 3 presences theory	
Clear	Submit

Enter your text	
What is cognitive presence according to Enbraim Mblanga?	
What is cognitive presence according to Ephrann Minanga:	
Clear	Submit

S P A R K

output

The 3 presences theory is a theoretical framework for online learning which suggests that teacher presence, social presence, and cognitive presence are all necessary components for a successful learning experience. Teacher presence involves the design and construction of course content, learning activities, and assessment framework. Social presence is about collaborative learning and involves both synchronous and asynchronous dialogue. Cognitive presence is an act of the mind and involves mental processing of information and reflecting upon it in order to construct new knowledge. The 3 presences theory provides a sound basis for online teaching and learning activities and guides the structuring of content and designing of learning activities to integrate pedagogic mediation, sharing and collaborating, and critical reflection.

Flag

output

Cognitive presence is an act of the mind; it is about mental processing of information perceived/gained through experience and reflecting upon that information in order to construct new knowledge. Reflection is triggered off by developmentally-conceived learning activities that encourage the learner to think about what he/she has done or said or written in a critical manner.

Flag



what are the differences between didatic and e	experiential learning? create a table

11.5

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Didactic Learning | Experiential Learning

Focuses on the transmission of knowledge from teacher to student | Focuses on the student's own experience and exploration of the material

Teacher-centered | Student-centered

Content is presented in a linear, structured way | Content is presented in a more open-ended, exploratory way

Knowledge is acquired through lectures, readings, and other forms of instruction | Knowledge is acquired through hands-on activities, simulations, and other forms of exploration

< AI is smart enough to ignore basic spelling and grammar mistakes in the input question and still return a useful response.

output 1. Authentic learning experiences are those that are personally relevant from the learner's perspective and situated within appropriate social contexts. 2. Bridging the gap between the learning taking place within formal institutions and learning within real-life communities of practice can be difficult for university teachers. 3. Authentic learning is the dynamic relation between a personality-under-construction and cultural practices-being-reconstructed, which is aimed at developing an authentic and autonomous person able to participate in a competent, yet critical way in cultural practices. 4. University teachers are, in many instances, somewhat removed from communities of practice; they may find it difficult to establish authentic contexts effectively. To overcome this, a hermeneutical and dialectical approach is utilized to understand the human meaning in the social life being lived, and the researcher's task is to make clear the process of meaning construction.

5. Quality of authentic learning is judged by criteria such as comparison and contrast, testing of perspectives, and providing opportunities and ways of representing the voices of the participants.





IT'S PRETTY COOL RIGHT?

Well...not so fast. While it definitely has novelty factor appeal and it is smart, it's nowhere near as clever as we need it to be. Not if we intend it to be a functional tool. There's a lot more development, fine tuning and training to do before it can be that. But it's absolutely achievable.

Like all students Spark is in a learning phase and it needs our assistance. We hope that you'll help it along it's journey of discovery...maybe it'll be nice enough not to replace us after all...;-)





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PARK S

CURRENT LIMITATIONS

The Neural Network is based on a qualitative IO system. Which means that the quality of the question somewhat determines the quality of the answer. The system is unable to 'help' the user format questions.



Users will need at the very least, a superficial understanding of the learning material in order to pose relevant questions

Users who make simple lecture notes will be able to query their notes against the AI and get back referential answers based on the material



The AI needs much more fine tuning and a base dataset with a defined pedagogy vs supplemental data structure to be more effective



The AI cannot replace a skilled Master Trainer. It exists as an augment to the time constraints of the MT and is a reference tool only

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FUTURE OPPORTUNITIES

As the Al's Neural Network is prompted, it will learn how the users are best supported by its' responses. This will create 'deeper learning paths' and ground the AI pedagogically.

