



FOUNTECH
THINKING ARTIFICIAL INTELLIGENCE

Artificial Intelligence in Educational Technology

Whitepaper

Yioupis Tower,
31, Agiou Ioannou Prodromou,
NO. 302, 4002, Limassol, Cyprus

ai@fountech.ai
www.fountech.ai
© 2019 Fountain Technology Ventures Limited

Prepared by the Fountech Team
25 October 2019

CONTENTS

Executive Summary	3
Introduction	3
Benefits Of AI-powered edtech	4
AI transforming teaching & learning practices	6
Non AI technologies	6
AI technologies	6
Understanding Learners' needs from student behaviour	8
From Aggregation to personalisation	8
True Hyper-Personalisation of Lesson delivery	8
Digital Interfaces	8
Fountech's AI EdTech Solutions	9
Abilities, Learning Styles, Teaching Delivery & assessment	9
ED-AI-01: 'Teachability' Score	9
ED-AI-02: Adaptive Learning Using Instant Insights For Learners	9
Marking, Assessment and Complaint Handling	10
ED-AI-03: Chatbot / Tutorbot	10
ED-AI-04: Plagiarism Detection	11
ED-AI-05: Tutor Content Validation & Curation	11
ED-AI-06: Classification	11
ED-AI-07: Summarisation	11
ED-AI-08: Template Generation	11
ED-AI-09: Mix-and-match Learner Styles	12
ED-AI-10: Emotional State Analysis of Students and/or Tutors	12
ED-AI-11: Lesson Plan recommendation	12
ED-AI-12: Automatic transcription	12
Potential Student recruitment and Lead Generation	12
ED-AI-13: Expedited Online Sign-up	12
ED-AI-14: Generating Potential Leads to Recruit Students / Teachers	13
Custom Solutions	13
ED-AI-XX: Custom Solutions	13
About us and contact details	14
The Fountech approach - Thinking AI	14
Get in touch	14
References	15
Icons	15

EXECUTIVE SUMMARY

This whitepaper from the team at Fountech.ai examines the impact that Artificial Intelligence (AI) driven solutions can have on the educational sector; how this technology can assist teaching and learning at every level, from basic literacy to postgraduate study.

Clearly, it's beyond the scope of this WhitePaper to analyse every piece of available EdTech software on the market in order to assess and review its efficacy. Rather, this document suggests how AI driven algorithms can be integrated into existing teaching and learning software and methods, to make huge improvements in learners' outcomes and institutions' achievements.

In this WhitePaper, Fountech have outlined and particularised how our AI solutions can benefit our potential customers, indeed they may even become our potential partners, in the Educational Technology sector. Our solutions can be integrated, adapted and supported by us, so that the inevitable necessity of entering this brave new world of AI can, and will, be smoother than one might think.

After reading this document, we will, naturally, be very keen to hear from anyone with questions or suggestions about how our technology can benefit teachers in their practice and / or learners in their studies.

INTRODUCTION

The word "**EdTech**" is defined by Wikipedia thus:

"Educational technology is the use of both physical hardware, software, and educational theories to facilitate learning and improving performance by creating, using, and managing appropriate technological processes and resources.

It encompasses several domains including learning theory, computer-based training, online learning, and where mobile technologies are used, m-learning."

Adoption of AI within EdTech has so far been slow, and despite the available possibilities, the 'one teacher, one voice, many ears' method still seems to be the mainstay of educational delivery. It's true that there is ample access to open learning resources in the first world, but such facilities are often expensive and only accessible if one is studying a formal online course. Even then, such resources are usually one way "published facts" as opposed to an interactive teaching & learning experience.

As the educational sector is currently built around the imparting of information, then testing the extent as to how successfully that information has been digested (i.e. teaching a syllabus followed by examinations or continuous assessment), Fountech's AI algorithms can transform that traditional process and theory, to make the facilitation of knowledge transfer so much more efficient than methods that have remained basically unchanged for generations.

EdTech empowers teachers to assist in the delivery of content, and for learners to access that content in a way that should suit their purposes. Integrating AI into this process shows great promise in providing quality tailored experiences; improving both the coverage and quality of any software provider's offerings, or indeed any institution's teaching capabilities, without increasing operational costs by employing more teachers.

This document is structured as follows:

1. **Benefits Of AI-powered EdTech** – An overview of AI's merits and power.
2. **AI transforming teaching and learning at many different levels** – How upcoming trends and technologies are disrupting the education sector.
3. **Fountech's AI EdTech Solutions** – What Fountech can offer to keep your company or organisation at the forefront of these changes, to become a proactive leader in the field, as opposed to a reactive follower.
4. **About us** – Fountech's goals, methodology and core philosophy.

BENEFITS OF AI-POWERED EDTECH

AI is capable of enhancing any type of business or organisation in any sector. Moreover, its wide variety of applications enables solutions in many educational domains; from private tuition through work-based training, on to schools and highly respected universities.

Below we provide an overview of the key advantages inherent in AI-powered EdTech:



Low Operational Costs and Risk

Integrating intelligent tools that automate repetitive and time-consuming tasks, such as reviews of teaching material content and basic marking of work. This reduces the rate of human errors and increases efficiency.



Increased Tutor Productivity

With task automation taking place, say for example marking test papers or assessing student questionnaires, tutors will be able to direct their efforts to more productive tasks, such as lesson planning and preparing teaching materials for the next session or for individual learners (see hyper-personalisation below).



Increased Learner Satisfaction

A learner's satisfaction with how well a lesson or subject has been covered plays a major role in effective teaching. Drop-out rates rise as dissatisfaction is experienced. Tutors can spend lots of time having to recommend resources to students, but Chatbots can assist with this process. A Chatbot can recommend courses of action, signpost resources, make appointments for tutorials and all manner of day to day tasks that are repetitive in nature.



Better Teaching Material Management

AI can automatically classify and cross reference documents based on content, subject, category and sub-category. Additionally, it can generate and suggest cross references: e.g. a black and white photograph of a team of tin miners from 1850 could be placed in the suggested learning materials catalogues severally for history, photography, geography and geology. This could be subcategorised further in the form of History >Social history of Britain > Victorian Industrial Era'; Photography > Industrial, Cornwall; Geography > Looe and N Cornish Coast; Geology > Cassiterite > Tin.



Teaching Methods Innovation

As less time and resources are spent on repetitive tasks, there will be more opportunity to create innovative delivery methods of teaching, which take much more effort to prepare and to draw up completely fresh lesson plans. For example, if a teacher's focus isn't taken up with hours of tedious marking, they can spend valuable time preparing lessons, using, say, virtual reality equipment.

Spending on AI integrated educational technology is certainly on the increase^{1&2}, and forecast to grow ever further. Two independent market studies predicted an EdTech spending growth in the USA alone of between 38 and 48 percent between 2018 and 2023 to around \$2 Billion. AI is clearly seen as a powerful force within education, in whatever various forms its integration might be taking. See the graphic below:

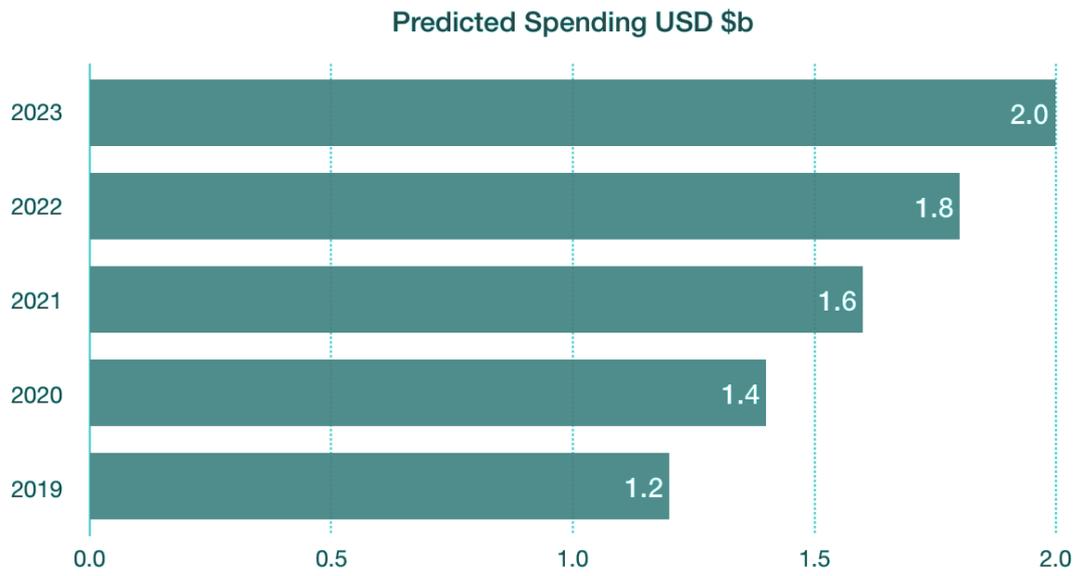


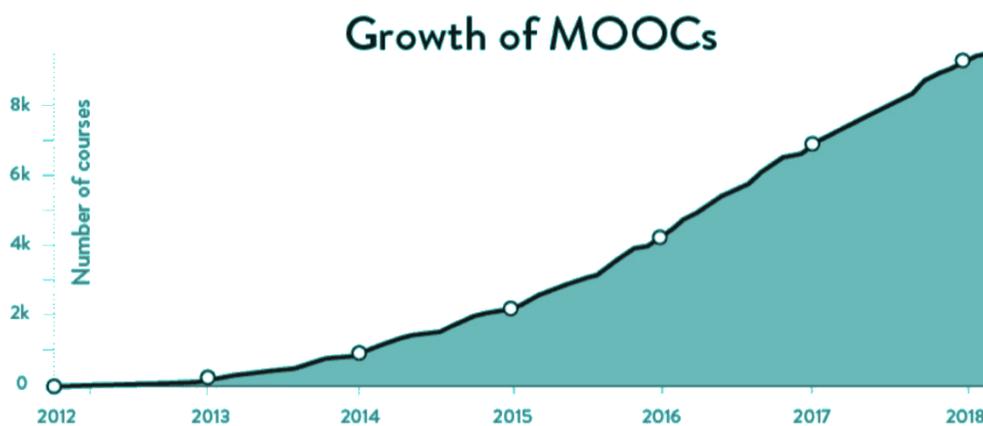
Figure 1: Estimated growth of spending, over the next few years, in Artificial Intelligence driven solutions within the Education Technology sector. Figure created based on information provided in references [1] and [2].

AI TRANSFORMING TEACHING & LEARNING PRACTICES

NON AI TECHNOLOGIES

The historically slow uptake of new technology within the educational sector might suggest that this is perhaps an arena slow to adopt change. Higher Education had been leading the way in distance learning with Massive Open Online Courses (MOOCs), which are now becoming commonplace from commercial educators. It's important to note that MOOCs don't tend to offer hyper-personalised, granular level interactivity, but rather bridge the gap of needing to physically attend lectures and physical institutions. It will only be a matter of time that MOOCs become a ripe venue for AI to become integrated.

According to ClassCentral.com³ MOOC uptake has been growing steadily since 2012 (see below graphic):



By the Numbers: MOOCs in 2017

Figure 2: The growth of Massive Open Online Courses between 2012 and 2018. The trend implies exponential growth. Figure adapted from [3].

There have been adoptions of certain technologies of course, video, audio etc, but crucially none of these involve hyper-personalization or autonomous learning by the teaching platform itself.

It's difficult to assess exactly why the uptake of AI's potential into EdTech has been so slow, we could conjecture that public sector institutions are cash starved and slow to respond to changes due to the committee like nature of their governance. Nobody expects large institutions to embrace change in the same way that a tech startup would adopt new practices, however Universities are supposed to be the trailblazers of fresh ideas.

Change is afoot, however. A recent UK government incentive offering funds for AI in education has been welcomed by the Vice Chancellor of Buckingham University. According to the website edtechnology.co.uk⁴

"£18.5 million will be available to boost diversity in AI technology and innovation and online training for adults, is to be welcomed. Up to £13.5m of the new funding will be for an extra 2,500 AI and data science conversion degrees, with 1,000 scholarships for people from underrepresented groups. The other £5m will drive innovation in adult online learning."