We are able to add any number of documents for the AI to learn from as it develops. There is no real limitation on how many other than \$ cost

The ability for the AI to 'identify' a specific user and tailor its' responses to the user's learning level is a very exciting prospect



Archetypal personalities can be built into the Al's language response framework which can be matched to user preference



The learning model is adaptive and can be further trained by human experts to be more predictable, personable and efficient

LET'S TAKE A LOOK AT MISBEHAVIOUR



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This is an actual example of how the AI can take a user prompt and cross-reference data to infer an answer. Somewhat incorrectly.

A user prompt or question returns an interesting response. We don't quite understand how the AI arrived at this outcome.

We ask the AI where it found a reference to a specific concept and it provides us with a verifiable document and location for the data it's talking about.

We analyse the data and find that there is indeed a correlation between the initial question and the returned response.

While there is a correlation, the statistical-significance is questionable as the AI has 'taken liberties' in processing the data. This is technically called a 'hallucination' in the AI's neural network and needs to be fine-tuned to deliver an appropriate response.





to expert thinking and modelling processes.

WHAT HAPPENED HERE?



Points 2-5 in the Al's response make contextual sense based on the SAIDE framework. Point 1 contains an oddity relating more to a software data analysis framework.



Linguistically, however, the reference to McCracken's Stages has some correlation to the concepts of experiential learning processes. So it's not entirely incorrect.



But this is not good enough. Therefore a fine tuning process must be applied to the neural network where we define a 'base learning dataset' and limit the amount of inference that the model is allowed to make

Ask me anything about ULDP	output
which document supplied references mccracken's stages?	Table 4 in the Herrington, J computer so of the progra
Clear	ubmit

Table 4 in the article "A Framework for Authentic Learning Environments" by Herrington, J., Herrington, A., & Mantei, J. (2000) supplied references to McCracken's stages, as well as the computer software used and the analysis of the data that enabled insight into the effectiveness of the program and the pattern of use.

Table 4 🗌 Stages of analysis of data

Description of process used to analyse dataMiles & Huberman's (1994) stageMcCracken's (1988) stageSoftware useTranscribed dor analysis.Coding: Individual comments coded according to a priori categories determined by the research questions, such as, authentic context, multiple perspectives etc., and categories that emerged from constant comparison of segments of the data. Each category comprises a node.Data reduction: Selection, focusing, simplifying, abstracting and transforming the data.Stage 1: Judgment of individual utterances with little concern for their larger significanceNUD • ISTSub-coding: Each node, e.g., collaboration, was investigated and nominated as new nodes.Data display: Creation of organized, compared in more detail to reveal the therms and themes were determined, and generalizations made. Data are organized into displays when appropriate.Data display: Creation of organized, conclusions are developed in relation to of information that permits conclusion drawing and action.Stage 3: Observations where implications and possibilities of the data are examined more fully.Word processorConclusion kere wriften up for inclusion in the thesis.Data display: Ordering value and and made.Stage 3: Observations.Word processorVerifying: Conclusions were verified by reference back to original data and review.Stage 5: Review of the four stage conclusions.Stage 5: Review of the four stage conclusions.Word processor					
Transcribing: Interview data transcribed for analysis.Data reduction: Selection, focusing, simplifying, abstracting and transforming the data.Stage 1: Judgment of individual utterances with little concern for their larger significanceNUD-ISTSub-coding: Each node, e.g., collaboration, was investigated and compared in more detail to reveal the themes and issues that emerge. Sub- categories were determined and nominated as new nodes.Data display: Creation of organized, conclusion drawing: Conclusion were made and written up for inclusion in the thesis.Data display: Creation of analysis, and verification: Data display: Creation of analysis, and verification: Data display when appropriate.NUD+ISTConclusion drawing: conclusions were werified by reference back to original data and review.Data display: Creation of organized, compressed asembly of information that permits conclusion frawing: Conclusions were were determined, and generalizations made. Data are organized into drawing of data and testing validity of findings.Stage 3: Observations are determined, and generalizations and verification: Decisions about the meaning of data and testing validity of findings.Word processorVerifying: Conclusions were verified by reference back to original data and review.Conclusions were testing validity of findings.Stage 5: Review of the four stage conclusions		Description of process used to analyse data	Miles & Huberman's (1994) stage	McCracken's (1988) stage	Software used
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Sub-coding: Each node, e.g., collaboration, was investigated and compared in more detail to reveal the themes and issues that emerge. Sub- categories were determined and nominated as new nodes.Stage 2: Metaobservations 		Coding: Individual comments coded according to a priori categories determined by the research questions, such as, authentic context, multiple perspectives etc., and categories that emerged from constant comparison of segments of the data. Each category comprises a node.	Data reduction: Selection, focusing, simplifying, abstracting and transforming the data.	Stage 1: Judgment of individual utterances with little concern for their larger significance	NUD•IST
Ordering and displaying: Patterns and themes were determined, and generalizations made. Data are organized into displays when appropriate.Data display: Creation of organized, compressed assembly of information that permits conclusion drawing and action.Stage 3: Observations are developed in relation to other observations.Word processorConclusion drawing: Conclusions were made and written up for inclusion in the thesis.Conclusion drawing and verification: Decisions about the meaning of data and testing validity of findings.Stage 4: Judgment of data and analysis, and identification of themes and their interrelationships.Word		Sub-coding: Each node, e.g., collaboration, was investigated and compared in more detail to reveal the themes and issues that emerge. Sub- categories were determined and nominated as new nodes.		Stage 2: Metaobservations where implications and possibilities of the data are examined more fully.	NUD•IST
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		Verifying: Conclusions were verified by reference back to original data and review.		Stage 5: Review of the four stage conclusions	