AI TECHNOLOGIES

With the increased use of AI in the education sector, it's clear that (eventually) new innovative models are being developed which are creating contemporary trends. Established providers are using AI to some extent in attempting various degrees of personalisation in learning. A chart from our own analysis of some market leaders is included below:

MARKETPLACE ANALYSIS

Platform Name	Feature 1	F 2	F 3	F 4	F 5	F 6	F 7	F 8	F 9	F 10	F 11	F 12	F 13	F 14	F 15	F 16	Score %	Notes / URL
Squirrel AI	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	50	http://squirrelai.com
Century Tech	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	38	https://www.century.tech/
Mindojo	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	38	mindjo.com
Byjus	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	25	https://byjus.com/
Area 9 Lyceum	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	25	https://area9lyceum.com
Toppr	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	25	https://www.toppr.com
New Assisments org	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	19	https://new.assisments.org/ *Feature 8 doesn't use AI
SmartSparrow	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	19	https://www.smartsparrow.com/
Word Dive	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	19	https://www.worddive.com
Aleks	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	19	https://www.aleks.com
Carnegie Learning	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	13	Classroom based https://www.carnegielearning.com
Dreambox	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	13	http://www.dreambox.com/
Inqits	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	13	http://www.inqits.com/
Web for classrooms	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	13	https://webforclassrooms.com/
Cogbooks	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	13	Classroom based - cogbooks.com
Alef Education	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	6	Classroom based https://alefeducation.com
Realize It learning	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	6	Very sparse info from website: http://realizeitlearning.com/
Self Study.com	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	6	Content curation only? https://selfstudy.com
Alta	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	0	https://www.alta.org/education/model-training-program.cfm
KEY to features																		
Feature 1	Indefinite free access at some level																	
Feature 2	For everyone - Available anywhere there is internet																	
Feature 3	Hyper-personalized 1 to 1 teaching & learning																	
Feature 4	Wider taxonomy than just two or three specialist subjects																	
Feature 5	Contact / Chat with peers and mentors																	
Feature 6	Constantly self learning AI from accredited sources																	
Feature 7	Completely unique, interactive lessons for each user																	
Feature 8	AI real-time assessment																	
Feature 9	Sentiment Analysis																	
Feature 10	Contextual cross referencing from dynamic resources																	
Feature 11	Microlessons available																	
Feature 12	Tutor assessment & registration																	
Feature 13	Learners become tutors as they score highly																	
Feature 14	Teach, learn and earn																	
Feature 15	Audio recognition and transcription																	
Feature 16	Multi Language																	

UNDERSTANDING LEARNERS' NEEDS FROM STUDENT BEHAVIOUR



Wearables and telematics such as smart devices, watches, sensors, mobile phones, cameras and microphones can all be used to capture data about a student's interaction with a lesson and the effectiveness of materials and delivery.

detected.

By using student engagement classifiers, the tutor can assess student understanding from instant testing and sentiment analysis, adjusting teaching methods in real time. This technology can also be used to point out to teachers that a particular student requires their attention if changes are suddenly

For example, if a student is presented with a long page of bullet-pointed textual content, they may find this more or less digestible than a series of images in a 'slide show' or a voice delivery of the salient lesson content. In this case, 20 students, wearing headphones, could be sitting in front of screens in the same room, and the AI would detect from heart rate, tone of voice, interaction with the materials by tapping the touch screen etc, which learners would best be presented with the same information in different forms. 15 students might be watching a slide show with a voiceover, three students might be reading text, and two purely listening to audio content.

FROM AGGREGATION TO PERSONALISATION



Considering the above, educational technology providers may be able to effect ground-breaking changes in the way that they can assess the effectiveness of their materials and delivery. This can involve shifting from aggregation of data from many, to sensors that can provide real time data from the individual, thereby enabling either hyper-personalised content (see immediately below), or partially adjusted content to address the needs of a various groups streamed by ability and optimum delivery style.

Instead of spending time preparing materials to mixed ability groups, AI can categorise learners either broadly, narrowly or individually, using sensor data and instant feedback, enabling considerable advances in learners' cognitive levels.

TRUE HYPER-PERSONALISATION OF LESSON DELIVERY



Taking into account the above methods of assessing a learner's cognition, sentiment and overall success in learning outcomes, the ultimate (and very easily achievable) logical conclusion of this technology is the ability to use AI driven tutor-bots. These bots will be tireless one-on-one tutors, which can assess exactly the best content and delivery method through real time assessment.

As above, using sentiment analysis, micro-lessons, virtual reality and whatever is at the learner's disposal in terms of technology, one-on-one 'tutorbots' will improve outcomes exponentially from the traditional 'one teacher, one voice, one message, many (deaf) ears' methodology.

DIGITAL INTERFACES



Registration, qualification documentation, course enquiries and administrative communications can now be managed using digital interfaces. Physically meeting with students and handling paper documentation for anything other than teaching, learning or emotional counselling will most likely become redundant in the near future.

Most, if not all, administrative and financial processes can now be performed online by web or mobile applications. Moreover, the use of digital interfaces for student customer service enables chat-bots and smart sensors, encouraging further innovation. This has been proved by the proliferation of various iSaaS (Software as a Service) models over the last few years, where whole business models in all walks of industry and finance are built around specific, more commonly, mobile application interfaces, which incorporate AI for process automation.

FOUNTECH'S AI EDTECH SOLUTIONS

Fountech offers a range of AI powered EdTech solutions. Through numerous iterations and continuous feedback, AI can learn and refine its abilities over time, unlike traditional, hard-coded software.

Based on your institution's or company's area of expertise and specialisms, you can combine any number of the products below to create your own, perfect-fit EdTech solution. Should you require any functionality not listed here, Fountech can create customised elements on request.

ABILITIES, LEARNING STYLES, TEACHING DELIVERY & ASSESSMENT

Assessing ability levels, barriers to learning, learner styles, group interactions, personalities and interests all impact on successful learning outcomes. Educationalists and tutors can derive insights from individual students' historical data then combine it with newly obtained information to determine optimal teaching methods for groups and individuals. Automating this process will enable better resource allocation and eliminate any unintentional bias or inappropriate teaching delivery methods.



ED-AI-01: 'TEACHABILITY' SCORE

Each new learner can be assigned an ongoing, real-time, dynamic 'teachability' score based on previous performance, accreditation of prior learning, previous qualifications, previous research, age, IQ, aptitude, subject strengths, type of qualification worked towards etc. Scores will be accompanied by a paragraph indicating the factors influencing the overall score, for a more detailed explanation of findings. The tutor can consult that score when deciding on whether to proceed with a particular teaching technique or when preparing lesson plans, perhaps grouped by individuals within a certain score band.



ED-AI-02: ADAPTIVE LEARNING USING INSTANT INSIGHTS FOR LEARNERS

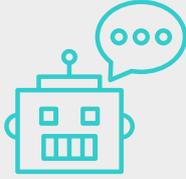
Using 'teachability' scores, combined with system-generated suggestions, these same scores can be displayed as benchmarks to show positive improvements or need to address weaknesses by suggesting insights to learners. This can guide students as to where their strengths lie and where best to concentrate their efforts.

For example, a student learning about history might score say, 68% on that subject after submitting a particular essay for marking. The score might identify that the student's grasp of historical events is strong and accurate, but their essay doesn't demonstrate that they understand the inter-relationship, the cause and effect of such a list of facts.

They might then be prompted to spend some time learning how to structure essays before writing an essay's content. The system would suggest to the learner that their efforts should be concentrated on understanding how to structure an argument just as much as putting effort into factual research.

After a change of strategy, re-submission of the essay might improve the score by, say, 10 %, indicating that the strategy is working. This score and suggestion process would be in real-time, after every submission of a micro lesson or whatever, not needing human intervention unless the system recognised that any suggestions might be beyond its remit.

MARKING, ASSESSMENT AND COMPLAINT HANDLING



ED-AI-03: CHATBOT / TUTORBOT

Students' learning outcomes are greatly improved when they are empowered to vocalise their issues, be understood, and be provided with efficient solutions.

Accurate assessment of a learner's progress is paramount in maintaining learner outcomes for any institution or teacher. If a learner (or indeed their parent) feels that the assessment is unfair or inaccurate, steps must be taken to address the cause of the issues and suggest a positive strategy. AI can streamline this process highly effectively, understanding user questions based on content, creating responses by content understanding, navigating conversation until resolution or passing off to human operator.

Natural Language Processing (NLP) AI algorithms enable the development of conversational machines, able to communicate with people via text or speech. AI-powered chat-bots can be quite versatile and are quickly becoming the new standard interface for interaction engagement. Using our AI chat-bot, all student messages and queries can be promptly handled, 24/7. Routine processes, like acquiring basic details, updating databases or answering basic questions are now delegated to the chat-bot, freeing human resources. The chatbot can be built in such way that it understands when demands cannot be handled and redirect the query to human tutors or administrators.