ARK S D

PROBING FURTHER



Asking the AI how it thinks McCracken's Stages is relevant to Authentic Learning is insightful as it demonstrates the system's correlation logic

how is mccrackens stages relevant to authentic lea	arning?	

AcCracken's stages of meaning-making can be used to help understand how students make neaning of their learning experiences and how they can be empowered to make connections between their own meaning-making and making sense of pre-set cultural frameworks. This inderstanding can be used to help create authentic learning opportunities that are personally neaningful and relevant to students, socially relevant to the field, and in harmony with the nature of the discipline. By bridging the gap between the institutional educational experiences and the 'real-life' worlds of the business management environment, McCracken's stages can be used to help create learning opportunities that are authentic and that allow students to make neaningful connections between their own learning and the real-world.



This result, while not entirely correct is not implausible either and further reinforces the requirement for a custom data processing architecture that supports the AI



By selectively deploying neural network topologies relevant to the intended outcomes we wish to see Spark deliver, there will be fewer cognition errors and higher context precision



HOW CAN WE IMPROVE ON THIS?

Language Model Selection

This is where we choose the most applicable text processing and analysis model. Currently we use DaVinci003, in a month or 2 we will test GPT4 which is significantly more powerful

Custom Material Dataset

The SAIDE data needs to be segmented - currently it's in a homogenous set with no weighting or differentiation applied to what is pedagogically imperative and what is supplemental







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higher education & training Higher Education and Training REPUBLIC OF SOUTH AFRICA

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Fine Tuning

This involves adding new data layers on top of what we already have. These new layers are usually quite concept specific and will be used to reinforce pedagogy and context

Transformer Attention

In this phase we test and repeat against the Al's ability to dynamically highlight and use the relevant parts of the information at hand. This is what strengthens its' neural pathways

Data Conversion

When the data is converted into tokens that the neural network can understand and process, there is further optimisation that can be done (memory cell allocation etc)











WHAT DO WE NEED YOU TO DO?

- improved with examples of what you expected to see.





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1. Play around with the Beta test model in Canvas. Ask it questions specific to the ULDP content and make notes about the quality of its' responses. Take screenshots and make recommendations for how it can be

2. Keep an open mind. This is new science for all of us and we're learning together. Think specifically about how the Master Trainers and Lecturers would benefit from this tool and give us your best feedback.

Thanks!