Perhaps surprisingly, chatbots are becoming more popular as a way of the general public communicating with companies and institutions. This is probably because chatbots are becoming more efficient and voice calls take ever longer to be answered by over-subscribed call centres.

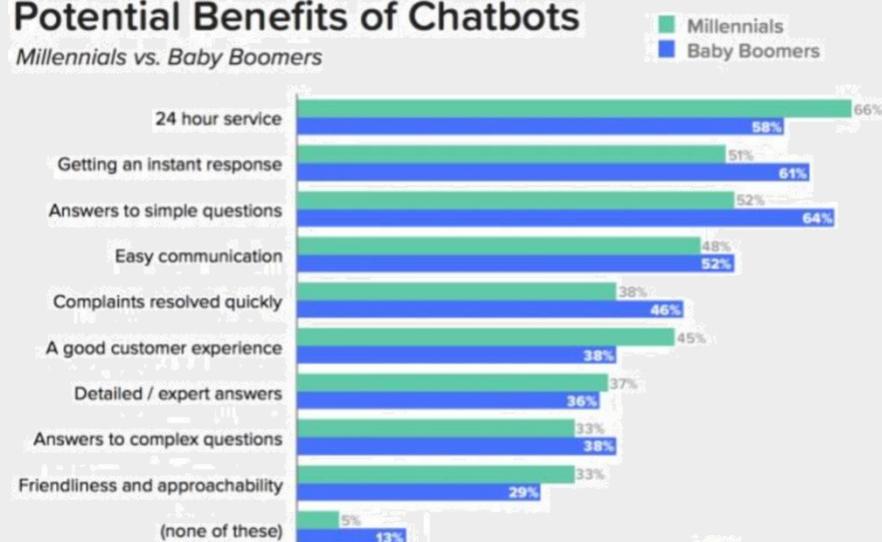
The USA based online marketing consultancy 'convincedandconvert.com'⁵, claim that "Chatbots Are Equally Popular Among Millennials and Baby Boomers" and furthermore that "37% of Americans would use a chatbot to get a quick answer, [even] in an emergency."

Finally, the chatbot solution can be interfaced with many of the other modules described here. For example, the chatbot can be combined with sentiment analysis (ED-AI-10) to understand a person's emotional state, be able to provide recommendations (ED-AI-02) or provide a call transcript (ED-AI-12) to human operators.

So it would seem that chatbots are becoming more and more accepted cross-generationally. As they become more efficient, and actually achieve desired outcomes, that might be fairly unsurprising. The website's graph is included below for reference:

Potential Benefits of Chatbots

Millennials vs. Baby Boomers





ED-AI-04: PLAGIARISM DETECTION

Fountech can utilise AI to assist plagiarism detection software by algorithms that search a myriad of source material. These look not only for word order, repetition and content but can even detect re-hashed, copy-pasted content; they use a complex technique originally designed for 'latent semantic indexing' (LSI - an algorithm intended for website search engine optimisation). LSI works by detecting word or sentence co-occurrence/proximity. When reviewing a single document it can be at the level of sentences or paragraphs.

LSI can help to point out whether two documents share similar co-occurrence, then, another software module can detect and / or decide upon plagiarism; for example using cosine similarity between specific sentences and setting thresholds to how similar something must be to call it plagiarised, accounting for (acceptable) paraphrasing practices.

It goes without saying that direct plagiarism, and even entire essays written by 'professionals' on crib websites, do no good for genuine knowledge transference, so spotting such behaviour by a learner not only allows action to be taken, but also flags up other issues. If a learner is cheating or skimming, what is the reason behind this? Motivation? Ability? Such issues are extremely important to detect.



ED-AI-05: TUTOR CONTENT VALIDATION & CURATION

Learning materials can be assessed for accuracy against given standards. For example, a tutor might have unintentionally provided invalid information within documents. Optical character recognition (OCR) in collaboration with named entity recognition (NER) can be used to convert data to digital text and assess the contents of the provided documents before the teaching material is approved. Missing information and expired or non-applicable documents can be detected by the AI.



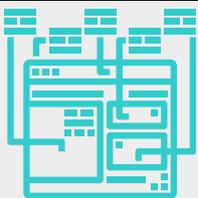
ED-AI-06: CLASSIFICATION

AI technology can identify keywords such as names, places, and other important terms in documents. By cross-referencing the discovered entities with libraries created specifically for learning materials, documents can be classified based on subjects and categories (as mentioned further above in 'teaching material management'). In addition, information needed to perform database queries like dates, locations etc. can be extracted automatically enabling tutors and administrators to seamlessly classify and retrieve documents.



ED-AI-07: SUMMARISATION

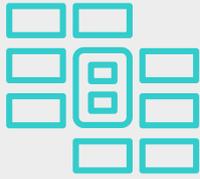
Lengthy documents such as essays, WhitePapers and dissertations can be summarised after assessment to the desired length while keeping the context intact, allowing quick overviews for subsequent reference. Additionally, the summarisation module can be developed with more features, such as enabling the reviewer to apply filters or to specify what information they want displayed. This can prove useful in a lengthy dissertation, where only the key points are needed while all the peripheral and opinion-based information can be filtered out.



ED-AI-08: TEMPLATE GENERATION

Learning material templates, based on lesson plan content, can be automatically generated. AI can be fed a set of documents and prepare questions to be answered by a learner.

The user will also have the option to choose which sections or types of procedures and / or content to include. Additionally, these templates can be filed automatically if needed by subject and / or category (see CLASSIFICATION module).



ED-AI-09: MIX-AND-MATCH LEARNER STYLES

Often learners respond well to the same lesson content delivered in different ways. Allied with the hyper-personalisation techniques and concepts mentioned further above, tutors can mix and match teaching delivery strategies by a given group of students, or indeed, at granular level opt for a bespoke delivery method.

Thus, the AI can present identical content in audio, audio visual, virtual reality, or simple text and infographics at will. Lesson plans can be honed for groups of learners by 'teachability' score (see further above) and other factors.



ED-AI-10: EMOTIONAL STATE ANALYSIS OF STUDENTS AND/OR TUTORS

Sentiment analysis algorithms can be used during various communications to analyse speech patterns, voice tone and word choices to determine a person's emotional state, providing additional insights to tutors and / or administrators.

The AI can give advice to people in real time on how to approach the conversation, e.g. whether they should change their speech pace or give the other party room to talk. Additionally, this technology can be extended to detect someone's intent, by spotting keywords corresponding to certain sentiments, perhaps providing indicators of potential course drop out or perhaps the desire to instigate formal complaint procedures.



ED-AI-11: LESSON PLAN RECOMMENDATION

By deriving insights about learners' needs and determining factors affecting teaching styles, this module can suggest micro lessons that are most suited to individuals and most likely to be successful for learning outcomes.

This technology can also help with targeted student and staff recruitment for an institution. When approaching prospective people, it can immediately offer suitable and attractive packages or learning outcomes.



ED-AI-12: AUTOMATIC TRANSCRIPTION

In cases where people must interact with human call administrators and tutors, AI can be used for automatic transcription of conversations, be they admin or lesson related. By converting speech to text, phone calls and audio interactions are stored in text form and may be later analysed using various Natural Language Processing (NLP) methods to provide insights. For the sake of accountability and clarity, automatic transcriptions also keep a textual record for legal purposes.

POTENTIAL STUDENT RECRUITMENT AND LEAD GENERATION

Virtually all educational institutions are now, to some extent, regarded as businesses. Private institutions are clearly of that nature; even those that are purely public-sector funded, league tables and/or good examination results are of paramount importance. Whether it's to attract new learners or even to pass governmental standards in order to remain in existence as a provider of teaching, must provide a high quality level of outcomes for all stakeholders, not least the students whose futures depend upon that success. Fountech can create a student recruitment solution to attract the desired nature of learners, by ability, catchment area or whatever.



ED-AI-13: EXPEDITED ONLINE SIGN-UP

Identification methods such as facial recognition, biometrics and passport/ID can be used to quickly on-board users and to create new profiles or update existing ones. This enables learners to quickly sign up for new courses, be in touch with staff, and have immediate access to their own profiles, marks and materials.



ED-AI-14: GENERATING POTENTIAL LEADS TO RECRUIT STUDENTS / TEACHERS

Companies and institutions from all sectors can benefit from AI's ability to simulate human logic and combine it with high processing power in order to identify the best 'leads' or target recruitment in the shortest time. The scattergun approach is unreliable. Techniques such as spending money on ads that don't reach the target market, cold calling, or manually going through e-mails and call logs trying to uncover information about potential recruits is, at the very least, time consuming and inefficient.

However, with the use of AI, lead generation becomes seamless, organisations can focus their resources on targeted assets or people. AI can analyse existing peoples' details such as: age, profession, income, assets etc., and match them to a required profile. Thereafter, the massive amount of raw lead-data can be analysed quickly, filtering out poor matches. Using feedback, such as acceptance or rejection of recruitment offers from leads, the model can improve over time by continuously updating and refining various selection criteria, thus, requiring minimal maintenance.

CUSTOM SOLUTIONS



ED-AI-XX: CUSTOM SOLUTIONS

With our expertise, there's very little that can't be done. We're very keen to talk to education professionals about automation of anything that they might find onerous, repetitive, routine, and labour intensive.

The sky's the limit, as far as we're concerned. So, if there's something not covered above that you've always wanted to perform more efficiently, please get in touch with us.

ABOUT US AND CONTACT DETAILS

Fountech is an Artificial Intelligence (AI) think-tank. We have designed AI solutions for a variety of industries, such as automotive insurance, hospitality, sales lead generation, energy arbitrage and supply, global educational technology and much more.

Our press coverage is well established, as we are a worldwide authority on AI integration and design, having worked in the USA, Europe, Asia and the Far East. We are regularly featured and referenced in international publications, as seen in our [media summary](#). You can also view or sign up to our [newsletter](#).

We provide seemingly simple solutions (even though they really are not!) to complex business problems using Big Data and disruptive technologies. To find out more about Fountech generally, please visit our website; <https://www.fountech.ai> or download our [e-brochure](#). To find out more about our methodology when we work with customers, please see [our methodology overview](#).

We would love to connect with you on [Twitter](#), [LinkedIn](#) and [Facebook](#).

THE FOUNTECH APPROACH – THINKING AI

Creation, application and integration of AI is part of what we do. Our experience and expertise enable us to identify ways we can empower your company by analysing your needs and proposing custom AI applications that are most suitable to you, rather than relying on text-book solutions. In this context, “we don’t just apply AI, we think it”.

Fountech know how to integrate technology into businesses because we understand primarily that return on investment is as crucial as providing an efficient solution to a given problem. Fountech’s CEO and serial entrepreneur, Nikolas Kairinos, has taken numerous tech start-ups from a zero balance sheet to having raised millions in investment capital; consequently, we understand the concept of bridging the gap that sometimes exists between technical and business people, to create products that return tangible results.

GET IN TOUCH

We are keen to hear from those interested in using our services to put themselves ahead of their competition. We often work by answering your – “*What if we only knew...?*” question, where the answer would revolutionise your profitability and your customers’ experiences. Every time you learn new ways about putting your business forward, so do we. That’s why we’re so keen that you ask us your burning question, So, don’t hesitate, why not **contact us right now for an absolutely obligation-free initial consultation**:

ai@fountech.ai

“You don’t just learn AI; you need to think it.”
– Nikolas Kairinos, Fountech.ai CEO

REFERENCES

- 1) Market Research Future: <http://bit.ly/Ed-Tech-FT-01>
- 2) Research & Markets report: <http://bit.ly/Ed-Tech-FT-02>
- 3) Class Central - MOOCS statistics: <http://bit.ly/Ed-Tech-FT-03>
- 4) Ed Technology UK, Bucks Uni feature: <http://bit.ly/Ed-Tech-FT-04>
- 5) Convince & Convert Marketing Consultancy - Chatbot study <http://bit.ly/Ed-Tech-FT-05>

ICONS

Icons from www.flaticon.com are licensed by [CC 3.0 BY](https://creativecommons.org/licenses/by/3.0/). Authors: [Freepik](#), [Pixelmeetup](#), [Kiranshastry](#), [geotatah](#), [eucalyp](#), [srip](#), [photo3idea-studio](#), [smashicons](#), [bogdan-rosu](#), [phatplus](#), [mynamepong](#). Icons from thenounproject.com: Authors: [Angela](#).